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BOMBAY NATURAL HISTORY SOCIETY.

EDITED BY

R. A. SPENCE, M.L.A., F.Z.S., B. C. ELLISON, C.M.Z.S., S. H. PRATER, C.M.Z.S.

VOL. XXVII.

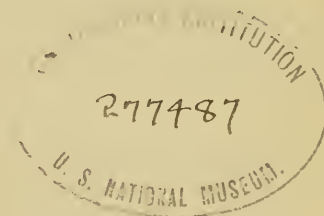
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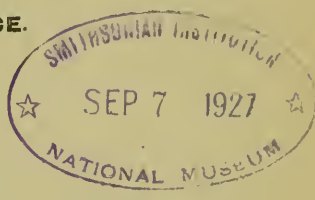
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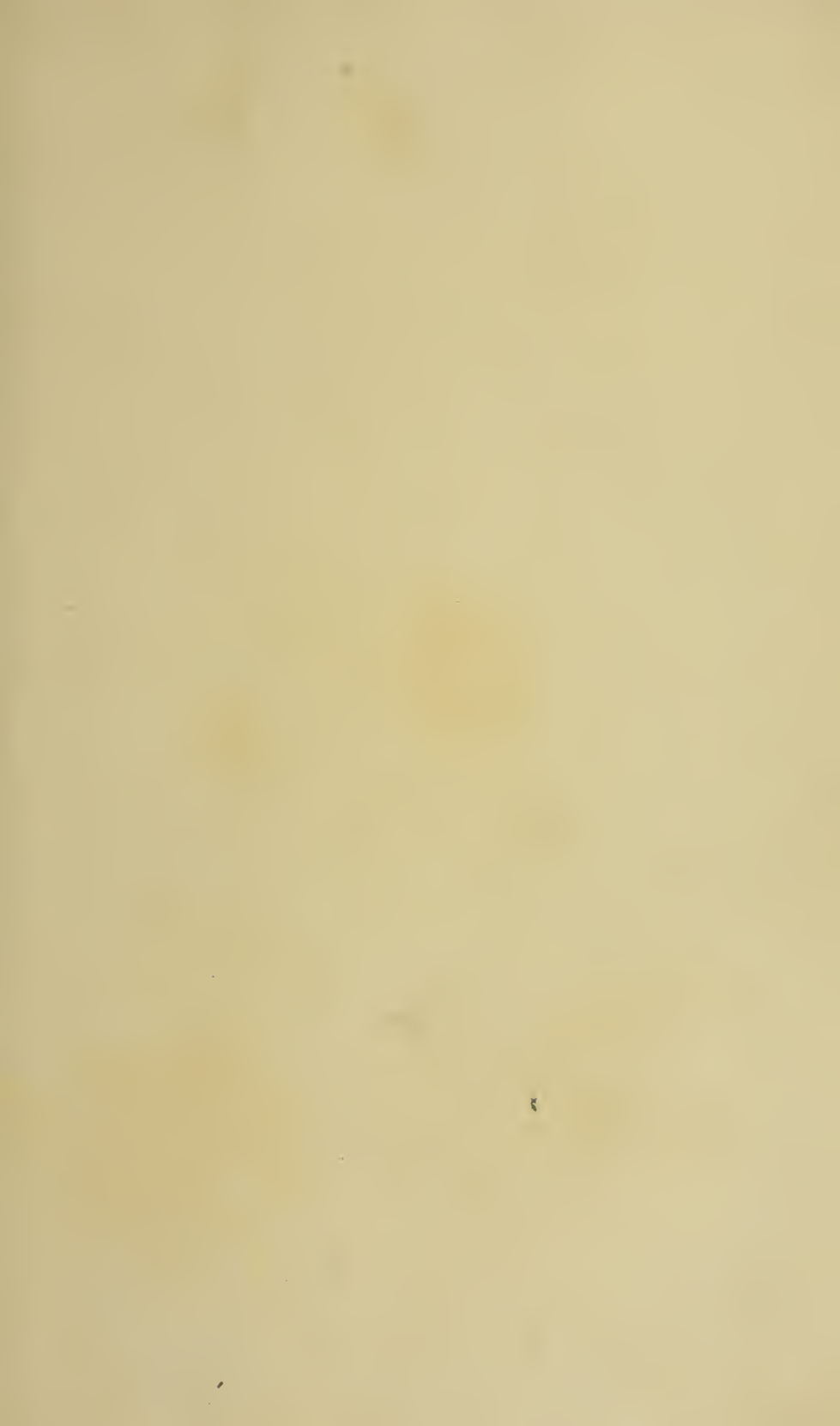
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GALLOPERDIX BICALCARATA.

The Ceylon Spur-Fowl.

♀

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JOURNAL OF THE Bombay Natural History Society.

JULY, 1920.

VOL. XXVII.

No. 1.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XXIX.

With a Coloured Plate.

(Continued from page 906 of Volume XXVI.)

Genus—GALLOPERDIX.

GALLOPERDIX SPADICEA SPADICEA.

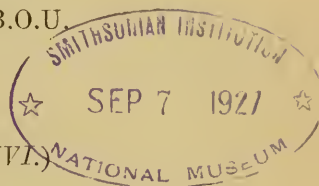
The Red Spur-Fowl.

The genus *Galloperdix* contains a group of small game-birds entirely confined to India and Ceylon. In general appearance they are half-way between the Jungle-Fowl and the Partridges; they have the general carriage of small hens, but their tails, though much longer than those of the Partridges, are carried in the same manner, and not erect as in the true Jungle-Fowl.

The moult of the tail feathers is not as yet known, so for the present I propose to retain these birds amongst the *Perdicinae* or Partridges, though in many ways they show a close affinity to the *Phasianinae*.

The wing is short and rounded, the first primary the shortest, and the fifth or sixth longest or equal. The tail consists of fourteen feathers, slightly graduated, and about two-thirds, or rather more, the length of the wing. The tarsus is long and stoutly built, and has two, three, and rarely even four spurs, the numbers on the two legs often being unequal. Even the female usually has a spur on either leg, and often two on one or both of them.

There is no wattle or comb as in the Jungle-fowl, but there is a naked space round the eye of a dull brick-red colour, which becomes markedly brighter in the breeding season.



There are three known species of this genus, and it is further necessary to sub-divide one of them, *G. spadicea*, into three races which are easily distinguished from one another and of which each occupies a well-defined area.

I adopt Blanford's key as it stands, as no better can be made.

Key to Species.

- A. Two or three spurs on each tarsus.
 a. Breast chiefly chestnut or rufous ... *G. spadicea* ♂
 b. Breast buff with black spots ... *G. lunulata* ♂
 c. Breast chiefly white ... *G. bicalcarata* ♂
 B. Rarely more than one spur on one leg
 and two on the other.
 d. Breast chestnut with black tips to feathers *G. spadicea* ♀
 e. Breast ochreous brown ... *G. lunulata* ♀
 f. Breast chestnut without black tips to
 feathers ... *G. bicalcarata* ♀

GALLOPERDIX SPADICEA.

Key to Sub-Species.

- A. General colour chestnut, crown brown ... *G. s. spadicea* ♂
 B. General colour very bright chestnut, crown
 blackish ... *G. s. stewarti* ♂
 C. General colour greyish chestnut paler every-
 where ... *G. s. caurina* ♂
 D. Above grey with only faint rufous tinge ... *G. s. spadicea* ♀
 E. Above rufescent grey and darker generally. *G. s. stewarti* ♀
 F. Very pale with no rufous tinge ... *G. s. caurina* ♀

The Red Spur-Fowl was originally described from Madagascar into which island it had apparently been introduced from India. Gray (Ill. Ind. Orn. II., pl. 42) describes the bird as being the "Kokee-tree of the Mahrattas". His *Polyplectron northice* is described from a female, but no locality is given, and, finally, Blyth's *Galloperdix spadiceus* is described as coming from Central and South India. We may therefore fix the type locality as Ootacamund in the Nilghiri Hills of South Central India.

GALLOPERDIX SPADICEA SPADICEA.

The Red Spur-Fowl.

La Perdix rouge de Madagascar,—Sonnerat, Voy. Ind. Orient. ii., p. 169 (1782).

Brown African Partridge,—Lath, Gen. Syn. pt. ii., p. 759 (1788) (Madagascar.)

Tetrao spadiceus,—Gmel. Syst. Nat. 1, pt. ii., p. 759 (1788) (Madagascar)

Perdix spadicea,—Bonnat. Tabl. Encycl. Meth. 1, p. 208 (1791) (Madagascar); Temm., Pig. et Gall. iii., p. 315, 719 (1815) (Madagascar), Less.; Traite 'd' Orn., p. 504 (1831) (Senegal); Gray, in Griffith's ed. Cuv. iii., p. 47 (1829) (Madagascar).

Francolinus spadiceus,—Gray, III. Ind. Orn. ii., pl. 42, fig. 2 (1834).

Polyplectron northiae,—Gray, III. Ind. Orn. ii., pl. 43, fig. 1 (1834) (female).

Ithaginis northiae,—Gray, List of Birds pt. iii., Gall. p. 32 (1844).

Ithaginis madagascariensis,—Gray, (nec. *Tetrao madagarensis*, Scop.) List of B. pt. iii., Gall. p. 32 (1844); id. Gen. B. iii. p. 504 (1846).

Galloperdix spadiceus,—Mc. Master, J. A. S. B. xl., pt. 2, p. 215 (1845); Blyth, Cat. Mus. As. Soc., p. 241 (1849) (C. and S. India); Gould, Birds Asia, vi., pl. 68 (1854); Jerdon, Birds of India, iii., p. 541 (1863); Hume, Nests and Eggs, Ind. B., p. 532 (1873); Fairb., Str. Feath. v., p. 409 (1877) (Palani Hills); Ball, Str. Feath. v., p. 418 (1877) (Mahanadi and Godaveri Rivers); Marshall, Birds' Nests Ind., p. 59 (1877); Hume & Marshall Game B. Ind. 1, p. 247, pl. (1878); Davidson and Wendon, Str., Feath. vii., p. 87 (1878) (Deccan); Ball, Str. Feath. vii., p. 225 (1878) (Ganges to Godaveri); Vidal, Str. Feath. ix., p. 76 (1880) (S. Konkan); Butler, Str. Feath. ix., p. 422 (1880) (Deccan and S. Mahratta Country); Davidson, Str. Feath. x., p. 316 (1882) (W. Khandeish); Davison, Str. Feath. x., p. 410 (1883) (Nilghiris, Wynaad and Mysore); Swinhoe and Barnes, Ibis, 1885, p. 131 (Central India); Taylor, Str. Feath. x., p. 1164 (Manzurabar, Mysore) p. 531 (1887) (Orissa); Terry, Str. Feath. x., p. 479 (1887) (Palani Hills); Barnes, Birds Bombay, p. 305 (1885); Oates, ed. Hume's Nests and eggs iii., p. 423 (1890); Davidson, J. B. N. H. Soc. vi., p. 340 (1891) (Kanara); Sharpe, J. ibid. ix., p. 487 (1895); (Coonor); Davidson, ibid. xii., p. 63 (1898) (Kanara); Dewar, ibid. xvi., p. 495 (1905) (Madras).

Hepburnia spadicea,—Hartl., Orn. Beits. Madag. p. 68 (1861) (Madagascar).

Ithaginis spadiceus,—Gray, List. Gall. Brit. Mus., p. 47 (1867).

Galloperdix spadicea,—Blyth, Ibis, 1867, p. 157 (Oudh, Gorakhpur); Elwes, Ibis, 1870, p. 528 (Cardamum Hills); Blanford, Journ. A. S. Bengal xxxviii., pt. ii., p. 189; Ogilvie-Grant, Cat. Birds B. M. xxii., p. 261 (1893); id., Man. Game B. 1, p. 206 (1895); Blanford, Faun. Brit. Ind. iv., p. 106 (1898); Oates, Mon. Game Birds Ind. 1, p. 215 (1898).

Hepburnia spadiceus,—Ball, Str. Feath. ii., p. 426 (1874) (Chota Nagpur), iii., p. 294 (1875).

Galloperdix spadicea,—Oates, Cat. Birds Eggs Brit. Mus. 1, p. 49, pl. iv., fig. 4 (1901) (Egg).

VERNACULAR NAMES.—Chota Jungli Murghi (*Hin. Cent. Provinces*, &c.); Chakotri, Kokatri (*Mahr. Syhadri Range*); Kustoor (*Mahr. Deccan*); Sarawa-Koli (*Tamil*); Yerra-Kodi, Jita-Kodi (*Tel.*)

Description.—*Adult Male.*—Crown and nape dark brown shading into pale brown on the hind neck and into sandy brown or buff on the forehead. Upper back, scapulars and inter-scapulars rufous chestnut, each feather margined with pale greyish-brown; lower back, rump and upper tail-coverts chestnut, finely vermiculated with broken bars of black; visible portions of tail the same, but the inner webs blackish on all but the central pair of rectrices and almost entirely black on the outermost.

Median and greater wing-coverts like the lower back, and lesser wing-coverts like the upper back; quills dark brown, the outer secondaries with chestnut buff mottling on the outer webs, and inner secondaries like the lower back; under aspect of wing lighter brown.

Below, chin whitish-brown, grading into silvery brown on the cheeks, ear-coverts, and sides of the throat; breast, flanks and

abdomen above vent chestnut, each feather margined with pale chestnut buff; thighs, vent and posterior flanks dull brown; under tail-coverts brown, or chestnut brown, vermiculated with black.

The sparse feathers on the naked part round the eye are dark brown, but hardly show except in a fine line under the lower eyelid.

Individuals, both of typical specimens of *spadicea* and of its two races, have a few of the feathers of the breast with grey centres, which, as Ogilvie-Grant has pointed out, appear to be indicative neither of age, locality nor season.

Colours of Soft Parts.—Iris yellow, yellowish brown or dull hazel brown; naked skin round the eye brick-red, dull and often somewhat livid in the non-breeding season, but brighter and redder in the breeding season; bill horny-brown, reddish at the base and paler on the lower mandible; legs generally reddish brick, often reddish-brown, sometimes almost reddish-yellow or, very rarely, with a faint greenish tinge; spurs dull horny brown.

Measurements.—Wing from 145 to 166 mm., average 32 specimens, 156.1 mm.; tail from 123 to 147 mm., average 137.5 mm.; tarsus from 48 to 52 mm.; bill from front about 20 mm., from gape rather over 25 mm.

Adult Female.—Forehead sandy brown, changing to brown and blackish-brown on crown and nape; neck dark brown. Back, scapulars and wing-coverts grey or sandy, rarely with a faint rufous tinge, each feather with two bold bars of black; rump and upper tail-coverts the same, but with less black and, generally, a more rufous tinge; tail blackish, the central feathers with mottled bars of buff or rufous, decreasing in extent until they only form a mottled edging to the outermost.

Chin and throat almost white, changing to dirty pale brown on foreneck; breast and flanks rather pale chestnut rufous, each feather with a terminal band of black, lessening in extent towards the vent; the posterior flanks often mottled with black in addition to the bars; vent and under tail-covert dull brown, the latter mottled with black and rufous or sandy.

The extent of the black on the lower parts varies considerably, in some the extreme upper breast and anterior flanks being very heavily barred. Wing-coverts and innermost secondaries like the back; primaries and outer secondaries amber brown.

Colours of Soft Parts.—As in the male, but the bare skin round the eye is duller and less clear a red, and the legs never become so red as they do in some breeding males and often are more brown or even greenish-brown.

Measurements.—Wing from 134 to 163 mm., average of 24 specimens 150.1 mm.; tail from 118 to 146 mm., average 129.1 mm.; tarsus 45 to 49 mm.; bill from front about 20 mm., and

from gape about 24 mm. Nearly all females have some signs of spurs, many have a well developed spur on one or both legs, and a few have two spurs on one leg and one on the other, and occasionally have two on both legs.

The Young Male is like the female, but is more richly and deeply coloured, with more black in proportion to the buff and rufous.

The Young Male in first plumage is like the female, but more dark and rich in general tint, and the tail is deep chestnut with definite bars of black.

Distribution.—The Red Spur-Fowl is found over a very wide area, although it is rather scattered in its distribution. It is found in the Terai below the Central Himalayas in Western Nepal to Goruckpur; it is common in practically all the well-wooded hill ranges throughout Central India from Saugor to Rajmahal and Nya Dunkah, though it appears to have now practically disappeared from the latter district. South of this it is found in suitable localities in Central India, Orissa and Madras wherever there are broken hills well covered with forests or bamboo jungle. Birds from Mysore and North-East Coimbatore are of the typical race, and this extends at least as far South-East as the Palni Hills, latitude 10°.

In South-East Bengal it is undoubtedly becoming more rare. In 1883 when stationed in the Sauthal Parganas it formed a not very rare item in our miscellaneous bags, but I hear that now it is never seen; in Madras, however, where it is to some extent preserved, it appears to be steadily increasing in numbers, and it is very common on all the Hill Ranges from the foot hills to 4,000 feet or more.

It extends into the Bombay Presidency South of Rajputana and the Mahableshwar birds referred to by Blanford are far nearer true *spadicea* than to *caurina*.

On the Malabar Coast North of Travancore specimens appear to assume a somewhat richer colour, and three specimens procured there by Chapman and now in the British Museum series are about half-way in depth of colouring between *spadicea* and *stewarti*, but have not the bright tint of the latter bird, so for the present I retain them under the typical name.

Nidification.—The breeding season of the Red Spur-Fowl varies very greatly in different portions of its habitat, and even in single areas is somewhat erratic. In the South and Central portion of its habitat its eggs may be taken any time from February to June, March being, perhaps the month in which most are found. It has generally been credited with having a second brood in September to November, but I can trace no grounds for this, and such an occurrence must be quite exceptional.

It breeds from the foot hills at all heights up to 5,000 feet, and sometimes in the Southern Hill Ranges up to 6,000 feet or more.

Most birds, however, will be found breeding in these hills between 2,000 and 4,000 feet. They make no real nest, but lay their eggs in some small hollow, either scratched out by themselves or a natural one, not infrequently they are laid on the flat ground, and are only kept together by the fallen leaves and rubbish under and around them. The majority of nests will be found in fairly thick scrub jungle, forest or bamboo jungle, and the latter, especially where there is plentiful undergrowth, is a favourite breeding haunt over much of its area. It does not appear necessary for the jungle to be very extensive, and in Chota Nagpore it was sometimes found breeding in quite small patches of *Sal* and scrub surrounded with small fields of cultivation.

The number of eggs laid is 2 to 5, and undoubtedly the normal full clutch is 3. I have never seen more than 4 myself, one taken by Mr. Vidal and one taken by Mr. J. Davidson in Kanara. The latter, who took very many nests of this Spur-Fowl in Kanara and Nasik, never found more than 4 in a clutch, and that number only two or three times in some 50 or 60 clutches. On the other hand two eggs only are often found incubated.

The stories of the large number of eggs laid seem to be founded only on native reports; Miss Cockburn, who made many of her notes on such authority, says that they lay from 6 to 10 eggs, but she writes of the Nilgiris where everyone else has found only 2, 3, or rarely 4 eggs in a clutch except Davison, who says he has rarely found more than 5. Hume *thinks* it lays from 4 to 7 eggs, but apparently he too writes on rumours chiefly, though it must be noted that Darling records one nest of 7 eggs and two of 5.

The eggs are miniature fowls eggs, on the whole rather narrower in proportion to their length, and perhaps slightly more pointed. The shell is very stout, and the texture fine and close, and the surface smooth and often with a slight gloss.

Hume gives the average of 25 eggs as 46.6×34.0 mm. 36 measured by myself have averaged much smaller, *i. e.*, 38.9×29.2 mm., whilst the average of Hume's eggs now in the British Museum is 42.8×31.8 mm. The largest egg both in length and breadth I have been able to measure is 46.9×36.3 mm., and the smallest in both length and breadth is 37.7×28.1 mm.

It is probable that these birds pair for life; the cock is certainly monogamous and keeps close to the hen whilst she is sitting and helps her to rear and look after the chicks when hatched. The hen is a very close sitter, and Hume writes that he has twice known one to be caught by natives on the nests.

General Habits.—The Red Spur-Fowl is found from practically the level of the Sea up to 5,000 feet, wandering above this up to 6,000 feet, and even 7,500 feet, but it does not appear to be found anywhere in the true plains; it is essential that there should be

ample cover and that it should be in broken hilly country. As regards the kind of cover it frequents, this does not really seem to matter much. It is sometimes found in thick evergreen forest, but more often in thick scrub, in bamboo jungle and the dense undergrowth of Sal and other deciduous forest. At other times it may haunt well wooded nullas and ravines of scattered patches of Jungle in more or less open or cultivated ground.

It is not a gregarious bird, and when found in small parties up to some half dozen or so, these consist only of the two old birds with their last brood, and before the breeding season commences the latter disperse to take up their own domestic responsibilities.

I have never heard of the Spur-Fowl being especially made the object of a day's sport; the few one gets are nearly always part of a mixed bag made when one is shooting game driven by a line of beaters. Under these circumstances one never seems to get many, even where they are most common, for they are such confirmed runners and skulkers that they are most difficult to flush, and prefer to race across from one patch of Jungle to another rather than trust to their wings. They are splendid runners, and dodge from one bush to another at such a pace that it is really just as sporting to treat them like rabbits on the ground rather than wait for the chance of their flying when they offer a very easy shot. If forced to fly they get up with a great fluster and flapping of wings, but their speed is by no means commensurate with the noise, consisting of a few flaps and beats, then a sail of a few yards, another few beats, and a headlong dive into cover. When rising, they always utter a chuckling noise which reminds one much of an old barnyard hen which has been frightened, but they cannot emit nearly such heart-rending cries as the latter bird. The crow of the cocks in the breeding season is much the same kind of call, and the conversational notes of a separated family are merely subdued and modified versions of the same.

In the mornings and evenings they frequently come out into the open to feed, especially where small patches of cultivation intersect their forests and jungles. In the Hazaribagh and Ranchi districts we often found them quite in the open feeding on the fallen berries of the Bér bushes scattered about on the broken hill sides and more than once we turned them out of millet and ripe rice in the very early mornings in the cold weather.

They feed on both an insect and vegetable diet, and as Hume records "their food consists chiefly of grain and seeds of all kinds, and small jungle fruit, the berries of the dwarf Zizphus (Jher bery), the figs of the Peepul and its congeners, but I have often found the remains of bugs, beetles, and other insects in their

crops mixed with these." I have also found their crops full of a millet (Bajra) and of paddy.

They are very good eating and are better and more gamy than most of our Indian partridges. No finer way of cooking them can be found than rolling them up in a ball of clay and roasting them in the ashes of a good strong fire. They should be rolled up, feathers, entrails and all, and then when the burnt clay is broken open the feathers and skin will come away with the clay, and a most juicy morsel remain to be eaten.

GALLOPERDIX SPADICEA STEWARTI.

Stewart's Red Spur-Fowl.

Galloperdiv spadiceus.—Blyth, Cat. Mus. As. Soc., p. 241 (1849) (part); Davison, Str. Feath. x., p. 410 (1883) (part); Bourdillon, J. B. N. H. Soc. xvi., p. 4. (1904) (Travancore).

Galloperdiv spadicea.—Ogilvie-Grant, Cat. B. M. xxii. p. 261 (1893) (part); id, Man. Game-B. i., p. 206 (1895) (part); Blanford, Avi. Brit. In. iv., p. 106 (1898) (part); Oates, Man. Game-B. In. i., p. 215 (1898) (part).

Galloperdiv spadicea stewarti.—Stuart Baker, Bull. B. O. C. xl., p. 18 (1919). (Aneichardi Travancore).

VERNACULAR NAMES.—Saravoo Koli (*Tamil, Travancore*).

Description—*Adult Male*.—Similar to *G. s. spadicea*, but very much more richly coloured; the crown is practically black, and the whole of the upper parts are a bright chestnut rufous, the pale borders to the feathers being absent or obsolete, the vermiculations on the lower back entirely absent and on rump and upper tail-coverts almost so. Below the colour is equally intensified and rich, and the chestnut colour extends right back behind the vent and on to the posterior flanks.

The type male has some grey spots on the breast, but this is probably only an individual characteristic, as two males obtained by Surgeon-Major Fry at Trevandrum have no such spots. It should, however, be noted that whereas these spots in typical *spadicea* are more or less circular in this bird they are heartshaped, and they are also bordered with black, a feature only seen, and that very faintly, in one other specimen of true *spadicea* from Ootacamund.

Colours of Soft Parts as in *G. s. spadicea*.

Measurements.—Wing, 145 to 161 mm., average 10 specimens, 154.5 mm.; tail, 123 mm. to 140 mm., average 129.6 mm.; tarsus, about 50 mm.

Adult Female.—Differs from the adult female of *spadicea* in the same way as the male differs from the male of that bird. The colour generally is very rich and very strongly suffused with rufous both above and below, and altogether it is a brighter, much handsomer bird than is the typical form.

The extent of the black markings varies to the same degree as in that bird, but they are generally bolder, and in one bird the smaller vermiculations are entirely wanting on the upper surface, the black being restricted to bold bars.

Colours of Soft Parts as in *G. s. spadicea*.

Measurements.—Wing, 148-150 mm. (4 specimens); tail, 125-129 mm.; tarsus, about 48 mm.; spurs, from one on each leg to two on each leg, up to 15 mm. long.

The Young Male differs from the young male of typical *spadicea* in being much more richly coloured. The upper parts are rufous with the black bars reduced to striae, whilst the breast and lower parts are bright chestnut brick-red with the black markings showing merely as black shaft lines on the extreme upper breast and foreneck, and as obsolete bars elsewhere.

Distribution.—Travancore only, between the foot hills and 3,500 feet.

Nidification.—The Travancore Spur-Fowl breeds during February and March, and it is during these two months only that Mr. Stewart obtained all his eggs. The nest-hole is always scraped in dense cover, and most often in some almost impenetrable cane brake in evergreen forest. Less often it is placed under a bush or a mass of creepers, and it may also occasionally be found in thick bamboo jungle. Like *G. spadicea* it makes no nest, the only materials used being the fallen leaves and rubbish accumulated on the ground.

The eggs number 2 or 3 only, and whilst Mr. Stewart has never seen or heard of more than 3, he has often taken 2 well incubated.

The eggs are, of course, quite inseparable from those of *G. s. spadicea*.

The average of 24 eggs is almost exactly 40×30 mm. The largest I have measured in length and breadth was 41.7×31.1 mm., and the smallest in length and breadth were 39.1×30.2 mm. and 40.7×28.3 mm. respectively.

The cock is monogamous, and Mr. Stewart thinks they probably pair for life, and as with the common Red Spur-Fowl, the cock bird proves an excellent father and husband.

They seem to breed only in the area of heaviest rainfall, to which fact is due their brilliant and dark colouration. The average rainfall is about 150 inches or more annually, an amount greatly in excess of that falling over the greater part of the range of the typical bird.

General Habits.—This Spur-Fowl is very common in Travancore on the Shinkotta Hills between 1,000 and 3,000 feet, being more common at elevations half-way between these two extremes, and sometimes being found still lower than 1,000 feet. They are

essentially birds of thick cover, and will never be found on the open bare lands so common in parts of Travancore, nor indeed will they often be found in scrub or thick grass, though they frequent the dense patches of Lantana bush in the mornings and evenings, greedily eating the berries and the white ants—or termites—which are as plentiful as the berries.

Their home is in the depths of evergreen Jungle, and less often in heavy bamboo jungle, and here, as one wanders gun in hand, they may often be heard rustling about amongst the fallen leaves, a habit which has bestowed upon them the Tamil name of Saravoo Koli or Dry-leaves Fowl.

Less often than they are heard they may be seen scuttling across some more open glade or forest path, and a hasty snap shot obtains a dinner worthy of an epicure. If put up by dogs, they invariably take to trees, and if so treed it is then easy to pot them as they sit. They are poor flyers, though like many others who are poor performers, they are very noisy, making a great fluster in rising, and a loud whirr as they fly.

Mr. J. Stewart, to whom I owe the foregoing notes, says that he has never attempted to make a bag of Spur-Fowl, but has several times got 4 or 5 in a morning's or evening's walk. They were most often met with when one was after big game, and in consequence escaped without being fired at.

When disturbed, they utter a chattering cry, and after a pair or a family have been put up and separated, they continue to call to one another until all have been reunited.

The cocks are not noisy birds, but crow, if one can call their chuckling cry a crow, regularly in the mornings and evenings during the breeding season. One would have expected birds so well armed with weapons of offence to be exceptionally combative, but I can find no support for such an idea, and Mr. Stewart informs me that he has never come across them fighting or obtained any evidence, native or otherwise, to make him think they are at all pugilistic by nature.

They are difficult birds to rear, and Mr. Stewart never succeeded in bringing them up. His most successful attempt was with some birds which grew half-way to maturity, and then all died after their first meal of paddy, a food substituted too suddenly for their previous diet of white ants.

They have, however, been reared in the Trevandrum Zoological Gardens, where they lived in amity with some Grey Jungle-Fowl.

They feed on a mixed diet of insects, fruit and grain, and in the mornings and evenings are very fond of scratching about and feeding in the intensely thick secondary growth which so soon covers the deserted coffee clearings. They do not, however, ever haunt the more open coffee which is being cultivated.

GALLOPERDIX SPADICEA CAURINA.

The Aravalli Spur-Fowl.

Galloperdix spadicea var *caurina*,—Blanford, *Avi. Brit. In. iv.*, p. 107 (1898).

Francolinus spadiceus,—Gray, *Ill. Ind. Orn. ii.*, pl. 42, fig. 2 (1834) (part).

Polyplectron northia,—Gray, *Ill. Ind. Orn. ii.*, pl. 43, fig. 1 (1834) (part).

Ithaginis northia,—Gray, *List of B.*, pt. iii., *Gall.* p. 32 (1844) (part).

Galloperdix spadiceus,—Blyth, *Cat. Mus. As. Soc.*, p. 241 (1849) (part);

Butler, *Str. Feath. iv.*, p. 5 (1876) (Aboo and N. Guzerat); Fairbank, *ibid.*,

iv., pp. 251, 262 (1876) (Khandala, Mahableswar and Ghat Range);

Butler, *ibid.*, v., p. 222 (1877) (Aboo); Hume and Marsh, *Game-B. i.*, p.

247 (1878); Butler, *Cat. B. of Sind*, p. 54 (1879) (Aboo).

Galloperdix spadicea,—Ogilvie-Grant, *Cat. B. B. M.* xxii., p. 261 (part),

(1893); *id.*, *Man. Game-B. i.*, p. 206 (1895) (part); Blanford, *Avi. Brit. In.*

iv., p. 106 (1898) (part); Oates, *Man. Game-B. In. i.*, p. 215 (1898) (part).

Description.—*Adult Male*.—Differs from the adult male of *spadicea* in being everywhere much paler; on the upper parts the chestnut centres of the feathers are paler, and the grey margins wider; below the tint is much paler over the whole surface.

Colours of Soft Parts.—"Legs and feet coral red; bill dusky reddish; irides light brown" (G. King).

Measurements.—Wing, 153 to 173 mm., average 8 specimens, 159.7 mm.; tail, 116 to 136 mm., average 123 mm.; tarsus, 49 to 41 mm.; bill from front about 21 mm. and from gape about 26 mm.

"Weight $8\frac{1}{2}$ to 10 ozs." (G. King).

Adult Female.—Very much paler both above and below than the female of *G. s. spadicea*; the black bars and markings are almost absent, being confined to narrow broken streaks on either side of the shaft and to dull mottlings on the inner secondaries. Below the chestnut is much paler, and the feathers are edged with paler grey, whilst the black markings are greatly reduced in amount. On the whole the differences between the females of this race and *G. s. spadicea* is even more marked than it is in the males.

Colours of Soft Parts.—"Legs and feet orange red to coral red; bill dusky red, irides dull yellow." (G. King).

Measurements.—Wing, 154-171 mm. (3 specimens); tail, 120 to 130 mm.; bill from front about 21 mm. and from gape about 25 mm.; tarsus, 49 to 51 mm.

"Weight, 8 ozs." (G. King).

Distribution.—The Aravalli Hills and Udaipur only. The birds from the Bombay Presidency South of these hills are at once strikingly darker and more chestnut than the Mt. Abu birds, and are nearer to the typical form, although somewhat paler and more grey than specimens from the Nilghiris and hill ranges of South India. These cannot, however, be given a name, as it is quite impossible to define any area for any special degree of depth of colouring.

Nidification.—I can find nothing beyond what is recorded in Hume's Nests and Eggs.

From Aboo Dr. King writes to me:—

“This species is common at Aboo in the valleys, ranging as high as 4,000 feet, but is most plentiful from about 1,500 to 3,000 feet above the sea. It prefers dense jungle about nullahs, and where there is a thick undergrowth and especially where there is much bamboo.

“I never took the nest myself, but its eggs were brought to me in the early part of May, and my shikaris and the Bheels employed said that the nests were flat and shallow, composed of dry bamboo leaves placed under, or even in the middle of, clumps of bamboo, in the deeper valleys.”

Col. Butler also wrote:—

“The Red Spur-Fowl is common all along the Aravallis. It is usually found singly or in pairs, and breeds like the last species during the hot weather, but I have often seen the chicks with the old birds after they have been hatched in May and June.”

I have not seen enough of these eggs to say whether they vary in size from those of the other races, but otherwise they are, of course, quite indistinguishable.

A pair in the British Museum measure 46.2×32.6 mm., and 44.7×31.5 mm. and a clutch of 3 in my own collection taken by Mr. Vidal measure 35.8×27.0 mm., 35.6×26.8 mm. and 36.5×26.4 mm. These are almost certainly abnormally small.

General Habits.—Like those of *G. s. spadicea*, but the Aravalli Spur-Fowl is less of a dense forest and thick jungle haunter than is that bird, and may be found more often in comparatively open forests and thin jungle.

It inhabits a country of comparatively small rain-fall, and less luxuriant vegetation hence its pale colouration. It is very common throughout the Aravalli Hills and the lower hills in Udaipur.

Col. Butler says that it is “common all along the Aravallis. It is usually found singly or in pairs and breeds during the hot weather.”

GALLOPERDIX LUNULATA.

The Painted Spur-Fowl.

Curvia Partridge.—Lath., Gen. Hist. viii., p. 270 (1823) (India).

Perdix lunulata.—Valenc. & Dict. Sci. Nat. xxxviii., p. 446 (1825) (Bengal); Gray in Griffiths, ed. Cuv. iii., p. 48 (1829) (Bengal); Lesson, *Traite, d'Orn.* p. 504 (1831).

Perdix hardwickii,—Gray in Griffiths' ed. Cuv. iii., p. 48 (1829); Id. iii., Ind. Zool. 1, pl. 52 (1830-32).

Francolinus nivosus,—Delessert, Mag. de Zool. Ois., pl. 18 (Text) (1840); Id. Rev. Zool. 1840, p. 100 (Bengal).

Francolinus hardwickii,—Delessert, Voy. dans l'Inde, p. 26, pl. 10 (1843) (Pondicherry).

Ithaginis lunulatus,—Gray, List of Birds, pt. iii., Gall. p. 32 (1844).

Galloperdix lunulosa,—Blyth, Cat. Mus. As. Soc., p. 241 (1849) (Rajmahl.); Gould, B. Asia vi., pl. 69 (1854); Sclater & Wolf, Zool. Sket. 2, pl. 41 (1861); Beavan, Ibis, 1868, p. 382 (Maunbhum); Blanford, Journ. As. Soc. Beng. xxxviii., pt. 2, p. 189 (1869) (Nagpur).

Galloperdix lunulosus,—Jerdon, B. India iii., p. 543 (1863); Marshall, B. Nest Ind., p. 59 (1877); Hume & Marshall, Game B. Ind., 1 pl. (1878).

Galloperdix lunulatus,—Hume, Nests and Eggs, Ind. B., p. 533 (1873); Ball, Str. Feath. ii., p. 427 (1874) (Chota Nagpur), v., p. 418 (1877) (Maharani & Godaveri Rivers); vii., p. 225 (1878) (Ganges to Godaveri); Hume & Marshall, Game-B. Ind. 1, p. 254, pl. (1878); Markham, Str. F. ix., p. 206 (1880) (Allahabad); Butler, *ibid.* ix., p. 422 (1880) (Belgaum Dist.); Davison, *ibid.* x., p. 410 (1883) (Nilghiris); Barnes, Birds Bombay, p. 306 (1885); Taylor, Str. F. x., p. 531 (1887) (Orissa); Oates, ed. Hume's Nests and Eggs, Ind. B. iii., p. 425 (1890).

Galloperdix lunulata,—Ogilvie-Grant, Cat. Birds B. M. xxii., p. 263 (1893); Markham, Journ. Bomb. N. H. Soc. ix., p. 35 (1894) (Ken. R.); *id.*, Man. Game-Birds I., p. 209 (1895); Oates, Man. Game-B. I., p. 220 (1898); Blanford, Faun. Brit. Ind. iv., p. 108 (1898); Finn, Ibis, 1899, p. 472; King, Journ. Bomb. N. H. Soc. xxi., p. 100 (1911) (Saugor); Whitehead, *ibid.* xxi., p. 163 (1911) (Schose); Pitman, *ibid.* xxii., p. 801 (1914) (C. Provinces, habits).

Galloperdix lunulata,—Oates, Cat. Egg & Brit. Mus. 1, p. 50, pl. iv., fig. 9 (1901).

VERNACULAR NAMES.—Askol (Orissa and Singbhoom); Hootkah (Gondhi); Cull-koli (Tamil); Jitta kodi (Telegu).

Description—*Adult Male*.—Crown of head black, glossed with green, each feather having a white oval spot, these again sometimes with a narrow black centre; sides of head, nape and neck all round, throat and extreme upper breast brownish-black, each feather with a glossy black terminal, and a white sub-terminal bar; the chin is whitish or buffish-white, less spotted with black. Whole upper parts from hinder neck to shorter upper tail-coverts rich chestnut with white, black-edged ocelli, the white decreasing in extent towards the tail-coverts, and often absent or obsolete on lower back, and rump. Longer upper tail coverts and tail brownish-black, the rectrices with green or purple reflections in a good light.

Scapulars and innermost median and greater coverts like the back but with strong metallic green gloss; other coverts like the back, but with larger and more conspicuous ocelli; bastard wing and quills brown, some of the innermost secondaries glossed on the outer web with green like the scapulars. Smaller under wing-coverts and axillaries chestnut with black and white bars; greater coverts brown faintly edged with chestnut.

Breast and upper abdomen bright buff, each feather with a terminal spot of black, the buff palest next these spots; flanks chestnut, each feather with a buffy white bar between two black ones. The colours of the flanks and breast grade into one another.

Lower abdomen, vent and under tail-coverts brownish-chestnut, more or less spotted with insignificant black-edged white spots; the under tail-coverts are black-tipped, and the longest almost wholly of this colour.

There is not much individual variation in colour, though some birds are more spotted than others, and some have the head a deeper black than the rest.

Colours of the Soft Parts.—Legs and feet horny-green, plumbeous horny, or plumbeous; upper mandible blackish horny, lower pale horny especially at the base and gape; irides hazel brown or dark brown,

Measurements.—Wing, 144-161 mm., average 28 specimens, 153 mm.; tail, 128-135 mm.; tarsus, 42-45 mm.; spurs, generally two on each leg, sometimes less, sometimes three on each leg or on one only. The spurs run up to about an inch in length (25·4 mm.); Bill from front, about 19 mm. and from gape about 22-23 mm.

“Weight, 9-10 ozs.” (Hume).

Adult female.—Crown black, the feathers with chestnut stripes, occupying nearly the whole of each web on the forehead, and the posterior crown chestnut tipped as well; broad supercilia chestnut, the feathers with pale centres; ear-coverts deeper chestnut; chin, throat and cheeks pale yellowish-buff, mottled with chestnut; neck all round, upper parts and wings dark brown tinged with greyish-olive, especially on back, scapulars and lesser coverts. Upper tail-coverts browner than the back; tail deeper richer brown, obsoletely rayed with black bars.

Below, the brown neck changes gradually to paler rufescent brown on breast and upper flanks, and then again to earthy brown on lower abdomen, vent and under tail-coverts.

Such variation as exists in adult females consists in the absence or prevalence of narrow terminal spots or bars on the lower plumage, and less often on the upper. These markings appear to have nothing to do with age, as old birds are to be found both well spotted and immaculate.

One female from Raipur is noticeable for its very bright, almost pure chestnut, breast.

Colours of Soft Parts.—Similar to the same parts in the male.

Measurements.—Wing, 138-159 mm., average 20 specimens, 146 mm.; tail, 128-145 mm.; tarsus, about 40 mm.; bill from front about 18 mm., and from gape about 21-22 mm.

“Weight, 8-9 ozs.” (Hume).

The Young Male and Female resemble the adult female, but are much duller. Above, the whole plumage is much freckled and weakly barred with dull black and rufous brown, and the tail and inner secondaries are chestnut brown, distinctly barred with black. Below, the whole surface is brownish, and the breast is no more chestnut than the rest of the plumage, but is more or less freckled with dull pale buff.

The Chick in Down is a rich chestnut rufous above, the head and a broad dorsal line darkest and brightest; below, a dull pale earth-brown, more chestnut on throat, upper breast, flanks, thighs and vent. The wing and tail feathers, when they appear, are dull rufous brown, vermiculated with black and with a few tiny buff ocelli on scapulars and innermost wing-coverts.

Distribution.—The distribution of the Painted Spur-Fowl is practically the same as that of the Red Spur-Fowl. Roughly to the North its boundaries are the Sind, Jumna and Ganges rivers, westwards it is found as far as the Eastern slopes of the coastal Hill Ranges, but not apparently on the Malabar coast itself or in Western Travancore, though it is found in suitable places throughout Coimbatore and Mysore. On the East it extends right up to the coast wherever the country is suitable.

Nidification.—There is not much on record about the breeding of this very common bird, and more detailed information is wanted. The breeding season appears to extend from February to June, the principal months being April and early May. It is of course resident wherever found, and breeds throughout the area it inhabits. The nest is the usual scrape, natural, or made by the birds, under the shelter of a rock, bush or tree trunk, and the only materials used are the fallen leaves and rubbish. The eggs are, I think, generally 3 in number, sometimes 2 or 4, and, rarely 5. In appearance they are hardly separable from those of the Red Spur-Fowl, but I think as a rule they are rather paler in tint, not so warm a buff-cream colour. They are just as smooth and fine-textured and the same long shape, but I have one clutch of 3 eggs in my collection which are very pointed and inclined to a peg-top shape.

The 15 eggs I have been able to measure vary in length from 39.9×30.3 mm. to 42.4×28.4 mm., and in breadth from the latter to 41.6×31.0 mm., the average is 40.6×29.9 mm. Like the other Spur-Fowl this bird is monogamous, and probably pairs for life.

Mr. Blewitt records that:—

- “ The parent birds assiduously care for their young, and
- “ when disturbed exhibit great anxiety for their safety. When
- “ closely pursued, the old birds endeavour by many artifices to
- “ draw the attention of the intruders from the spot where the

“ chicks lie concealed, and invariably on the cry of a chick
 “ wounded or captured, the parent birds daringly return to the
 “ rescue, often to within a dozen yards or so of the sportsman.
 “ The chicks are very soon able to fly as well and as fast as
 “ the old birds, and it is then not easy to get very near
 “ them.”

General Habits.—This Spur-Fowl is not so restricted to dense forest or bamboo cover as the last species, and appears rather to haunt broken ground with numerous boulders and rocks amongst the vegetation, and this love of rocks and rocky ground seems to be the principal cause in restricting its haunts, for in wide stretches where these are absent, no birds will be found, though in suitable areas on either side it may be common. Neither does it ascend the hills to the same height as does the Red Spur-Fowl, and probably few birds live at altitudes over 3,000 feet, though the evidence on this point is very scanty.

Major C. R. S. Pitman says that he found them extraordinarily common in the Central Provinces on rocky hills of Granitoid Gneiss covered with forest, bamboo and thorn jungle, with thin scrub and grass on the tops. Here they seemed to prefer the crests of the hills where the cover consisted of this scrub and grass rather than those parts lower down with tree forest, and the more open this cover, the greater the certainty of finding several pairs of Painted Spur-Fowl.

In a letter to me Major Pitman writes :—

“ It much prefers running to flying, and is fond of scuttling
 “ about amongst rocks or standing on the highest one of some
 “ group of rocks and thence surveying the country all round it.
 “ During three weeks I saw many every day, and, though
 “ when hard-pressed they are not difficult to flush, flying rather
 “ like a partridge, I never saw one fly up-hill unless occasion-
 “ ally when birds flew down from one hill across a col to the
 “ next one. Then if flushed again, they would sometimes fly
 “ back to their original crest. Down-hill they fly readily enough
 “ however steep and seem to get along equally well whether
 “ hurling themselves down obliquely or at the steepest angles.
 “ I have often noticed both sexes perch in trees when fright-
 “ ened whether by dog or man, possibly to see better what
 “ was worrying them; even then though they had to fly *up* it
 “ was either a sort of scramble from directly below or a point
 “ used as a rest as they flew down-hill.

“ When frightened on the slopes at the bottom of a hill,
 “ they invariably make for the top running, all with a view of
 “ eventually being able to look back from some high vantage
 “ point. Thus I found an excellent way of shooting them was
 “ to walk along the hill crests with a beater on either side

“ of the hill about 50 yards below me. By this means
 “ birds from the slopes would always run up and were
 “ then flushed together with those which were originally on
 “ the top.

“ I cannot agree with some descriptions of this bird which
 “ say that it is difficult to flush, and even when flushed at
 “ once makes straight for the thickest cover. My experience is
 “ that males when first put up usually fly along the crest of
 “ the hills, and after being flushed a couple of times or so,
 “ break back; broods and pairs flew straight down-hill, and
 “ at once started running up again. On such occasions they
 “ generally just went over the crest and squatted a few yards
 “ down the opposite slope.

“ When flushed the males get up with a curious bubbling,
 “ scolding, chuckling noise and at night I heard this same
 “ cry on the rocky hills.

“ Females with broods, whether young chicks or nearly
 “ fullgrown, in the first instance usually led them away by
 “ running, uttering at the same time a peculiar scolding
 “ chuckle. Even under these circumstances they were always
 “ so eager to climb to the tops of rocks and look back that
 “ one could often get right up to them.

“ Their food seemed to consist of seeds, berries, grain and
 “ other vegetable matter. In the crops of all I examined
 “ there was a soft dark brown mash with occasionally a few
 “ small seeds distinguishable in it, and I also found a lot of
 “ stale dry mowrah flowers in their crops after the middle of
 “ May.

“ The legs of the males I examined had from two to three
 “ spurs, in one case three on both legs, the females had from
 “ one to two, often two on each leg.”

Jerdon does not think much of it as an article for the table, he writes:—

“ Its qualities for the table are inferior to those of the last
 “ species, having less flavour and being more dry. Numbers
 “ are snared in the hills not far from Madras, and are generally
 “ procurable in the Madras market. I have kept them in
 “ confinement for long. They thrive pretty well, but the
 “ males are very pugnacious. The males have a fine cackling
 “ sort of call, very fowl-like.”

It should be noted that Capt. Baldwin states that this Spur-Fowl when running carries “the tail up, not like a partridge.” This must surely be wrong, but I have never seen it contradicted, and unfortunately skins will not either refute or confirm this, and some sportsman should remember to take observations which will enable him to do one or the other.

GALLOPERDIX BICALCARATA.

The Ceylon Jungle-Fowl.

- Perdix bicalcaratus*,—Pennant, Ind. Zool., p. 40, pl. vii. (1769).
Perdix zeylonensis,—Gmel. Syst. Nat. 1, pt. ii., p. 759 (1788); Bonnat., Encycl. Meth. 1, p. 210, pl. 93, fig. 3. (1791).
Perdix ceylonensis,—Lath. Ind. Orn. ii., p. 644 (1790); Temm., Fig. et. Gall. iii., pp. 311, 718 (1815).
 Ceylon Partridge, Lath., Gen. Syn. Suppl. ii., p. 278 (1802).
Francolinus ceylanensis,—Less., Traite d'Orn., p. 504 (1831).
Galloperdix zeylonensis,—Blyth., Cat. Mus. As. Soc., p. 241 (1849); Gould, B. Asia vi. pl. 67 (1854); Hume, Nests & Eggs Ind. B. p. 535 (1873).
Galloperdix bicalcarata,—Layard, Ann. Mag. Nat. Hist. (2) xiv., p. 105 (1854); Blyth, Ibis 1867, p. 308; Holdsworth, P. Z. S., 1872, p. 469; Legge., Ibis, 1874, p. 26; 1875, p. 400; id., Birds Ceylon iii., p. 741, pl. (1880); Hume, Str. Feath. vii., pp. 430, 453 (1878); Hume & Marshall, Game-B. Ind. i, p. 261 pl. (1878); Oates, ed. Hume's Nests & Eggs Ind. B. iii., p. 426 (1890); Ogilvie Grant, Cat. Birds B. M. xxii., p. 264 (1893); id., Man. Game-B. 1, p. 210 (1895); Butler, Journ. Bomb. N. H. Soc. x. p. 31 (1896); Blanford, Faun. Brit. Ind. iv., p. 109 (1898); Lewis, Ibis, 1898, p. 551; Oates, Man. Game-B. 1, p. 224 (1898); Wait, Spolia Zeylanica x, pt. 39, p. 371 (1917).
 VERNACULAR NAMES. Haban-or Saban-kukula (*Cinghalese*).

Description—Adult Male.—Crown, nape, hind neck, back, scapulars and wing-coverts black with white central lines; on the head these are very narrow, but gradually broaden towards the back until on the outer wing-coverts they become large pear-shaped drops. The bases of the feathers of both back and wing-coverts are pale brown or chestnut brown, vermiculated with blackish, and these show through everywhere; on both the lower back and greater wing-coverts the feathers have broad chestnut edges vermiculated with black and grade gradually into the chestnut rump and shorter tail-coverts. The rump is sometimes immaculate except for a terminal black spot or narrow bars of buff and black, at other times there is a certain amount of black vermiculation; the coverts are invariably freely vermiculated with black and the longer tail-coverts and tail are black, the central tail feathers sometimes, and the outer feathers on the bases nearly always, vermiculated with chestnut.

Primaries brown; secondaries brown, vermiculated with chestnut on the outer webs, the innermost on both webs; greater coverts like the quills, but with white pear-shaped black-edged ocelli at the tips.

Sides of head white, the feathers with tiny edges of black; chin and throat pure white. Neck, breast, flanks and abdomen white, each feather black-edged. On the flanks the black edges dominate so that this part of the plumage is almost black; the upper breast is boldly black and white, and the centre of the abdomen almost

white. Vent, posterior, abdomen and flanks dull earth-brown with white spots. Under tail-coverts blackish-brown with grey tips.

The extent to which individual variation is found is in the proportionate amount of black and white on the feathers of the breast and lower parts and in the amount of vermiculation on the back rump and upper tail-coverts.

Colours of Soft Parts.—"Iris brownish-yellow or brownish-red; orbital skin red; bill, legs and feet red; spurs dusky reddish." (Legge.)

Measurements.—"Length, 13.5 to 13.8 inches." (Legge.) Wing, 151 to 174 mm., average of 20 specimens, 164 mm., tail 121 to 130 mm.; tarsus, 54 to 57 mm.; bill at front about 22 mm., and from gape about 25 mm. The spurs run up to about 20 mm., and are more generally about 12-15 mm.

I can find no records of weight.

There are usually two spurs on each leg, sometimes only one on one, and sometimes as many as three.

Adult Female.—Crown blackish-brown, the feathers of forehead and sides with paler centres; sides of the head dull chestnut, the feathers black-edged. Whole upper plumage and wing-coverts dull chestnut vermiculated with black, most profusely so on the longest upper tail-coverts. Tail black, the two central pairs of feathers faintly vermiculated with chestnut.

Quills brown, the secondaries all vermiculated with chestnut on the outer webs, and the innermost on both webs.

Below, chestnut, practically immaculate on the breast, and more and more vermiculated with dark brown towards the vent. Vent, posterior, abdomen and flanks earthy chestnut; under tail-coverts darker chestnut, densely vermiculated with black.

Colours of Soft Parts.—"Iris brownish-yellow; bill, legs and feet lighter red than in the males." (Legge.)

Measurements.—"Length, 11.75 inches." (Legge.)

Wing, 143 to 150 mm., average 8 specimens, 146 mm.; tail, 108 to 110mm.; tarsus, 46 to 48mm.; bill from front about 18mm. and from gape about 22 mm.

The spurs are small, seldom as much as 12.5 mm., and number either one or two on each leg, sometimes, however, wanting on one or both legs. Wait says that the females are *generally* without spurs, but this is not so with the British Museum series.

Distribution.—This Spur-Fowl is found only in Ceylon, and only in those portions which are well forested and have an ample rain-fall. Thus it is very common in the South-Western portion, more or less common in the West and East, but is not found in the extreme North-West nor in the North-Eastern portion of the island.

Nidification.—The breeding season of the Ceylon Spur-Fowl lasts almost throughout the year. Wait says that it appears to be

from about November to March or April and occasionally again in July and August. I have a pair of eggs taken in June, and Hart found them in October. Possibly February and March are the two months in which most eggs are laid.

The nesting arrangements are much the same as those of the Red and Painted Spur-Fowls. No real nest is made, but the eggs are laid in some shallow hollow under the protection of a bush or thick clump of creepers or grass, and the only lining is the mass of fallen debris carpeting the whole forest. The site selected appears always to be in very thick cover, and, preferably, in evergreen forest with dense undergrowth.

Undoubtedly the number of eggs most often laid is two. Wait says "usually two, sometimes more," but I understand that three is the largest number he has personally seen or taken. Legge found two only, but the natives told him that they laid up to four, and Hart records it as laying from 4 to 6 eggs. Personally I have never seen a genuine clutch of more than three, but believe four may rarely be found.

They are like other Spur-Fowls' eggs, but of a warmer tint of buff or café-au-lait, and are not so elongated.

The eggs measured by W. E. Wait averaged $1.60'' \times 1.16''$ (42.1×30.4 mm.), but 3 in my collection and a few others which have passed through my hands average only 39.1×28.9 mm. The largest 40.2×29.0 mm. and 39.0×29.5 mm. and the smallest 38.0×28.4 mm. and 39.4×28.3 mm.

Like other Spur-Fowls, the Ceylon bird is monogamous, and the cock and hen remain together throughout the year.

General Habits.—The Ceylon Spur-Fowl may be found within the damper regions of Ceylon at all heights from the broken ground of the foot hills up to 4,500 feet or even 5,000 feet, and according to Wait "spreads further into the dry flat country between the hills and the sea" on the South-East. Ample cover is essential. Legge records that:—

"The shy habits of this bird would prevent its being detected in most places where it is even abundant, were it not for its noisy cries or cackling, so well known to all who have wandered in our Ceylon jungles.

"It frequents tangled brakes, thickets in damp nullahs, forest near rivers, jungle over hill sides, and in fact any kind of cover which will afford it entire concealment.

"It runs with great speed, and has the knack of noiselessly beating a retreat at one time, while at another it ventriloquizes its exciting notes, until the sportsman becomes fairly exasperated, and gives up the attempt he has made to stalk it in disgust. I have more than once endeavoured to cut off its retreat or flush it by rushing into a little piece of jungle

“or detached copse in which I had found it, and from which
 “it seemed impossible for it to escape, but I invariably failed
 “in the attempt, a failure aggravated by my utter bewil-
 “derment at its unaccountable disappearance.

“The cock birds begin to call at six in the morning, and
 “when one has fairly commenced, the curious ascending scale
 “of notes is taken up from one to another, until the wood re-
 “sounds with their cries.”

Most writers give the Ceylon Spur-Fowl the credit of being a strong swift flyer when once it is forced to take to wing, and its flight is possibly stronger than that of its Indian relations whose powers in this respect are not very great. Like them, however, it is a skulker of the most crafty and persistent description, and very hard to flush. Even dogs only force it up into the nearest thick bush or tree, where it will lie concealed and quiet until it thinks all danger has passed.

Everyone seems to agree that it is hard to rear from eggs and almost impossible to tame if caught. If precautions are taken to prevent its killing itself against the roof or sides of its cage or enclosure when startled, or if they do not quickly die from unsuitable food or refusal of all food, they still always remain shy, wild birds, resenting observation and also the presence of other birds or beasts.

They are constantly trapped by the natives, who lay snares for them in the places they most frequent for feeding purposes. A favourite trap described to me by a Mr. Kellow, formerly a tea-planter in Ceylon, is said to consist of little triangles made by two fences with open bases and open apexes, in the latter of which are numerous nooses into which the birds walk, led thereto by the fences which they run along in preference to jumping or flying over.

They are also said to be decoyed into a ring of nooses by a captive bird, for the cocks are very quarrelsome, and the cocks in the vicinity soon come to the challenge of another invading their sanctuaries. As far as I could ascertain, however, the decoy system was one introduced into Ceylon by immigrant Tea labourers, and used by them only.

Legge remarks that in their manner of fighting the males reminded him of the game-cock, both in the way they elevated and depressed their heads and in the way they imitated one another's action.

The flesh is very good eating, and has been likened to that of Grouse. Their own food is both vegetarian and insectivorous, and they are particularly fond of the ripe berries of that imported pest of Ceylon, the Lantana bush. Hart says that their diet is principally white ants, and various other insects and their larvæ.

Its powers of ventriloquism have already been referred to above, and this has been corroborated by many observers. So great indeed

is this power that Layard says that when listening to birds confined in his aviaries, he could have declared that the calls proceeded from every part of the ground rather than from the aviary itself.

OPHRYSIA SUPERCILIOSA.

The Mountain Quail.

Rollulus superciliosus,—Gray., Knowsl. Menag., Aves. p. 8, pl. xvi. (1846) (India).

Ophrysia superciliosa,—Bonap. Comp., Rend. xliii., p. 414 (1856) (no loc.); Hume, Str. Feath. vii., p. 434 (1878) (no loc.); Hume & Marshall, Game-B. Ind. ii., p. 105 pl. (1879) (Mussorie, Nainital); Ogilvie-Grant, Cat. Birds B. M. xxii., p. 266 (1893); id., Handb. Game-B. 1, p. 212 (1895); Blanford, Faun. Brit. Ind. iv., p. 105 (1898); Oates, Man. Game-B. 1, p. 121 (1898); Comber., J. Bomb. Nat. Hist. Soc. xvi. p. 361 (1905).

Ptilopachus (Ophrysia) superciliosa,—Gray, List Gallinæ Brit. Mus., p. 45 (1867).

Malacoturnix superciliosus,—Blyth, P. Z. S. 1867, p. 475 (Mussorie); Gould, B. of Asia vii., pl. 8 (1868).

Malacortyx superciliiaris,—Blyth, Ibis, 1867, p. 313.

Coturnix (Ophrysia) superciliosa,—Gray, Handl. B. ii. p. 269 (1870).
VERNACULAR NAMES. None known.

Description.—*Adult Male*.—Forehead and a broad supercilium reaching to the nape white, a band above and below this supercilium black; chin, throat, sides of the face and upper ear-coverts black; lower ear-coverts and cheeks white, extended in a broken band down the sides of the throat; a spot in front of the eye and another behind it white; crown greyish-brown with velvety black central striæ. Plumage, generally, above and below dark clear slaty olive-brown, each feather with black edges to the basal four-fifths of each web except on the longest tail-coverts and tail feathers. Under tail-coverts black with broad white terminal bars.

The wings are rather browner and lighter than the rest of the upper plumage, and the primaries are vermiculated with pale dull buff on the basal halves of the outer webs.

Colours of Soft Parts.—"Bill coral red; legs and feet dull red or dusky red" (Hutton).

Measurements.—"Length 10 inches" (Hutton).

Two specimens in the British Museum. Wings, 86 mm. (in moult), and 95 mm.; tails, 80 and 82 mm.; tarsus, 29 mm.; bill from front 11.5 mm., and from gape 13.5 mm. two other specimens not quite adult have wings of 85 and 86 mm.

Adult Female.—Above cinnamon brown, the centre of the crown with practically no markings, nape and neck with broad black streaks changing to triangular black spots on the back, scapulars, rump and upper tail-coverts which are bordered with fulvous, more especially on the scapulars. A white spot both in front and behind the eye, and a small white eyebrow. A broad supercilium, ear-coverts and sides of the head vinaceous-brown, merging into albescent

on chin and throat; a broad black band on either side of the crown and a black patch under the eye next the beak.

Wings like the back; primaries light brown, mottled with buff on the outer webs, the mottlings gradually increasing in depth of colour and extent towards the innermost secondaries which are like the back.

Below a beautiful pale, but bright, vinaceous brown, each feather with a broad black central stripe and faint chestnut edgings; flanks and vent vermiculated with brown and black.

Colours of Soft Parts.—“Bill dusky red, lower mandible brightest; legs dull red; eyelids black, with a small white spot at the corners”. (Hutton.)

Measurements.—Two females in the British Museum collection. Wings, 88 and 93 mm.; tails, 70 and 71 mm.; tarsus and bill, not different in size to that of the males.

Young Male.—Judging from a specimen in the British Museum collection, the young male must be somewhat like the female, as it still retains a few buff and brown mottled wing-feathers and a certain amount of mottling on the breast.

Distribution.—As yet only known from Mussoorie and Naini-Tal.

Nidification.—Unknown.

General Habits.—The 10 specimens enumerated by Hume in *Game-Birds* remain the only known specimens of this bird. The original specimens were a pair in the Knowsley Collection, and their origin was unknown but supposed to be “from India”. This was in 1846. In 1865 Kenneth Mackinnon shot a pair near Mussoorie in the month of November, and in the following year from November to June, 1868, there were several birds, or covies of birds at Jerepani at about 5,500 feet elevation, and five specimens were procured, and finally Major G. Carwithin shot one at Sher-ka-danda, 7,000 feet, near to Naini-Tal. Since then this bird has never been seen again. Kenneth Mackinnon, writing to Hume about the birds he sent, said:—

“It was shot together with a second, also a male, out of a covey of 8 or 10 in grass jungle on the southern face of Budraj.

“I noticed that nearly half the birds, probably females, were brown, rather darker than the ordinary game brown.

“They were very difficult to flush, and, but for the dogs, we could not have got them up. After being flushed they col-

lected again at some distance with a shrill whistling unlike that of any of our other birds. Their flight was slow and

heavy, and I should never have supposed them capable of migrating far.

“I saw these birds frequently after this, and have frequently heard their whistling when out shooting near Mussorie. They

“are not confined to the spot where I shot that brace, I have
 “seen and heard them at other similar places, at about the
 “same elevation, in the neighbourhood of Mussorie, but to the
 “best of my recollection only during the winter, but of this
 “latter I am not sure.”

Capt. Hutton's boys knocked over three specimens, one of which was destroyed, and again a fourth in December. Hutton writes of these as follows:—

“There were only 5 or 6 birds in this covey, and all young
 “apparently. This one was shot with a pistol, as we find the
 “gun of little use, the birds refusing to take wing and only
 “running among the long high grass when pressed, and allow-
 “ing themselves to be nearly trodden upon before they will
 “move. During the forenoon they wander to feed up among
 “the long-grass to which they obstinately cling, feeding on the
 “fallen seeds, and their presence being made known by their
 “short Quail-like note. They will not come out into the open
 “ground, and in the afternoon they descend into sheltered
 “hollows amongst the grass and brushwood.”

Major Carwithin records of the bird shot by him that it was shot by him on the eastern slopes of Sher-ka-danda when hunting for Cheer-Pheasant. The ground is described as “very steep, with patches of brushwood here and there.”

The above contains all we know about these birds, and Hutton thought that they were migratory birds probably breeding in South-Eastern Chinese Tibet. Judging, however, from what we know of their habits, I should think it is more probable that they are resident birds, and that Mussorie and Naini-Tal probably form the outposts of their habitat in native Garhwal and Nepal. Their skulking habits and the extraordinary persistence with which they refuse to fly would suffice to keep them unknown to any but the most observant of sportsmen, and as the few that are flushed generally would get up when men were expecting pheasants, they would probably not waste shot upon such small fry.

Probably we shall have to wait until someone with time, patience and acute powers of observation makes a regular business of once more locating and obtaining these birds. Once found, their very habits should make them an easy prey to clever netters, and perhaps we may see some before long in the Zoological Gardens in India and London.

(To be continued.)

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY

No. XXII.

By

OLDFIELD THOMAS, F.R.S.

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A.—A NEW BAT OF THE GENUS RHINOPOMA FROM S. E. PERSIA.

The following new bat belonging to the genus *Rhinopoma* occurs among the collections made by Col. J. E. B. Hotson:—

RHINOPOMA PUSILLUM, sp. n.

A species of the *cystops* group, smaller than any as yet described.

General build light and delicate, about as in *R. muscatellum* and *seianum*, but size still smaller. Connecting band of ear well developed. Feet small and very slender. Tail short, slightly shorter than the forearm, the converse being generally the case in all the smaller forms of *Rhinopoma*.

Skull with the prominent nasal inflations characteristic of the *cystops* group, and these proportionally a little higher; top of muzzle, as seen in profile and compared with the line of the tooth row, slanted downward anteriorly in *cystops*, horizontal in *muscatellum* and *seianum*, upwards anteriorly in the new form, though very slightly so. Sagittal crest well developed anteriorly. Bullæ not so large as in *muscatellum* and *seianum*.

Molars smaller than in any of the allied species. Canines shorter, comparatively broad at base.

Dimensions of the type, measured on the spirit specimen:—

Head and body, 54; tail, 46; ear, 17·5; lower leg and foot (c.u.), 32; hind foot (c.u.) 11·3. Skull:—greatest length, 15·5; median naso-occipital length, 14; zygomatic breadth, 9·2; breadth across nasal inflations, 5·5; mastoid breadth, 8; length of bulla, 4·4; basal diameter of canine, 1·1; front of canine to back of m^3 , 5·3; combined length of m^1 and m^2 , 2·6.

Hab.:—Sib, S. E. Persia, near the Perso-Baluchistan frontier.

Type:—Old female in spirit B.M. No. 20.1.19.3. Collected by Col. J. E. B. Hotson, presented by the Bombay Natural History Society. One specimen only.

Considering how near are the respective localities I had expected this would prove to be *seianum*, but it is readily to be distinguished by its small size, much smaller teeth and shorter tail.

THE COMMON BUTTERFLIES OF THE PLAINS
OF INDIA.

(INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, I.F.S. (RETD.).

(Continued from page 954 of Vol. XXVI.)

PART XXV.

39. Genus—*VIRACHOLA*.

Eyes hairy; body robust. In the male there is tuft of hairs turned upwards from the inner margin of the fore wing, these hairs fixed on that margin; in the hind wing there is also a male sexual mark: glandular, depressed, on the upper surface, near the base, pear-shaped with the narrow end directed towards the base, extending slightly below the costa into the discoidal cell and reaching as far out as the discocellulars; the palpus of the male shorter than that of the female; the hind wing with an anal lobe and a thin threadlike tail at the end of vein 2. The genus contains three species, all belonging to the Indian region. Two of these are found throughout India except in the absolutely desert tracts and in Ceylon; the third is confined to the Andamans. The transformations of the two Indian species are known and have often been described; they will be found below. The larvæ and pupæ are very similar to those of *Deudoria* and *Bindahara* and the larvæ all feed on the inside of fruits of different sorts. They are all the butterflies of the present genus that is, very powerful fliers, quick and agile and capable of traversing long distances. Our two species, *isocrates* and *perse*, are both fond of the sun and the males bask on the tops of high trees, sitting with the wings half-open as long as the sun is bright. They rest, with them closed, under leaves, &c.

196. *Virachola perse*, Hewitson—Male. *Upperside*: Fore wing with the costa above the median vein up to the base of vein 2 deep black; the apex broadly black; the black colour occupying the whole apical space and outer margin, leaving the inner and lower portion of the wing blue; sometimes with an ochreous-red patch varying in size outside the cell. Hind wing with the costa broadly black, the band narrowing suddenly round the apex and continued narrowly down the outer margin to the anal angle; abdominal space also rather broadly black; the fold grey; the remaining inner space blue; the anal lobe black, with a dull ochreous spot in it; tail black, tipped with white; *cilia* of both wings black. *Underside*: vinous-grey, sometimes with a red tinge; markings darker grey, pale-edged. Fore wing with an irregular, rather large spot at the end of the cell with dark edges; a discal band of conjoined spots from the cost to near the submedian vein; the lowest small, the first four outwardly oblique, the others straight down, commencing a little inwards. Hind wing with a black, subbasal spot below the costa; twin spots at the end of the cell; a discal band of conjoined spots, the third and fourth a little outside the others, its lower part curving suddenly in towards the abdominal margin below its middle; anal lobe black, a small, round black spot in the first interspace, ringed with ochreous. Antennæ black, ringed with white, club with an ochreous-red tip; frons grey; eyes ringed with white; head

and body black above, grey beneath.—Female. *Upperside* paler blue, without gloss. Fore wing with broad, costal and outer, marginal, black borders, a white patch, sometimes tinged with ochreous beyond the cell. Hind wing with the costal and outer, marginal, black borders broader than in the male; abdominal space clear of blackish suffusion; the fold blackish-grey; a white, anteciliary line from the anal lobe to vein 2. *Underside* paler than the male, markings similarly disposed, but more defined. Expanse: male, 35-50mm; female, 45-60 mm.

Egg.—Hemispherical, very much flattened in *shape*. *Surface* pitted all over with small cells which may be hexagonal but their shape is obscured by the thick, coarse walls which are double the diameter of the cell—apertures; there are some scattered thickenings of the intersections of cell walls; on the very apex of the egg there is a more or less circular depression, the bottom of which is minutely pitted. The egg is broadest just above the base. The *colour* is green as seen at the bottoms of the cells and apical depression; the cell-walls are all white obscuring most of the ground-colour. B: 1.75mm.; B: 1mm.

Larva.—Nearly exactly the same as that of *V. isocrates*. *Head* of medium size, light yellow-brownish; shining. The *surface* shining; covered with similar black hairs but slightly longer than in *isocrates*; the other hairs also longer: instead of one hair, subdorsal, on each segment there are here three or four subdorsal on each side on segments 4-6 and two on 8-10; the little wart-like tubercular swellings below each spiracle bear some rather longer, white bristles; the edges of the shovel perhaps more tumid. The *spiracles* large, oval, black. The colour indigo-brown; segments 1-3 orange-brown; marks on segments 7, 8 are light-cream coloured; segments 11-13 same colour as 1-3, but somewhat darker; the spiracles of segment 12 larger, L: 25mm.; B: nearly 7mm.

Pupa.—Similar to that of *isocrates* but the constriction more pronounced because the abdomen is more swollen at segments 7 and 8 where it is highest and broadest; circular in transverse section. *Surface* covered with minute hairs sparsely, more dense round spiracles and a little longer along the front margin of segment 2: the thorax is more humped than in *isocrates*. *Spiracles* of segment 2 facing slightly forwards instead of being flush; the other spiracles long and narrow, dark-brown. *Colour* dirty light-brown. L: 16 mm.; B: 7 mm.

Habits.—Exactly the same as those of *V. isocrates*. They do not deviate in any single particular from them; ants only attend the larvæ as scavengers and not as visitors except that they may occasionally find some of the sugary ferment on the backs of the latter that might attract them—there should be a good deal of the sort adhering to a bristle-bearing surface. The butterflies are strong and rapid in flight and difficult to catch; the maies bask also, like those of *isocrates*, but are not found at the tops of hills so much; they do not commonly visit flowers, neither do they go to water. The habitat of *perse* in India is from the Himalayas to the South. It is, seemingly, confined more to the jungles than the other species, *isocrates*, and is certainly more plentiful on the sea-coast in Kanara than that species, and continues plentiful as far as the jungle lasts to the east, say to where the rainfall diminishes to 40 inches. The commonest foodplant is *Randia dumetorum* (fruits).

197. Virachola isocrates, Fabricius. Male (Pl. H., fig. 54)—*Upperside*: violet brown. Fore wing: with the colour darkening on the margins in certain lights, showing a bright violet gloss on the inner area; an indistinct orange-ochreous patch, varying in size in different examples, beyond the cell, only visible in certain lights. Hind wing: with the costal area and abdominal fold blackish-brown; anal lobe whitish with a black spot in it, varying in size in different examples, with some pale bluish-white scaling on its upper side, in some examples the black spot nearly fills the whole of the anal lobe; tail black, tipped with white. *Cilia* of both wings with the basal part black, the outer half white, becoming bluish-grey below the tail and round the anal lobe. *Underside* vinous-grey, or slaty-grey, markings darker than the ground colour, edged on both sides with white. Fore wing with a bar at the end of the cell, a discal band of conjoined spots, decreasing in size hindwards, nearly straight down, from near the costa to below vein 2, where the spot is very small. Hind wing with similar discoidal bar and discal band, the latter somewhat irregular; the third, fourth and sixth spots a little outside the others, then the band, with a sudden curve, reaches the abdominal margin a little below its middle; anal lobe black with a white spot on its upper inner side, a smaller black spot ringed with orange in the first interspace, with some blue, grey and white scaling between them; both wings with indications of a narrow, submarginal band and very fine, marginal, grey line. Antennæ black, ringed with white, club with an orange tip, with a white streak below at its base; frons greyish-white; eyes ringed with white; head and body above and below concolorous with the wings, abdomen below white.—Female. (Pl., H., fig. 54a)—*Upperside* brown. Fore wing: with the colour darkening towards the margins, the orange-ochreous patch larger and more distinct and varying much in extent, in some examples extending broadly to the base below the median vein. *Upperside* as in the male, but the bands are broader and more outwardly curved; the black, anal spots larger. Expanse: male, 40—45 mm.; female, 45—50 mm.

Larva.—The *shape* is exactly the same, practically, as that of *Deudorix epijarbas*, with the same kind of anal end, *i.e.*, a “shovel,” circular and flat, on the dorsal areas of segments 12-14; the general style of marking is also similar. *Head* rather small, hidden under segment 2, shining, round in shape and dark-brown in colour; segment 2 semicircular in shape, thickened round the margins, slightly emarginate in dorsal line on front margin, evenly convex transversely, with a dorsal depression which has on it a double, fine, dorsal line flanked on either side by a small, black spot; segment 3 broader and higher than segment 2, flat on dorsum or top, rising suddenly from the front margin, that is forming a perpendicular declivity from the surface of segment 2; segments 4-6 shorter than 3, the body highest at segment 4, each of the segments 4-6 with a transverse dent on dorsum; segments 7-10 about the same breadth—the larva is broadest at segment 3—with, each, a small, dorsal, elliptical indentation; segments 3-10 have also a lateral, central longish depression or dent parallel to the front and hinder margins; segment 11 is dorsally flat (as in *Deudorix*) and not very distinguishable from the succeeding “shovel” segments: the surface of the shovel-disc is pitted and the margins raised; all segments very distinct except the anal ones, especially on the dorsoventral margin which is somewhat flanged or thickened all round; segment 13 about the same breadth as segment 2 and the hinder margin of 14 is semicircular. The *surface* of the larva is shining-oily looking, covered with many small, tubercular, black hairs; front margin of segment 2 and the whole dorsoventral margin of body with a row of fine, short, white hairs much longer than the tubercular, black ones; on top of each segment 3-10

is a subdorsal, erect, white much longer hair, each rising from a small swelling; bases of legs and prolegs also finely hairy. *Spiracles* are oval, shiny-brown and sunk in depressions. *Colour* of the body is a dark indigo-blue with the front margins of segments 2, 3 broadly yellow, top of segment 3 also yellow, with a dorsal, blue line; segments 7, 8 with a large, dorsal, square, whitish patch over both of them, the whole length of the segments and about one-third of the breadth, with a semicircular, small, blue indentation on the dorsal line of each near the hinder margin; these two segments 8, 9 have also a whitish blotch under each spiracle; segments 11-13 are translucent-looking grey as well as the ventrum: legs shining glassy-yellow. The organs on segment 13 are small and cylindrical, occasionally protruded from the circular orifices, white; gland not perceptible. L: 20 mm.; B: 6 mm.

Pupa.—Is quite normal in *shape*; *head* under segment 2 which over-reaches it in a thin margin ever so slightly, eyes prominent with a central, shiny depressed line; antennæ hardly distinguishable between eyes and margin of segment 2; segment 2 transversely convex, sloping up to the hinder margin very steeply, rounded in front—that is the front end of pupa is rounded; thorax with its front ascent in the same plane as that of segment 2, only slightly humped, rather long, the hinder margin running into segment 4 in a point on dorsal line; constriction slight and gradual; abdomen and thorax the same breadth to segment 8, transverse section at segment 8 circular, slightly depressed; segmental divisions distinct, that between 9, 10 especially accentuated—that is the segmental membrane is visible; segment 11 to anal extremity are, dorsally, in a plane very nearly perpendicular to the longitudinal axis of the pupa—the passage from 10 being of course evenly rounded; the anal segment itself turned under ventrally. The *surface* is sparsely covered with minute, comb-topped hairs which are denser round the front margin of segment 2 and round the spiracles; otherwise pitted and dull. *Spiracles* of segment 2 are long, prominent, velvety-looking and light in colour; the rest are in small, circular depressions, slightly prominent, oval, brown in colour and conspicuous. *Colour* of the pupa is brown-pinkish suffused with blackish; wings light reddish-brown, spotted and splashed with blackish; a blackish, dorsal, blotchy line and row of dark, lateral spots on abdomen; sides of thorax and head blackish. L: 16 mm.; B: 6.25mm.

Habits.—The egg is laid on flowers, fruits, stalks, leaves, &c., always one at a time. The little egg-larva eats into the carpel or the fruit, wandering until it finds one, if born otherwise than in a flower or on a fruit. The mother-insect generally chooses a fruit that is not too far advanced and often a flower—to give the small larva a chance: what it does when the egg is laid on bark, leaves, &c., is a matter of conjecture. Certain it is, however, that many eggs are laid which never come to anything; also many larvæ bore into fruits that never reach maturity—possibly because they cannot get inside the hard stone? For it is in the interior of the stone, in the case where a tree with a stoned fruit is chosen that the larva chooses to live and feed. When well-grown it does not seem to have any difficulty about piercing the stone and during its habitation of the inside, which means during the time it has sufficient food to go on with, it enlarges the perforation so as to admit of its passing its body through it as it finds necessary. When it has

finished one fruit, hollowed it out completely that is, it wanders out and looks for another,—it is generally at these times, in all probability, that many get eaten by birds, &c. When the fruit chosen is large enough to accommodate more than a single larva, there may be several in it. In these cases where one large fruit—such as a Pomegranate for example—contains only a few larvæ of small size, it takes them a long time to finish the contents. In the course of time, also, the gradual demolition of the vital parts of the inside, would and does lead to the eventual atrophy and the consequent weakening of the stalk attachment. In the ordinary course of events, the fruit would fall before the contents were nearly finished. To prevent this, the larvæ have evolved a very efficacious method: they tie the fruit on to the branch at the stalk. They come out at intervals from their retreat and weave silken ropes all over the stalk and the surface of the fruit as well as on the neighbouring surface of the branch, repeating this again and again until the fixings become so strong that it requires quite an effort to tear the fruit away. Every larva attaches its particular fruit to the branch or twig in this manner and thus prevents it being shaken off by the wind or falling to the ground while still inhabited. If it did, it would quickly rot and the inside would become unserviceable as food; or ants and other enemies would invade the premises and make short work of the inhabitants. Of course, when the caterpillars come out to fix the fruit, they are always liable to be snapped up by a bird or lizard or something, so that it is a dangerous game for them; but it is not half as dangerous as if they were to fall to the ground in their houses or house to become a prey to many more pertinacious and probably more numerous enemies. This is not the only adaptation that these larvæ have developed in the course of by-gone ages either. The “shovel” at the end of the body is another. The inside of a fruit becomes very insanitary after a time, wet and damp and mouldy and extremely strong-smelling (anybody can testify to this who has bred the larvæ from “Ghela”, *Randia dumetorum*). As the sap accumulates from the wound, due to the biting of the larvæ, and gets mixed with the droppings, it becomes necessary to clean up and hence the shovel. It is used to push out the refuse from the interior and just fits the orifice which is always made of the requisite size for that purpose. The inside of a fully eaten fruit is as clean as a new pin, especially when the larva is full grown and about to change. It pupates inside the last fruit as a rule and a very general rule. The operation is rarely effected anywhere else. Before finally settling down to change, the larva spins a web across the orifice, and always a web with two holes at the sides and hinged on one side as well; it is quite opaque. The pupa is formed inside, attached by the tail and a body-band to the surface. The butterfly, upon emerging, runs to the hole, forces its way

under the edge of the web—the edge that has been left unfastened by the larva for that purpose—and runs out to find a place from which to hang and develop its wings. Ants are hardly ever found with the larvæ and the few that were observed had probably other things in view than to visit them—the sugary, fermented juices of the inside of the fruit for example. The fruits the larvæ have been found in are various :—*Randia dumetorum* (*Rubiaceæ*); *Eriobotria japonica* (*Rosaceæ*); *Psidium guava* (*Myrtaceæ*); *Tamarindus indica* (*Leguminosæ*); *Strychnos nux-vomica* (*Loganiaceæ*); *Gardenia latifolia* (*Rubiaceæ*). It is evident, from this list, that they feed upon any species handy. The pupa is so attached inside the fruit that its head is directed towards the opening. It is stated by Downes that “we may notice an interesting fact, namely that the insect has the precautionary instinct, which acts as a second inducement, to make the aperture in the fruit in that stage of its existence in which it is furnished with organs best adapted for that purpose; for, had the larva omitted taking this step, the consequences would have been that the insect, when come to the butterfly state, would have been a prisoner totally unable to escape, being unprovided with any instrument suited to the purpose.” But it does not; it makes the aperture and enlarges it as found necessary all through its existence for egress and ingress so as to be able to come out and fix the stalk: after a time that is, after it has passed through, say, the first two stages. The larvæ in confinement will leave any fruit to which there is want of access of air because of the fermentation and consequent smell which must be exceptionally bad. Also, in confinement, they may not be able to shovel out the dirt owing, perhaps, to the hole not being uppermost and free—no wonder they then quit. Ants take away the droppings for some purpose or other but the larva does the cleaning itself, independently of their help. The shovel is very often used to block up the opening—to prevent enemies from gaining ingress very probably; though this device is not always resorted to.

The butterfly itself is a strong, powerful flier and takes quite long flights on occasion as when in pursuit of another one—a practice it is much prone to when basking on the tops of trees in the sun. It sits there expectant of sport—and gets it. It is one of the “basking butterflies” that is always to be found on the tops of the trees on the summit of the 2,000' high hill near the coast at Karwar in Kanara; and it appears at about 2 p.m. in the monsoon months—all butterflies have their particular time of day for putting in an appearance. Once known, their sequence is as good as a watch up there. The females are never seen on the hills-tops and do not bask. They may be found ovipositing however round the food plants. The insects are very difficult to catch in a net because

of their swiftness and high-flying habits; they are, also, so strong that they batter themselves to pieces before one can get hold of them. To illustrate the strength of the larval jaws E. H. Aitken remarks *a propos* of *V. perse*—and it is apposite here—that “the stony hardness of the fruit turns the edge of one’s penknife and one’s curiosity too.” Also, in alluding to the strength of the fastening of the fruits to the branches he says “I have taken a pomegranate infested with these larvæ (several usually inhabit each fruit) and made it stand in an egg-cup. In the morning it was so securely fastened that in taking up the fruit I lifted the cup.”

Virachola isocrates inhabits the whole of India, Burma and Ceylon except the desert tracts. It is commoner in the open country, with moderate rainfall of say about 20" where scrub jungle is the best forest available, than in heavy forest country with a large rainfall; it is commoner in the Bijapur District than in Kanara in the Bombay Presidency. It is also, in the latter District, more plentiful on the uplands at 2000' than on the sea-coast.

The figures 54 and 54*a* of the male and female on Plate H Vol. XXVI are fair; the male shows too little purple on the upperside; the female upperside is too light. Both are too pink.

(To be continued.)

THE PAST AND PRESENT DISTRIBUTION OF THE LION IN SOUTH EASTERN ASIA

BY

N. B. KINNEAR.

From the popular point of view one of the, if not the, most interesting animals found in India is the lion and to many, who are not members of the Society and have not read Colonel Fenton's papers in the Journal, it may come as a surprise to hear that the lion does occur in this country though, it is true, in very small numbers and in a restricted area.

Dr. Blanford, in his volume on the Mammalia in the Fauna of British India series, gives a good account of the present and former distribution of the lion in India, but as that work is now out of print and not easy to obtain, I propose in the present paper to trace as far as possible the history of the lion in this country. At the same time a number of notes have been included on the lion in Persia, Mesopotamia and Asia Minor, which I have collected for some time. As it has not been possible to see the Asian, certain numbers of the Oriental Sporting Magazine and several of the other old Indian sporting magazines, a number of records have probably been missed and in the same way some records from books of travel referring to Mesopotamia, Persia and Asia Minor have also not been seen.

In the various cave and river deposits throughout Europe the remains of what is called the cave lion, *Felis spelæa*, have been found and by many authorities this animal is considered to have been identical with the lion of the present day or, at the most, a race. The deposits in which these remains are found belong to the Pleistocene.

Dr. A. B. Meyer in his paper on "The Antiquity of the Lion in Greece", which was reproduced in the Annual Report of the Smithsonian Institute in 1903, summarises what has been written on the lion being found in south east Europe and Asia Minor by various authorities, and his conclusions are that, within historic times, lions were found in Greece, if not also in the Balkans and the valley of the Danube. According to Herodotus the baggage camels of Xenophon were attacked by lions in the country of the Pæonians in Macedonia, this was roughly about 355 B. C. so that at that time most of Asia Minor and Syria were included within the range of the lion. Also we know that in Biblical times lions were found in Palestine, but according to Canon Tristram they appear to have become extinct about the time of the Crusaders, the last mention of them being by writers of the 12th century, when the lion still existed near Samaria.

We may take it then that during the 12th century, the lion roamed over parts of Syria, along the banks of the Euphrates and Tigris, parts of Arabia, the south western corner of Persia and northern India, through the Punjab, Sind, as far east as Palaman and south to the Nerbudda. There is no evidence of the lion being found in Afghanistan or Baluchistan nor have I been able to find any record of its occurrence in southern Arabia.

Coming now to actual records it is proposed to trace the history of the lion in S. E. Asia down to the present day and for the sake of convenience this will be arranged under the two headings (1) Syria, Mesopotamia and Persia, and (2) India.

(1) SYRIA, MESOPOTAMIA AND PERSIA.

Rich, in his "Narrative of a Residence in Koordistan" published in 1836 and dealing with the years 1820-21, mentions that a part of the Tigris called Jat was famous for lions, but apparently he did not see or hear any

there, though at the junction of the Hye and the Tigris he saw some Arabs carrying a bier containing the mangled remains of a young child which had been killed by a lion. Lower down, below Kut, he heard lions roaring at night, but did not actually see any.

Colonel Chesney, the leader of the Euphrates Expedition, which was to prove the practicability of the Euphrates as a quick mail route to England, made his first visit to Mesopotamia in 1830, to carry out a hurried survey of the Euphrates and the Tigris. In his account of this expedition he mentions that near Gobain Island, on the well wooded banks of the Euphrates above Hit, he saw a lion on the bank within eight yards of his boat, and higher up at El Werdi he heard lions roaring at night.

The Euphrates Expedition took place in 1835-36, but no lions appear to have been seen on the voyage down the river, and Ainsworth, writing after 1850 (Personal Narrative of the Euphrates Expedition), says that "it is remarkable that the last two mentioned explorers (Loftus and Layard) saw many lions during their excavations of the mounds in the central parts of Khaldeæa, whilst we met with none during the navigation of the river;" and later on he remarks that "the jungle of the Karun is reputed to be infested with lions, but we never saw one."

On the completion of the expedition down the Euphrates, the steamer "Euphrates" was taken up the Tigris, and at Bagdad Ainsworth tells us that he saw a tame lion sitting in a kufa with its owner. He also mentions that near Kut the natives spoke in terror of the lion, but that though he always went on shore, when the steamer was tied up for woodcutting, the only large carnivora he saw was a cheeta.

Assistant Surgeon Winchester, who was on the same trip, seems to have been more fortunate in seeing lions and he writes (Memoir on the River Euphrates, etc., during the late Expedition of H. C. armed steamer "Euphrates" Rec. Bomb. Geog. Soc., Nov. 1838) that below Ctesiphon, where the tamarisk was very thick on the river banks, he saw about sunset, three lions basking on the river's edge. The lions were fired at, but the shooting was bad and "so independent were they" notes Winchester that "they did not move!"

The next author to mention lions is Layard, the famous explorer of the ruins of Nineveh. He not only came across many lions, but also hunted them with the friendly Bakhtiyari chiefs in Arabistan, of which he gives interesting accounts, but of that more later.

In 1840, on his first visit to Mesopotamia, he mentions that while they were encamped on the desert side of the Tigris, near Mosul, they lit fires to keep off the lions "which are occasionally found there in the jungle in this part of Mesopotamia", and at Tekrit his raftsmen would not stop during the night "for fear of marauders and thieves and also he averred lions, which are occasionally, but very rarely, found so far north on the banks of the Tigris" (Autobiography, vol. 1).

In 1841 Layard saw a lion which had done much damage in the plain of Ram Hormuz and had eventually been killed by a detachment of the Luristan regiment. "It was unusually large and of very dark brown colour in some parts of its body almost approaching black." He goes on to say that "The lion has not, I believe, been known to traverse the high chain of the Luristan mountains into the valleys of the Persian side.* In the plains of Khuzistan its usual places of concealment are the brushwood and jungle on the banks of the rivers and streams and in the rice fields." (Early Adventures). On the desolate hills near Mt. Asemari

* Layard apparently meant north of the Bakhtiyari mountains, since at this time lions certainly occurred round Shiraz.

in Khuzistan Layard says that besides wolves, lions, leopards, bears, hyænas, jackals and other beasts of prey, various species of wild sheep and goats are found in great numbers, and while living with the Bakhtiyari near there he was present at a number of lion hunts. Of one of these he writes "One afternoon when Mehemet Taki Khan was seated at the doorway of his castle with the elders, a man arrived breathless and in great excitement, declaring that in crossing the plain he had met with a lion in his path. The beast, he said, was preparing to spring upon him, when he conjured it in the name of Ali to spare a poor unarmed man, who never harmed any of his kin. Thereupon the lion being a good Musalman and a Shia to boot, as some lions are believed to be, turned away and disappeared amongst the bushes. The man, ungrateful to the lion, offered to conduct Mehemet Taki Khan to the spot. . . ." Layard then goes on to say how the man took them to a hollow covered with brushwood, where he said the lion was and on its being disturbed it sprang out at one of the chief's followers, who wounded it with his long gun but did not kill it. The lion then seized another follower and in doing so knocked down a third. The situation, as can be imagined, was most critical and Layard gives a delightful account of how the lion was killed. "Mehemet Taki Khan himself" he says "jumped off his horse, and advancing towards the beast addressed it thus in a loud voice: "O lion, these are not fit antagonists for thee. If thou desired to meet an enemy worthy of thee contend with me." The lion did not however appear to think that the chief was better than any of the rest and did not let go of its prey, so "the chief approached it and drawing the long pistol which he carried in his girdle, fired at its head and the lion falling on the ground was quickly despatched by the guns and swords of his, Mehemet Taki Khan's, followers." This lion was an unusually large one and had a short black mane.

As a rule, Layard tells us, these lions seldom attack human beings, but once, while on a hunting expedition, one of the party was carried off in the night. They were sleeping in the open and the man was not missed till, next morning, his remains were found close by! In the plain of Ram Hormuz, the flocks and herds of sheep and oxen belonging to the Bakhtiyari suffered from the depredations of lions. On account of this, Layard tells us, the Bakhtiyari used to place male buffaloes on the outskirts of their encampments, since "It is said that the buffalo does not fear a lion, and will even drive it away."

Between the years 1848 and 1849 Layard was at Nineveh and in his book "Nineveh and Babylon" he writes "The lion as I have observed is now rarely found on the banks of the Tigris as far north as Mosul, or even above Bagdad. That it was originally an inhabitant, there can be no doubt. From the earliest period it was considered the noblest of game, and was included amongst the wild beasts preserved in the paradises, or parks, attached to the royal palaces. On the monuments of Nineveh, the triumphs of the King are deemed no less worthy of record than his victory over his enemies."

Of the distribution of the lion in Mesopotamia as a whole, Layard in the abovementioned book says "The lion is frequently met with on the banks of the Tigris below Bagdad, rarely above. On the Euphrates it has been seen, I believe, almost as high as Bir, where the steamers of the first Euphrates Expedition under Col. Chesney were launched. On the Sinjar, and on the banks of the Khabour, they are frequently caught by Arabs. They abound in Khuzistan, the ancient Susiana. I have frequently seen three or four together and have hunted them with the chiefs of the tribes inhabiting that province."

When making excavations at Niffer near Karna, Layard frequently saw lions and he says that "The Midian Arabs boast of capturing them in the following manner, and trustworthy persons assure me that they have seen the feat performed. A man, having bound his right arm with strips of tamarisk, and holding in his hand a short piece of the same wood, about a foot or more in length, hardened in the fire and sharpened at both ends, will advance into the animals lair. When the animal springs upon him, he forces the wood into the animals extended jaws, which will then be held open whilst he can dispatch the astonished beast at his leisure with the pistol he holds in his left hand."

The Bedouins and Jebours, in Layard's time, used frequently to find lion cubs in the spring at Khabour and at Hillah. On his first visit to the last mentioned place Layard was presented with a pair of lions by Osman Pasha. These two lions appear to have been very tame and were allowed the run of the town, in the same way as sacred cows are allowed in this country. As the behaviour of these lions is rather amusing, I give Layard's description in full. "One was nearly of full size, and was well known in the bazaars and thoroughfares of Hillah, through which he was allowed to wander unrestrained. The inhabitants could accuse him of no other objectionable habit than that of taking possession of the stalls of the butchers, who, on his approach made a hasty retreat leaving him in undisturbed possession of their stores, until he had satisfied his hunger and departed. He would also wait the coming of the large kuffas, or wicker boats of the fishermen and driving away the owners help himself to a kind of a large barbel, of which he appeared to have a decided relish. When no longer hungry he would stretch himself in the sun, and allow the Arab boys to take such liberties with him as in their mischief they might devise. He was taller and larger than a St. Bernard dog, and, like the lion found generally on the banks of the rivers of Mesopotamia, was without the dark and shaggy mane of the African species. The other lion was a cub, and had recently been found by an Arab in the Hindeyah Marshes."

Loftus, who travelled in Chaldea and Susiana about 1849-50, while encamped near Sinkara killed two lion cubs and frequently heard lions roaring. He also says that at this date lions were to be found at Susa near Dizful in Khuzistan. (*Travels and Researches in Chaldea and Susiana.*)

The lion existed in Upper Mesopotamia to a much later date than any already given, and in the Proceedings of the Zoological Society for 1880 Durnford writes that "Sheik Muslapha also informed him that five years ago a lion appeared near Biledjik* and after destroying many horses was done to death." In 1885 Cannon Tristram in his "Fauna and Flora of Palestine" says "the latest trace being that a few years ago the carcass of one was brought into Damascus" adding that "it is still common in Mesopotamia though rare in India." Still later Sir Alfred Pease, in his "Book of the Lion," published three years ago, remarks on the status of the lion in Upper Mesopotamia as follows: "I find in my notes on the Fauna of Asia Minor made during a journey in 1891, the following:—The lion is no longer found in Asia Minor, but exists in Mesopotamia and Arabistan, between Pœlis, west of Aleppo, and Deyr, and in the Euphrates valley, where it frequents impenetrable thickets growing in places along the banks and in the islands in the river; it is also found in the lower part of the Karun river but is nowhere plentiful." Unfortunately there is nothing to show how this information was obtained and whether it was from direct occurrences or simply what the Arabs reported.

* This is probably Biredjic, of the Times atlas, on the Euphrates north east of Aleppo.

Sir Oliver St. John, in Blanford's *Eastern Persia*, volume 2, which was published in 1876, writes that lions "are very numerous in the reedy swamps bordering the Tigris and Euphrates and are also found in the plains of Susiana, the modern Khuzistan." At this date too, they were also common in the country south of Shiraz as far east as longitude 53, but how far north the lion existed, St. John was unable to say, though he had definite information that they were not found north or west of Kerman-shah*. In a certain valley west of Shiraz four or five adult lions used to be killed every year, which shows that in Sir Oliver St. John's time they must have been pretty common.

Mr. Robertson, H. B. M. Consul at Busra, informed Sir Victor Brook in 1875, that lions were then plentiful on the Karun, and Dr. Morit, writing on the *Geology and Ethnology of Lower Mesopotamia*, mentions that in 1888 lions were still numerous.

About 1907 or 1909, Sultan Abdul Hamed presented to the Berlin Zoological Gardens a full grown lion from Mesopotamia, but whether or not it came from Mesopotamia proper is not mentioned. This appears to be the last record for Mesopotamia, but in the adjoining country of Persia Sir Percy Sykes tells us that in 1900† the hills around Kazerun between Bushire and Shiraz were full of game "notably the maneless lion, which haunt this locality," and ten years later‡ he wrote "lions still exist along the banks of the rivers in Arabistan, but in very small numbers, I once saw a dead one floating down the Karun being eaten by sharks." Apparently this is the last authentic record of the lion in Mesopotamia, since Hubbard in his book "From the Gulf to Arat," published in 1916, says that on "the Karun it is now ten years or more since the last lion was seen in this part of the world." Whether a few stragglers still exist in the country between the Karun and Amara or near Kharbour remains to be seen, but so far no member of the Expeditionary Force§ has been able to give any definite information as to whether any are still to be found though many have been asked.

INDIA.

India.—There is no evidence to show that the lion inhabited Afghanistan or Baluchistan within historic times, but it was formerly found in Sind,|| Bahawalpur and the Punjab, becoming extinct round Haryana, in

* Dr. A. B. Meyer in "The Antiquity of the Lion in Greece" mentions Khaurism as a locality in which the lion was found. This is on the strength of a statement in a book called "A Narrative of a Journey from Herat to Khiva, Moscow and St. Petersburg" by Abbott.

The book was published in 1843 and in the appendix at the end of volume two the lion is mentioned, along with the tiger, leopard and bear, as occurring in Khaurism, now spelt Khorassan, the country between the Caspian and Afghanistan. No other traveller as far as I have been able to find out, confirms this statement.

† Ten thousand miles in Persia, 1900, p. 319.

‡ *The Field*, 1910, p. 625.

§ In an official publication on Mesopotamia published in 1916 it is stated that a few lions may be met with near Kharbour and on the borders of Persia.

|| Blanford, F.B.I. *Mammalia*, includes Khandesh within the range, but according to the *Bombay Gazetteer* for Khandesh, published in 1880, this is not certain and in a footnote it is stated that "whether lions were formerly found in Khandesh seems doubtful." Reference is made to an article which appeared in the *Oriental Sporting Magazine* on "Lion Hunting in Khandesh," but, as it is pointed out, this article refers to Guzerat and not to Khandesh. Lions certainly have not been found in Khandesh since 1818, as special enquiries have been made, and there would seem to be no record of lion shooting in Khandesh since the beginning of British rule."

the latter province, in 1842. It was however extinct in Sind before that date and the last on record was shot near Kot Deji in 1810. Exactly how far eastwards the lion was a regular inhabitant we do not know, though there is a statement of one being killed in the Palamaw district, Behar and Orissa, in 1814, but whether this was merely a straggler or not, there is no evidence to show. The southernmost limit appears to have been the Narbada. In 1832 one was killed at Baroda, while further north it was comparatively common round Ahmedabad in 1836. Central India in these early days was one of the strongholds of the lion and to give an idea of its numbers we may mention that Lydekker was informed that during the Mutiny, Colonel George Acland Smith killed upwards of 300 Indian lions and out of this number 50 were accounted for in the Delhi district!

The occurrence of the lion in Cutch is doubtfully recorded. The lion probably was found in Cutch at one time but the records are not satisfactory. Lt. Dodd mentions that Burns about 1830 wrote that lions as well as tigers, bears and wolves were found north of Bhooj, but that none except the last named were now found, though a solitary lion was shot near Bela on the Runn, which was supposed to have been a straggler from Guzerat.

Edward Blyth, the curator of the Royal Asiatic Society of Bengal, in his catalogue of the mammals in the collection, which was published in 1863, wrote that the "lion was extirpated in Hurriana about 1842, a female was killed at Rhyal in Damoh district Saugor and Nerbudda territories, so late as the cold season of 1847-48, and about the same time a few still remain in the valley of the Sind river in Kotah, C. I. The species would appear to be now extinct in that district."

A few years later writing in the *Oriental Sporting Magazine*, Blyth drew attention to some more recent records of the lion, which he said must have come as a surprise to sportsmen and naturalists, as it was thought that they had been long exterminated in these localities.

These two records consisted of one from Deesa, where Lt. Clarke of the Royal Artillery was badly mauled by a lioness in March 1864 and lost his arm, and near Gwalior, where three officers out shooting in March of the following year came suddenly on three lions, two of which they secured. Blyth seems to have missed certain records, for in 1863 Col. Martin of the Central Indian Horse, and Mr. Beadon, the Deputy Commissioner, saw and killed no less than eight lions at Patulghar, 70 miles north-west of Goona while in 1864 Mr. Arratoon of the police "shot at and wounded a lion near Sheorajpur (25 miles west of Allahabad) and eventually with native help stoned him to death as he had no spare ammunition." In 1866 Blanford tells us that Messrs. Lovell and Kelsay, of the railway staff at Jubbulpore, shot a lion in Rewah near the 80th mile stone on the railway from Allahabad to Jubbulpore, and in the same year no less than nine lions were shot by one party in the neighbourhood of Kotah, Rajputana.

Round Goona lions were still numerous and two or three were shot in 1867, and Blanford, writing in the *Journal of the Asiatic Society of Bengal* for that year, says "a few appear to be killed about Gwalior and Goona, but the animal is scarce." At the end of his article he summarized the distribution of the lion in India at that date as follows:—"The lion seems still to exist in three isolated parts of central and western India, omitting its occasional occurrence in Bundelkund. These are (1) from near Gwalior to Kotah, (2) around Deesa and Mt. Abu and thence southwards nearly to Ahmedabad and (3) in part of Kathiawar, in the jungles known as the Ghur."

On Waterloo day, 1872, Sir Montagu Gerard killed a lion on Cheen Hill, nine miles from Goona, and the last one in Central India proper

appears to have been that mentioned by Selater as having been killed by Col. Hall near Goona in the following year.

In Rajputana they became extinct about the same date and in the Gazetteer of the "Western Rajputana States Residency and Jodhpur Residency" we find that a full grown female lion was killed on the Anandra side of Abu by a Bhil shikari in 1872, and in Jodhpur "the last four" are stated "to have been shot near Jaswantpura about 1872."

Lydekker gives 1888 as the date the last lions was killed in Guzerat exclusive of Kathiawar, but the last record I have been able to find is that mentioned by Colonel Nurse in the Society's Journal, volume XIII, 1900, in which he says "the last, I believe, killed in 1878 near the village of Bhoyn, about two miles from Deesa." According to the Gazetteer for Palanpur the lion was "now very rare" there in 1880.

The lion is still found in small numbers in the Native State of Junaghad in Kathiawar, where they are principally found in the Gir forest, but occasionally lions stray over the border into neighbouring states, where it is not long before they are shot.

For information in regard to the present position of the lion in Junaghad reference can be made to Colonel Fenton's two papers in the Society's Journal, Volumes XIX and XX, and Mr. Crump's notes in the Mammal Survey Report for Kathiawar in Volume XXII.

THE FLORA OF THE INDIAN DESERT.
(JODHPUR AND JAISALMER).

BY

E. BLATTER, S.J., AND PROF. F. HALLBERG.

PART V.

(Continued from page 987 of Vol. XXVI.)

1. STATISTICAL NOTES.

We give in the first place a tabulated list of the orders represented in the Rajputana Desert, together with their respective genera and species, indigenous as well as introduced:—

Order.	Genera.		Total of Genera.	Species.		Total of Species.
	Indigenous.	Introduced.		Indigenous.	Introduced.	
Menispermaceæ .	1	..	1	2	..	2
Nymphaeaceæ ..	1	..	1	1	..	1
Papaveraceæ ..	..	2	2	..	2	2
Cruciferae ..	1	2	3	2	3	5
Capparidaceæ ..	4	..	4	8	..	8
Violaceæ ..	1	..	1	1	..	1
Polygalaceæ ..	1	..	1	2	..	2
Caryophyllaceæ..	2	..	2	2	..	2
Portulacaceæ ..	1	..	1	2	..	2
Tamaricaceæ ..	1	..	1	3	..	3
Elatinaceæ ..	1	..	1	3	..	3
Malvaceæ ..	4	1	5	12	4	16
Sterculiaceæ ..	1	..	1	4	..	4
Tiliaceæ ..	2	..	2	10	..	10
Linaceæ ..	..	1	1	..	1	1
Zygophyllaceæ .	5	..	5	6	..	6
Geraniaceæ ..	4	..	4	5	..	5
Rutaceæ ..	..	1	1	..	2	2
Burseraceæ ..	2	..	2	3	..	3
Meliaceæ ..	..	1	1	..	1	1
Celastraceæ ..	1	..	1	1	..	1
Rhamnaceæ ..	1	..	1	5	..	5
Vitaceæ ..	..	1	1	..	1	1
Sapindaceæ ..	1	..	1	1	..	1
Anacardiaceæ ..	1	1	2	1	1	2

Order.	Genera.		Total of Genera.	Species.		Total of Species.
	Indigenous.	Introduced.		Indigenous.	Introduced.	
Moringaceæ ..	1	..	1	1	1	2
Leguminosæ ..	21	10	31	47	13	60
Rosaceæ ..	1	..	1	1	..	1
Combretaceæ ..	1	..	1	4	..	4
Myrtaceæ ..	..	3	3	..	3	3
Lythraceæ ..	1	2	3	3	2	5
Saxifragaceæ ..	1	..	1	1	..	1
Onagraceæ ..	1	..	1	1	..	1
Cucurbitaceæ ..	8	1	9	14	3	17
Cactaceæ ..	..	1	1	..	1	1
Ficoideæ ..	5	..	5	10	..	10
Umbellifereæ ..	..	1	1	..	1	1
Rubiaceæ ..	3	..	3	4	..	4
Compositæ ..	28	3	31	33	3	36
Oleaceæ ..	..	1	1	..	1	1
Salvadoraceæ ..	1	..	1	2	..	2
Apocynaceæ ..	1	2	3	1	2	3
Asclepiadaceæ ..	9	..	9	9	..	9
Gentianaceæ ..	3	..	3	3	..	3
Boraginaceæ ..	6	..	6	15	..	15
Convolvulaceæ ..	9	..	9	21	1	22
Solanaceæ ..	7	..	7	9	6	15
Scrophulariaceæ ..	7	..	7	9	..	9
Orobanchaceæ ..	1	..	1	1	..	1
Bignoniaceæ ..	1	..	1	1	..	1
Pedaliaceæ ..	..	1	1	..	1	1
Acanthaceæ ..	7	..	7	12	..	12
Verbenaceæ ..	4	..	4	4	..	4
Labiata ..	3	..	3	9	1	10
Nyctaginaceæ ..	1	..	1	3	..	3
Amarantaceæ ..	8	1	9	17	1	18
Chenopodiaceæ ..	5	..	5	7	..	7
Polygonaceæ ..	2	1	3	3	1	4
Aristolochiaceæ ..	1	..	1	1	..	1
Lauraceæ ..	1	..	1	1	..	1
Euphorbiaceæ ..	2	1	3	13	1	14
Urticaceæ ..	..	3	3	..	5	5
Gnetaceæ ..	1	..	1	1	..	1
Hydrocharitaceæ ..	1	..	1	1	..	1
Liliaceæ ..	3	2	5	3	2	5
Commelinaceæ ..	2	..	2	4	..	4
Naiadaceæ ..	2	..	2	6	..	6
Cyperaceæ ..	6	..	6	26	..	26
Gramineæ ..	25	3	28	65	3	68
Orders 69 (58 indigenous) ..	226	46	272	440	67	507

As can be seen in the above list there are 69 orders, 272 genera and 507 species. Of these are indigenous : 58 orders, 226 genera and 440 species. From now we shall confine ourselves to the indigenous plants only.

The following are the 10 dominant orders :—

1.	Gramineæ	with 65 species in 25 genera.
2.	Leguminosæ	„ 47 „ „ 21 „
3.	Compositæ	„ 33 „ „ 28 „
4.	Cyperaceæ	„ 26 „ „ 6 „
5.	Convolvulaceæ	„ 21 „ „ 9 „
6.	Amarantaceæ	„ 17 „ „ 8 „
7.	Boraginaceæ	„ 15 „ „ 6 „
8.	Cucurbitaceæ	„ 14 „ „ 8 „
9.	Euphorbiaceæ	„ 13 „ „ 2 „
10.	{ Malvaceæ	„ 12 „ „ 4 „
	{ Acanthaceæ	„ 12 „ „ 7 „

In order to get a clearer insight into the relations of the flora of W. Rajputana with the neighbouring countries, we add a list of the 10 dominant orders of N. Gujarat, the Indus Plain region and the Gangetic Plain region. The fact that W. Rajputana itself belongs to the Indus Plain region cannot prevent us from instituting this comparison, as W. Rajputana was practically unknown from a botanical point of view when J. D. Hooker wrote his “ Sketch of the Flora of British India.”

<i>N. Gujarat*</i>	<i>Indus Plain Region**</i>	<i>Gangetic Region**</i>
1. Gramineæ.	1. Gramineæ.	1. Gramineæ.
2. Leguminosæ.	2. Leguminosæ.	2. Leguminosæ.
3. Cyperaceæ.	3. Compositæ.	3. Cyperaceæ.
4. Compositæ.	4. Cyperaceæ.	4. Compositæ.
5. Convolvulaceæ.	5. Scrophulariaceæ.	5. Scrophulariaceæ.
6. Euphorbiaceæ.	6. Labiatæ.	6. Malvaceæ.
7. Acanthaceæ.	7. Boraginaceæ.	7. Acanthaceæ.
8. Malvaceæ.	8. Malvaceæ.	8. Euphorbiaceæ.
9. Scrophulariaceæ.	9. Euphorbiaceæ.	9. Convolvulaceæ.
10. Amarantaceæ.	10. Convolvulaceæ.	10. Labiatæ.

*Saxton and Sedgwick in Rec. Bot. Surv. Ind. VI (1918) 218.

** Hooker, J. D., in Imper. Gazetteer, ed. 3.

Nymphæ.	Viol. Celastr.	Sapind.	Anacard.	Moring.	Rosac.	Saxifrag.	Onagrac.	Apocyn.	Orobanch.	Bignon.	Aristol.	Laur.	Gnetac.	Hydrocharitac.																																																		
Menisperm.	Crucif.	Polygal.	Caryophyll.	Portulac.	Salvadorac.																																																											
Tamaric.	Elatin.	Burser.	Lythrac.	Gentian.	Nyctag.	Polygon.	Lil.																																																									
Stereul.	Combret.	Rub.	Verb.	Commelin.																																																												
Gemniac.	Rhamnac.																																																															
Zygophyllac.	Naiadac.																																																															
Chenopodiac.																																																																
Capparidac.																																																																
Asclepiad.	Solan.	Scrophul.	Lab.																																																													
Tiliac.	Ficoideæ.																																																															
Malvac.	Acanth.																																																															
Euphorb.																																																																
Cucurbitac.																																																																
Boraginac.																																																																
Amarantac.																																																																
Convolvulac.																																																																
Cyperaceæ.																																																																
Compositæ.																																																																
Leguminosæ.																																																																
Gramineæ.																																																																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65

To show how many species belong to each order.

A comparison of the Dicotyledons with the Monocotyledons shows the great poverty of the latter, whether we consider the orders, genera, or species :

	Orders.	Genera.		Total of Genera.	Species.		Total of Species.
		Indigenous.	Introduced.		Indigenous.	Introduced.	
Dicotyledons	63	187	41	228	335	62	397
Monocotyledons	6	39	5	44	105	5	110

If we take only the indigenous plants into account we find that the Dicotyledons make up 76·13 per cent., and the Monocotyledons 23·86 per cent. of the total, in other words, the ratio of Monocotyledons to Dicotyledons is 1 : 3·9.

The ratio of orders to genera and species is 1 : 3·9 : 7·3.

The proportion of genera to species is striking. In the whole of British India it is 1 : 7, in the Bombay Presidency (including Sind) it is 1 : 2·6, whilst in the Rajputana desert it is 1 : 1·99.

For the number of genera belonging to each order we refer to the following diagram which does not require any explanation :—

28	Compositæ.
25	Graminæ.
21	Leguminosæ.
9	Asclepiadaceæ, Convolvulaceæ.
8	Cucurbitaceæ, Amarantaceæ.
7	Solanaceæ, Scrophulariaceæ, Acanthaceæ.
6	Boraginaceæ, Cyperaceæ.
5	Zygophyllaceæ, Ficoideæ, Chenopodiaceæ.
4	Capparidaceæ, Malvaceæ, Geraniaceæ, Verbenaceæ.
3	Rubiaceæ, Gentianaceæ, Labiatæ, Liliaceæ.
2	Caryophyllac. Tiliac. Burserac. Polygonac. Euphorbiac. Commelin. Naiad.
1	Menisperm. Nymphaeac. Cruciferae. Violac. Polygalac. Portulac. Tamaric. Elatinac. Sterculiac. Celastrac. Rhamnac. Sapiud. Anacard. Moringac. Rosac. Combret. Lythrac. Saxifrag. Onagrac. Salvador. Apocynac. Orobranch. Bignon. Nyctag. Aristoloch. Laurac. Gnetac. Hydrocharit.

To show the number of genera in each order.

Out of 440 indigenous species we have classified 406 according to their geographical distribution. 34 have not been considered on account of their abnormal and erratic distribution, which makes one doubt whether the plants have been accurately named and compared in all cases. These are the results of our classification arranged according to the greater or smaller number of species belonging to each division :

North African-Indian Desert	..	..	71
Indian	..	..	67
Tropics of the Old World	..	..	46
Trop Afr. and N. Afr.-Ind. Desert	..	..	44
Tropical Africa	..	..	37
Oriental	..	..	28
Indo-Malayan	..	..	27
Tropics generally	..	..	26
All warm countries	..	..	25
Endemic	..	..	17
Mediterranean	..	..	9
Cosmopolitan	..	..	7
Temperate and subtropical regions	..	..	2

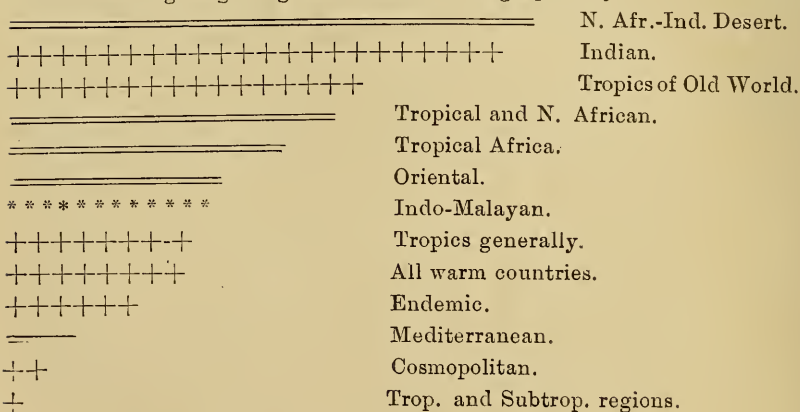
We can easily distinguish 3 well-marked elements in the flora of the Rajputana desert : A western, an eastern, and a more general element (including those which are purely Indian).

The following make up :—

	The Western Element.	The Eastern Element.	The General Element.
N. Afr.-Ind. Desert	71	Indo-Malayan	27
Trop. and N. Afr.	44	Indian	67
Trop. African	37	Trop. of Old World	46
Oriental	28	Tropics generally	26
Mediterranean	9	All warm countries	25
		Endemic	17
		Cosmopolitan	7
Total	189	27	Temp. and subtrop. reg. 2

190

The following diagram gives the same data graphically :—



Explanation : { ----- Western element.
 ***** Eastern element.
 +++++ The rest.

The general element can be neglected for our purpose, as it consists of species which are either only Indian or show a wider distribution over the Eastern and Western parts of the Old World, or comprise even certain regions of the whole globe.

What is left to form an estimate of the plant-geographical position of the flora is the western element with 189 species, and the eastern (here Indo-Malayan) element with 27 species. The eastern forms just 1/7 of the western. These numbers indicate that the Indo-Malayan and western botanical regions meet in the Western Rajputana desert. The ecological conditions of the country are not such as to exclude Indo-Malayan types entirely, but the western element is preponderant. This proves that Drude was correct, when he drew the line of demarcation between the Indo-Malayan flora and the Perso-Arabian region from the Gulf of Cambay northwards along the Aravallis.

We have said that there are 17 endemic species. We mention their names, as they are new to systematic botany:

- Farsetia macrantha, Blatt. and Hall. (*Cruciferae*).
 Melhania magnifolia, Blatt. and Hall. (*Sterculiaceae*).
 Zizyphus truncata, Blatt. and Hall. (*Rhamnaceae*).
 Psoralia odorata, Blatt. and Hall. (*Leguminosae*).
 Tephrosia multiflora, Blatt. and Hall. (")
 Tephrosia petrosa, Blatt. and Hall. (")
 Rhynchosia rhombifolia, Blatt. and Hall. (")
 Rhynchosia arenaria, Blatt. and Hall. (")
 Anogeissus rotundifolia, Blatt. and Hall. (*Combretaceae*).
 Ammannia desertorum, Blatt. and Hall. (*Lythraceae*).
 Pulicaria rajputanae, Blatt. and Hall. (*Compositae*).
 Glossocardia setosa, Blatt. and Hall. (")
 Convolvulus densiflorus, Blatt. and Hall. (*Convolvulaceae*).
 Convolvulus gracilis, Blatt. and Hall. (")
 Aerva pseudo-tomentosa, Blatt. and Hall. (*Amarantaceae*).
 Euphorbia jodhpurensis, Blatt. and Hall. (*Euphorbiaceae*).

It is very likely that a better knowledge of the Cutch, Sind and Baluchistan floras will reduce the number of endemic species.

(To be continued.)

INDIAN DRAGONFLIES,

BY

MAJOR F. C. FRASER, I.M.S.

*(With Text-figures.)**(Continued from page 932 of Volume XXVI.)*

Part VII.

64. *Rhythemis plutonia*, Selys.

Male and female much alike.

Male: Expanse 64 mm. Length 30 mm. Female: Expanse 54 mm. Length 28 mm.

Head: eyes reddish brown above, paler olivaceous beneath and at the sides; vesicle, frons and upper part of epistome metallic blue green; occiput blackish brown; lower part of epistome, labium and labrum brown.

Prothorax black.

Thorax and abdomen brown with a metallic green lustre. Legs brown.

Wings; both short, the fore narrow, the hind very broad, especially at the anal area; black or blackish brown by transmitted light but reflecting a dark, metallic green. In the male the metallic lustre is general throughout the wing but in the female is most marked at the base, especially in the fore part of loop. The apex of forewing in the male is hyaline, this area being very variable, from a mere spur at the extreme apex, to a wider area extending to within 1 or 2 cells of the stigma and running obliquely outwards and backwards. In the female both wing apices are hyaline, in the fore to just proximal of the stigma and in the hind to 1 cell distal of the stigma, its free border being here deeply concave. In the male, there is often a clearer triangular area just distal of the node more marked in the hindwing than in the fore.

Sexual organs as for the genus.

Hab. Burma, Bengal, Indo-Malay and Indo-China, Borneo.**65. *Rhythemis triangularis*, Kirby.***Rhythemis lankana*, Kirby.*Rhythemis bipartita*, Selys.

Expanse 60 mm. Length 28 mm. Subject to slight variation in size.

Head: eyes reddish brown above, lilaceous at the sides and beneath; vesicle and forehead metallic green; face and labrum yellowish.

Prothorax brown.

Thorax and abdomen blackish with a metallic green lustre. Legs black.

Wings short and broad, the anal field of hindwing very broad. In both sexes hyaline, with the bases of all wings deep black, this part appearing dark metallic blue by reflected light. The hyaline part is suffused with a greyish brown which gradually deepens as traced towards the wing apices. The limits of the black basal marking in the forewing, up to the 2nd antenodal nervure and to the distal or proximal end of trigone; in the hind up to the 3rd antenodal nervure or in some specimens up to as far as the node. The outer border of the marking sharply defined and serrated or notched. The extent of the marking is extremely variable, Ceylon specimens usually being more extensively marked than those from South India. In an average specimen, the black extends to within 1 cell of the

node, 3 cells distal of the trigone and as far as the apex of the loop. Usually there are two, more or less clear, hyaline rays at the base of the hindwing.

Sexual organs as for genus.

Hab. South India, Coorg, Ceylon, Java, Borneo.

Genus—PANTALA.

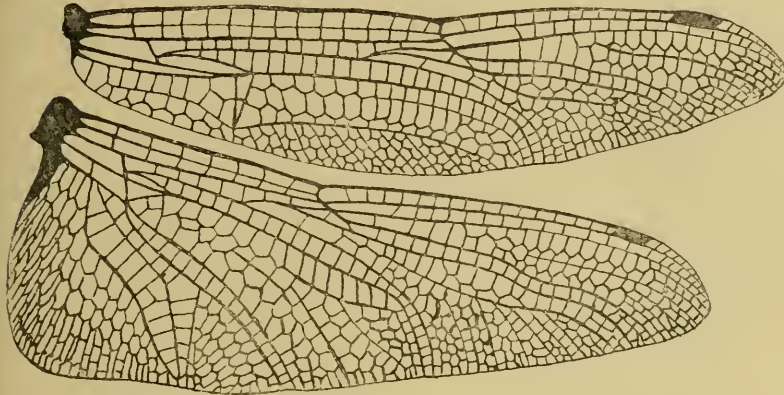


Fig. 53. Wings of *Pantala flavescens* showing neuration.

Genus *Pantala*, Fabr, 1861.

Head large and globular; eyes contiguous for a long distance; suture very deep and separating two flat areas which lie below the forehead, the latter narrow and prominent; vesicle broad and low.

Prothorax with a very small lobe which is almost entirely hidden by the approximation of head and thorax.

Thorax robust, very hairy. Legs slim and long; hind femora with about 25 small, evenly sized spines and some larger, wider-spaced ones in the outer third; mid femora with a row of gradually lengthening, larger spines. Tibial spines very long, moderately robust and numerous. Claw-hooks robust, situated about the middle. Armature of legs very similar in the female.

Abdomen cylindrical and appearing relatively short due to the depth of the hindwing, dilated at the base, constricted at the third segment and then gradually tapering to the end. Supplementary ridges on the 2nd, 3rd, 4th and 5th segments.

Wings long, the fore narrow, the hind very broad; reticulation close; trigone in forewing 2 or 3 cells distal to the line of trigone in hind; sectors of the arc with a moderately long fusion, about equal in the two wings; the arc lying between the 1st and 2nd antenodal nervures; antenodal nervures $13\frac{1}{2}$, the final one incomplete; 1 cubital nervure in the forewing, 2 in the hind, the distal of which lies near the trigone and forms a minute subtrigone; no supplementary nervures to the bridge; trigone in the forewing traversed once, very narrow, the costal side about $\frac{1}{4}$ th the length of distal side, its relation to the hypertrigone a little more than a right angle; trigone in hindwing entire, its base very slightly proximal to the arc; 8th nervure in the hindwing from the anal angle of trigone, in the forewing nearly straight, so that the discoidal field is strongly contracted at the termen; discoidal field begins with 3 rows of cells for 4 or 5 rows and is then continued as rows of 4; 2 rows of cells between 5 and 5a; all hypertrigones entire; 4th nervure strongly undulated; 5th nervure

diverging from the 4th and tending to become lost in the general reticulation a short distance from the termen; the 7th nervure at the distal end of 7a, strongly approximated towards the 6th and bent abruptly towards the termen; loop long and narrow, made up of 2 rows of cells none of which are as a rule divided, its outer angle tending to become obliterated and its midrib to become straightened. The inner border with a strong angle from which a nervure descends and splits the anal area into a distinct outer zone of large cells and an inner one of narrow, elongated ones. Membrane moderately large. Stigma of forewing much larger than that of hind.

Anal appendages very long and slender, in close apposition.

Sexual organs: male: 2nd segment very small, the lamina projecting and deeply fissured so that it appears to be made up of 2 lobes; tentaculæ broad, depressed, the internal directed outwards, the external only present as a rudimentary ridge on the internal; lobe small, oval and depressed.

Female: borders of 8th segment not dilated; no distinct vulvar scale formed on the 8th ventral plate, the free border of which projects as a stunted, tongue-like process; 9th ventral plate short, carinated, near its middle 2 small, horn-like processes similar to those seen in *Rhyothemis*.

Anal appendages in the female as long as those of the male.

66. *Pantala flavescens*, Fabr.

Libellula flavescens, Fabr.

Libellula viridula, Palisot de Beauvais.

Libellula analis, Burm.

Libellula terminalis, Burm.

Male and female very similar. Expanse 85 mm. Length 48 mm.

Head rounded and relatively large; eyes capped with bright red or reddish brown, pale lilac blue at the sides and beneath; vesicle and occiput bright yellow or olivaceous; face and forehead bright yellow, often with a dash of bright red at the upper part of latter; labium and labrum dark yellow.

Prothorax ochreous.

Thorax variable in colour, usually olivaceous or golden brown but sometimes a reddish orange, especially in wet season forms which are more highly coloured. Laterally paler, bluish green or greenish white, no markings.

Abdomen ochreous or yellow, suffused with red along the dorsum and on the dorsum of the 8th, 9th and 10th segments, small black spots. Beneath the first four segments, bluish green or whitish, the remainder dark yellowish brown and all bearing lateral, black "f"-shaped marks.

Superior anal appendages very long, as long as segments 9 and 10, brownish or the basal part yellow.

The female is very similarly coloured but has no red on the face or abdomen and the eyes are olivaceous brown above. The abdomen is stouter and without the constriction at the 3rd segment.

Wings similar in the sexes but the basal spot paler and more diffuse in the female. Hyaline with a pale yellow, basal spot in the hindwing extending as far as the cubital nervure, inner border of the loop but not as a rule to the termen. Very often the apices of the wings are a little smoky. Stigma reddish brown. Membrane white. Legs ochreous streaked with black.

Sexual organs as for genus.

Hab. Throughout India. *P. flavescens* occupies in the dragonfly world the same position, which *Cynthia cardui* occupies in the lepidopterous, it being a very cosmopolitan insect and found throughout the warmer zones of the whole world.

In Indian limits it is usually found to be gregarious and a swarm of a hundred or more may often be seen dancing lazily in the air. They prefer open breezy situations and for no explicable reason, will often choose the

lee-side of a banyan tree bordering a hot, dusty highway. To such situations they appear to migrate from their breeding places which are usually to be found at no great distance off, these being generally shallow swamps or marshes.

Genus—*TRAMEA*.

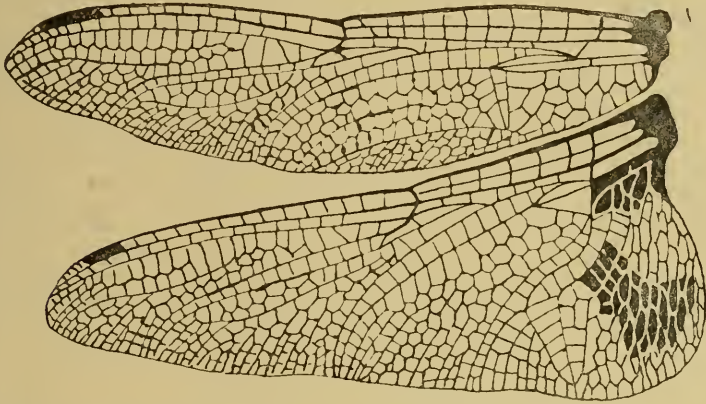


Fig. 54. Wings of *Tramea basilaris* to show neutration.

Genus *Tramea*, Hagen, 1861.

Head very large; eyes contiguous for a long distance, about equal to the length of occiput; vesicle large; forehead broad and prominent, but with no marked foreborder; suture flush.

Prothorax with a very small posterior lobe which is completely hidden beneath the head.

Thorax robust, cubical, very hairy, almost pilose. Legs very long and slim; the hind femora with a row of stout, widely-placed, gradually lengthening spines; mid femora similar; tibial spines robust, numerous; claw-hooks robust, situated near the apex. Armature in the female very similar.

Wings very long, the fore moderately and relatively narrow, the hind broad; reticulation close; trigone in the forewing 3 or 4 cells distal to the line of the trigone in the hind; sectors of arc fused for a long distance in the forewing and running close together for some distance, in the hind a much longer fusion; arc lying between the 1st and 2nd antenodal nervures; antenodal nervures $10\frac{1}{2}$ to $11\frac{1}{2}$, the final incomplete; the distance between the first two antenodals is much greater than the following ones; 8th nervure in the forewing from the anal angle of trigone, very short and only a little convex, its outer end more or less lost in the general reticulation; the discoidal field on account of the shortness of the 8th nervure, but very slightly dilated at the termen, usually parallel-sided throughout its extent, 4 rows of discoidal cells; base of trigone in the hindwing at the arc; only 1 cubital nervure to all wings; no supplementary nervures to the bridge; trigone in the forewing extremely narrow and very long, usually traversed twice; trigone in the hindwing long and narrow, entire; all hypertrigones entire; subtrigone in forewing almost or quite square, with 6 or 7 cells, its outer angle more or less lost; 4th nervure straight, but the outer end bent abruptly towards the termen; 5a strongly concave, with 2 rows of cells between it and 5; a well-marked accessory nervure running, about midway between the 3rd and 4th nervures and parallel to both, but with a concavity towards

the 3rd; loop very long and very narrow, its inner border with an angle very similar to that seen in *Pantala flavescens*, from which a tolerably distinct supplementary sector runs back to split up the anal area into an inner area of narrow, elongated cells arranged in oblique rows and an outer, of rounder, hexagonal cells. Divided cells in all angles of the loop; body of loop narrow and strongly constricted, the toe much elongated. Stigma small, that of the hindwing much smaller than that of the fore. Membrane moderately large.

Abdomen long and narrow, cylindrical, the base tumid, the 3rd and 4th segments markedly constricted, the remainder fusiform in the male, cylindrical in the female.

Anal appendages very long and slender in both sexes.

Sexual organs: male: lamina broad and depressed, the border curling outward a little; internal tentaculæ very robust, long, almost straight hooks, somewhat carrot-shaped; external tentaculæ obsolete; lobe quadrate, strongly arched posterior border.

Female: border of 8th segment not dilated; 8th ventral plate prolonged into a split, vulvar scale; 9th ventral prolonged into a tongue-like process overhanging the 10th and furnished at its middle with two small, horn-like processes similar to those seen in *Pantala*.

KEY TO SPECIES.

- A. Basal marking of hindwing a golden yellow enclosing a dark reddish brown, smaller mark *T. basilaris burmeisteri*
 B. Basal marking of hindwing a blackish brown without any surrounding zone of yellow . . *T. limbata*.

67. *Tramea basilaris burmeisteri*, Kirby.

Libellula chinensis, Burm.

Libellula basilaris, Hagen.

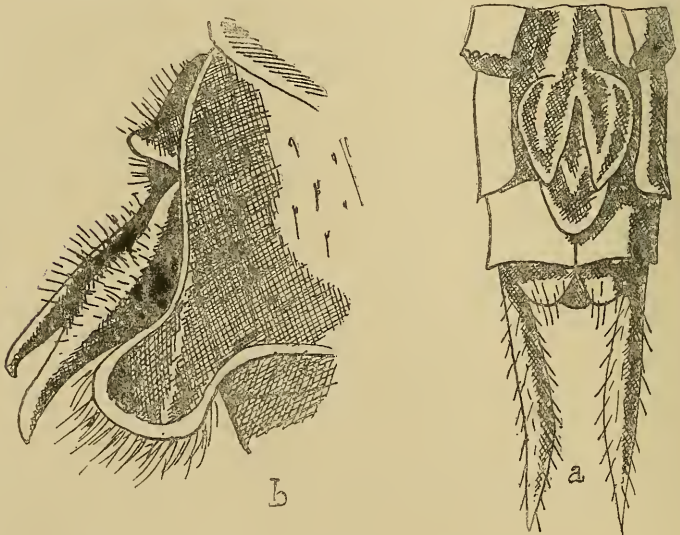


Fig. 55. Sexual organs of *Tramea basilaris burmeisteri*.
 a. Female organs. b. Male organs. (x 12).

Expanse in both sexes 90 mm. Length 50 mm.

Male: head; eyes deep reddish brown above, lilaceous at the sides and beneath; vesicle yellow; occiput olivaceous; forehead brilliant crimson, with a fine, well-defined, black, basal line; bright red above, paler yellow below; labrum yellow; labium brownish.

Prothorax olivaceous yellow.

Thorax ochreous on the dorsum, where it is thickly covered with short, light brown hairs, paler at the sides and a bluish or yellowish green, marked with two oblique, black stripes placed close together and often confluent at their middles. A black humeral stripe often present, incomplete below or connected by a fine black line to the black on the under surface of the fore part of thorax.

Abdomen rust red, with black annules as far as the 6th, at the distal end of each segment. These annules widening laterally and occasionally incomplete on the dorsum; black spots on the dorsal surface of the 7th to 10th segments, each of these bearing a fine, clear white annule at its proximal border. Some specimens especially those caught during the rains, have the abdomen a brilliant red. Legs black, the armature brown.

Wings hyaline. A basal marking in the hindwings, consisting of a golden yellow background in which lie two, dark brown, irregular spots. The yellow area extending as far as the middle of trigone, nearly as far as the 2nd antenodal, as far as the midrib of loop and thence somewhat obliquely to the termen but not reaching the tornus or anal margin. The anterior brown spot begins in the cubital space and extends out to trigone and backwards for about one cell's breadth into loop; the posterior is separated from the anterior by about one cell's breadth and extends obliquely towards the tornus, being a little constricted at its middle. The nervures in this spot are golden yellow and contrast well with the dark ground colour. Antenodal nervures $11\frac{1}{2}$. Membrane white. Stigma mahogany red; that of the hindwing about two-thirds the size of the fore.

Female very similar to the male. Eyes and face without the red, olivaceous or yellowish, the cap of the eyes being brown. Thorax similar to the male. Abdomen, segments 2 to 7 light olive brown, with complete distal, black rings, the remaining segments blackish brown.

Basal marking in hindwing more extensive, the yellow extending as far as the 3rd antenodal and outer end of trigone.

Sexual organs as for genus.

Hab.—Throughout Continental India and extending into Thibet in the North, and to Ceylon southwards. Burma and Indo-Malay. This insect is usually found hovering over tanks in which it breeds or wandering in the near neighbourhood, generally ascending to great heights. On some days, during the rains in Bombay, the air is seen to be full of them, often in company with *pantala* whose flight they rival in gracefulness. I once took a male specimen of this insect about forty miles off the Kathiawar coast on board a liner so that it probably has strong migratory instincts.

68. *Tramea limbata*, race *similata*, Rambur.

Tramea limbata, Kirby.

Libellula limbata, Desjardins.

Libellula incerta, Rambur.

Tramea incerta, Brauer.

Libellula mauriciana, Brauer.

Libellula similata, Rambur.

Tramea similata, Brauer.

Libellula stylata, Rambur.

Tramea stylata, Brauer.

Tramea rosenbergi, Brauer.

Tramea transmarina, Brauer.

Tramea samoensis, Brauer.

Tramea eurybia, Selys.

Tramea euryale, Selys.

Tramea continentalis, Selys.

Tramea limbata continentalis, Ris.

Tramea translucida, Kirby.

Tramea madagascariensis, Kirby.

From the long list of synonyms, it will be seen that *Tramea limbata* is the name applied to a series of insects, differing but slightly and all tending to merge the one into the other. Ris remarks that they are all probably subspecies or varieties of one form and that the Indian representative is a tolerably well defined form, described first from a female specimen under the name of *similata* by Rambur, and later from a male, under the name of *stylata*, by the same odontologist.

Male. Expanse 90 mm. Length 50 mm.

Head: eyes dark brown above, olivaceous at the sides and beneath; vesicle occiput and face dark olivaceous brown; forehead dark, glossy, metallic violet; labrum blackish brown; labium olivaceous brown, with the middle lobe and a stripe on the lateral lobe, black. Some greenish yellow occasionally on the sides of face.

Prothorax brown.

Thorax densely pubescent, dark reddish brown with some obscure dark lines laterally and often some pruinescence beneath. Legs black.

Abdomen deep mahogany brown, the last three segments black. Broad, black annules at the junctions of the segments and the borders often edged with black. Anal appendages very long, black.

Wings hyaline, reticulation black; a basal spot in the hindwing of a deep blackish brown, a ray in the intercostal spaces extending as far as the 1st antenodal nervure and separated from the main larger spot, which extends halfway along the subcostal space, nearly or quite up the trigone in the cubital space, for 1 cell in the base of the loop and from thence in a more or less indented line to the tornus, at which spot only it reaches the termen. In some specimens, there is a very marked indentation where the base of the loop cuts into the marking, so that it appears more or less bilobed.

Stigma reddish brown, the hind about two-thirds the size of the fore.

Membrane pale brown, or grey.

Sexual organs: male: lamina similar to *basilaris*; internal tentaculæ longer and narrower than *basilaris* and the end of hook more bent; lobe long and narrow. Female similar to *basilaris* but the vulvar scale smaller and not obscuring the 9th ventral plate which is longer than in that insect.

Female very similar to the male but paler in colour. A broad, black, basal line to the forehead. The abdomen a dark olivaceous brown or yellow, or in many specimens a reddish brown as far as the 10th segment. Basal marking of hindwing more extensive outwardly but less so posteriorly. Outwardly it extends as far as the trigone or slightly within it and for halfway along the body of the loop internal to the mid rib. Posteriorly it fails to reach the tornus and internally, the anal border, where a small, clear hyaline area is enclosed. (A very small, hyaline area, similar to this is occasionally seen in the male but is absent in all my specimens). Wings decidedly smoky.

Burma specimens differ a little from the above description. The face is a deep red, the forehead a lighter red and with a broad, black, basal band. The basal marking extends rather beyond the 1st antenodal nervure, as far as the arc, to just within the trigone, rather more into the loop and to within 2 or 3 cells of the termen. The hyaline area at the base covers about 12 cells. The colour of the marking is a deep reddish brown.

Hab.—Similar to that of *basilaris* and with similar habits. Cosmopolitan.

Genus HYDROBASILEUS.

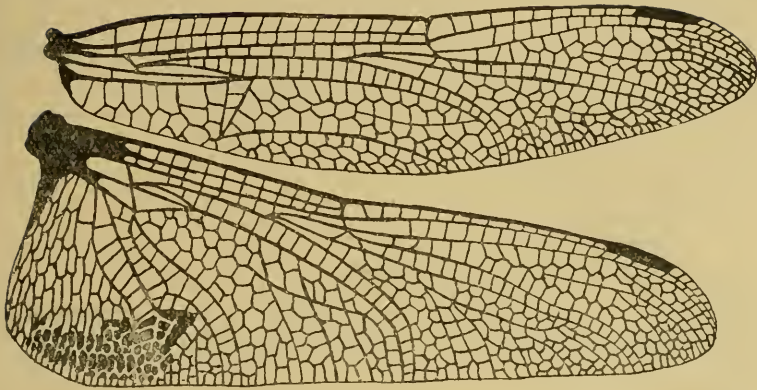


Fig. 57.—Wings of *Hydrobasileus croceus* to show neuration.

Head relatively large; eyes contiguous for a long distance; forehead prominent and rounded; suture deep; vesicle high and deeply notched.

Prothorax with a small lobe which is hidden beneath the head.

Thorax robust. Legs long and slim; hind femora with a row of numerous small but gradually lengthening spines; mid femora with similar spines but less numerous and rather wider spaced; tibial spines fine, short and numerous; claw-hooks very robust, situated about the middle of claws. Armature of the female very similar but the spines rather less numerous and more widely spaced.

Abdomen relatively short, the base dorso-ventrally dilated, the sides much compressed, tapering from the base to the end. A transverse ridge on the 4th segment.

Wings very long and broad; reticulation moderately close; trigone in the forewing about 3 cells distal to the line of the trigone in the hind; sectors of arc in forewing with a short fusion, in the hind a somewhat longer one, the sectors running very close together at their origin; arc lying between the 1st and 2nd antenodals; antenodal nervures $12\frac{1}{2}$ to $18\frac{1}{2}$ the final incomplete, the distance between the 1st two antenodals distinctly longer than that between those following: base of trigone in the hindwing at the arc; 1 cubital nervure to all wings; no supplementary nervures to the bridge; 8th nervure from the anal angle of trigone; trigone in the forewing very long, with a very short costal side, traversed once or twice; trigone in the hindwing longer than usual, entire, the distal side concave; all hypertrigones entire; subtrigone in the forewing variable, with 3 to 8 cells, its outer angle a little obscure and tending to be lost in the general reticulation; 4th nervure strongly undulated; 2 rows of cells between 5 and 5a; 8th nervure in the forewing moderately curved and short; the discoidal field contracted at the end due to an abrupt curving of the 7th nervure towards the termen, the field usually beginning with one or two rows of 4 cells and then continued as rows of 3 cells; the loop with a long body and short toe, its outer angle very obtuse and its inner border often incomplete and lost in the general reticulation so that the loop is open at the apex; a distinct supplementary sector runs from the angulation of the inner border of loop, which splits up the anal area

into an inner area of narrow, elongated cells arranged in transverse rows and an outer of somewhat larger cells. Stigma equal in the two wings, of moderate size. Membrane moderately large.

Sexual organs: male: lamina depressed, its free border turning outward, tentaculæ straight, the point turning a little outwards; lobe short, oval, a little less prominent than the tentaculæ. Female: border of 8th segment not dilated; end of 8th ventral plate prolonged into a deeply cleft vulvar scale; 9th ventral plate carinated at its distal half and bearing two small horny processes similar to those of *tramea*.

Only one Indian species.

69. *Hydrobasileus croceus*, Karsch.

Tramea croceus, Brauer.

Tramea extranea, Hagen.

Hydrobasileus extraneus, Kirby.

Expanse 90 mm. Length 50 mm.

Male: head; eyes reddish brown above, lilaceous or olivaceous at the sides and beneath; vesicle brown; face and forehead ochreous, tinged with red and with a brown, basal line to the latter; labrum yellow.

Prothorax light brown.

Thorax olivaceous or ochreous, paler at the sides where the colour is a whitish green. Legs ochreous or yellow.

Abdomen dark ochreous to reddish brown, the first 4 or 5 segments with the borders finely dark brown and on the 5th to 7th, a brownish, subdorsal stripe. A dorsal band commencing on the 7th which merges into reddish brown on the 8th to 10th segments.

Wings suffused with bright golden yellow, this more intense along the costa of both wings and over the basal area of the hind. The apices often tinted with pale brown, this being more marked in the hindwings. Nervures in the basal part of wing and in the costal fields, bright yellow. The basal marking black and its included nervures a bright yellow; its size and shape somewhat variable, usually beginning at the tornus and running out as far as the apex of the loop where it ascends that structure, being limited outwardly by its outer border. Anteriorly the border of the spot is more or less crenated and runs obliquely from the outer angle of loop to the tornus. Stigma brownish yellow. Antenodal nervures numbering about 17.

Female very similar to the male. The face and forehead olivaceous without any reddish tinge; the thorax similar to the male; the abdomen ochreous, with a reddish tinge and all the sutures, the carina and the lateral borders finely mapped out in black. Wings scarcely differing from those of the male.

Sexual organs. See under genus.

Anal appendages in the female very small, ochreous.

Hab.—Throughout India in the moister zones, Ceylon, Burma, Indo-Malay and Indo-China.

(To be continued.)

SUMMARY OF THE RESULTS FROM THE INDIAN
MAMMAL SURVEY

OF THE

BOMBAY NATURAL HISTORY SOCIETY

By R. C. WROUGHTON, F.Z.S.

PART VI.

(Continued from page 967 of Volume XXVI.)

Subfamily III.—CRICETINÆ.

The CRICETINÆ contains three Indian genera which are arranged in a key, by Blanford, as follows:—

Key to the genera of the CRICETINÆ.

- | | |
|--|----------------|
| A.—Molars rooted, tubercular | I. CRICETULUS. |
| B.—Molars rootless, elongate, composed
of prisms. | |
| a.—Ear-conch present | II. MICROTUS. |
| b.—Ear-conch absent | III. ELLOBIUS. |

Gen. I.—CRICETULUS.

The separation of CRICETULUS, as a subgenus, from CRICETUS, to represent the oriental forms, was proposed by Milne-Edwards in 1867, and it is now accepted as a full genus.

No. 309. *phaeus*, Pall. Blanford records a doubt as to

No. 310. *fulvus*, Blanf. the validity of these three species,

No. 311. *isabellinus*, de Fil. Thomas who has quite recently studied them (A. M. N. H. (8). xix, p. 452, 1917) concludes that none of these names apply to the Ladak form, for which he proposes the name *alticola*. There is no other species.

DISTRIBUTION:—

C. alticola, Thomas.

Type locality:—Shushal, 13,500',
Ladak (Ward—Crump).

Other localities:—Ladak; Upper
Sutlej Valley (Whitehead) (B. M.).

Type:—B.M. No. 6. 10. 3. 13.

Gen. II.—MICROTUS.

This genus has been divided into a large number of subgenera of which, however, only five are found in or on the boundaries of our area. They may be placed in a key as follows:—

Key to the subgenera of MICROTUS.

- A.—Pattern of lower anterior molar with some triangles closed
 a. Mammæ 2—2=8.
 a¹. Palate normal.
 a². Claws small, those on forefeet
 always shortest I. MICROTUS.
 b². Claws large, those on forefeet
 usually longest II. PHAIOMYS.
 b¹. Palate abnormal, ending in a broad
 median plate, cut off from the maxil-
 laries on both sides... .. III. ALTICOLA.
 b. Mammæ 0-2=4 IV. HYPERACRIUS.
 B.—Pattern of lower anterior molar with all
 triangles open. V. EOTHENOMYS.

Subgenus I.—MICROTUS.

No. 306. *sikimensis*, Hodgs. The only species recorded from our area.

DISTRIBUTION :—

M. (M.) sikimensis, Horsfield. Type locality :—Sikkim. (Hodgson).
 Other localities :—Sikkim (Hodgson);
 Kalapokhri, Darjiling (B. M.), Sikkim
 (M. S. I.)
 Type :—B. M. No. 79.11.21.397.

Subgenus II.—PHAIOMYS.

No. 305. *blythi*, Blanf. Bonhote described a species,
waltoni, from Lhassa, of which I
 named a subspecies *petulans*, (J. B. N. H. S., xx, p. 931, 1911),
 on specimens taken by Captain C. H. T. Whitehead. This form
 may be distinguished from *blythi* as follows :—

Key to the forms of PHAIOMYS.

- A.—General colour drab 1. *blythi*, Blanf.
 B.—General colour sepia 2. *waltoni petulans*, Wr.

DISTRIBUTION :—

1. *M. (P.) blythi*, Blanford. Type locality :—Tsomoriri, 14,000',
 Western Ladak. (Theobald).
 Other localities :—Thibet (B. M.).
 Type :—Ind. Mus. Calc. No. a.
 (Type of *leucurus*, Blyth, Ind. Mus.
 Calc. No. a.).
 2. *M. (P.) waltoni petulans*, Wroughton. Type locality :—Teza, Upper Sutlej
 Valley. (Captain C. H. T. Whitehead).
 Other localities :—Upper Sutlej Val-
 ley (B.M.).
 Type :—B. M. No. 10.12.2.27.

Subgenus III.—ALTICOLA.

Miller dealt with these voles in his paper on Dr. Abbott's collection from Central Asia, and I propose to follow his results closely. In two cases, however, I cannot accept the type localities mentioned by him. In the case of *roylei* I have already pointed out in this Journal (J. B. N. H. S., xxiii, p. 299, 1914) my reasons for believing Kumaon and not Kashmir to be the type locality. The name *M. stracheyi*, Thomas, is a re-naming of the animal called "*Cricetus songarus*" by Horsfield, who, in his Catalogue (p. 145) distinctly states that the specimen is "From Capt. R. Strachey's Collection in Ladak." The following is Miller's key to the species:—

Key to the species of ALTICOLA.

- A.—Under parts dark.
- a. The third upper molar with 4 salient angles 1. *wynnei*, Blanf.
- The third upper molar with 6 salient angles.
- a¹. Hind-foot 22 mm. 2. *roylei*, Gray.
- b¹. Hind-foot 20 mm. 3. *montosus*, True.
- B.—Under parts whitish.
- a. Back bright, ferruginous, brown ... 4. *stoliczkanus*, Bly.
- b. Back grey or pale fawn.
- a¹. Tail vertebræ over 45 mm. ... 5. *blanfordi*, Scull.
- b¹. Tail vertebræ under 40 mm.
- a². Third upper molar with 6 salient angles.
- a³. Anterior upper molar with 10 salient angles 6. *stracheyi*, Thos.
- b³. Anterior upper molar with 8 salient angles 7. *albicauda*, True.
- b². Third upper molar with 5 salient angles.
- a³. Teeth heavy; posterior loop of third upper molar forming much less than half of crown 8. *acrophilus*, Mill.
- b³. Teeth light; posterior loop of third upper molar forming at least half of crown ... 9. *cricetulus*, Mill.

DISTRIBUTION :—

1. *M. (A.) wynnei*, Blanford. *Type locality* :—Murree, Punjab.
Other localities :—Murree (B. M.).
Co-types :—B. M. Nos. 92.2.27.1 & 8.3.9.18.
Lectotype :—B. M. No. 8.3.9.18.
2. *M. (A.) roylei*, Gray. *Type locality* :—Kumaon. (See above).
Other localities :—Kumaon ; Sikkim (M. S. I.).
Type :—B. M. No. 2002a.
3. *M. (A.) montosus*, True. *Type locality* :—Central Kashmir, 11,000'. (Abbott).
Other localities :—Kashmir (Ward) ; Kaghan Valley (Whitehead) (B.M.).
Type :—U. S. Nat. Mus. No. ²⁰¹⁴⁵/₃₅₅₀₈. (Type of *imitator*, Bonhote, B. M. No. 5. 1. 5. 12.).
4. *M. (A.) stoliczkanus*, Blanford. *Type locality* :—Plateaux of Northern Ladak.
Other localities :—None.
Co-types :—Ind. Mus. Calc. Nos. a and b.
5. *M. (A.) blanfordi*, Scully *Type locality* :—Gilgit, 9,000'—10,000'.
Other localities :—Gilgit ; Skardo (Whitehead) (B. M.).
Co-types :—B. M. Nos. 83.3.1.122 and 8. 3. 9. 17. (Other co-types Ind. Mus. Calc. Nos. a. and b. in al.).
Lectotype :—B. M. No. 8.3.9.17.
6. *M. (A.) stracheyi*, Thomas. *Type locality* :—Ladak, Strachey, (See above).
Other localities :—Ladak (Ward) (B. M.).
Type :—B. M. No. 60.5.4.113.
7. *M. (A.) albicauda*, True. *Type locality* :—Baldu Valley, Baltistan. (Abbott).
Other localities :—None.
Type :—U. S. Nat. Mus. No. ²⁰³⁹³/₃₆₈₁₆.
8. *M. (A.) acrophilus*, Miller. *Type locality* :—Ladak side of Kara Korum Pass, 17,000'. (Abbott)
Other localities :—None in B. M.
Type :—U. S. Nat. Mus. No. 26.126

9. *M. (A.) cricetulus*, Miller. *Type locality*:—Tso Kyan, 16,000', Ladak. (Abbott).
Other localities:—None.
Type:—U. S. Nat. Mus. No. 84043.

Subgenus IV.—HYPERACRIUS.

Three species have been described (all from Kashmir), one by True and two by Miller, who arranges them in a key as follows:—

Key to the species of the subgenus HYPERACRIUS.

- A.—Hind-foot (with claws) 19 mm.;
 upper tooth-row 7 mm. ... 1. *aitchisoni*, Mill.
 B.—Hind-foot (with claws) 16-18 mm.
 upper tooth-row 6 mm.
 a. Ear, from meatus, 10-11 mm. ... 2. *fertilis*, True.
 b. Ear, from meatus, 7·8 mm.... 3. *brachelix*, Mill.

DISTRIBUTION:—

1. *M. (H.) aitchisoni*, Miller. *Type locality*:—Gulmarg, Kashmir.
Other localities:—None.
Type:—B. M. No. 96.11.2.3.
 2. *M. (H.) fertilis*, True. *Type locality*:—Pir Panjal, 8,500', Kashmir. (Abbott).
Other localities:—Central Kashmir (B. M.).
Type:—U. S. Nat. Mus. No. $\frac{20147}{25510}$.
 3. *M. (H.) brachelix*, Miller. *Type locality*:—Nagmarg, Kashmir (Abbott).
Other localities:—Kashmir (Ward) (B. M.).
Type:—U. S. Nat. Mus. No. 63445.

Subgenus V.—EOTHENOMYS.

This form has never been taken within our limits, but as it, with several subspecies, is found all over Szechuen and may therefore be found in the Kakhyen Hills, I have included it here.

DISTRIBUTION:—

- M. (E.) melanogaster*, Milne-Edwards. *Type locality*:—Moupin, Szechwan.
Other localities:—Not yet taken within the Northern Burmese border.
Type:—In Paris Museum.

Gen. III.—ELLOBIUS.

The only species of the genus No. 308. *fuscicapillus*, Bly. found within our area. Blanford records that it was taken at Quetta by Hutton, but Blyth when he named it thought that it came from the Himalayas. The British Museum has no Indian specimens, and only three in alcohol contributed by the Afghan Boundary Commission from Bala Marghab, &c., in Afghanistan. A lady recently gave me a description of a small animal seen by her at Quetta, which she stated to be not uncommon, and which could only have been this animal.

DISTRIBUTION :—

E. fuscicapillus, Blyth. *Type locality* :—Unknown (? Quetta) (Hutton).
Other localities :—Bala Marghab, Afghanistan.
Type :—Not traced.

Family V.—SPALACIDÆ.

Blanford recognises only one genus of the Bamboo Rats, but Thomas has recently revived NYCTOCLEPTES for the giant forms, restricted RHIZOMYS to the medium-sized ones, and established CANNOMYS for the smaller animals of the *badius* type (A. M. N. H. (8) xvi., p. 57, 1915). These three genera may be arranged in key as follows :—

Key to the genera of the SPALACIDÆ.

- A.—Size large, condylo-basal length of skull 57-76 mm. ; soles of feet granulated ; mammæ 1-3=8 or 2-3=10.
- a. Size larger, condylo-basal length of skull 71-76 mm. ; posterior solepads conjoined I. NYCTOCLEPTES.
- b. Size smaller, condylo-basal length of skull 57 mm. ; posterior solepads separate II. RHIZOMYS.
- B.—Size small, condylo-basal length of skull 43-50 mm. ; solepads not granulated ; mammæ 2-2=8 III. CANNOMYS.

Gen. I.—NYCTOCLEPTES.

No. 314. *sumatrensis*, Raff. The proper name for the Indian form is *cinereus*, McClelland. Besides *sumatrensis*, Thomas has distinguished another form from Sumatra, but *cinereus* alone is found within our limits.

DISTRIBUTION :—

N. cinereus, MacClelland.*Type locality* :—Moulmein.*Other localities* :—Tenasserim (M. S. I.).*Type* :—Not traced. (Co-types of *erythrognys*, Anderson, Ind. Mus. Calc. Nos. *a.* and *b.*).

Gen. II.—RHIZOMYS.

No. 313. *pruinus*, Bl. Besides the Assam species, Thomas has recently described *senex*, from eastern Burma and Yunnan (A. M. N. H. (8) xvi, p. 313, 1915). These two may be distinguished as follows :—

Key to the species of RHIZOMYS.

- A.*—Size smaller, palatilar length of skull
32.2 mm. 1. *pruinus*, Blyth.
- B.*—Size larger, palatilar length of skull
37.2 mm. 2. *senex*, Thos.

DISTRIBUTION :—

1. *R. pruinus*, Blyth. *Type locality* :—Cherrapunji, Assam (F. Skipwith).
Other localities :—Khasi Hills (B. M.)
Co-types :—Ind. Mus. Calc. Nos. 1. *m.* and *n.*
2. *R. senex*, Thomas. *Type locality* :—Yunnan. (Orii).
Other localities :—Mountains east of Bhamo (B. M.).
Type :—B. M. No. 12. 7. 25. 42.

Gen. III.—CANNOMYS.

Besides *badius*, Hodgs., of Nepal and *castaneus*, Blyth, of Tenasserim, Thomas has recently described *pater* from Mt. Popa and *c. plumescens* from the Shan States. These four forms may be arranged in a key as follows :—

Key to the species of CANNOMYS.

- A.*—Size larger, condylo-basal length 49-53 mm.
- a.* Colour normal 1. *badius*, Hodgs.
- b.* Colour paler and brighter, pinkish cinnamon 2. *pater*, Thomas.
- B.*—Size smaller, condylo-basal length of skull 43-46 mm.
- a.* Colour normal 3. *castaneus*, Blyth
- b.* Colour plumbeous 4. *c. plumescens*, Thos.

DISTRIBUTION :—

1. *C. badius*, Hodgson. *Type locality* :—Nepal (Hodgson).
 Other localities :—Darjiling; Khasi Hills; Manipur (B. M.); Chin Hills, Chindwin (M. S. I.).
 Type :—B. M. No. 43. 1. 12. 61.
2. *C. pater*, Thomas. *Type locality* :—Mt. Popa, Burma.
 (B. N. H. S.—Shortridge).
 Other localities :—Mt. Popa (M.S.I.).
 Type :—B. M. No. 14. 7. 19. 231.
3. *C. castaneus castaneus*, *Type locality* :—“Arakan” (?)
 Blyth. (Phayre).
 Other localities :—Thaton, Burma; Tenasserim (B. M.).
 Co-types :—Ind. Mus. Calc. Nos. l. and m.
4. *C. castaneus plumbescens*, *Type locality* :—Gokteik, N. Shan States (B. N. H. S.—Shortridge).
 Thomas. *Other localities* :—N. Shan States (M. S. I.)
 Type :—B. M. No. 14. 7. 8. 78.

Family VI.—HYSTRICIDÆ.

The family includes two genera which may be distinguished as follows :—

Key to the genera of the Hystricidæ.

- A.—Tail short, clothed with spines, with hollow quills at the end I. ACANTHION.
 B.—Tail long, clothed with scales, with a tuft of bristles at the end... .. II. ATHERURUS.

Gen. I.—ACANTHION.

Some years ago Lyon in a paper on Malay Porcupines (Proc. U. S. Nat. Mus. xxxii, p. 575, 1907) revived the name ACANTHION for them. In a note, quoted in my Sind Report (J. B. N. H. S. xxiv, p. 757, 1916), Thomas pointed out that that name must equally be applied to the Indian species, in place of HYSTRIX, as now used.

The Indian Museum Catalogue gives no locality for the type of No. 315. *leucura*, G. & H. *bengalensis*, and I have entirely No. 316. *hodgsoni*, Gray. failed to find any authentic record of any other specimen having been No. 317. *bengalensis*, Blyth. taken. I propose to take the general view and regard it as a synonym of *hodgsoni*. Thomas has quite recently divided off the south Burmese porcupine, under the name of *klossi*, from *brachyurus*,

the Malay form. At the commencement of the Survey I named a species, *cuneiceps*, from Cutch (J. B. N. H. S. xxi, p. 771, 1912), in the note incorporated in my Sind Report, quoted above; however, Thomas accepts it only as a subspecies. These forms may be arranged in a key as follows:—

Key to the species of ACANTHION.

- A.—A full crest of long hairs; a mantle of long, thin spines; the stout, stiff spines of the back ringed black and white.
- a. Size larger, condylo-basal length of skull 155 mm. 1. *l. leucurus*, Sykes.
- b. Size smaller, condylo-basal length of skull 145 mm. 2. *l. cuneiceps*, Wr.
- B.—Little or no crest; no mantle; chief spines white with a black median ring.
- a. The black on the chief spines much more than the white tips 3. *hodgsoni*, Gray.
- b. The black on the chief spines much less than the white tips 4. *klossi*, Thos.

DISTRIBUTION:—

1. *A. leucurus leucurus*, Sykes. *Type locality*:—"Dukhun" (Sykes).
Other localities:—Bannu, Punjab; Rajputana; Sehore; Central India; Dekhan; Nilgiri Hills; Malabar; Ceylon; Nepal (B. M.); Kathiawar; Palanpur; Khandesh: Berars; Dharwar; Coorg; Mysore; Ceylon; Kumaon (M. S. I.).
Type:—B. M. No. 42.8.6.6. (Type of *indica*, Gray and Hardw. not found; Type of *zeylonensis*, Blyth, Ind. Mus. Calc. No. e.; Type of *malabarica*, Sclater, B. M. No. 65. 1. 30. 10.).
2. *A. leucurus cuneiceps*, Wroughton. *Type locality*:—Nokania, Cutch (B. N. H. S.—Crump).
Other localities:—Cutch; Sind (M. S. I.).
Type:—B. M. No. 12. 9. 1. 11.
3. *A. hodgsoni*, Gray. *Type locality*:—Nepal (Hodgson).
Other localities:—Sikkim (B. M.); Bhutan Duars (M. S. I.).

Co-types :—B. M. Nos. 45. 1. 8. 8 & 47. 7. 22. 9. (Lectotype of *alophus*, Hodgson, B. M. No. 53. 8. 16. 11; Type of *bengalensis*, Blyth, Ind. Mus. Calc. No. f.).

4. *A. klossi*, Thomas.

Lectotype :—B. M. No. 47. 7. 22. 9.

Type locality :—Tenasserim. (B. N. H. S.—Shortridge).

Other localities :—Sagaing, and Mt. Popa, Burma; Tenasserim (M. S. I.)

Type :—B. M. No. 14. 12. 8. 223.

Gen. II.—ATHERURUS.

No. 318. *macrura*, L.

The only species found in our area.

DISTRIBUTION :—

A. macrourus, Linnæus.

Type locality :—“Asia.”

Other localities :—Tenasserim (B. M.); Tenasserim (M. S. I.).

Type :—Unknown.

Suborder II.—DUPLICIDENTATA.

The two Families in this Suborder may be distinguished as follows :—

Key to the families of the DUPLICIDENTATA.

A.—Ears, long; a tail present I. LEPORIDÆ.

B.—Ears, short; no tail II. OCHOTONIDÆ.

Family I.—LEPORIDÆ.

The Hispid Hare is now generally classed in a separate genus, CAPROLAGUS, from the ordinary hares which make up the genus LEPUS. The two may be distinguished as follows :—

Key to the genera of the LEPORIDÆ.

A.—Ears at least as long as the head; tail white beneath I. LEPUS.

B.—Ears shorter than the head; tail entirely brown II. CAPROLAGUS.

Gen. I.—LEPUS.

The first four names in Blanford's list represent the hares of the plains, while the last three are the mountain hares. Of the former, in addition to those here enumerated, Bonhote named *siamensis*, in 1902 (P. Z. S., p. 40), while in the course of this Survey I have added three names (J. B. N. H. S. xxi, p.

No. 319. *nigricollis*, F. Cuv.
 No. 320. *ruficaudatus*, Geoff.
 No. 321. *dayanus*, Blanf.
 No. 322. *peguensis*, Bl.
 No. 323. *tibetanus*, Waterh.
 No. 324. *oiostolus*, Hodgs.
 No. 325. *hipsibius*, Blanf.

338, 1912; xxii, p. 15, 1913; xxiv, p. 42, 1915). Of the mountain forms I think *craspedotis*, Blanford, may be kept distinct from *tibetanus*, but as to *hypsibius*, Blanford, I can offer no opinion. Including these additional forms the species of the true hares may be arranged in a key as follows:—

Key to the species of LEPUS.

I.—Hair comparatively short and coarse.

A.—Tail brown above.

a. Colour darker; ears blackish brown 1. *ruficaudatus*, Geoff.

b. Colour paler; ears bright buff ... 2. *rajput*, Wr.

B.—Tail black above.

a. Nape black.

a¹. Feet ochraceous 3. *nigricollis*, F. Cuv.

b¹. Feet white 4. *singhala*, Wr.

b. Nape grey or brown or ochraceous.

a¹. Nape grey 5. *simcoxi*, Wr.

b¹. Nape brown, or ochraceous.

a². Face pale, grizzled brown and buff; a grey rump ... 6. *dayanus*, Blanf.

b². Face darker, grizzled black and tan.

a³. Nape brown; general ground colour tan... .. 7. *mahadeva*, Wr.

b³. Nape ochraceous, or rufous.

a⁴. Nape ochraceous; feet white 8. *peguensis*, Bly.

b⁴. Nape rufous; feet ochraceous 9. *siamensis*, Bouh.

II.—Hair long and silky.

A.—Tail black above.

a. General colour paler, écreu drab; nape fawn 10. *craspedotis*, Blanf.

b. General colour darker, dark pinkish drab; nape cinnamon rufous.. 11. *tibetanus*, Waterh.

B.—Tail all white.

a. Ears longer than hindfoot with tarsus 12. *oiostolus*, Hodgs.

b. Ear not longer than hindfoot with tarsus 13. *hypsibius*, Blanf.

DISTRIBUTION:—

1. *L. ruficaudatus*, Geoffroy. *Type locality*:—"Bengal."

Other localities:—Saran, Bengal; Puri, Orissa; Nepal; Sikkim (B.M.);

- Gwalior; Kumaon; Behar; Bengal; Sikkim; Darjiling; Bhutan Duars (M. S. I.).
Type:—Perhaps in Paris Museum.
2. *L. rajput*, Wroughton. *Type locality*:—Sambhar Lake, Rajputana (Adams).
Other localities:—Sambhar Lake, Ulwar (B. M.)
Type:—B. M. No. 85.8.1.342.
3. *L. nigricollis*, F. Cuvier. *Type locality*:—Madras.
Other localities:—S. Mahratha Country; Dekhan; Nilgiri Hills (B. M.); Satara; Ratnagiri; Dharwar; Kanara; Mysore; Bellary; Coorg (M. S. I.).
Type:—Perhaps in Paris Museum.
4. *L. singhala*, Wroughton. *Type locality*:—Kumbukkam, Ceylon (B. N. H. S.—Mayor).
Other localities:—Ceylon (B. M.); Ceylon (M. S. I.).
Type:—B. M. No. 15.7.1.8.
5. *L. simcoxi*, Wroughton. *Type locality*:—Edalabad, Khandesh. (B. N. H. S.—Crump).
Other localities:—Khandesh; Nimar; Berars; Central Provinces (M. S. I.).
Type:—B. M. No. 11.8.7.1.
6. *L. dayanus*, Blanford. *Type locality*:—Sukkur, Sind (Dr. Day).
Other localities:—Sind (B. M.); Sind; Cutch; Palanpur; Kathiawar; (M. S. I.).
Co-types:—B. M. Nos. 90.4.9.2 and 3.
Lectotype:—B. M. No. 90.4.9.3.
7. *L. mahadeva*, Wroughton. *Type locality*:—Dhaim, Mahadeo Hills, Central Provinces. (B.N.H.S.—Crump).
Other localities:—Mahadeo Hills (M. S.I.)
Type:—B. M. No. 12.7.8.1.
8. *L. peguensis*, Blyth. *Type locality*:—Upper Pegu (Phayre).
Other localities:—Rangoon (B. M.); Chindwin; Mt. Popa (M. S. I.).
Type:—Ind. Mus. Calc. No. a.
9. *L. siamensis*, Bonhote. *Type locality*:—Chiengmai, Siam (Lyle).

- Other localities* ;—Siam ; Bhamo (Harrington) (B. M.).
Type :—B. M. No. 1.7.7.13.
10. *L. craspedotis*, Blanford. *Type locality* :—Pishin, Baluchistan (Blanford).
Other localities :—Quetta, Baluchistan ; Afghanistan (B. M.).
Type :—Ind. Mus. Calc. No. a.
11. *L. tibetanus*, Waterhouse. *Type locality* :—Little Thibet. (Vigne).
Other localities :—Yassin, Gilgit ; Ladak ; Kurram Valley (B. M.)
Type :—B. M. No. 53.8.29.25.
12. *L. oiostolus*, Hodgson. *Type locality* :—Nepal. (Hodgson).
Other localities :—Sikkim ; Ladak ; Upper Indus Valley (B. M.).
Type :—B. M. No. 43.1.12. 44. (Type of *pallipes*, Hodgson, not traced).
13. *L. hypsibius*, Blanford. *Type locality* :—Changchenmo Valley, Ladak (Stoliczka).
Other localities :—No specimen.
Co-types :—Ind. Mus. Calc. Nos. a. and b.

Gen. II.—CAPROLAGUS.

No. 326, *hispidus*, Pears. The only species of the genus.

DISTRIBUTION :—

C. hispidus, Pearson. *Type locality* :—Assam. (McClelland).
Other localities :—E. Bengal ; Nepal (B. M.)
Type :—Not traced.

Family II.—OCHOTONIDÆ.

There is only the one genus.

Gen.—OCHOTONA.

No. 327. *roylei*, Ogil. In dealing with the collection made by the Survey in Kumaon,
 No. 328. *curzoniæ*, Hodgs. I classed the specimens of this
 No. 329. *macrotis*, Günth. genus as *roylei*. Later when speci-
 No. 330. *rufescens*, Gray. mens were obtained from Sikkim,
 No. 331. *ladacensis*, Günth. it appeared impossible to separate
 them from *roylei*, and yet they

were apparently different from the Kumaon individuals, so I suggested that Hodgson's name *nipalensis* should be revived for these latter. Now however on laying out all the available material I am of opinion that mere colouring cannot be trusted as a guide where seasonal changes are so great and so common. I therefore propose to call all this group *roylei*, pending the working out of the genus on adequate material. This material is badly wanted, and should include specimens taken "all round the year," or as near it as possible for each locality. Bonhote added a species, *wardi*, (P. Z. S., p. 124, 1904), allied to *rufescens*, which I include in the following key to the species:—

Key to the species of OCHOTONA.

- A.—Palatal and incisive foramina not distinct.
- a. Combined foramina constricted in centre.
- a¹. Colour brownish, with white collar behind the ears 1. *rufescens*, Gray.
- b¹. Colour greyish, with red head and shoulders in summer 2. *wardi*, Bonh.
- b. Combined foramen not constricted.
- a¹. Ears small, 23mm., or less.
- a². Uniform pale brown; feet white. 3. *curzoniae*, Hodgs.
- b². Dark brown 4. *roylei*, Ogil.
- b¹. Ears large, 27 mm. 5. *macrotis*, Günth.
- B.—Palatal and incisive foramina distinct. 6. *ladacensis*, Günth.

DISTRIBUTION:—

1. *O. rufescens*, Gray.

Type locality:—Baber's Tomb, Kabul.

Other localities:—Ziarat, Baluchistan; Bolan Pass, Quetta; Kurram Valley, Afghanistan (B. M.).

Co-types:—B. M. Nos. 44.9.15.9 & 10.

Lectotype:—B. M. No. 44.9.15.9.

2. *O. wardi*, Bonhote.

Type locality:—Talien, Kashmir, (Col. Ward).

Other localities:—Gulmarg, 8,700'; Gugga Nala, 8,900'; Liddar Valley, 9,500'; Sultanmurg, 11,000'; Kishtwar, 11,000'; Badrawar, 12,000'; Kashmir, Chilas, 12,700'; Gilgit, Hazara, 13,700'; Tashgaum, 9,500'; Ladak (B. M.).

Type:—B. M. No. 4. 5. 6. 1.

3. *O. curzoniæ*, Hodgson. *Type locality* :—Nepal. (Hodgson).
Other localities :—Sikkim (B. M.).
Co-types :—B. M. Nos. 58.6.24.98
and 99.
Lectotype :—B. M. No. 58. 6.
24.99.
4. *O. roylei*, Ogilby. *Type locality* :—Choor Mountain,
Punjab (Ogilby).
Other localities :—Garwhal; Kuma-
on; Nepal; Sikkim (B. M.).
Type :—B. M. No. 55. 12. 24.326.
(Type of *nipalensis*, Hodgs. B. M.
No. 43.1.12.63; Type of *hodgsoni*,
Blyth, not traced).
5. *O. macrotis*, Günther. *Type locality* :—Kuenlun Moun-
tains, Thibet (Biddulph).
Other localities :—Shushal, 13,500',
and Indus Valley, 12,000'; Ladak
(B. M.).
Co-types :—B. M. No. 44.3.1.14 &
75.3.30.3. (Type of *auritus*, Blanford,
Ind. Mus. Calc. No. a.; Co-types of
griseus, Blanford, Ind. Mus. Calc.
Nos. c. and d.).
Lectotype :—B. M. No. 75. 3. 30. 3.
6. *O. ladacensis*, Günther. *Type locality* :—Chagra Lake,
14,000', Ladak; (Biddulph).
Other localities :—Upper Sulej Val-
ley (Whitehead) (B. M.).
Co-types :—B. M. No. 75. 3. 3. 32.
and specimens in Calcutta.
Lectotype :—B. M. No. 75.3.
30. 2.

Order VII.—UNGULATA.

With the exception of the Muntjacs, or Rib-faced Deer, practically nothing has been done in this Order by the Survey. This was to be expected, for the great majority are large animals, which do not lend themselves to collection on a large scale. The late R. Lydekker, F. R. S., brought out a Catalogue of the specimens in the British Museum (Natural History) in 1913, and it seems almost unnecessary to deal with the subject here, but for the convenience of Members I have decided to extract as shortly as possible, the information contained in that Catalogue, in so far as it concerns the Indian region.

The Order is divided into three Suborders as follows:—

Key to the suborders of the UNGULATA.

- A.—Upper lip and nose not produced into a flexible trunk.
- a. The third and fourth toes, which may be the only ones, equal in size, and symmetrical to a vertical line drawn between them ... I. ARTIODACTYLA.
- b. The third toe, which may be the only one, larger than the lateral ones, when present, and symmetrical in itself ... II. PERISSODACTYLA.
- B.—Upper lip and nose produced in a trunk ... III. PROBOSCIDEA.

Suborder I.—ARTIODACTYLA.

The Suborder is divisible into three Sections as follows :—

Key to the sections of the ARTIODACTYLA.

- A.—Upper incisors wanting ; ruminating.
- a. Horns or antlers present, at least in males... I. PECORA.
- b. No horns or antlers ... II. TRAGULINA.
- B.—Upper incisors present ... III. SUINA.

Section I.—PECORA.

This Section includes two Families which may be distinguished as follows :—

Key to the families of the PECORA.

- A.—Horns permanent ; a corneous sheath on a bony core ... I. BOVIDÆ.
- B.—Horns solid, no cores, deciduous, generally branched ... II. CERVIDÆ.

Family I.—BOVIDÆ.

The BOVIDÆ have been divided into a number of Subfamilies, but in dealing with the restricted Indian fauna, it has not seemed necessary to use them. I may note however that in the following key, the first three genera represent the BOVINÆ, the next four the CAPRINÆ, the next three the RUPICAPRINÆ, the following two the TRAGELAPHINÆ, and the last three the ANTILOPINÆ. The genera of the BOVIDÆ may be arranged in a key as follows :—

Key to the genera of the BOVIDÆ.

- I.—Horns smooth, or closely, irregularly, and transversely wrinkled.

- A.—Horns in the two sexes not differing much in size.
- a. Horns inserted far apart, at extremities of vertex.
 - a¹. Horns circular, or oval, in section.
 - a². Dorsal vertebræ 13; no long hair on flanks I. BIBOS
 - b². Dorsal vertebræ 14; a fringe of long hair on flanks II. PŒPHAGUS.
 - b¹. Horns triangular, or partly so, in section III. BUBALUS.
 - b. Horns inserted close together.
 - a¹. Horns large in male, small, usually mere spikes, in female.
 - a². Males inodorous; horns curved at sides of head.
 - a³. Horns in male with a circular or spiral curve IV. OVIS.
 - b³. Horns in male curved in an S. V. PSEUDOIS.
 - b². Males odorous; horns ascending spirally, or scimitar-shaped VI. CAPRA.
 - b¹. Horns small, not longer than head not differing except in size, in the two sexes.
 - a². Adult horns directed straight back over the head.
 - a³. Horns angulate in front... .. VII. HEMITRAGUS.
 - b³. Horns circular in section.
 - a⁴. Size larger; face glands present VIII. CAPRICORNIS.
 - b⁴. Size smaller; face glands absent IX. NEMORHÆDUS
 - b². Adult horns bent downwards, then outwards, and finally upwards X. BUDORCAS.
- B.—Horns in male only.
- a. Size large; male with two horns; a long tail XI. BOSELAPHUS.
 - b. Size small; male usually with four horns; a short tail XII. TETRACEROS.
- II.—Horns with prominent rings at subequal intervals.

- A.—Adult horns much longer than head; females hornless.
 a. Horns spiral; muzzle not swollen. XIII. ANTILOPE.
 b. Horns straight; muzzle swollen... XIV. PANTHOLOPS.
 B.—Adult horns scarcely longer than head; female sometimes with horns XV. GAZELLA.

Gen. I.—BIBOS.

Blanford includes in the genus BOS all the five subgenera recognised by Lydekker but Thomas supports me in the view that the three subgenera (Bos is limited to Europe, and BISON to America) represented in India should be treated as full genera.

The species *frontalis* I retain because a wild specimen is claimed as having been killed in No. 338. *gaurus*, H. Smith. Tenasserim. The name *sondaicus*, No. 339. *frontalis*, Lamb. Müller and Schlegel must give place No. 340. *sondaicus*, M. & S. to *banteng*, Raff. which is older by ten years. Lydekker divides *gaurus* and *banteng* into a number of subspecies. The whole may be arranged in a key as follows:—

Key to the forms of BIBOS.

- A.—Horns turning inwards at the tips.
 a. No white on back of thighs; no horny mass between the horns.
 a¹. Intercornual ridge rising in a prominent forwardly inclined arch.
 a². Generally no dewlap; no throat fringe; colour olive black ... 1. *g. gaurus*, H. Sm.
 b². A distinct dewlap and throat fringe; colour darker ... 2. *g. readi*, Lyd.
 b¹. Intercornual ridge forming a less prominent and less forwardly inclined arch, which may be entirely absent 3. *g. hubbacki*, Lyd.
 b. A large white disc on back of thighs; a horny mass connecting the horns; coat unicolor 4. *bant. birmanicus* Lyd.
 B.—Horns not, or scarcely, turning inwards at tips 5. *frontalis*, Lamb.

DISTRIBUTION :—

1. *B. gaurus gaurus*, H. Smith. *Type locality* :—"India."
Other localities :—Rajputana ;
 Central Provinces ; Western Ghats ;
 Kanara ; Mysore ; Travancore ; Nepal ;
 Bhutan Duars ; Assam (B. M.) ;
 Kanara ; Coorg (M. S. I.).
Type :—Unknown.
2. *B. gaurus readi*, Lydekker. *Type locality* :—Burma. (Read).
Other localities :—Burma ; Tenasserim (B. M.).
Type :—In Mr. Read's collection in 1913.
3. *B. gaurus hubbacki*, Lydekker. *Type locality* :—Pahang, Malay Peninsula (Hubback).
Other localities :—Malay Peninsula (B. M.).
Type :—B. M. No. 7. 11. 27. 1.
4. *B. banteng birmanicus*, Lydekker. *Type locality* :—Burma.
Other localities :—Burma (B.M.).
Type :—B. M. No. 79.11.21.16.
5. *B. frontalis*, Lambert. *Type locality* :—Tipperah.
Other localities :—Tenasserim (feral) ;
 Assam (semi-domesticated) (B. M.).
Type :—Unknown.

Gen. II.—POEPHAGUS.

No. 341. *grunniens*, L. The only species of the genus.

DISTRIBUTION :—

P. grunniens, Linnæus. *Type locality* :—Thibet.
Other localities :—Sikkim ; Thibet
 Ladak (B. M.).
Type :—Unknown.

Gen. III.—BUBALUS.

No. 342. *bubalus*, L. This is the only Indian species,
 (Blanford wrongly spells it *bubalus*),

but Lydekker recognises three subspecies which he distinguishes as follows :—

Key to the subspecies of B. bubalis, L.

A.—Colour blackish.

a. Horns crescentic, or subcircular ... 1. *b. bubalis*, L.

b. Horns directed mainly outwards ... 2. *b. macroceros*,
 Hodgs.

B.—Colour brown dun 3. *b. fulvus*, Blanf.

DISTRIBUTION :—

1. *B. bubalis bubalis*, Type locality :—Rome, Italy (domesticated).
Linnæus. Other localities :—Assam.
Type :—Unknown.
2. *B. bubalis macroceros*, Type locality :—Assam.
Hodgson. Other localities :—Central Assam (B. M.).
Type :—Not traced.
3. *B. bubalis fulvus*, Type locality :—Mishmi Hills,
Blanford. Assam (Hume).
Other localities :—Mishmi Hills (B. M.).
Co-types :—B. M. No. 91.8.7.215, & in the Indian Museum, Calcutta.
Lectotype :—B. M. No. 91.8.7.215.

NOTE :—*I believe the wild buffalo is found over considerable areas in the Central Provinces, etc., but I can find no record of any specimen from that part of India in either the British Museum (including the Hume Collection), or the Indian Museum, Calcutta.*

Gen. IV.—OVIS.

- | | |
|--------------------------------|--|
| No. 343. <i>hodgsoni</i> , Bl. | Lydekker treats the first two as |
| No. 344. <i>poli</i> , Bl. | subspecies of <i>ammon</i> , L., revives |
| No. 345. <i>vignei</i> , Bl. | <i>cycloceros</i> , and names a new form, |
| | <i>punjabiensis</i> , as subspecies of <i>vignei</i> . |

These five forms may be arranged in a key as follows :—

Key to the forms of OVIS.

- A.—Size small, 32-36 inches high at the shoulder; a long-haired and partially (or wholly) black throat ruff; no nuchal or dorsal crest; tips of horns turning mainly inwards.
- a. Horns curving nearly in one plane and tending to form a circle.
 - a^r. Size larger, reaching 36 inches at shoulder; much black in ruff, which is small 1. *v. vignei*, Bly.
 - b^r. Size smaller, reaching 32 inches at shoulder; ruff strongly developed 2. *v. punjabiensis*, Lyd.
 - b. Horns turning outward at tips, forming an incipient spiral 3. *v. cycloceros*, Hutt.

- B.—Size large, 46-48 inches at shoulder ; throat ruff, when present, wholly white, yellowish, or greyish ; generally a dark nuchal, and sometimes a dorsal, crest ; tips of horns markedly everted.
- a. Tips of horns but slightly everted ; the whole forming about one complete circle... .. 4. *a. hodgsoni*, Bly
- b. Horns slender, forming an open and outwardly extended spiral... .. 5. *a. poli*, Bly.

DISTRIBUTION :—

1. *O. vignei vignei*, Blyth. *Type locality* :—Astor (Vigne).
Other localities :—Ladak (B. M.).
Type :—Unknown.
2. *O. vignei punjabiensis*, Lydekker. *Type locality* :—Salt Range, Punjab (Hume).
Other localities :—Salt Range, and Akhor Hills, Punjab (B. M.).
Type :—B. M. No. 12.10.31.65.
3. *O. vignei cycloceros*, Hut-
 ton. *Type locality* :—Afghanistan.
Other localities :—Afghanistan ; Baluchistan ; Waziristan (B. M.)
Type :—Not traced. (Type of *blanfordi*, Hume B. M. No. 12. 10. 31. 71.)
4. *O. ammon hodgsoni*, Blyth. *Type locality* :—Thibet. (Hodgson).
Other localities :—Ladak ; Sikkim ; Thibet (B. M.)
Type :—B. M. No. 45.1.8.150.
5. *O. ammon poli*, Blyth. *Type locality* :—Syr Daria, Pamirs.
Other localities :—Altai Plateau ; Karakol ; Togdumbash ; Pamirs (B.M.)
Type :—B. M. No. 79.11.21.20.

Gen. V.—PSEUDOIS.

No. 346. *nahura*, Gray. The only species in the genus. Hodgson called it *nahoor* five or six years before Gray published the name *nahura*.

DISTRIBUTION ;—

- P. nahoor*, Hodgson. *Type locality* :—Northern Nepal (Hodgson).

Other localities :—Ladak ; Barinda Pass, Punjab ; Garwhal ; Kumaon ; Nepal ; Sikkim (B. M.) ; Sikkim (M. S. I.).

Type :—B. M. No. 43.1.12.122 ; (skull and horns 43.1.26.12.).

Gen. VI.—CAPRA.

- | | |
|-----------------------------------|--|
| No. 347. <i>ægagrus</i> , Gmel. | Lydekker accepts the name |
| No. 348. <i>sibirica</i> , Mey. | <i>blythi</i> , Hume, for the Persian Wild-goat, ranking it however as a subspecies of <i>hircus</i> , L. The Ibez and |
| No. 349. <i>falconeri</i> , Wagn. | Markhor are well marked forms, |

but they have been split into a large number of subspecies, based to a great extent on the size and shape of the horns, characters which vary considerably and are most difficult to describe. Lydekker recognises seven of these subspecies, *viz.*, four of the one and five of the other, but confesses his inability to arrange them in any kind of key. I, too, have therefore omitted these forms from my key, but have entered them separately under the heading DISTRIBUTION. The three main forms may be distinguished as follows :—

Key to the forms of CAPRA.

- A.—Horns scimitar-shaped ; beard long,
and restricted to the chin.
- a. Front side of horns compressed to an
edge 1. *hircus blythi*, Hume.
- b. Front side of horns wide, flattened... 2. *sibirica* group.
- B.—Horns spirally twisted 3. *falconeri* group.

DISTRIBUTION :—

1. *C. hircus blythi*, Hume. *Type locality* :—Sind.
Other localities :—Khirtan Hills, Uric Hill, Surjun Hills, and Mekran Hills, Sind ; Baluchistan (B. M.).
Type :—B. M. No. 12. 10. 31. 62.
- 2 (a). *C. sibirica wardi*, Lydekker. *Type locality* :—Nanga Parbat, Baltistan (Ward).
Other localities :—Baltistan (B. M.).
Type :—B. M. No. 0. 6. 25. 1.
- 2 (b) *C. sibirica skyn*, Wagner. *Type locality* :—North and East Kashmir.
Other localities :—Tillel Valley and Sind Valley, Kashmir ; Wardwan ; Khagan Valley, Hazara (B. M.).
Type :—Unknown.

Note:—*Lydekker uses Blyth's name, viz., "sakeen" but Blyth never published a description of that name, consequently Wagner's name, although confessedly based on the animal intended by Blyth, must stand,*

- 2 (c). *C. sibirica pedri*, Lorenz. Type locality:—Gilgit.
Other localities:—Chitral (B. M.).
Type:—In Vienna Museum.
- 2 (d). *C. sibirica filippii*, Camerano. Type locality:—Lahoul.
Other localities:—Spiti; Upper Sutlej Valley (B. M.).
Type:—In Turin Museum.
- 3 (a). *C. falconeri falconeri*, Wagner. Type locality:—Astor.
Other localities:—Astor; Baltistan; Indus Valley (B. M.).
Type:—Unknown.
- 3 (b). *C. falconeri cashmiriensis*, Lydekker. Type locality:—Pir Panjal, Kashmir.
Other localities:—Pir Panjal (B.M.).
Lectotype:—B. M. No. 12.10.31.54.
- 3 (c). *C. falconeri megaceros*, Hutton. Type locality:—N. Afghanistan.
Other localities:—Afghanistan Baluchistan (B. M.).
Type:—Not traced.
- 3 (d). *C. falconeri jerdoni*, Hume. Type locality:—Suleman Range, Punjab.
Other localities:—Dehra Ismail Khan and Sheikh Budin, Punjab (B. M.).
Lectotype:—B. M. No. 12.10.31.52.
- 3 (e). *C. falconeri chialtansensis*, Lydekker. Type locality:—Chialtan Hills, Baluchistan. (Appleton).
Other localities:—None.
Type:—B. M. No. 13. 3. 15. 1.

Gen. VII.—HEMITRAGUS.

No. 350. *jemlaicus*, H. Sm. The name of the Tahr was first written *jemlanicus* and then twice corrected to *jemlahicus* by H. Smith.

No. 351. *hylocrius*, Ogil.

The two species may be distinguished as follows:—

Key to the species of HEMITRAGUS.

- A.—Horns flattened externally; mammae four 1. *jemlahicus*, H. Sm.
- B.—Horns convex externally; mammae two 2. *hylocrius*, Ogil.

DISTRIBUTION :—

1. *H. jemlahicus*, H. Smith. *Type locality* :—Jemla Hills, Nepal.
Other localities :—Kulu ; Sutlej Valley ; Garwhal ; Kumaon ; Nepal ; Sikkim (B. M.).
Type :—B. M. No. 886.1.
2. *H. hyllocrius*, Ogilby. *Type locality* :—Nilgiri Hills, Madras.
Other localities :—Nilgiris ; Travancore (B. M.).
Type :—B. M. No. 55. 12. 24. 291.

Gen. VIII.—CAPRICORNIS.

Pocock in a paper published in 1908 (A. M. N. H. (8) i, p. 183) discussed the question of the proper generic names of the Serows and Gorals, and decided that CAPRICORNIS must be used for the former and NEMORHÆDUS for the latter.

No. 352. *bubalinus*, Hodgs.

Pocock in 1913 (J. B. N. H. S. No. 353. *sumatrensis*, Shaw. xxii, p. 296) reviewed the distinguishable forms of this genus, and recorded his reasons for treating them all as subspecies of *sumatrensis*. The following is adapted from his key, viz. :—

Key to the forms of C. sumatrensis.

A.—Head, body, and limbs not all red.

α. Head, and body brownish black or black.

α¹. Legs white or dirty white below the knee.

α². Belly only a little paler than the sides, their colours blending ; much less white on the jaw, throat, and breast ... 1. *s. thar*, Hodgs.

β². Belly white, sharply contrasted with the rufous brown of the sides ; much white on chest, and along lower jaw... 2. *s. rodoni*, Poc.

β¹. Legs with a considerable amount of rusty or yellow below the knees and hocks.

α². Legs below knees and hocks all rusty ; body brownish black... 3. *s. milne-edwardsi*, Dav.

- b*². Legs below knees and hocks
rusty fawn; knees and fetlocks
white; body jet black ... 4. *s. jamrachi*, Poc.
- b*. Head pale chocolate brown, body
probably that colour also, and legs
probably white below the knee ... 5. *s. humei*, Poc.
- B*.—Head, body, and limbs all red ... 6. *s. rubidus*, Bl.

DISTRIBUTION :—

1. *C. sumatrænsis thar*, Hodgson.
Type locality :—Nepal. (Hodgson).
Other localities :—Sutlej Valley,
Kumaon; Nepal; Sikkim (B. M.).
Lectotype :—B. M. No. 43.1.12.89.
2. *C. sumatrænsis rodoni*, Pocock.
Type locality :—Chamba State,
Punjab. (Rodon).
Other localities :—None.
Type :—B. M. No. 2. 12. 11. 1.
3. *C. sumatrænsis milne-
edwardsi*, David.
Type locality :—Moupin, Sze Chuen.
Other localities :—Sze Chuen; Pegu;
Moulmein; Mount Muleyit; Tenasse-
rim (B. M.); N. Shan States; Pegu
(M.S.I.).
Type :—Perhaps in Paris Museum.
4. *C. sumatrænsis jamrachi*, Pocock.
Type locality :—Kalimpong, Darjil-
ing.
Other localities :—Kursiong, Dar-
jiling (B.M.).
Type :—2. 10. 12. 1.
5. *C. sumatrænsis humei*, Pocock.
Type locality :—Kashmir. (Hume).
Other localities :—Pir Panjal, Kash-
mir (B. M.).
Type :—B. M. No. 91. 8. 7. 65.
6. *C. sumatrænsis rubidus*, Blyth
Type locality :—Arakan.
Other localities :—Arakan (B. M.)
Type :—Not traced.

Gen. IX.—NEMORHÆDUS.

In the paper quoted above, Pocock
No. 354. *goral*, Hardw. recognises three species which he
distinguishes as follows :—

Key to the species of NEMORHÆDUS.

- A*.—Tail shorter, about three inches long,
exclusive of hair; black stripe on foreleg
passing over the knee, down the middle of
the cannon bone, to the fetlock.

- a. General colour grey or fawn-grey, more or less suffused with black; spinal stripe absent, or not passing beyond withers; no stripe down middle of tail, and none on back of thigh 1. *goral*, Hardw.
- b. General colour brown, suffused with black; spinal stripe reaching at least to the croup; a black stripe down tail; blackish on back of thigh ... 2. *hodgsoni*, Poc.
- B.—Tail longer, about five inches without hair; black stripe on foreleg not passing over knee, but turning down outer side of cannon bone 3. *griseus*, M. Edw.

DISTRIBUTION :—

1. *N. goral*, Hardwicke. *Type locality* :—Western Himalaya.
Other localities :—Kashmir; Dharamsala, Punjab; Garwhal; Kumaon (B. M.).
Type :—Not traced. (Type of *Urotragus bedfordi*, Lyd. B. M. No. 97. 4.3.1).
2. *N. hodgsoni*, Pocock. *Type locality* :—Sikkim. (Blanford-Mandelli).
Other localities :—Nepal (B. M.).
Type :—B. M. No. 91. 10. 7. 169.
3. *N. griseus*, Milne-Edwards. *Type locality* :—Moupin, Sze Chuen.
Other localities :—Arakan, Upper Burma (B. M.).
Type :—In Paris Museum.

Gen. X.—BUDORCAS.

Blanford does not include this animal in his Fauna, though he mentions it (Mamm. p. 515, 1891) as occurring in the Mishmi Hills. More recently it has been obtained in Bhutan. The Sze Chuen form may still be found within our limits. The three forms which interest us may be distinguished as follows :—

Key to the forms of BUDORCAS.

- A.—Dorsal stripe extending from occiput to tail; ears, and entire face in front of them, black.

- a. Rather larger; paler, with large
dun saddle 1. *t. taxicolor*, Hodgs.
- b. Rather smaller; darker, with smaller
saddle 2. *t. whitei*, Lyd.
- B.—Dorsal stripe not extending forward
of the withers; black on head confined
to back of ears, a ring round each eye,
face in front of same, and tip of chin... 3. *tibetana*, M. Edw.

DISTRIBUTION :—

1. *B. taxicolor taxicolor*,
Hodgson. *Type locality* :—Mishmi Hills.
Other localities :—Mishmi Hills
(B. M.).
Co-types :—B. M. Nos. 53.8.16.9,
79.11.21.11 and 662.
Lectotype :—B. M. No. 79.11.21.662.
2. *B. taxicolor whitei*,
Lydekker. *Type locality* :—Bhutan (J. Claude
White).
Other localities :—Bhutan (B. M.).
Type :—B. M. No. 6. 8. 24. 1.
3. *B. tibetana*, Milne-
Edwards. *Type locality* :—Moupin, Sze Chuen.
Other localities :—Sze Chuen (B. M.).
Type :—In Paris Museum.

Gen. XI.—BOSELAPHUS.

No. 355. *tragocamelus*, Pall. The only species of the genus.

DISTRIBUTION :—

- B. tragocamelus*, Pallas. *Type locality* :—Plains of India.
Other localities :—Central India;
Central Provinces; Oudh (B. M.).
Type :—Unknown.

Gen. XII.—TETRACEROS.

No. 356. *quadricornis*,
Blainv. The only species of the genus.

DISTRIBUTION :—

- T. quadricornis*, Blainville. *Type locality* :—Plains of India.
Other localities :—Kathiawar; Cen-
tral India; Central Provinces;
Southern Mahratha Country; Eastern

Ghats, Madras (B. M.); Berars ; Central Provinces ; Dharwar (M. S. I.).

Type :—B. M. No. 884.c. (skull 43.a.).

Gen. XIII.—ANTILOPE.

No. 357. *cervicapra*, L.

The only species of the genus.

DISTRIBUTION :—

A. cervicapra, Linnæus.

Type locality :—Plains of India.

Other localities :—Punjab ; Kathiawar ; Rajputana ; Central India ; Dharwar (B. M.) ; Sind ; Kathiawar ; Khandesh ; Coorg (M. S. I.).

Type :—Unknown.

Gen. XIV.—PANTHOLOPS.

No. 358. *hodgsoni*, Abel.

The only species of the genus.

DISTRIBUTION :—

P. hodgsoni, Abel.

Type locality :—Hundes District, Thibet.

Other localities :—Thibet ; Ladak ; Sikkim ; Kumaon (B. M.).

Type :—Unknown.

Gen. XV.—GAZELLA.

No. 359. *bennetti*, Sykes. The name *subgutturosa* has been restricted to the Yarkhand, &c., forms
 No. 360. *subgutturosa*, and the name *seistanica*, Lyd., provided for the form from Baluchistan, &c. The three forms may be distinguished as follows :—
 Guld.
 No. 361. *picticaudata*,
 Hodgs.

Key to the species of GAZELLA.

- A.—Females horned ; horns of males not turned in at tip ; face stripes distinct 1. *bennetti*, Sykes.
 B.—Females hornless ; horns of males turned in at tip.

- a. Face stripes present ; no caudal disk. 2. *seistanica*, Lyd.
 b. Face stripes absent ; white caudal
 disk 3. *picticaudata*,
 Hodgs.

DISTRIBUTION :—

1. *G. bennetti*, Sykes. *Type locality* :—Dekhan. (Sykes).
Other localities :—Sind ; Punjab ;
 Rajputana ; Central India ; Nepal ;
 Bengal (B. M.) ; Sind ; Cutch ; Ka-
 thiawar ; Central India ; Central Pro-
 vinces ; Khandesh (M. S. I.).
Co-types :—B. M. Nos. 42.8.6.9 &
 10. (Type of *christyi*, Blyth. B. M.
 No. 617.a.).
Lectotype :—B. M. No. 42.8.6.9.
2. *G. seistanica*, Lydekker. *Type locality* :—Seistan.
Other localities :—Seistan.
Type :—B. M. No. 10.1.22.2.
3. *G. picticaudata*, Hodgs. *Type locality* :—Hundes District,
 Thibet.
Other localities :—Thibet ; Ladak ;
 Sikkim (B. M.).
Type :—B. M. No. 48.6.11.19.

(To be continued.)

NOTES ON INDIAN BUTTERFLIES.

(Continued from Vol. XXVI, Page 1023.)

BY

LT.-COL. W. H. EVANS, F.Z.S., F.E.S.

19. Fruhstorfer in "Iris" or "Deutsche Entomologische Zeitschrift" No. 27, p. 172, 1914, gives new names to certain Rapalas, viz., *varuna gabenia* for the Assam race, said to be paler than others: *nissa tacola* for the Assam race of the W. Himalayan *nissa*, Kollar.

20. There is a paper called "Übersicht der Lycænidien" by Fruhstorfer in the "Berlin Entomologische Zeitschrift" No. 56, p. 198, 1911-12, which has not been brought to the notice of Indian Lepidopterists; it appeared at the same time as the "Lepidoptera Indica," vols. 7 & 8.

(1). Four varieties of *Poritia hewitsoni*, M, are given: *principalis*, the ordinary form: *interjecta* with the orange spot very large; *nigrita*, a very dark form; *palilia*, an extreme dry season form, very bright blue above and bluish gray below.

(2). *Poritia erycinoides*, Fd, is confined to Sumatra, where it has 3 named varieties; the race flying from Tenasserim to Siam is *phraatica*, Hew.

(3). The Burmese race of the Bornean *Poritia phalia*, Hew, is described as *binghami* from the figure in Bingham's "Butter-flies of India, etc," a somewhat dangerous course; *potina*, Hew, is the Malayan race.

(4). The genus *Zarona* is sunk to *Deramas*, Dist. and *jasoda*, DeN, placed as a race of *livens*, Dist. from Perak.

(5). The genus *Arrhenotrix* is sunk to *Dacalana*, while the following are sunk to *Tajuria*, *Charana*, *Ops*, *Britomartis*, *Bullis*, *Remelana* and *Cophanta*. This, in my opinion, is a good thing, as the differences are not very pronounced.

(6). The N. Indian race of the S. Indian *Camena deva*, M, is called *gada*, Fruh.

(7). *Camena lucida*, Druce, from Borneo is put as the name type of what we used to call *cippus*, Fab, and now call *argentea*; *argentea*, Aur, is the S. Indian race and *minturna*, Fruh, the N. Indian.

(8). The Indian races of the Javan *Tajuria jalindra*, Hors, are given as: *indra*, M, N. India: *macanita*, Fruh, S. India: *tarpina*, Hew, Andamans.

(9). The Ceylon race of *Tajuria cippus*, Fab, from Continental India, is given as *longinus*, Fab; thus we get back a familiar name.

(10). The dry season form of *Tajuria maculata*, Hew, is called *albipicta*, Fruh.

(11). *Tajuria megistia*, Hew, is stated to be Sumatran and the Indian races are: *yajna*, Doh, from Kumaon: *istroidea*, DeN. from Sikkim, based on a dry season form: *thria*, Den, from Tenasserim. The inference is that Fruhstorfer considers that, what we call *istroidea* and *megistia* at present, are seasonal forms of the same species; this does not seem correct.

(12). The Indian race of the Javan *Aphnæus syama*, Hors, is given as *orissana*, M. *Aphnæus zoilus*, M, is treated as a distinct species, of which *zebrinus*, M, is probably a race.

(13). *Aphnæus lohita*, Hors, was described from Java and the Indian races are said to be: *himalayanus*, M, N. E. India; *concanus*, M, South India; *lazularia*, M, Ceylon: *seliga*, Fruh, Tenasserim.

(14). *Aphnæus vulcanus*, Fab, is given from Sikkim, S. India and Ceylon with race *bracteatus*, But, from the N. W. Himalayas to Mhow.

(15). *Aphnæus ictis*, Hew, is given from Ceylon, with the following races: *maximus*, El, from Burma; *lunulifera*, M, from Sikkim; *khurdanus*, M, from Bengal and S. India; *trifurcata*, M, from the N. W. Himalayas, of which *uniformis*, M, and *elima*, M, are names for the dry season form.

(16). *Aphnæus fusca*, M, is treated as a species.

(17). *Loxura atymnus*, Cr, is from S. India with races: *arcuata*, M, from Ceylon; *prabha*, M, from S. India with Andamans: *continentalis*, Fruh, from Sikkim to Burma, the dry season form being *mahara*, Fruh.

(18). The Indian race of the Javan *Sithon nedymond*, Cr, is called *ismarus*, Fruh.

(19). The Indian races of the Javan *Sinthusa nasaka*, Hors, are *pallidior*, Fruh, W. Himalayas and *obscurata*, Fruh, E. Himalayas and presumably Burma.

(20). *Sinthusa chandrana*, M, is the form from W. China and the W. Himalayas with race *grotei*, M, from Sikkim to Burma.

(21). *Sinthusa amba*, Kir, is given from Perak and Borneo and is said to be probably a race of *nasaka*, Hew.

(22). *Horaga onyx*, M, is given from continental India with races *cingalensis*, M, Ceylon: *moulmeina*, M, Burma and *rana*, DeN, Andamans.

(23). *Catapœcilma elegans*, Druce, is from Borneo and the Indian races are *major*, Druce, N. India and Burma: *myosotina*, Fruh, S. India and Ceylon.

(24). The name type of *Hypolycæna erylus*, God, is not from India: *hima-vantus*, Fruh, is the race from India and Burma and *andamana*, M, from the Andamans.

(25). *Hypolycæna marciana*, Hew, is confined to Sumatra, Borneo, the Burmese race being *miniata*, M, *Thamala* he does not think is worth considering as a separate genus to *Hypolycæna*.

(26). *Bindahara phocides*, Fab, is given from Sikkim to Burma: race *moorei*, Fruh, from Ceylon and race *areca*, Fd, from the Nicobars. Race *sugriva*, Hors, which is a familiar name to us, is the Javan form.

(27). The dry season form of *Ticherra acte*, M, is called *idina*, Fruh.

(28). *Cherita freja*, Fab, is given from Sikkim to Burma, with race *pseudo-jaffra*, M, from S. India and Ceylon.

(29). *Marmessus lisias*, Fab, is from Cochin China, the Burmese race being *boisduwali*, M, of which the dry season form is *alcira*, Fruh. *Marmessus moorei*, M, is said not to occur in India.

(30). *Biduanda fabricii*, Doh, is placed as a race of the Malayan species *thesmia*, M.

(31). *Biduanda martina*, Hew, is a race of the Javan *hypoleuca*, Hew, The genera *Manto* and *Drupadia* are sunk to *Biduanda*.

(32). *Ierda epicles*, God, is Javan: the Indian race is *indicus*, Fruh, the dry season form being *indica*, Fruh, and the wet season form *latilimbata*, Fruh, while *rufonotata*, Fruh, is a variety with very wide red markings.

(33). *Rapala manea*, Hew, is a butterfly found in the Celebes, with an Indian race, *grisea*, M, which is found from Kangra to Burma. The male has no brand; it is metallic blue above and below the discal band is very narrow. This is what we have called *varuna*, Hors, the type of which came from Java. I should think that the Indian form is much more likely to be conspecific with the Javan than the Celebesian form, but Fruhstorfer says *varuna* is a species not occurring in India.

(34). *Rapala deliochus*, Hew, is put as a race of the Javan *kessima*, Hors.

(35). *Rapala nissa*, Koll, is confined to the Western Himalayas and Sikkim, *rectivitta*, M, being the Assam race.

(36) *Rapala xenophon*, Fab, is said to be Javan, the Indian race being *suffusa*, M. What we have hitherto called *xenophon*, is said to be *dienece*, Hew, of which *intermedius*, Std, is the Andaman race.

(37) *Rapala melampus*, Cr., is confined to S. India and Ceylon and *jarbas*, Fab, is the race from N.-E. India and Burma. Fruhstorfer, however, modifies his views in the reference quoted in Note 19 above, where he says *jarbas* is quite distinct and that *melampus* is a very rare insect only found in Mussoorie. The treatment of these two species is rather a good example of the very sketchy methods adopted by Fruhstorfer.

(38) The genera *Virachola* and *Lehera* are sunk to *Deudoryx*, perhaps a wise step.

(39) *Deudoryx epijarbas*, M., is given from S. India and Ceylon, with the following races: *ancus*, Fruh, N.-W. Himalayas to Sikkim; *amatus*, Fruh, Assam to Tonkin. Perhaps he does not know that this species occurs in the Andamans or a name would be at once forthcoming.

(40) *Deudoryx perse*, Hew, is given from the N.-W. Himalayas to Sikkim: race *ghela*, Fruh, S. India and Ceylon; race *maseas*, Fruh, Andamans; *smilis*, Hew, was described from East India and is taken to represent the race from Tenasserim and Malay Peninsula.

(41) *Deudoryx skinneri*, W. M. & DeN., is considered as the name for a variety of the female of *eryx*, L.

21. In note 17 (J. B. N. H. S. XXIII. p. 310) I stated that I had no access to the original descriptions of *Papilio echo*, Ehrman or *Athymy gymea*, Swin. (1) The reference for the latter is wrongly quoted by Swinhoe in Lep. Ind. and I spent some time at the B. M. searching for the description in vain: I now find that Fruhstorfer in the Macrolepidoptera places it as the Perak race of the Bornean *ambra*, Stg. (2) *Papilio echo* is stated to be very similar to *bootes*, Wd, but there are no spots on the tail and all the crimson markings above and below are much reduced; the upper median cell of the hindwing below bears a faint red streak in the place of the white spot; the tails are longer than in *janaka*, M., but not so long as in *bootes*, Wd. The type specimen is in Mr. Ehrman's collection at Pittsburg and was obtained by the late Bernhard Gerard in the Khasi Hills. Jordan in the Macrolepidoptera places *echo* as = *nigricans*, Roth, the W. China race of *bootes*. (3) In my list of Indian Butterflies J. B. N. H. S. XXI, I omitted 2 *Papilios* given by Jordan in the Macrolepidoptera as occurring in Indian limits: they are *evemon albociliatis*, Fruh, from Assam and the Shan States, a species between *doson*, Fd., and *eurypylus*, L. (4) The second is *arycles*, Bdv., from the Shan States, like *agammemnon*, L. but tailless.

22. Col. Swinhoe has described several new forms in the Annals and Magazine of Natural History.

(1) *Elymnias merula*, Swin, from Kandy. As *hecate*, But, N. Borneo, but on the hindwing below there is a prominent whitish blue spot below the middle of the costa (xvi, 171). This is sure to turn out a variety of *fraterna*, M.

(2) *Hypolimnias curiosa*, Swin, from Starn, C. P. This is obviously a sport of *bolina*, L. (xvi, 171).

(3) *Jamides atcina*, Swin., from Haipaw, Yet Sank, Shan States. It is a milky white insect, tinged with lavender blue. A long description is given, but nothing is mentioned as to how it differs from the other species in this difficult genus. (xxi, 171).

(4) *Rapala nissa nissoides*, Swin., from the same locality as the last, whence a long series was obtained. The discal patch on the forewing above is said to be large, bright and square in shape, while the anal ocellus on the hindwing below is minute. (xvi, 171).

(5). *Astictopterus quadripunctatus*, Swin, Khasi Hills. Above as *olivascens*, M, larger: there are two subapical white dots on the forewing above and three below. (xvi, 171).

(6). In xviii, 209, Swinhoe describes the females of *Bullis buto*, DeN from the Khasi Hills and *Tajuria drucei*, Swin, from Haipaw, Shan States.

(17). *Isamia noblei* is the name Swinhoe gives to a butterfly caught by Noble in Rangoon in 1887 and figured as *iravada*, var, by Moore in Lep. Ind. pl. 47. 1e. (xviii, 481). This is merely a variety of *splendens*, But.

(9). *Isamia eclecta*, Swin, from Palone, Burma, caught in June 1887. There is a long description, but no comparison with any other insect. (xix, 331). This will certainly be a variety of some well-known form, probably *splendens*, But.

(8). *Arhopala dascia*, Swin, from Toungoo. This is said to be rather as *ganesa*, M, but darker and is what Watson figured in plate A., fig. 6, J. B. N. H. S. x., but Watson's specimen had the tails broken off. (xix, 499). Watson was too careful an observer to make a mistake about tails; I have already named his specimens as *ganesa watsoni* in J. B. N. H. S. xxi, 993. *A. dascia* I suspect to be the same as my *ellisi* described in J. B. N. H. S. xxiii. 303; my name has priority.

(10) Swinhoe describes the female of his *Rapala francesca* from Cherra Poonji. (xx. 158).

(11). *Cyrestis atosia*, Swin, from Maymyo. (Graham, presumably the late Major G. H. Graham) said to resemble *irmae*, Forbes, from Sumatra; it belongs to the *mœnalis* group, which is represented in India by the *nivea* group. Swinhoe states that Bingham in his "Butterflies of India" figured *nivalis*, Fd. from Java instead of the very distinct *nivea*, Z. S., which has a broad black costal border from the base to the apex of the forewing. In *atosia* the band is similar, but the transverse lines are dark chocolate brown (xx, 408). It seems to be very near to *nivea*, and I think will prove to be a mere variety of *nivalis*.

(12). *Neptis ancus*, Swin, from Toungoo (Graham). Resembles *clinia* from the Andamans, but above the markings are larger, the submarginal band is pure white, while on the forewing below, the cell streak is narrower and the subapical spots are joined together (xx, 408). This is probably a seasonal form of *susruta*, M.

(13). *Tacupa curiosa*, Swin, Naga Hills (Graham: 3 males). *Tacupa* is a new genus in the group *Astictopterinæ*. The specimens were named *Watsoniella swinhœi*, El, but are generically distinct. In describing the genus, *Tacupa*, Swinhoe does not mention how it differs from any other genus, nor does he say how *curiosa* differs from any other species. It is said to be a chocolate black insect, very dark and uniform, the veins prominent, below it is paler, the outer and hind margins of the forewing being paler still (xx, 408).

23. Lord Rothschild gives us some interesting notes on the *Morphinæ* or what he calls *Amathusiidæ*.

(1). In *Novitates Zoologicæ* xxiii, he figures a male *Stictopthalma* from Kindat, Burma, which he considers to be *sparta*, DeN, and states that *sparta* is a distinct species and not a race of *howqua*, as considered by Fruhstorfer. In N. Z. xxv, he names the *Stictopthalma* caught by Col. Tytler at Sebong, Manipur, *tytleri*, Roth and considers that the male he previously figured from Burma belongs to this species and not to *sparta*, which is a distinct species between *howqua*, Wd, and *louisa* W. M. As far as I know De Nicville's type of *sparta* remains unique, but I believe that time will show that *tytleri*=*sparta*.

(2). The form of *Enispe euthymius*, Db, from Burma, Siam and the Malay Peninsula is separated as race *intermedia*, Roth; it is intermediate between *euthymius* and *durania*, Fruh. (N. W. xxiii)

(3). *Thauria lathyi*, Fruh, described from Tonkin is a species distinct from *aliris*, Wd, described from Borneo. In Burma we have *aliris intermedia*, Crowley, from N. Burma; *aliris pseudaliris*, But, from S. Burmah and Tenasserim; *lathyi amplifascia*, Roth, from South and Central Burma and Tenasserim. In Toungoo the two species occur together; *intermedia* differs from *amplifascia* in that the oblique light bands are wider and the male has very conspicuous cellular androconial tufts. (N. Z. xxiii and A. M. N. H. xvii, 474).

(4). *Stictopthalma camadeva nagaensis*, Roth, from the Naga Hills. Much paler than *camadeva*, Wd, or *camadeovides*, DeN, and at once conspicuous by the golden yellow costa and small chevrons on the forewing; below all the transverse lines are much straighter. (N. Z. xxiii).

(5). In A. M. N. H. xvii, 474, *Stictopthalma godfreyi*, Roth, is described as a new species from Siam, near *cambodia*, Hew, from Cambodia. Mr. O. C. Ollenbach obtained a specimen of *godfreyi* from Taungshaun, Taung Tavoy, caught on May 17th, 1917. A forewing of the same species was picked up by Mr. Ollenbach in the neighbourhood of Tavoy in February 1918. *Godfreyi* is a very distinct species of the size of *camadeva*, Wd, the ground colour above being very dark brown; there is a double postdiscal row of large white spots, terminating on the costa in a large white patch; along the termen there are a series of chestnut coloured chevrons. Below the ground colour is a dark fulvous; there are two ocelli on the forewing and three on the hindwing.

24. Dr. Chapman in *Novitates Zoologicae* xxii. p. 80, gives an analysis of the genus *Curetis* based on an examination of the male genitalia. The *thetis* section has the harpe soft and hairy and contains the following species; (1). *thetis*, Drury, from N. India to the Malay Peninsula; (2). *phædrus*, Fab, always paler, from Bengal to Ceylon; (3). *saronis*, M, from the Andamans, with race *nicobarica*, Swin, from the Nicobars and race *gloriosa*, M, from Sylhet to Burma; in *saronis* the postdiscal line is always distinct, while the lunules between veins 5 and 6 on the forewing hardly project beyond the others as they do in *thetis*. In the *bulis* group the harpe is smooth and hard; below the bands are not parallel to the margin as they are in the *thetis* group, this group contains the following species: (1) *bulis*, Db and Hew, from the N. W. Himalayas to Malayana, with *felderi*, Dist, as possibly a race from S. Tenasserim and the Malay Peninsula; (2) *sperthis*, Fd, from Malayana and not recorded from India; (3) *acuta*, M, differing from *bulis* in having a constantly smaller ædagus while there is always a dark tooth projecting from the dark costal border into the discal red area; *paracuta*, DeN, is given as the Chinese race, *acuta* occurring in N. India and Burma, while *dentata*, M, *stigmata*, M, and *angulata*, M, are treated as synonyms. This is a very useful analysis, but I do not understand *acuta*, which was described from China and *paracuta* from Japan; *acuta* is the oldest name and might represent the Chinese race, while *dentata* would be the name for the Indian race. Again *thetis*=*phædrus* is the name usually given to the form from South India and Ceylon, while *gloriosa*, M, is the N. Indian and Burmese species: I do not know where the types of *thetis* or *phædrus* came from:—

25. A good deal has been written about the genus *Parnassius* lately: the more important papers are:—

(a) *Novitates Zoologicae*, xxv, p. 218. Catalogue of the *Parnassiineæ*.

(b) *Trans. Ent. Soc.*, 1915, p. 351—360. Some new forms of *Parnassius* by A. Avinoff.

(c) Jahrbuch des Nassavischen vereins fur Naturkunde lxxv, p. 4, some notes by Bryk.

I propose to give an up-to-date list of the Indian and S. Thibet forms, culled from these sources, referring to them by their letters when necessary.

(1). *Hypermnestra helios balucha*, M.: Verity says *balucha* = *maxima* Gr. Gr., but the B. M. type is a good deal smaller. (a).

(2). *Parnassius jacquemontii*. Bdl. ("Himalaya"). Nashing La & Chita Ladak.

r. *himalayensis*, El. (Lahoul). Kulu: Nila valley: Tonglon, Sikkim: Afghanistan? ab. *impunctata*. Aust. (Sikkim).

r. *chitralensis* M. (Madaglasht, Chitral).

Avinoff in "Records of the Indian Museum" ix, 330, gives *P. rhodius chitralensis*, Verity, from the Shandur Pass, Chitral and Darkot. I think he means *P. jacquemonti chitralensis*, M.

(3). *Parnassius epaphus*, Ober. (Kashmir). Skoro La.

r. *phariensis*, Avinoff. Phari jong, S. Thibet.

r. *sikkimensis*, El. (Kamba Jong, Chumbi Valley)

r. unnamed, a good deal larger than last. Native Sikkim. (a).

r. unnamed, darker, with very large spots. Phari Jong, Tongla Pass: and Yatsung, Sikkim? (a).

r. unnamed, a very white form. Chitral. (a).

(4). *Parnassius discobolus insignis*, Stz. Avinoff in "Records of the Indian Museum" ix., 330, records this from the Shandur Pass, Chitral; I have specimens in my collection referable to this form.

(5). *Parnassius hardwickii*, Gray, (Ladak). Chitral to Sikkim. No races, aberrations or seasonal forms are given. (a).

(6). *Parnassius delphius stenosemus*, Honrath. (Kutie Pass. Ladak).

r. *stoliczanus*. Fd. (Narka, Rupshu, Ladak).

ab. *atkinsoni*, M. (Pir Parjal, N. Kashmir.)

r. *lampidius*, Fruh. (Kamba Jong, Chumbi Valley).

r. *macdonaldi*, Roth. (Yatung, Thibet), between *lampidius* and *albulus* ab *styx*, Std. (a).

r. unnamed, 1 ♀ from Kulu, larger than *stoliczanus*. (a).

r. *nicevillei*, Avinoff. (b). Burzil pass, Kashmir: Zogila: Kishtwar Mts. caught by Lt. Brownlow. Between *stoliczanus* and *atkinsoni*, Avinoff has 70 specimens of this form, including two conspicuous aberrations one of which is near *cardinal*, the 3 red ocelli being very well developed; he names it *cardinalia*, Avinoff. The specimens from the Zogi La and the Kishtwar Mts. have the markings on the hindwing more developed and may be a separate race.

r. *mamaievi*, Avinoff. (b) W. Ladak. A member of the *staudingeri-hunza* group.

r. *workmanni*, Avinoff. (b). Saltoro Glacier, Baltistan, caught by Mrs. F. B. Workman's expedition. Markings much reduced: between *mamaievi* and *hunza*.

r. *hunza*. Gr. Gr., (Beik Pass, Hindu Kush).

r. *chitralica*, Verity, (Shandur Pass, Chitral).

r. *kafir*. Avinoff. (b). Mountains between Kila Drosh and Kafirstan, obtained by Mr. A. Smith. No transverse discal band on the forewing: the shape of the hindwing narrower and angled at vein 6.

It looks as if every mountain will be found to have its own race of *delphius*, rather reminding one of the land snails in the valleys of a certain Sandwich Island.

- (7). *Parnassius acco*, Gray (Ladak).
r. gemmifer, Fruh. (S. Thibet). Kamba jong (a).
r. baileyi, South. (S. Yatuug).
r. hunningtoni, Avinoff. (b). Mountains between Sikkim and Thibet caught by Mr. Hannington's collectors early in the year. A very small form. The dark basal area differs in contour from *acco*. where it is irregular about the cell. In the male above the dark markings are very red. Cilia are very long and of the ground colour. In the female the pouch is shorter than in *acco*. Avinoff puts this race as a species distinct from *acco*.
r. hampsoni, Avinoff. (b). Karakoram.
- (8) *Parnassius maharaja*, Avinoff. (b). Rupshu, 18,000 feet, Chinese Turkestan and Karakoram. Near *cephalus* and *szechenyi*. I imagine Rupshu must be the Southern province of Ladak, but that is a long way from Chinese Turkestan.
- (9) *Parnassius acdestis*, Gr. Gr.
r. rupshuana, Avinoff. (b). Rupshu, Chinese Turkestan.
r. ladakensis, Avinoff. (b). one female from Shera La, E. Ladak.
r. latoni, Bryk. Kangma, near Shigatse, S. Thibet. A heavily marked and large form of *Acdestis lampidius*, Fruh, from Sikkim. (b).
Acdestis is treated in Seitz "Macrolepidoptera" as a race of *delphius*.
- (10). *Parnassius imperator augustus*, Fruh. (Mountains between Sikkim and Thibet). Yatung (a).
- (11). *Parnassius charltonius*, Gray. (Ladak). Lahoul. (a).
r. bryki, Haude, (Nilang Pass).
r. unnamed. Cashmere. A large form (a).
ab. deckerti. Verity. (Chitral). Ladak. (c).
ab. haudei, Bryk. Kashmere. (c).
ab. atroguttata, Bryk. Nilang Pass, Chitral. (c).
r. occidentalis, Bryk. Chitral. (c). Described from one male and two females.
- (12). *Parnassius simo*, Gray. (Ladak).
r. acconus, Fruh. (Chumbi Valley). Kambajong (a).
r. simonides. Aust. (Internat. Ent. Zeitschrift: 1911-12 v., 360). High mountains N. of Ladak. A small form. Localities given in brackets are those of the type.
26. Mr. Bethune Baker in T. E. S. 1913. p. 205-12, gives some notes on the *Lycenidæ*.; he states that *jaloka*, M., is a distinct species more nearly allied to *pheretiades*, Ev., than to *orbitulus*, Prun, and that *ellisi*, DeN, and *leela*, DeN, are synonymous with *jaloka*. In the Ent. Rec. xxvi, 135 and A. M. N. H. xvii, 378, he discusses the synonymy of the *Lycenidæ*, or, as he calls them the *Ruralidæ*, *Ruralis* has been dug out and found to be older than *Lycæna*. It is used as a generic name to replace *Thecla* plus *Zephyrus*. *Heodes* has also been disinterred and is to replace the familiar *Chrysophanus*. *Polyommatus* has been taken for the *argus* group of *Lycæna* and *baeticus*, Ramb, put in *Lampides* along with *celianus*. The true *Lycænas* are split up into a number of genera, *Lycæna* itself being restricted to the non-Indian *arion* group. Mr. Bethune Baker is working out a revision of the genus, which will be extremely useful, but I wish he would not rob us of our familiar names, nor multiply needlessly the many genera we already have to deal with. His new classification is, I believe, to be based solely on genitalia examinations, regardless of the habits, larval stages, facies, etc.

27. The life-history of *Leptocircus curius*, Fab, is given in the Entomologist xlvi, 203. Other papers that may be of interest to Indian naturalists are :—

(a). Notes on Ceylon butterflies, W. Ormiston "Spolia Zeylanica" 6.-2-18. This is a most interesting and useful paper dealing with the habits and localities of Ceylon butterflies. Mr. Ormiston has collected for nearly 30 years and has collected a mass of useful information.

(b) A list of butterflies of Borneo, Part iv., Papilionidæ by J. C. Moulton. Journal No. 67, Dec. 1914, Straits Branch. Royal Asiatic Society, The same author in T. E. S., 1913, 273, writes on new and little known Bornean. *Lycaenidæ*, with a revision of the genus *Thamala*.

(c). Fruhstorfer in "Iris" xxiv., 58. (1910) ran through the *Hesperidæ* and produced a number of new races. Swinhoe in writing up the *Hesperidæ* in Lep. Ind. had the paper before him, so it is unnecessary to summarize it, but there are several points in the paper that Swinhoe overlooked.

28. Major H. D. Peile, I. M. S., sent a note on 17-4-15 regarding certain butterflies caught in Nov. 1913 by Col. S. W. Lincoln in thick forest near Anisakan, North Shan States.

(a). *Stictopthalma louisa fruhstorferi*, Rober. 1 female. This race was described from Tonkin and differs from typical *louisa* from S. Burma, in that the tawny brown colour of the hindwing extends and surrounds the sagittate spots.

(b). *Euthalia* sp. Three females, one of which has been deposited in the B. M. and placed with *Euthalia pratti*, Leech, from Central China, to which species it certainly seems more nearly allied than to any other. The B. M. specimen differs from *pratti* in the following respects: ground colour above more bronzy; forewing above, central of the 3 subapical spots missing and the lower spot pushed forward; the black markings in the cell are heavier; of the discal white band the costal streak is faint, the outer edges of the series are more rounded, and the inner edge of the 4th spot from the costa is very oblique; the lower spot is shifted right forward towards the outer margin, on the hindwing above only the costal is white. The hindwing below is more vinous tinted and the apex is browner; there is a trace of a white spot below the lower subapical spot. On the hindwing below only the upper two spots of the discal band are well marked.

Major Peile proposed a new name for these specimens, but I advise him to refrain at present, until the male turns up.

FURTHER NOTES ON BIRDS ABOUT SIMLA.

BY

HUGH WHISTLER, F.Z.S., M.B.O.U.

In Volume XXVI of the Journal, pages 770-775, I recorded a short series of observations made out at Fagoo near Simla in 1918, under the impression that it would be a long time before I should again have an opportunity of visiting that locality. The unexpected however always happens and the end of October 1919 found me under orders to spend a month's leave in Simla to recover from the effect of illness. This gave me an excellent opportunity of increasing and supplementing the observations of the previous year, more specially as I reached Simla on November 2nd whereas the previous visit had ended on October 31st. From the 2nd to the 13th November I was in Simla itself and thereby limited in my field for observation to occasional expeditions to neighbouring hill sides. The period from 13th to 23rd November was spent at Fagoo with daily collecting and observation, and on the 27th November I finally left Simla for the plains. As many very interesting species were met with, and a series of over a hundred skins was collected, it appears desirable to set these notes on record. With them have been incorporated the results of a short period spent at Fagoo by Captain Claud Ticehurst, R.A.M.C., from the 15th to the 21st October. The original intention was for us both to have been there together, but this plan unfortunately was upset by various causes. It will be seen that the list now given includes 7 species which do not appear in the list of birds of the Simla Hills by Mr. A. E. Jones (Jour. B. N. H. S., Vol. XXVI, 601) and further work in these parts will certainly bring more additions to light. The field is very great and many species are exceedingly local and capricious in their distribution.

In the case of certain of the more interesting specimens obtained I have appended a few notes on measurements, etc., etc. The measurements have been taken in accordance with the methods used in the "Practical Hand-book of British Birds" (Witherby). I feel that some apology is required for the changes in nomenclature, not only as compared with the Fauna, but even with my previous note. I can however only urge that it is inevitable that these notes should reflect the general instability of ornithological nomenclature, annoying at the moment, but intended ultimately to secure a general uniformity.

The Jungle Crow, *Cioides intermedius*, Adams.

Abundant in all the places visited as before.

The Himalayan Nut-cracker, *Nucifraga caryocatactes hemispila*, Vig.

This species was certainly more abundant than on my last visit and was common even at Kufri on November 9th. The gizzards of two specimens preserved contained the long white seeds of some species of pine, and this would appear to be their ordinary food, judging from the frequency with which individuals are to be seen examining the ends of pine branches. They travel considerable distances along the hills to their feeding grounds, and appear to be very regular in their movements.

The Himalayan Great Tit, *Parus major* subsp. ?

A few individuals of this Tit (*Parus atriceps*, Horsf., partim of the Fauna B. I. Vol. 1, p. 46) were observed at 6,500 feet, below Kasumpti on the 6th November, but as the species was not otherwise met I have not yet been able to settle, by comparison of specimens, conclusively which race is the breeding bird of the Simla hills but in all probability it is *Parus major caschmirensis*, Hartert. (Vog. Pal, F. p. 345.)

The Green-backed Tit, *Parus monticolus monticolus*, Vig.

Ticehurst found the Green-backed Tit common out at Fagoo in company with mixed hunting parties, but by the date of my arrival comparatively few were still to be found about Fagoo and Kufri, and these only down in the valleys, rarely venturing higher than 7,500 feet. It was however still common on Jakko. It frequents any type of forest or cultivation.

The Crested Black Tit, *Parus melanolophus*, Vig.

Abundant about Kufri and Fagoo up to 8,500 feet, and invariably met with in flocks, which were accompanied in most cases by a few Goldcrests and individuals of the other species which earlier in the autumn are so common in these hunting parties. On Jakko the Black Tit was not so distinctly in the majority. In October a few birds were still in pairs.

The Yellow-browed Tit, *Parus modestus*, Burton.

A male of this curious Tit was obtained by me on November 24th at an elevation of roughly 7,500 feet, between Mahasoo and Simla.

It was in company with a hunting party composed chiefly of *Ægithalos* and I shot it under the impression that I was procuring some species of *Phylloscopus*. The measurements are as follows:—Bill from skull 18mm.; wing 57.5mm.; tail 35.5mm.; tarsus 16 mm.

The Red-headed Tit, *Ægithalos erythrocephalus erythrocephalus*, Vig.

Occasional flocks were met with in all places, but they did not venture much above 8,000 feet.

The Himalayan Goldcrest, *Regulus regulus himalayensis*, Jerdon.

First observed by Ticehurst near Kufri on October 19th. Several had arrived on Jakko by the second week of November and at Fagoo I found it common; it was only met with in company with hunting parties of *Parus*, *Ægithalos* and *Phylloscopus*.

Of seven specimens obtained in the two trips only two have fire-red feathers in the coronal streaks; all the others have the streak plain lemon yellow, but unfortunately, as I found great difficulty in sexing these minute birds by dissection, I am unable to draw any deductions of value as to whether the presence or absence

of the red feathers is governed by the same conditions as in the typical race; it would be interesting to examine a better series. There is some variation in the shape of the tail feathers between the sharply cut acuminate feather of the adult male and a coarser more broad and rounded type; this is doubtless a mark of age. The seven specimens yield the following range of measurements, which I have not given in detail owing to the failure to sex the series satisfactorily:—Bill from skull 10-11 mm.; wing 50-55 mm.; tail 33·5-37 mm.; tarsus 15·5-18 mm.

The White-throated Laughing-Thrush, *Garrulax albogularis*, Gould.

A single flock was met with close to Wildflower Hall (8,000 ft.) on November 24th. They had just moved up out of the catchment area.

The Variegated Laughing-Thrush, *Trochalopteron variegatum variegatum*, Vig.

This species has obviously a well marked altitudinal migration as it had almost vanished from the ridge at Fagoo, where I had found it so common last year and where Ticehurst met a few flocks; and in the first days of my stay at Simla it had arrived on Jakko where it is entirely wanting during the summer. A decrease on the ridge at Kufri was also observable.

The Streaked Laughing-Thrush, *Trochalopteron lineatum griscentior*, Hartert.

No particular change was observable in the status of this species, unless the upper limit of its range at Fagoo had descended by a few hundred feet. It is active early and late but a great skulker in the middle of the day.

The Black-headed Sibia, *Lioptila capistrata pallida*, Hartert.

Only observed about 7,500 ft. on the eastern side of Jakko; here it was common in small parties which fly from top to top of the trees after the manner of Jays, also descending at times into the low undergrowth below the trees.

The Stripe-throated Siva, *Siva strigula strigula*, Hodgs.

On November 4th and 5th a small flock was frequenting a nullah on the eastern side of Jakko about 7,500 feet, feeding in company with a mixed hunting party. The call is very distinctive being a varied combination of the syllables 'Pip' and 'Peep.' It may be worth noting that I saw a couple snuggle up to rest side by side on a twig, after the manner of Bulbuls or Munias.

The Indian White-eye, *Zosterops palpebrosa*, Temm.

A few were met with in some cultivation at 6,500 feet, below Kasumpti on November 6th, but the species was not otherwise observed by me. Ticehurst however found one with a party of *Phylloscopi* on October 20th.

The Black Bulbul, *Hyppipetes psaroides*, Vigors.

Parties of this Bulbul were observed in Simla on November 4th, and at Kufri on November 9th. On November 19th a large flock was found in the same nullah at Fagoo whence I recorded it in my previous note.

The White-tailed Nuthatch, *Sitta himalayensis*, Jard. and Selby.

A pair were observed about 7,500 feet in a nullah on the eastern side of Jakko on November 11th.

The White-cheeked Nuthatch, *Sitta leucopsis leucopsis*, Gould.

Only observed on November 21st when two or three were met with in company with a very large flock of *Parus melanolophus*; this was at 8,500 feet near Fagoo: attention was drawn to their presence by the very curious call "Quair Quair" in a tin trumpet sort of tone, and by their habit of perching on the topmost shoots of the large deodars in which the flock was met. I obtained a single specimen with difficulty, and its companion deserted the hunting party and remained in the locality anxiously calling for the missing bird.

The Ashy-bellied Drongo, *Dicrurus leucophaeus longicaudatus*, Hay.

A single specimen was hawking about in a nullah on the eastern side of Jakko at 7,500 feet on November 6.

The Wall Creeper, *Tichodroma muraria* (L).

One was seen on the railway line near Solon on October 21st and another on Tara Devi on November 2nd.

The Himalayan Tree-Creeper, *Certhia himalayana himalayana*, Vig.

Occasional individuals were met with, usually in the company of hunting parties, throughout my stay at all heights and places visited.

The Cashmere Wren, *Troglodytes troglodytes neglectus*, Brooks.

First observed by me by Sanjouli tunnel on November 13th, and after that date I saw a total of some 20 birds in all about Fagoo and Kufri between 7,500 feet and 8,500 feet. In every case they were solitary, and attention was always drawn to their presence in some bush or tangle of undergrowth by the familiar scolding call.

In the two years a total of 9 specimens were obtained, but as in the case of the Goldencrest I was very unsuccessful in sexing these birds satisfactorily. Measurements of the series are as follows:—

No.	Sex.	Bill from Skull.	Wing.	Tail.	Tarsus.
		mm.	mm.	mm.	mm.
2907	♂	14	50	28	19
2932, 2898..	♀ ♀	12.5: 13	45.5: 48	28: 28.5	17:—(—)
2906, 2945,	♀ ♀ ♀ (?)	12.5:	46.5: 45.5:	26.5: 27.5:	(—): 17.5:
2953.		13.5: 13.	47.5.	28.5.	16.5.
2356, 2357.	Sex? Ossi- fication of skulls incomplete.	13.5: 12.5	47.46	28.5: 25	18: 16.5
2917	Sex?	13.5	46.5	28.5	19.5

All the above birds are exactly alike in plumage and appearance with the exception of the fact that in Nos. 2898 and 2945 the lower mandible was paler than the upper, whereas in the remainder the entire bill was dark brown, Iris dark brown; legs dark brown; mouth yellow. No moult in any specimen.

Hodgson's Grey-headed Flycatcher-Warbler, *Cryptolopha xanthoschistos xanthoschistos*, Gray.

In marked contrast to the abundance of this species in Simla during the summer months I saw only a single individual at 6,500 ft. below Kasumpti on 6th November. Ticehurst however observed it in October.

The Pale Bush-Warbler, *Horeites pallidus*, Brooks.

Ticehurst observed two individuals in thick scrub near Fagoo but the species had vanished before my arrival.

The Siberian Chiff Chaff, *Phylloscopus collybita tristis*, Blyth.

In October the Siberian Chiff Chaff was observed commonly on the hill-sides about Fagoo, often singly in bushes, or in company with other *Phylloscopi*. These birds however must have been on passage as I only definitely identified a single specimen, in the ilex trees before the Dak Bungalow at Fagoo on November 22.

Hume's Willow-Warbler, *Phylloscopus humei humei*, Brooks.

Ticehurst found the autumn passage of this Warbler in full swing as it was at the time of his visit the commonest of the *Phylloscopi*, hunting in company with Tits and *P. proregulus*. These birds had practically all vanished before my arrival though I noticed one or two individuals still on Jakko up till November 7th.

Brook's Willow-Warbler, *Phylloscopus subviridis*, Brooks.

Two specimens were obtained from a hunting party at 7,500 ft. on the eastern side of Jakko on November 7th.

Pallas' Willow-Warbler, *Phylloscopus proregulus newtoni*, Gatke.

On my arrival in Simla this Willow-Warbler was fairly common in the hunting parties about 7,500 ft. on Jakko, but I did not with certainty identify it at either Kufri or Fagoo; here however Ticehurst had found it fairly common in October.

The Short-billed Minivet, *Pericrocotus brevirostris*, Vig.

Ticehurst only observed a solitary individual at Fagoo, while I saw a party of 3 females or young males fly past the Dak bungalow at Fagoo on 18th November.

The Common Mynah, *Acridotheres tristis*, (L).

No change was observed in the status of this bird.

The White-browed Blue Flycatcher, *Muscicapa superciliaris*, Jerd.

Observed by Ticehurst in Simla, but it had moved down to lower levels before my arrival.

The Slaty-blue Flycatcher, *Muscicapa leucomelanurus*, Hodgs.

One was obtained by Ticehurst at Fagoo from some bushes in a nullah. It was tame and confiding and took much of its food from the ground.

The Orange-gorgetted Flycatcher, *Muscicapa strophliata*.

I obtained a male of this species from a hunting party of Tits and other small birds in thick jungle at 8,000 ft. near Kufri on November 23rd. It was hawking about the inner boughs of the trees exactly after the manner of *Muscicapa parva parva*.

The Yellow-bellied Flycatcher, *Chelidorhynch hypoxantha*, Blyth.

A specimen was obtained from a mixed hunting party at 7,500 ft. on the eastern side of Jakko on November 7th.

The Indian Bush-Chat, *Pratincola torquata indica*, Blyth.

A pair of these Chats was observed in cultivation at Fagoo by Ticehurst.

The Dark-grey Bush-Chat, *Oreicola ferrea ferrea*, Gray.

This common summer resident in Simla had vanished before my arrival. A few however were met by Ticehurst who considered it rather a skulker, inclined to dive into cover from its perch on some bush top when noticed.

The Little Fork-tail, *Microichla scouleri*, Vig.

Ticehurst observed a single bird from the Railway near Solon on 21st October.

The Blue-fronted Redstart, *Phoenicurus frontalis*, Vig.

Ticehurst observed 3 or 4 as early as October 19th about the shallows in forest nullahs. I observed it in small numbers from 7,500 to 8,000 ft., at Simla, Kufri and Fagoo, but the species was probably on the move lower, as it was clearly decreasing in numbers towards the end of my stay. The call note is indistinguishable from that of *Phoenicurus rufiventris*.

The Blue-headed Redstart, *Phoenicurus cœruleocephala*, Vig.

Ticehurst was a little early for this species and only observed two males. I found it in slightly larger numbers than the last species about the same localities, but in addition as low as 6,500 ft., below Kasumpti, on November 6th. This Redstart frequents the upper branches of trees more freely than the other species but is not averse to the thickets of damp shallows which grow in the more shaded portions of the hills and are beloved of *P. frontalis*.

The Golden Bush-Robin, *Tarsiger chrysæus*, Hodg.

Ticehurst met with single example of this handsome species above 8,500 ft. near Kufri on October 21. It was in damp willow thicket and was tame and confiding.

The Red-flanked Bush-Robin, *Tarsiger rufilatus*, Hodge.

Ticehurst met with one or two individuals amongst pine trees on October 19th.

On my trip the species was met with as follows:—

One at 8,500 ft. at Kufri on November 9th: and three near Fagoo about 8,000 ft. on the following dates, November 13th, 14th and 18th, all were in undergrowth under trees, and the last three were all viewed from the Fagoo-Kufri road in the undergrowth above it. The movements and habits appear to be those of the Redstarts except that the tail is not shivered.

The birds of 9th and 13th November were respectively a male and female just completing their body moult into 1st Winter plumage. The bird of 18th November is similar, but unfortunately not sexed. All three birds agree with the description

of the adult female, so the description of the young given in the Fauna, Vol. II. 107, evidently refers to the juvenile plumage.

The Himalayan Ruby-throat, *Calliope pectoralis*, Gould.

Ticehurst met with this Ruby-throat about 8,000 ft. at Fagoo on October 16th and 18th, obtaining the latter specimen. Both birds were great skulkers and were found in the bushes at the bottom of small nullahs running through cultivation.

It appears probable that a bird which I wounded and lost not far from the same place in October last year was of this species, but I did not include it in my first list as there was then no clue to its identity.

The Red-spotted Blue-throat, *Luscinia succica*, L.

One was obtained by Ticehurst on October 16th in short scrub on a cultivated hill-side at Fagoo.

The Himalayan Whistling-Thrush, *Myiophonus temminckii temminckii*, Vig.

A few individuals were observed but the species had I think started to descend to lower levels before my arrival.

The Black-throated Ouzel, *Turdus ruficollis atrogularis*, Temm.

This Ouzel had begun to arrive early in the month about Fagoo and Kufri but only occasional individuals were seen before November 21st when there were a number about the hill behind the dak bungalow at Fagoo, clearly fresh arrivals. A flock was seen in the catchment area near Sanjouli on November 24th.

The Himalayan Missel-Thrush, *Turdus viscivorus bonapartei*, Cab.

During the whole of my stay at Fagoo a loose scattered flock of about 20 Missel-Thrushes was frequenting the southern slopes, and the extreme summit of the hill mentioned above. They appeared to be feeding largely on the small red berries of a curious creeping bush which dotted the bare side of the hill. On November 17th a single individual was found about 7,500 feet in the valley to the west of the ridge on which the State rest-house stands.

This race of Missel-Thrush differs from the European bird *T. v. viscivorus* in its larger size (wing 160-173 mm. as against 145-158 mm.) and in its somewhat paler colouration.

The three specimens obtained measure as follows:—

No.		Bill from Skul.	Wing.	Tail.	Tarsus.
		mm.	mm.	mm.	mm.
2916.	17-11-19 ♂ ad.	27	164.5	116	38
2923.	18-11-19 ♀ ad.	27	159	112.5	36
2937.	21-11-19 ♀ 1st win-ter	26.5	159	109	36

The young bird is distinctly paler, almost whitish, on the chin and throat, than the old pair. No bird shows any trace of moult.

Soft parts:—iris dark brown; orbicular plumbeous; bill dark brown, basal portion of lower mandible horny (No. 2923) or yellowish (No. 2916); legs olive brown; claws black (No. 2923) or olive yellow, joints marked with brown, claws blackish (No. 2916).

The Eastern Alpine Accentor, *Prunella collaris rufilatus*, Sw.

A single bird was shot by the side of the upper road (8,000 ft.) close to Wild-flower Hall on November 24th, but I did not otherwise meet with the Alpine Accentor unless a flock of birds seen flying over head in the same locality was rightly identified as of this species. This specimen proved to be a male, and appears to be referable to the above race, which has been shown by Whitehead (*Ibis*, 1909, 224) to occur on the Samana in winter and to breed on the Sufed Koh above 12,000 feet. The examination of a series of birds is however desirable to confirm the identification.

Jerdon's Accentor, *Prunella strophiaetus jerdoni*, Brooks.

Ticehurst met with a party of four of these Accentors at Fagoo as early as October 19th. It was common about the Fagoo-Kufri ridge when I first arrived there and had arrived on Jakko before the middle of November.

The Black-throated Accentor, *Prunella atrigularis*, Brandt.

A few individuals, occasionally one or two together, were met amongst the undergrowth between 7,500 and 8,500 feet on the Fagoo-Kufri ridge on various dates after November 13th. Minute seeds were in the crops of the two specimens obtained.

The Altai Accentor, *Prunella himalayanus*, Blyth.

Single individuals were obtained on November 9th and November 14th about 8,500 feet near Kufri, and a third example was shot from a small flock at the same elevation at Fagoo on November 21st. While the single birds were both extremely confiding and allowed a close approach as they sat motionless on the stones on bank faces, I found that this species when in flocks was extremely hard to procure. These flocks were common, occurring on the hill sides about 7,500-8,500 feet, and appearing indifferent both to the presence or absence of wind and sun (in this they strongly contrasted with most birds about these hills). I found great difficulty in discriminating these flocks from those of the Mountain-Finch; both species are shy and restless, difficult to see when feeding amongst the waste bush clad slopes, rising in loose order, and once roused difficult to mark down again; as the flocks when disturbed fly backward and forward round the contours of the hill sides, rising and lowering many hundred feet. The call note is silvery and very finch-like, and with the reddish-brown iris and the streaked back this Accentor seems to afford a curious case of parallelism with the Mountain-Finch, which in Entomology would certainly be called "Mimicry."

The Black and Yellow Grosbeak, *Pycnorhampus icteroides*, (Vig.)

Only observed at Kufri on November 9th and again on November 23rd and 24th about 8,000 feet:—

The Red-mantled Rosefinch, *Carpodacus rhodochlamys grandis*, Blyth.

This race of Rose-Finch was first described by Blyth (*Journal*, A. S. B. xviii, 810) in 1849 with the type locality of "Range beyond Simla, near snowline," but for some time it was confounded by later writers with the true *Carpodacus rhodochlamys* of Brandt 1843 (type locality Altai). The latter is somewhat

smaller in size (wing of male 87-91), with the rosy superciliary plumes meeting over the forehead, with a heavier beak, and a brighter tint of rose colour on the upper parts.

The restricted range of *C. rh. grandis* is given by Hartert. (Vog. P. F. P. 101.) as from Pushut in N. E. Afghanistan and the Karakorum Mountains, Kashmere, and the Himalayas to Kumaon. There appears however to be but little on record regarding this race and of records of interest to Punjab ornithologists I only find the following:—Jerdon (B. I. i.i. 401) says that it has been obtained in the Tyne range of Mountains between Simla and Mussoorie, and in the Pubher valley, near the snow, on the Simla side by Hutton.

Later Hume writes (Lahore to Yarkand. 259.) "This species is only a winter visitant to the British Himalayas. At that season it is not very uncommon, and one or two specimens are to be found in every collection made during the cold weather near Darjeeling, Almora, Massoorie, Simla and Murree."

The British Museum Catalogue shows the following specimens from the Hume collection:—

2 specimens from Kotegarh near Simla.
♀ Pumlahie 17 November 1869.
♂ Baja in Kunaitee 1st January 1871.
♂ ♀ Simla November 1880.
One Simla 1st December 1880.
♂ near Chamba.

The late Captain C. H. T. Whitehead obtained a female on December 15th, below Sardi in the Salt Range (Jhelum district) as he duly recorded in the Journal.

Mr. A. E. Jones has kindly sent me an adult male which he obtained with two others at Chhoi near Campelpore on 27th December 1918, remarking that although the species was fairly common adult males were scarce.

I had hardly expected to meet this bird on this trip and was somewhat surprised on November 9th to find a few associating with Meadow Buntings about 8,500 feet on the ridge above Kufri. After that I discovered that there were a small number about the entire ridge above 8,000 feet between Kufri and Fagoo, but none were actually identified after November 20th. They were met with singly or in small parties in any type of ground or cover, and the call note was a curious "Sqwee."

A small series of 2 adult males, 3 immature males and 2 females were collected. Their measurements are as follows:—

No.	Description.	Bill from skull.	Wing.	Tail.	Tarsus.
		mm.	mm.	mm.	mm.
2893.	Adult male (rose plumage)	.. 19	94	73	20.5
2940. a.	" " "	.. 17.5	93.5	74	22.5
2894.	Male (1st winter plumage)	.. 18	91.5	69.5	22.5
2875.	" " "	.. 17.5	87	67	23
2874.	" " "	.. 18.5	94	71	22
2899.	Female (probably 1st winter)..	18.5	90	70	22
2900.	" " "	.. 20	88	67.5	22

"No specimen shows any sign of moult, but I should judge from the appearance of the feathers that whereas the two adult males had moulted rectrices and remiges at the recent autumn moult, the other birds had not done so.

The young males and the females are absolutely alike in plumage and agree completely with the description of the adult female, of which however I have been unable to examine specimens.

Iris brown; legs dull brown, claws blackish: Bill dull brown above, horny livid below (adult males); livid horny (young males and females).

The Pink-browed Rose-Finch, *Carpodacus rhodochroa*, Vig.

A very few of these Rose-Finches were met about 7,500-8,000 feet on Jakko and at Kufri, and the two specimens which I actually obtained I fired at under the impression from their behaviour that I was obtaining Jerdon's Accentor. The call note is very sweet and canarylike.

The Himalayan Greenfinch, *Acanthis spinoides*, Vig.

On Ticehurst's arrival at Fagoo there were small parties of this Finch still about in the cultivation. Adults were in worn breeding dress and a bird in juvenile plumage just out of the nest was obtained by him on October 19th.

The species was not however observed by me apart from the fact that I heard its call note just below Kasumpti Bazar on November 6th.

The House-Sparrow, *Passer domesticus indicus*, Jard & Selby.

Common both in Simla and at about Fagoo rest-house. A pair observed appear somewhat darker on the underparts than birds from the plains.

The Cinnamon Sparrow. *Passer rutilans debilis*, Hartert.

Common about Fagoo, both in October and November and a flock met with in cultivation at 6,500 feet, below Kasumpti on November 6th. When in flocks about cultivation this sparrow is wild and difficult to approach, but the birds about the neighbourhood of houses are tame and familiar enough, either taking the place of the last species or being found together with it.

Stoliczka's Mountain-Finch, *Montifringilla nemoricola altaica*, Eversm.

First observed on November 13th at Kufri where a flock were frequenting the rough undergrowth of willow which borders the terraced cultivation there at 8,500 feet. One or two other flocks were seen towards Fagoo on later dates, but I never was able to get to terms with this finch and only secured a single specimen by firing at a flock which passed high over my head when I was beating a wood for pheasants. The habits of these flocks have been noted under the heading of *Prunella himalayana*.

The Pine-bunting, *Emberiza leucocephala*, S. G. Gmel.

A few were observed about 8,500 feet at Kufri on November 9th and a single bird was found several hundred feet higher than this on the same ridge on November 14th. The call is a sharp "Pit," "Pit."

The White-capped Bunting, *Emberiza stewarti*, Blyth.

While it was difficult to be sure of identifying this bunting amongst the great numbers of the next species, I certainly saw it about 8,500 feet on the Kufri-Fagoo ridge on November 9th and 14th.

The Eastern Meadow-Bunting, *Emberiza cia stracheyi*, Moore.

As before this was the most abundant species on the hill-sides. It is distinctly pugnacious.

The Crag-Martin, *Riparia rupestris*, Scop.

Only a few odd birds were observed about Fagoo in October although at that time the Crag Martin was common along the road near Sanjouli. In November I saw none near Simla itself but found a good many about Fagoo; here it was rather erratic in its appearance; some days none would be seen or only an occasional individual; on others distinct flights would be hawking about a particular locality. It is possible that the explanation of this is that the species was passing through on migration. A suggestion that is rendered all the more probable by the fact that 3 specimens shot on November 22nd were all very fat.

The Martin, *Chelidon urbica*, subsp. ?

One or two House Martins were observed hawking about the Kufri ridge on November 13th, but as no specimens were procured the exact race must remain in doubt.

The Striated Swallow, *Hirundo rufula*, subsp. ?

On 2nd November from the train I observed a large flock of Swallows, apparently of this type, and clearly on migration, on the telegraph wires near Solon Brewery.

The Upland Pipit, *Oreocorys sylvanus*, Hodgs.

On November 6th I heard what I feel sure was the song of this Pipit at 6,500 feet, below Kasumpti, on the slopes where I have met the bird in previous summers.

The Tree-Pipit, *Anthus trivialis trivialis*, L.

Ticehurst met with a few odd Tree-Pipits on different days in cultivation at Fagoo in October.

The Indian Tree-Pipit, *Anthus trivialis maculatus*, Hodgs.

Ticehurst obtained one from damp sallow undergrowth at Kufri on October 21st.

The Brown Rock-Pipit, *Anthus leucophrys jerdoni*, Finsch.

A single bird was seen by Ticehurst on October 15th at Fagoo.

The Water-Pipit, *Anthus spinoletta blakistoni*, Swinh.

From November 15th onward a large flock of Water Pipits was frequenting the ground described under the paragraph regarding the West Himalayan Skylark. They were very restless and rather shy, spending much of their time on the dry terraced hill side above the pond. The only specimens procured were immature but there need be no hesitation in attributing them to this race, which is very common throughout the Punjab plains in winter, and with specimens of which they closely agree.

The White Wagtail, *Motacilla alba*, subsp. ?

A party of 3 Wagtails of this type were seen passing over at Fagoo on October 15th.

The Grey Wagtail, *Motacilla cinerea*, Tunst.

One was seen by me from the train on November 2nd in a stream bed about 4,000 ft.

The West-Himalayan Skylark, *Alauda gulgula guttata*, Brooks.

Here and there on the bare hill tops near Fagoo may be found small semi-artificial ponds which are used for the watering of local herds of cattle. The neighbourhood of these ponds is usually productive to the ornithologist as, for the most part, other water is scarce. One pond that I paid particular attention to was situated at 8,500 feet. The edges were made up with hard earth, dry and baked in the sun; the water was dark and muddy-looking with no vegetation in it. Round about stretched an expanse of coarse short rough grass and low moor-land plants, scarred here and there by crevices cut into the hard ground by the draining away of rain water, and amply studded with stones. On one side rose the still bleaker summit of the hill to another 200 feet or so, terraced all up its sides with that curious formation of natural steps so familiar to those who live near the Kentish and Sussex downs. The locality thus described was quite small in extent.

Here on November 15th I found a number of these Skylarks and met with them again on subsequent dates about the same place, which they were never willing to leave if it could possibly be avoided: a few others were occasionally met on the bare summits of neighbouring ridges.

Having previous acquaintance with the difficulty of identifying races of Larks I was careful to procure a series of six specimens. These on comparison with a series of *A. g. gulgula* from the Punjab plains (Ludhiana. Jhang) prove to be much larger birds, and darker in colour with less rufous on the upper surface. These are exactly the differences pointed out by Hartert (Vog. P. F., Vol. I., p. 247) between *Alauda g. gulgula* and *A. g. guttata*, for which latter race he gives only the locality of Cashmere. The measurements of the two races he gives respectively as:—*A. g. gulgula*, wing 83-97 mm., *A. g. guttata*, wing 95-102 mm., exceptionally up to 107 mm.

The measurements of my specimens are appended below, and I have no hesitation in referring them to *A. g. guttata*:

No.			Bill from skull.	Wing.	Tail.	Tarsus.
			mm.	mm.	mm.	mm.
2919.	17-11-19	♂	14.5	97	59.5	22.5
2908.	15-11-19	♂	14	98	58.5	22.5
2920.	17-11-19	♂	14	100.5	61	23
2938.	21-11-19	♀	13.5	94.5	60	23.5
2910.	15-11-19	♀	13.5	95.5	58	23.5
2909.	15-11-19	♀	14	95	59	23

No bird shows any trace of moult. The soft parts in all were similar, viz.: iris olive brown; bill horny; culmen and tip blackish; mouth yellowish; legs pale reddish brown; joints and claws dusky; soles yellowish.

The Eastern Skylark, *Alauda arvensis cinerascens*, Ehmeke.

In the locality described under the last species I found a flock of Skylarks on November 15th and with some difficulty procured

two specimens; these were very fat, in distinct contrast to all the specimens of the last species, and it is in consequence probable that these birds were migrating. On the next day a solitary individual was seen on a bare ridge some 900 feet lower but not procured. The measurements of these two birds are given below and while I hesitate to be dogmatic on two specimens, I am of opinion that these birds belong to the same race as a small series of Skylarks obtained near the Chenab in Jhang District during the winter months. These from their very white underparts I identify provisionally with that race of Skylark described in the Hand-book of British Birds under the above name.

No.		Bill from skull.	Wing.	Tail.	Tarsus.
2911.	♂	15.5 mm.	114 mm.	73.5 mm.	24 mm.
2912.	♂	15.5 mm.	116	76	25

My identification is however necessarily provisional because of the situation outlined below.

There is considerable difficulty over the question of the identification of Asiatic races of *Alauda arvensis*, due to the absence of a sufficient series of breeding birds to enable the number of real races to be accurately discriminated.

Yet until such breeding races have been satisfactorily worked out it is most unsatisfactory to endeavour to identify winter or passage birds. This difficulty has not yet been circumvented, and the situation is made much more difficult by the confusion in the past between *A. arvensis* and *A. gulgula*.

The latest examination of the Eastern Skylarks which I have seen is that by Hartert (Vog. Pal. F. Vol. I, p. 247). Hartert states that *Alauda arvensis cinerea*. Ehmeke, now corrected to *A. a. cinerascens* Ehmeke (*vide* Hand-book of B. B. p. 166), is the breeding bird of West Siberia, Turkestan and Persia, wintering further South. He goes on to state that the birds which winter in India and China may belong to that form, or to the Eastern Asiatic form of *Alauda arvensis intermedia*., Swinhoe, or to the supposed Himalayan breeding form which he states it is impossible to be certain of until a series of breeding specimens is available for examination.

This unsatisfactory position led me to take up the question of where these Himalayan birds breed, with the view of then considering how it might be possible to obtain a series. But an examination of the literature of the subject has proved most unsatisfactory. In short I begin to wonder whether there is a breeding form in the Himalayas at all. The evidence on the point appears to be as follows:—

The Fauna of B. I. (Vol. II. 325), in which of course the Skylark is treated as one species, identical in Europe and Asia, gives the following account:—

“*Distribution*.—The whole extent of the Himalayas from Hazara and Kashmir to Assam, where the Skylark appears to be a constant resident, moving about to different levels according to season. In the winter many birds appear to visit the plains of the Punjab and N.-W. Provinces and a lark killed by Dr. Anderson near Bhamo in Upper Burma appears referable to this species.”

Under the next paragraph *Habits* it continues “Breeds in the Himalayas in May and June” giving a brief description of nesting habits.

The first point to be noted is that the synonymy on the same page includes *Alauda triborhyncha*, Hodg. and *Alauda guttata*, Brooks. This latter name is incorrectly attributed to this species. Since *Alauda guttata*, Brooks, is really the Kashmere race of the other species of Skylark *gulgula*, and should be called *Alauda gulgula guttata*, Brooks (Vog. P., F. p. 249), it of course breeds in Kashmere. *Alauda triborhyncha*, Hodgson, which apparently breeds commonly in Ladakh and is figured in "Lahore to Yarkand" (p. 268, plate xxviii) is expressly stated by Hume later (S. F. I., 48) to be identical with *A. guttata*, Brooks. It is therefore clear that part of the evidence on which the breeding of the Skylark in the Himalayas (Kashmere and Ladakh) is based in the Fauna refers not to a skylark of the *arvensis* species, but to a race of the *gulgula* species.

In Hume's Nests and Eggs, (2nd ed., Vol. ii., p. 220) it is expressly stated that a large Skylark, which is certainly not *A. triborhyncha*, "breeds, I believe, pretty well all through the Himalayas, at elevations of from 8,000 to 10,000 feet, although I only know of its nests having been found in Kooloo and Cashmere." The further account there given is not very clear, but mentions Soonamerg as a Cashmere locality where Captain Cock obtained the eggs, and it attributes them to the doubtful race *leiopus*. Yet at one time Hume certainly considered *leiopus* as a synonym of *A. triborhyncha* (S. F. ix. 354). I notice also that while the British Museum Catalogue includes a specimen named *leiopus* from the Hume Collection obtained in "The Sutlej Valley" 'in June' the collection appears to include no Kooloo or Kashmere skins of this species.

Fulton has stated (Journal. B. N. H. S. xvi, p. 56) that the Skylark is a resident between 5,000 and 11,000 feet in Chitral, while Perreau (Jour., B. N. H. S. xix., 901) says "Some present in the winter low down, very common in March; some present in April after which they disappeared, probably going higher." Neither writer mentions any lark of the *Alauda gulgula* type, nor does it appear that specimens were submitted to critical examination, so I am not prepared to accept the statement that any race of *arvensis* breeds in Chitral until skins can be produced.

Ward is quoted as stating (Jour., B. N. H. S. xvii. 724) that *A. arvensis* is a resident in Cashmere, but I have been unable to consult the original reference. As he does not appear to include *Alauda guttata* or *A. gulgula* it is possible that the identification of the birds as *arvensis* may be a mistake. The evidence regarding the breeding of any race of *arvensis* in Cashmere is clearly not conclusive.

On the extreme Western edge of our area there is no evidence at all that any race of *A. arvensis* breeds. Whitehead and Magrath (*Ibis*. 1909, 246) found it to be an abundant winter visitor from November till March, about Kohat and Kurram, and expressly state that it is replaced by *A. gulgula* as a summer breeding species.

From Quetta *arvensis* has been reported as a breeding species, but I understand from private correspondence that really it is only a winter visitor while the breeding birds when verified have proved to be *A. gulgula* and not *arvensis* as recorded.

In Nepal, Scully states (S. F. viii., 338) that a race of *arvensis* which he calls *dulcivox*, is tolerably common in the winter, being

quite social in its habits and frequenting the fields in February and March, leaving about the end of the latter month.

In Gilgit (S. F. Vol. ix) Biddulph found some race of *A. arvensis*, here also named *dulcivox*, to be a winter visitant only, first appearing in November and leaving by the end of March; he also clearly states that although there is a breeding Skylark in Gilgit it belongs to the form *Alauda guttata*, Brooks; it arrives at the end of March and leaves about October. As he appears to have secured a fair series of both birds, and critically notes on their peculiarities these records are of considerably more value than most of those referring to the Himalayan Skylarks.

The respective status of these two Skylarks in Gilgit is again emphasised by Scully in the "Ibis" (as reprinted in S. F. x., 135).

So far the published records which I have been able to consult on the question.

I have made a few enquiries by letter from which it appears that no race of *A. arvensis* is known near Simla or Dharmasala, in the Garhwals or Kumaon, or near Darjheeling.

I have gone into this question at some length, in the hope that members of our society who are suitably situated in the Himalayas will endeavour to obtain a small series of whatever Skylark is breeding in their vicinity, care being taken not to confuse the problem by the inclusion in the breeding series of migrants or non-breeding birds. At present I confess to being sceptical whether any race of *arvensis* does breed in the Himalayas at all, but possibly there is evidence which I have overlooked and which I should be most grateful to have brought to my notice. There are of course many winter records of Skylarks in the plains, but it is not worth collating these until the question of the supposed breeding Himalayan race is settled one way or the other.

The Long-billed Horned-Lark, *Eremophila alpestris longirostris*, Moore.

The greatest prize from my hill pond was however reserved for November 18th. I had just secured a Missel-Thrush and was sitting on the high bank above the pond packing it up and giving directions to my orderly when a bird ran out from under the lee of the bank and along the dry hard margin of the pond quite close to us. It ran like a small plover or sandpiper but I had no difficulty in recognising it as some member of the genus of the Horned Larks, which I had never seen in life before. Luckily my .22 bore with dust shot was ready beside me and I at once shot at the bird which rose and flew across the pond falling dead on the other side. It proved to be a male in freshly moulted plumage. The measurements are as follows:—bill from skull 19, wing 122.5, tail 76, tarsus 26.5 mm.

The West-Himalayan Scaly-bellied Green Wood-pecker, *Picus squamatus squamatus*, Vig.

Two odd ones were met by Ticehurst in Pine forest.

The Brown-fronted Pied Wood-pecker, *Dryobates auriceps*, Vig.
Fairly common in and about Simla at 7,500 feet.

The Himalayan Pied Wood-pecker, *Dryobates himalayensis*, Jard. & Selby.

An occasional odd bird was observed on the Kufri-Fagoo ridge.

The King Vulture, *Otogyps calvus*, Scop.

A single King Vulture was seen over Jakko on November 12th and again on November 24th.

The Himalayan Griffon Vulture, *Gyps fulvus himalayensis*, Hume.

Common about Simla and Fagoo, both in October and November.

The Egyptian Vulture, *Neophron percnopterus percnopterus*, L.

Common at Simla in October but only a few observed there in November. Not seen near Fagoo.

Dodsworth (Ibis, 1913, p. 544) and A. E. Jones (Journal, B. N. H. S. xxvi, 616) both recorded the Egyptian Vulture of Simla as belonging to the Eastern form *Neophron percnopterus ginginianus*: this appeared to me to be most unlikely so I requested Mr. Jones to examine a few specimens and let me know the result. He accordingly shot a couple and sent me the particulars recorded below. While it is unsafe to dogmatise without further material, it is clear that the description of these two specimens supports my belief that the race of *Neophron* found at Simla is the typical one.

No. 1. Male: shot 7-9-1919 at 7,000 feet, testes small, tail and wing feathers very worn.

Bill, pale flesh, streak of pale horn colour on either side of upper mandible.

Cere, orange shading to lemon on throat and nape.

Legs & feet, flesh colour; *Claws*, horn.

No. 2. Female: shot 7-9-1919 at 7,000 feet. Organs appeared to be those of a bird too old to breed, tail and wing feathers very worn.

Bill, flesh colour throughout.

Cere, rich orange, shading to lemon on throat and nape.

Legs & feet, flesh colour; *Claws*, horn.

The measurements of these two birds were as follows:—

	No. 1.	No. 2.
Bill from gape	$2\frac{3}{4}$ ins.=70 mm.	$2\frac{3}{4}$ ins.=70 mm.
Cere to tip of bill	1 in. =25·4 mm.	$1\frac{1}{16}$ ins.=26·5 mm.
Depth of bill at end of cere	·55 ins.=14 mm.	·55 ins.= 14 mm.
Mid toe (without claw) from tarsus.	$2\frac{3}{8}$ ins.=60·4 mm.	$2\frac{3}{8}$ ins.= 60·4 mm.
Tarsus	3 ins.=76·2 mm.	$3\frac{1}{8}$ ins.= 79·3 mm.
Wing	$20\frac{1}{4}$ ins.=514·4 mm.	$19\frac{1}{2}$ ins.=495·3 mm.
Tail from oil gland	$10\frac{3}{8}$ ins.=263·5 mm.	$10\frac{1}{8}$ ins.=257·2 mm.

The Lämmergeyer, *Gypaëtus barbatus grandis*, Storr.

Observed as commonly as in the previous year.

Hodgson's Hawk-Eagle, *Spizaëtus nepalensis*, Hodgs.

Ticehurst met with this species on one or two occasions near Fagoo.

The Pariah Kite, *Milvus govinda*, Sykes.

Observed as before.

The Shahn Falcon, *Falco peregrinus peregrinator*, Sundev.

A Falcon seen on the summit of Jakko on November 7th was doubtless of this species.

Buzzard sp., *Buteo* sp.

An occasional Buzzard was seen on the ridge between Fagoo and Kufri about 8,500 ft. in November, but I failed to obtain a specimen or satisfy myself as to what species was represented.

The Common Kestrel, *Falco tinnunculus*, subsp. ?

A few odd birds were observed from 6,500 feet at Kasumpti to 8,500 ft. at Fagoo both in October and December, but I was unable to obtain any specimens.

The Indian Turtle-Dove, *Streptopelia turtur ferrogg*, Eversm.

Not common. With the exception of a small party which were usually to be found in a small patch of pines about 8,500 feet about Kufri, only one or two odd birds were seen along the Kufri-Fagoo ridge.

The Eastern Wood-Pigeon, *Palumbus palumbus casiotis*, Bp.

One was seen at 8,500 feet near Fagoo on November 15th.

The Chukor Partridge, *Alectoris graeca chukor*, Gray.

On one stretch of very stony and barren hill-side I found many coveys of Chukor, but elsewhere met with only a single pair which kept very closely to the same spot.

I only discovered the favoured locality on the last day of my visit through hearing and seeing some 15 to 20 Chukor acting in a very excited manner for no apparent cause. They were calling loudly, running, and making short flights round about a patch of ground which appeared favourable for a stalk. This I assayed, though only a single 410 bore was in my hands, and had managed to get well into the centre of the birds when I discovered that the excitement was due to a large red fox which leapt out of a hollow in the ground near me. He had doubtless also been engaged on a stalk and I had spoilt his chance; one covey was only a few yards from him and ignorant of his whereabouts.

The Black Partridge, *Francolinus francolinus asiae*.

On November 18th a pair of Black Partridges were flushed on a fairly open hill-side at Fagoo at an elevation of 8,500 feet.

The White-crested Kalij Pheasant, *Gennaeus albocristatus*, Vig.

The Koklas Pheasant, *Pucrasia pucrasia macrolopha*, Less.

I did not pay much attention to Pheasants from the point of view of sport but noticed that both the above species were present in small numbers on much of the ground which I visited.

The crop contents were examined of a hen of each species shot in the evening of the same day on very nearly the same ground. The Koklas had been feeding almost entirely on coarse green grass; with this was a very little maiden hair fern and moss, and a few grass seeds. The Kalij on the other hand had eaten a much more varied selection of seeds, roots, small bulbs and a little clover.

The Woodcock, *Scolopax rusticola*, L.

On the 19th November I shot a Woodcock on the Kufri road at about 8,000 feet. It was feeding in thick undergrowth just above the road and so close to it that a dog with me scented it from the road and ran up and flushed it. This bird was extremely fat and was preserved with difficulty. A second bird was apparently flushed the same evening but I did not actually see it, though a man with me declared that it had risen in front of him from a path. In support of his statement he showed me fresh borings which might have been made by a Woodcock.

This appears a suitable opportunity also to record the fact that the Woodcock has at last been proved to breed close to Simla.

On 15th May 1919 a valued correspondent met a hen Woodcock with 4 chicks only 2 or 3 days old, in the downy plumage; these were in fairly heavy jungle about 8,500 ft. My correspondent caught the 4 chicks and the old bird came quite close to him in her anxiety until 3 of the chicks were given back to her: the fourth was preserved for me and it is now in the collection of Capt. C. B. Ticehurst. On the same day in the same locality a nest was found containing a single chipped and dented egg which was quite fresh but apparently deserted. No bird was seen near it and it was finally taken on the 19th May and given to me: it measures 47.5×34.5 mm. and is in my opinion undoubtedly the egg of a Woodcock.

THE POWER OF SCENT IN WILD ANIMALS

BY

E. C. STUART BAKER, F.Z.S., F.L.S., M.B.O.U.

Recently there has been a good deal of discussion as to the powers of scent in wild animals, more especially amongst the *Felidae*. and rather contradictory opinions have been given on the subject.

My own opinion is that cats have a very indifferent sense of smell, and it may be of interest if I give some of the reasons which have led me to this belief.

Although many minor incidents occurring during the earlier days of my life in the Indian jungles had made me pretty sure that such was the case, it was not until I tried to work out the life history of a certain notorious man-eating tiger that I became quite confirmed in my own mind of the defectiveness of this sense in tigers.

These animals, as every one knows, obtain many of their victims by lying up in extra thick patches of cover beside tracks made, through forest and grass, by cattle, deer, pigs, etc. As long as the tiger is favoured by the wind, the unfortunate prospective dinner will often wander right up to within a few paces of the would-be diner without getting any hint of his presence and it is not until the tiger makes his actual rush, that he knows, too late, of his danger. But I believe it is equally the case that in many instances the tiger, himself, does not know what kind of animal he is charging upon until he is practically on the top of his victim.

It is this, indeed, which in some cases turns an ordinary tiger into a man-eater, and such was the case in the present instance. It appears that a party of villagers were returning from their work on their fields and were passing along a narrow deer track which led towards their home through a dense patch of jungle, such as generally grows up the second year on abandoned cultivation. Weary with their work there was no conversation and, beyond the soft pad, pad of their feet along the muddy track, nothing to indicate to a watcher what it was that was using the path regularly traversed by Barking-deer and Sambhur on their way to water. Suddenly there was a hoarse coughing grunt and the tiger rushed out, knocked over the leading member of the band and then incontinently bolted down the path as hard as he could go. One of the men describing the episode to me some time after said that men and tiger were racing down the path together, and that though two or three more of the party were knocked over as they ran none were touched by tooth or claw and the tiger seemed quite as frightened as themselves.

It was nearly dusk when the man was killed and the sudden eastern darkness fast setting down, so the villagers left the body where it lay and hurried back to their village as fast as they could. The unfortunate man was a Mikir, a tribe who, however brave they may be by daylight, will never leave the immediate vicinity of their own houses by night for they believe every patch of forest, every hill and every piece of water to be the abode of some wicked spirit who works his evil will in the hours of darkness. It was not, therefore, until the next morning that they returned to recover the body of their comrade and when they did so they found on arriving at the spot it had been partially eaten, the legs from the buttocks to the knees being finished. The evidence given by the tiger's tracks in the muddy pathway showed that he had not touched the body until hard driven by hunger. His footprints showed that he could not have returned to it until early morning after the dew had ceased to fall and, apparently, he had several times come up to within a few feet of the corpse from either side before

finally mustering up sufficient pluck to satisfy his hunger. Even after commencing to feed he had, seemingly, had one or two bad frights as he had rushed headlong from the body more than once prior to his being disturbed by the Mikers in the morning.

In this case there can be no doubt that the tiger had relied entirely on his sense of hearing so that until he actually struck the man down he had no idea that he was attacking anything more formidable than deer or some other of his usual game. When he found what he had done he was at first smitten with terror, but later, failing to kill anything else, he was tempted to go back and investigate and then by degrees hunger overcame his natural fear of man and he commenced the meal which eventually turned him into the boldest and most clever man-eater I have known.

On one occasion when walking through the forest with a shot gun and accompanied by some terriers I came on this same tiger standing some five yards away, listening with ears pricked up and eyes staring towards me, but evidently not using his sense of smell at all. The small dogs routed him for a time but that evening he returned and killed a coolie within a few feet of where I had been standing.

On yet another occasion I saw him as I was coming up a pathway leading from my office to my bungalow. The pathway was cut on the side of a sloping hill, covered with sun grass from three to four feet high, and suddenly down below me I caught sight of the tiger moving along a track made by the school boys taking a short cut to the school house fifty yards away down the hill. It was about three o'clock on a sunny afternoon and the school was in full swing, the boys after the manner of all small Indian school boys, hard at work reciting loudly the lessons they were learning, making a perfect babel of noise. The tiger was slinking along this track, his attention entirely fixed on the sound in front of him and evidently gloating over a hoped for easily won meal, not the first obtained in similar circumstances. I was not thirty yards from him and the wind was blowing steadily from me to him, but he seemed utterly unconscious of my presence until turning my foot in the gravelly soil I made a sound which attracted his attention. One glimpse of my white sola-topee, evidently a most dangerous enemy in his opinion, was enough for him and he quickly and quietly slunk away into some jungle and when, a few seconds later, my chappassie came running up with my rifle he was no longer to be found.

Once, however, I was even nearer than this to a tiger without his being able to smell me. At the time I was out after Sambhur and was sneaking along a deep nullah running through some open bamboo forest, here and there dotted with small but very dense Ber bushes. It was just as dawn was breaking and in the deep hollow the light was still very dim as I dodged from one clump of bushes to another. As I got to one of these clumps I heard something more on the far side and shake the bush, very much as if a deer was feeding on the Ber berries and shaking the branches as he pulled at them. I was just about to step from behind the bush when I heard a deep "Aough h h" and of course at once realized that my supposed deer was a tiger. There may have been five or six feet between us, certainly not more and though I could smell the tiger strongly he evidently was very doubtful about me and kept inhaling long breaths in the attempt to make out what I was. Finally, deciding it was something suspicious, he began to trot away in the opposite direction and as I stepped from behind the bush raced up the bank giving me a snap-shot which luckily spined him and rolled him over. He had originally come up to the bush from the opposite direction to myself and was apparently lying beside it when the sound of my approach roused him up.

On yet another occasion I lay for some minutes on a sandbank within 25 yards of a tigress as she drank, and she calmly alternately lapped and cleaned herself without any suspicions of my presence before she eventually put herself into a satisfactory position for a shot and I was able to terminate the interview.

Most sportsmen who have sat up for tiger, whether on mychauns comparatively high up or actually on the ground behind screens, know that it really matters little which way the wind blows as far as frightening the tiger goes but that, on the other hand, the most absolute silence is essential.

A clever tiger who lies up any where within hearing distance of his kill over which a mychaun has been erected, will never return to it, however hungry he may be, unless he has *heard* the last—as far as he can tell—of his persecutors clear off. A very good instance of this was given me by Mr. G. M. Peddie of the Assam Bengal Railway. A tiger had been regularly killing cattle and goats belonging to his coolies and every attempt to shoot it had failed. Time after time Mr. Peddie had had mychauns made over the kill and at other times when a tree with a convenient branch was handy had gone out by himself with one gun bearer and climbed on to the perch and waited. Whatever his arrangements were, however, the result was always the same—no tiger,—yet a visit the following morning generally showed that after he had gone the tiger had returned and made a hearty meal.

Happening to pass through Mr. Peddie's camp at this time he told me of his failures and said that he thought the tiger must be able to smell him. I advised him the next time he went out to take a number of men with him, let them make as much noise as they liked whilst he climbed up to his mychaun and, after he had settled himself comfortably, to let them go away still talking as they went.

Within two days I got a letter to say that the tiger had been bagged. Mr. Peddie had followed my suggestions with the result that immediately the coolies who had come with him to the kill had noisily retired for about a couple of hundred yards, the tiger had sneaked out, walked round the far side of the kill listening to the men in the distance, followed them slowly up and, finally, after he thought he had heard them off the premises returned to his dinner and was promptly shot with a single bullet through heart and lungs. Mr. Peddie told me that judging from the action of the tiger he followed the men almost entirely by sound though every few paces he put his nose to the ground and inhaled a deep breath as if getting a whiff of the trail left by the men. At the same time invariably after one of these inhalations he finished by cocking his ears and listening intently as if to verify his poor sense of smell by his outer sense of hearing.

The trick of making a very noisy approach to a kill and an even more noisy departure, so that the fact that one or more persons have been left behind may not be detected, is of course a very old one. It had been taught me by my father but has often proved effective within my own experience.

Of course I must not be understood to claim that tigers have no sense of smell. Some they have, though it is not acute, and an incident in the career of the man-eater already referred to proves this. My Head Quarters were at the time at a place called Gunjong in the North Cachar Hills, right away on the North-East Frontier of India where tigers—like he poor—were always with us. They often came near the house, more than once killed my animals in their stables and I had already killed one tiger within a stone's throw of my garden. On the occasion referred to, a tiger had two nights running passed along by the narrow path on the

crest of the hill just outside my garden fence, the tracks showing that he had come in the early night and returned in the very early morning. I accordingly determined to sit up and see whether he would not come again a third time but as there were no trees suitable for mychauns I arranged to squat under the shadow of a very big, very dense orange tree where there was just room to sit upright and move one's rifle round in a circle. Unfortunately it was a pitch dark night and though the tiger came and remained within easy shooting distance of me for at least an hour I never saw anything to shoot at. The one gap in the fence in front of me had a big white post against which anything passing must have shewn up but this was carefully avoided. On one side of me and about fifteen yards to the right was a very massive hedge of bougainvillea and most of the hour the tiger entertained me with an endless walk backwards and forwards behind this. He knew something was wrong somewhere but what he could not decide; every now and then I could hear him put his nose to the ground and draw deep breaths in the attempt to get my scent, then he would once more resume his walk, the soft pad, pad of his feet hardly audible in the intense stillness unless a dried leaf or brittle twig betrayed his movements. Every now and then he would make a little whimper a sound I have sometimes heard tigers make when hungry, and less often, he would give vent to his impatience in a long drawn, "a-a-a-ough."

He could not possibly have seen me and I made no sound so in this instance it must either have been his sense of smell which warned or else that uncanny extra sense which so many animals seem to possess of the vicinity of danger.

Eventually he cleared off the way he came, and I went off to bed to be awoke the next morning just after day light by two sweating frightened men who came to tell me that this tiger had killed their companion about two miles from my bungalow. I went out at once but failed to get him and after this he killed with the greatest regularity, disposing of 52 people in eight months before I finally shot him.

This tiger, all through his career, as far as we could ascertain, killed by sound alone or by sight and sound; his boldness was extraordinary and he would enter huts and villages in broad daylight and pull people out, but his usual habit was to lie up beside a village path in some patch of grass or jungle, much too dense to see through, and leap out on any one he heard passing. His caution, however, was just as great as his boldness and he would never face any risk he could avoid or run any danger he did not understand. He had no objection to charging out upon a crowd of men whose advent, as they approached his hiding place, had been heralded by the patter of their feet and the sound of their voices, but if some of them turned and faced him he never tried conclusions with them.

On the morning following the night I sat up for him in my garden, he attacked two men who, as is usual with hill-men, carried spears and daos. They saw him as he charged up a steep hill at them and when he had got within a couple of paces of them dashed their spears in his face upon which he immediately turned tail and bolted. The next three men who passed that way a few minutes later ran when they caught sight of him and the slowest was promptly caught and completely eaten within the next three hours.

Three or four times I saw this man-eater when I was unprepared for him and each time he seemed to be depending mainly on sound for his preliminary charge and it was only at the last moment, on catching sight of something unusual, he repented and cleared off. My large white, or khaki-coloured sola-topee always seemed to scare him terribly and I have

no doubt that more than once his superstitious dread of this unknown object saved my life; indeed on one occasion I passed within inches of where he was lying and knew nothing of it until I had passed some paces when with a "woof" he jumped up and bolted. I had had to follow him up into some long grass by means of one of the tunnels in it made by deer and other game and up which he had dragged the body of a man he had killed. When I reached the remains of the body I found the tiger had retraced his steps and then leaped on one side, probably on hearing my approach. I suppose my whole attention was so concentrated on the expected tiger in front of me that I was oblivious to anything on either side of me, but it was a lesson never to be forgotten and in the many times afterwards in which I had to follow him up I always remembered to keep a very sharp look out on both sides of me as well as in front.

I saw an excellent example once of the want of scent possessed in a tiger, who was drinking at a stream, within ten paces of a sambhur with the wind blowing in fitful gusts from the deer to the cat. We were poling down the Diyung River in a dugout, a dense mist driving up the stream into our faces and completely obscuring both banks except at odd moments when the wreaths blew on one side. I was sitting on the edge of the boat, my legs dangling in the water and a shot gun on my knees waiting for the mist to rise and give me a chance of shooting my grub for the day, when the mist suddenly curled away from the bank and gave me a glimpse of a grand tiger, his head between his paws as he lay on the edge of the bank lapping his morning drink. Next second the rapid stream had swung us round a bend of the river and there stood a Sambhur Stag, head n air, evidently troubled by some faint whiff of his striped foe so close to him. The rifle I had snatched up too late for the tiger was in time for the deer who dropped where he stood with a shot through the neck. When we brought the boat to the bank and investigated matters more closely, we found that tiger and deer had been well within ten yards of one another although separated by a very dense strip of reeds and grasses. The tiger certainly appeared to have had no hint of the presence of the deer though the wind was in his favour, whilst the deer, almost equally certainly had been disturbed by the presence of the tiger, though the wind was against him.

Tame, or semi-tame, leopards which I have had in captivity have never shewn any great powers of scent, although some of them were allowed considerable liberty. Whilst my dogs would come up to me at a run when tracking me by scent, the leopards would nose about, snuffle and inhale and often fail altogether to find me out. Bears, which I have had at the same time as leopards, were much keener nosed and though clumsy in their movements would soon hunt me out. On the other hand the leopard was the quickest at hearing of all my animals, even sambhur and barking deer were not half so quick.

After the leopard had had a good meal it was often possible to allow him off his leash with the other animals, who curiously enough never showed the instinctive fear of him one would have expected, and often I have been able to compare their powers of hearing and invariably the leopard was the first to hear any sound with the occasional exception of a little prick-eared Tibetan dog.

The first sound, which to my human ears, used to convey the news that any one was approaching my compound was the creaking of a bamboo gate which let them into it, but long before this the animals knew all about it. First the leopard would prick up his ears, raise his head, and stare, with that curious far away look in his pale eyes, in the direction of the new-arrival, next the deer would erect their heads, stamp with their

forefeet and also turn in the same direction and lastly the dogs would show that they too had heard. The bears and monkeys never seemed to take any notice unless the person was approaching about meal time, but even then they were the last to pay any attention.

Unlike the true cats, the civet cats have an extraordinary powerful sense of smell. I once had a beautiful grey beast brought to me by some Nagas late in the evening as it was getting dusk. They asserted that it was absolutely tame so I took it out of the basket and it at once licked my hands and climbed over me uttering a sound like a contented little purr. I kept it with me for about an hour and then wanting to go to bed decided to lock him up in an old aviary I had once used for some eagles. Leaving it, as I thought, safely shut up, I turned in, but hardly was I in bed before I heard a scratching at the thatch roof and presently down dropped the civet, pushed itself cheerfully through my mosquito net and evinced the greatest delight at having once more found me. Feeling that it was hardly a desirable bed companion, I again grabbed it by the neck and carried it out to the cage. Shut up once more it was out, however, and back in my bed almost as soon as I was. Determined to be allowed to sleep in peace I again carried him right away out of the garden to a huge cotton tree about 200 yards away and saw him run safely up into the top branches far overhead, but, before I got back to my garden, I turned to have a look and there was my recently acquired pet with its nose to the ground simply racing over it after me.

This cat would often nose out birds' nests in trees or bushes within a few feet of the ground and then climb up and devour any eggs or young contained in them. When he arrived at a bush with a nest in it he would halt for a second or two with his little nose lifted up and quivering about in every direction until it was in a bee-line with the nest and then up he climbed. Fortunately he was the most amenable animal to deal with I have ever had and soon learnt that no nests within my garden fence must be touched. He was immense pals with all the dogs and could track them up by scent at a gallop, proceeding in ungainly leaps after the manner of his kind. His sight for distant objects was very poor though for anything near it was exceptionally quick.

Before leaving the subject of feline senses it may be of interest to relate a story of a leopard child which has not yet ever been published though it was pretty well known at the time.

In the North Cachar Hills, where the boy was found, Government taxation used to consist in part of labour, so much being supplied by every village for the upkeep of roads, rest-houses, etc. Sometimes men would petition for exemption from this labour on various grounds, and one day when questioning a man as to why he wanted exemption from such labour he told me that he had a little "wild" son to look after and as his wife had recently died he could not leave the village to work or the boy would run back to the jungle.

I accordingly went outside the court to see the "wild child" and satisfy myself as to the truth of the story. There sure enough outside was a small boy about seven years old, or less, squatted on the ground like a small animal; directly I came near him he put his head in the air and snuffed about, finishing by bolting on all fours to his father between whose legs he backed like a small wild beast retreating into a burrow. Looking closer at the child I saw that he was nearly or entirely blind from some form of cataract and his little body was covered with the white scars of innumerable healed tiny cuts and scratches. Struck with his appearance I asked the father to tell me all about the boy and he then narrated the following wonderful story which I fully believe to be true, but which my readers must accept or not as they think fit.

It appears that about five years before I saw father and son, the Cachari villagers of a village called Dihungi, had found two leopard cubs close to their village which they killed. The mother leopard had tracked the murderers of her children back to the village and had haunted the outskirts for two days. The third day a woman cutting rice in some cultivation close to the village laid her baby boy down on a cloth whilst she went on with her work. Presently, hearing a cry, she turned round and saw a leopard bounding away and carrying the child with it. The whole village at once turned out and hunted for leopard and baby but without success and finally they were forced by darkness to leave the boy, as they supposed, to be eaten by the leopard.

Some three years after this event a leopardess was killed close to the village by a sportsman who brought in the news of his success together with the information that the leopard had cubs which he had failed to secure. On hearing this the whole village turned out and eventually captured two cubs and one child, the boy of this story. He was at once identified by his parents, claimed by them, and their claim admitted by the whole village.

Subsequently when visiting Dihungi I interviewed the head man and also the man who actually caught the child and they both corroborated the father's tale in every detail. It appeared that at the time he was caught the child ran on all fours almost as fast as an adult man could run, whilst in dodging in and out of bushes and other obstacles he was much cleverer and quicker. At that time he was only suffering from cataract to a slight extent and could see fairly well, but after he was caught his eyes rapidly became worse. His knees, even when I saw him and when he had learnt to move about upright to a great extent had hard callosities on them and his toes were retained upright almost at right angles to his instep. The palms of his hands and pads of toes and thumbs were also covered with very tough horny skin. When first caught he bit and fought with every one who came within reach of him and, although even then affected in his eyes, any wretched village fowl which came within his reach was seized, torn to pieces and eaten with extraordinary rapidity.

When brought before me he had been more or less tamed, walked upright except when startled into extra rapid motion, was friendly with his own villagers, whom he seemed to know by scent, would eat rice, vegetables, etc., and consented to sleep in his father's hut at night. Clothes, being a Cachari child of tender years, he had not been introduced to.

His blindness was not in any way due to his treatment by the leopard—if the story is true—as I found that another child, a couple of years older, and the mother also had both had the same cataract. At the same time the defective sense of sight may well have intensified his sense of smell as the loss of the one must have caused him to rely more on the other. When caught the child was in perfect condition, thin but well covered, and with a quite exceptional development of muscle.

SOME SOUTH INDIAN BATRACHIANS.

BY

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[With two plates.]

These notes discuss a portion of the material collected some time ago in certain parts of Coorg and Shimoga, and I propose to include in this paper a few remarks on some of the unidentified examples of batrachians belonging to the Bombay Natural History Society, entrusted to me for determination. Through the courtesy of Dr. N. Annandale I have had access to the named collection of amphibians in the Indian Museum, and I should like to thank him and Dr. Boulenger who has very kindly examined a few specimens submitted to him for his opinion.

Two specimens belonging to the species *Spelerpes fuscus* are contained in the Society's collection and the label on the specimens shows that they are from Burma. There are a few points in which these two examples differ from the description of *fuscus* given in the Catalogue of the British Museum. For instance, 1. The remnants of cirri or balancers are absent below the nostrils in both the specimens. 2. The distance between the snout and the gular fold is less than three times in the length of the snout and the vent. 3. Two parotoids are present in both examples. 4. The deep groove behind the gular fold is continuous with the cervical groove starting from the posterior angle of the eye. 5. A lateral glandular fold over the costal grooves (9-10) is present. 6. Total length from tip of snout to tip of tail 105mm., more than 4 in. (a) 7. The tail is marbled. Considering the locality that the specimens are alleged to come from and also in view of the fact that the characters enumerated above are constant in the two forms, I naturally thought whether they could not be distinct from *fuscus*. But Dr. Boulenger who has examined one of the specimens, identifies it as the European *Spelerpes fuscus* and states that it could not have been picked up in Burma. (b) The only species of *Spelerpes* present in the Indian Museum is *S. ruber*, No. 2712 from North Carolina, and there is practically no further material in India for comparison. As the source of these salamanders cannot be definitely traced for the present, the interpretation of Dr. Boulenger is certainly the more natural and correct one.

Among the unidentified examples of batrachians belonging to the Society I found 1. *Rana pileata*, 2. *R. plicatella*, 3. *R. erythraea*, 4. *Rhacophorus bimaculatus*, 5. *Galophrynus pleurostigma*, 6. *Kaloula pulchra*, 7. *Bufo melanostictus*, 8. *Leptobrachium hasseltii*? All these are from Burma, except *Rh. bimaculatus* which I found in Mr. Kinnear's collection from Somavarapatna, Coorg. The occurrence in South India of this species which is known to affect the rain forests of Assam is certainly very interesting and is reported here for the first time. The two specimens of *Cal. pleurostigma* are in a beautiful state of colour preservation and the scheme of markings on them closely conforms to the description of

(a) Dr. Boulenger's measurement for the male specimens is 96mm, and Dr. Gadow (Camp, Nat. Hist. Amp. Rept., p. 105) states that the total length of *fuscus* remains under four inches.

(b) The only two salamanders known from this region are *Tylototriton verrucosus* and *Amblystoma persimile*.

Engystoma interlineatum (c) rather than Boulenger's account (d). The ventral surface bears in both the examples beautiful white roundish or squarish spots, not alluded to by any previous writers and such as are present in some species of *Megalophrys*.

Only the following examples of batrachia included in my collection call for observation at present.

Rana hexadactyla, Less.

1890. *Rana hexadactyla*, Boulenger, Faun. Brit. Ind. Rept. Batr., p. 441.

Larva.

1904. *Rana hexadactyla*, Fergusson, J. B. N. H. S., Vol. XV., p. 500.

A young specimen measuring 23 mm. taken in Jog, Shimoga Dist., shows the following peculiarities as compared with examples of similar size.

1. The strong fold of skin behind the eyes and across the head is continued over the tympanum on each side.
 2. Pearl-like granules crowd over the body and the limbs and toes
 3. First finger equals the second.
 4. A very distinct canthus rostralis.
 5. Nostrils with valve-like flaps.
 6. The tibio tarsal articulation reaches beyond the eyes
- This specimen has been sent to the Indian Museum.

Rana tigrina, Daud.

1890. *Rana tigrina*, Boulenger, Faun. Brit. Ind. Rept. Batr., p. 449.

1915. *Rana tigrina*, Nicholls, Proc. Zool. Soc. London, pp. 603, 609.

1917. *Rana tigrina*, Annandale, Mem. As. Soc. Bengal, Vol. VI, p. 112.

1918. *Rana tigrina*, Id. & Boulenger, Rec. Ind. Mus., Vol. XV, 51, 67.

Larva.

1904. *Rana tigrina*, Ferguson, J. B. N. H. S., Vol. XV, p. 501.

1917. *Rana tigrina*, Annandale, Mem. As. Soc. Bengal. Vol. VI, p. 125.

The variations observable in this species are quite striking and are associated with the different modes of life adopted by the individual members. In the Mysore State, *e. g.*, Bangalore as in Madras town both this species and its variety *crassa* occur together and though both are of robust build their powers to stand captivity are so small, that any prolonged observations on their habits in a vivarium becomes almost impossible. My own experience is that the fossorial habits are by no means confined to *crassa* and I have on several occasions exhumed specimens of *tigrina* S. S. while digging for earthworms. The presence of a horny plate on the roof of the mouth or on the sides of the lower jaw of the larvæ is purely arbitrary and indicates nothing. In my opinion it would not be perfectly safe to use this character as a basis for specific or racial distinction. The dental formula ascribed to the tadpole by Dr. Annandale (e) does not provide for the outer limits of variations and the description of Dr. Boulenger (f) would be correct if the formula is written thus, 1 : 3 or 4/3 or 4 : 1.

The osteological characters of *Rana tigrina* recently described by Dr. Nicholls would appear to be subject to a great deal of variation and the following description refers to the more important of them. He compares the vertebral column of the Indian bull frog with that of the European

(c) J. A. S. B., 1854, Vol. XXIII, P. 732,

(d) Faun. Brit. Ind. Rept. Batr., 1890, p. 490.

(e) 1917, Mem. As. Soc., Bengal, Vol. VI., p. 125.

(f) 1918, Rec. Ind. Mus., Vol. XV., Part II, 57.

R. temporaria, and Dr. Annandale (*g*) states that he has been able to confirm the observations of Dr. Nicholls on most of the bones by an independent examination. In South Indian colleges where practical zoology is taught, the laboratory type is *R. hexadactyla*, and during the breeding season of frogs, examples of *R. tigrina* are frequently brought to the class for practical work. The skeleton of a *R. tigrina* S. S. prepared for the Central College recently showed certain abnormal individual variations and led to the making of a large series of skeletons of this species for the purpose of comparison. On a careful examination of these series with the skeletons of *R. hexadactyla* and *R. cyanophlyctis*, I am not able to confirm some at any rate of the statements of Dr. Nicholls.

(*a*). The vertebral column :—In regard to the neural arches, *R. tigrina* is said to show, “a very marked overlap of each arch dorsally upon that immediately posterior to it and accordingly when the vertebræ are in position, the centra are not visible from above (*h*)”. “In this imbricate condition of the vertebral column, it would appear then, that *R. tigrina* has retained (or reverted to) a somewhat primitive condition (*i*)” such as is met with in the families of *Discoglossidæ* and *Pelobatidæ*. The condition, shown in text fig. 1 of the paper cited, in support of the above statement, is easily produced by a bend or flexure such as appears in badly prepared skeletons, (*j*) and ; however, in carefully prepared bones the neural arches only notch between the zygapophyses (*k*) so as to produce a more or less open-work condition that Dr. Boulenger (*l*) describes as being characteristic of the genus *Rana*. I possess two skeletons of *R. esculenta* and a comparison with them or with the two other Indian species already mentioned, discloses nothing strikingly different in the vertebral column of *tigrina*. I may further mention that its vertebral column is certainly not like that of *Discoglossus pictus* (*m*) and the figure of Dr. Nicholls therefore does not represent the correct position of the neural arches in well prepared and normally articulated spinal column. It is further pointed out that the imbricate condition of the neural arches is produced in *tigrina* as in *Pelobates fuscus*, by the fact that in these examples the centrum has practically the same length as the neural arch (*n*). In the vertebræ of *R. tigrina* that I have forwarded to Dr. Annandale, the length of the centrum is $1\frac{1}{2}$ of the length of the neural arch measured along the median line. This holds not only for the sixth vertebra that Dr. Nicholls selects for comparison, but for all others in the series. The dorsal view of the vertebral column of *R. tigrina* is not, however, the fully and completely open-work condition figured for *R. temporaria* by Howes (*o*) and for *R. esculenta* by Ecker, (*p*) and the seemingly imbricate appearance is due to,—1. The largely developed neural spines, directed backwards hiding the vertebral gaps. 2. The pre and post zygapophyses are considerably flattened and hide the communications between the dorsal gaps and the vertebral foraminae, and 3. On the posterior border of the neural arch of some of the vertebræ, a flange or arcualium is developed.

(*g*) 1917, Mem. As. Soc., Bengal, Vol. VI, p. 124.

(*h*) 1915, Proc. Zool. Soc., p. 603.

(*i*) 1915, *ibid.* pp. 603-604.

(*j*) All osteological material in support of these statements are sent to the Indian Museum.

(*k*) This is true of *R. hexadactyla* and *R. cyanophlyctis* also.

(*l*) 1897, the Tailless Batrachians of Europe, Vol. I, p. 38.

(*m*) 1907, *Wiedersheim* and Parker Comp. Anat. Vert., p. 56.

(*n*) 1915, Proc. Zool. Soc., London., p. 605.

(*o*) 1902, Howes, Atlas Pract. El. Zool., pl. IV., fig XXXV.

(*p*) 1889, Ecker. Anat. Frog., p. 18;

In regard to the development of the neural spines, I agree with the statement of Dr. Nicholls (p. 606) and I find that the neural spine of the seventh vertebra is as upright as that of the eighth. The cartilaginous ribs of the third vertebra of *R. tigrina* are said to be very like those of *P. fuscus* and this condition is obviously common to more than one Indian frog. The third vertebra of some of the examples of *hexadactyla* also show this character and the third vertebra of these two Indian species are to be distinguished by a flange or an osseous tubercle in *tigrina* alone. This tubercle or flange may perhaps represent the partial bifurcation of the diapophyses described by Dr. Bourne (g) as an abnormal occurrence in *temporaria*. As regards the diapophyses of the eighth vertebra, it may be mentioned that its stouter nature is rather an exception than a rule, and in the specimens that I have sent to the Indian Museum they will be seen to be not bigger than the transverse process of the seventh vertebra. The sacral diapophysis is certainly cylindrical in *tigrina*. I entirely agree with the description of the coccyx in Dr. Nicholls's paper, but in respect of the shoulder girdle, although there is a slight overlap, the ventral suture of the two coracoids which meet in a median bar in front, passes through the median axis of the girdle. Dr. Nicholls's text fig. 3A showing the right coracoid beyond the mid-ventral line, is rather an exaggeration. The overlapping condition is certainly a primitive feature which *tigrina* has retained, and in the metamorphosing larvæ of this, as in other Ranid larvæ (r) it is the epicoracoidal cartilages that overlap and the left coracoid bone extends slightly dorsally over the right, while ventrally they meet in a median suture.

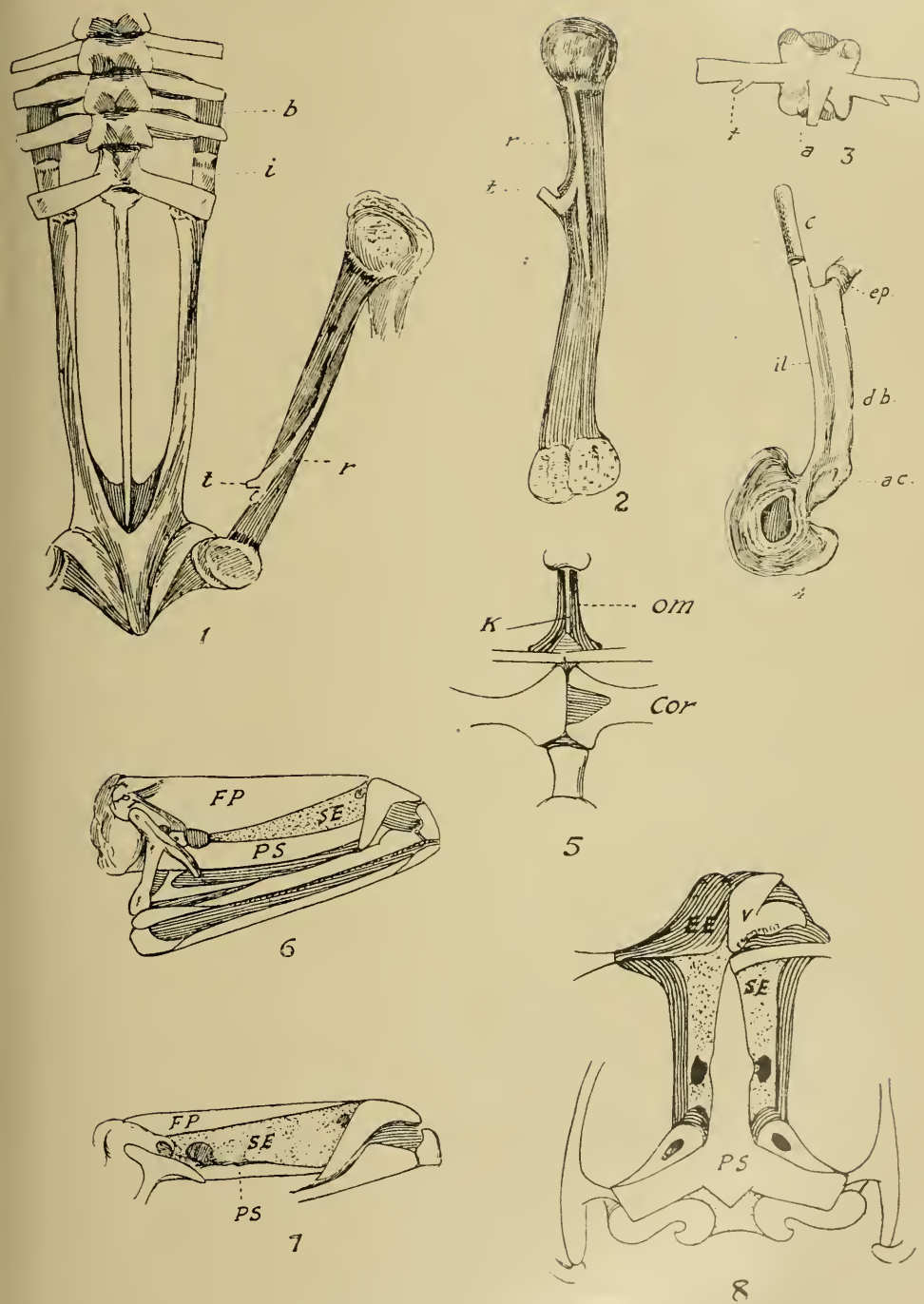
(b). The skull:—Dr. Boulenger appends a short description of the skull of *R. tigrina* to his definition of the species (s) and in certain regards it needs amplification. The cartilaginous basis of the skull is really confined to the processes given off from the nasal capsule which is, however, perfectly ossified; the principal processes being the transverse ones meeting the cartilaginous epiphyses of the pterygoid, the anterior and the anterolateral and the alar cartilages. The floor, the roof and the septum of the olfactory capsule are ossified by the great development of the othmoid bone—the cornets are present in the form of powerful turbinated bones. The large nasals which overlie the bony capsule,—occasionally with bony outwardly a very short directed spines,—are united with one another and with the frontoparietals so completely that the sutures may be lost or may be faintly indicated by grooves. The osseous floor of the nasal capsule is underlaid by two equally large vomers the outer borders of which have two processes enclosing a deep notch between them,—the anterior process almost meeting the maxillary bone, while teeth are borne on the postero-lateral border. The sagittal and coronal sutures are only indistinctly marked or not at all, and the upper surface of the skull is either flat or slightly convex (noticed in *R. temporaria* and *R. oxyrhinus* (t)). The parietal ridge is generally strongly marked, extending backwards to the apex of the heart-shaped foramen magnum. The mastoid ridges and the mastoid elevations are prominent. The lateral cartilaginous portions of the cranium are completely replaced by the backward extension of the sphenethmoid which is incorporated behind into the ala magna. Thus the foramen pro ramo-nasalis, foramen opticus and foramen oculomotorius are simple perforations in the sphenethmoidal bone. In some specimens the downward prolongation of

(g) 1894, Bateson, Mat., Stud. Var., p. 124, and 1884, Bourne, Q. J. M. Sci., XXIV, p. 86.

(r) 1901, Gadow., Camb. Nat. Hist., Amph. Rept., p. 25.

(s) 1918, Rec. Ind. Mus., Vol. XV., p. 57.

(t) 1889, Ecker, Anat., Frog. p. 23.



SOUTH INDIAN BATRACHIANS.

the fronto-pariels may meet the upward extension of the parasphenoid in front of the exit of the optic nerve. The foramen trigeminus is a large vertically oval aperture and in some specimens of skulls, is constricted slightly in the middle by the approximation of tongue-like processes of the sphenethmoid and the ala magna. The ophthalmic branch of the fifth, the sixth and the palatine branch of the seventh occupy the dorsal part of the foramen, while through the lower half of the foramen emerge the maxillo-mandibularis of the fifth and the hyo-mandibularis of the facial nerves. The trochlear nerve has no separate exit and issues through the foramen opticus. The canalis nervi vagi may bear three orifices,—though the usual number is only two,—the internal foramen condyloidium for the exit of the vagus and glossopharyngeal nerves and two lateral ones for the entry of the internal and the external carotid arteries. The maxillo—palatine process is large and extending below the nasals, supports the cartilaginous epiphyses of the pterygoid and the transverse cartilaginous extension from the nasal capsule.

(c). The individual abnormal variations.—

i. The pelvic girdle. In the preparation I have forwarded to the Indian Museum the ventral border of the ilium extends far beyond the sacral diapophyses and before maceration, was continued over the transverse processes of the eighth and the seventh vertebræ by means of a flat cartilaginous bar. In accordance with this fact the diapophyses of these vertebræ are flattened into wing-like expansions at the base, thus deviating from the cylindrical shape. The dorsal blade of the ilium is practically of the same depth throughout and it is the terminal portion of this sharp border, which unites with the transverse process of the sacral vertebra by a cartilaginous epiphyseal connection.

ii. The femur. The inner border of the right femur bears a strongly developed tubercle or a process projecting in the living specimen between the great adductor and internal vastus muscles. There is a distinct ridge on the ventral surface of the bone, running from the head of the femur to more than half the distance. A similar but fainter ridge is found on the dorsal face also.

iii. The pectoral girdle. The inner end of the left corocoid is distinctly forked and a mass of epicorocoidal remains persisted in the living condition, in front of the corocoidal suture. The future is imperfect on account of the deficiency of the left corocoid. The ventral face of the bony style of the omosternum bears a strong carina-like ridge throughout its length.

Rana leptodactyla, Boul.

1890. *Rana leptodactyla*, Boulenger, Faun. Brit. Ind. Rept. Batr., p. 448.

Larva.

1918. *Rana leptodactyla*, Annandale, Rec. Ind. Mus., Vol. XV., p. 19.

I have had opportunities of witnessing the spawning of this frog in Coorg and could rear the larvæ only up to the two-legged stage. I am of opinion that the tadpoles described by Dr. Annandale in the paper cited, do not belong to *R. leptodactyla*. I have myself examined the tadpoles No. 17698 contained in the Indian Museum collection, and I have in my own collection other tadpoles quite identical with this number, a few of these latter tadpoles with me have developed the feet. Judging from this and other characters I am led to infer that the examples described under *leptodactyla* may prove to belong to one of the species of *Nyctibatrachus*. I am forwarding

to Dr. Annandale these suspicious looking larvæ and other material, and at present I am not in a position to say anything regarding the larvæ he describes under *N. pygmeus* (u).

The eggs of *R. leptodactyla* are large, measuring with the gelatinous outer coat $4\frac{1}{2}$ mm. and are laid in small clumps at several places along the grassy margins of the ponds. The sexual embrace is axial. The total number of eggs included in any one batch does not usually exceed thirty, and the batches of eggs deposited by any one frog in the different parts of the same pond may vary from six to eight. The localities for spawning are most arbitrarily selected and have no reference to protection or development being ensured. The debris that usually collects round the margins of ponds fed by storm-water confers, however, some measure of protection. The gelatinous outer envelope of the eggs which swells out into a large spherical mass in the water, shrinks in the preserving fluid. The two poles of the eggs are not distinguished by any colour.

The tadpoles are of moderate size, oval, rather flattened above (elevated in the young). The ventral surface is convex. The snout is obtusely pointed. The nostrils are widely separated, nearer to tip of snout than to eyes. The inter nasal space is only half the inter orbital width. The eyes are dorsal and directed upwards in the young, but outwards in the older forms. Eye nearer to the snout than to spiracle. The spiracle is lateral, not visible from above, sinistral, tubular, pointing backwards and upwards. It is nearer to the root of hind leg than to tip of snout. A frontal gland is present. The mouth disk is moderate, ventral in position. Lips opposible, the lower fringed with a double row of fingers-like processes, which extend on the emarginate sides. The upper beak is broadly semilunar, produced more or less in the middle into a blunt tooth-like process. The lower beak is V-shaped and the margins of both the beaks are entire. The dental formula is $1: 2 + 2/1 : 2$ or 3 . The upper entire tooth row is the longest and the other two are broadly interrupted. The innermost lower series is either narrowly broken or entire and all the three series are equally long. The vent is dextral, tubular. The tail is long, pointed at the tip. The muscular part at the middle of tail is as deep as the membranes,—these are poorly marked in front but are deep and convex behind. The dorsal surface of head and body is olive green or brown, more or less speckled. The ventral surface whitish, immaculate. The tail is spotted throughout.

Measurements of a specimen in which the hind limbs are fully grown:—

Total length	.. .. .	43mm.
Length of head and body	.. .. .	18mm.
Greatest breadth of body	.. .. .	11 $\frac{1}{2}$ mm.
Greatest depth of body..	.. .. .	10mm.
Greatest depth of tail	.. .. .	7mm.

The eggs and specimens of tadpoles were obtained at Watekollé, Coorg, in December 1918 and were taken also in Shimoga, Mysore State. Twelve hours after the deposition of the eggs, the young one are found wriggling in their gelatinous envelopes, which gradually spread out into a continuous film over the water. This viscous mass becomes completely dissolved, before the final emergence of the larvæ takes place. Buds of hind limbs sprout nearly a fortnight later, which is certainly a remarkably short period for the Ranid larvæ in general and the rapidity in the present case is correlated with the fact that metamorphosis has to be completed before the element in which the larvæ live should dry up.

The eggs and the tadpoles are in the Indian Museum.

Nyctibatrachus sancti-palustris sp. nov.

♂ Vomerine teeth in two strongly set, large oblique series, behind the choana, —considerably further behind in the young. Habit moderate. No canthus rostralis, which in the young is obtuse. Length of snout nearly equals the diameter of the eye in the adult, but longer in the young. Eyes moderately prominent, directed upwards and forwards. The upper eye lid is narrow and smooth in the young and covered by warty folds in the adult. The inter orbital space is slightly wider than the upper eye lid. Nostrils equidistant between the eye and tip of snout. Snout optuse in the young, broadly rounded in the adult. Fingers moderate, first shorter than the second; tips swollen, truncate. Toes more than half webbed, tips dilated into disks. Subarticular tubercles moderate. An inner metatarsal tubercle. Tarso-metatarsal articulation reaches the eye or slightly beyond. Skin nearly smooth in the young but covered by short semicircular folds on the back and the sides, in the adult. A median fold on the snout, forking behind in the adult, but generally continued between the eyes in the young. A moderate sub-orbital fold and another from the eye to the shoulder. Reddish brown above, limbs barred. A broad dark band between the eyes. Throat bronzed in the adult, as also the under surface of limbs. Abdomen yellow, the liver showing through the transparent skin in the form of a squarish dark patch. In the young, the upper surface of the limbs is lighter, the dark bands extend on the toes. A triangular bright yellow mark on the snout and orange yellow streaks on the shoulder, sometimes continued to the groin in the young.

From snout to vent 39mm.

Locality.—The sacred swamps of the Cauvery, Brahmagiri hills 4,000 feet, Coorg.

The type and syntypes are in the Indian Museum. Dr. Boulenger has retained for the British Museum one of the three specimens which he kindly examined.

Nyctibatrachus sancti-palustris modestus var. nov.

This variety of the foregoing species differs in a striking manner and in several important particulars and for the purpose of comparison, I have selected examples of the same size.

1. The length of the throat along the mid-ventral line is $\frac{1}{2}$ the distance measured ventrally between the angles of the mandibles in *sancti-palustris*, and in *modestus* it is $\frac{1}{4}$.

2. The length of snout equals the diameter of eye in *modestus*, exceeds by far in *sancti-palustris* of the same size.

3. Nostrils nearer tip of snout in *modestus*.

4. The inter orbital width more than twice the upper eyelid in *modestus*.

5. No canthus rostralis.

6. A more elongate metatarsal tubercle.

7. Tarso-metatarsal articulation reaches the snout or slightly beyond. Toes less fully webbed.

8. Skin thrown into long longitudinal folds on the body and limbs.

9. Pinkish above, more or less blotched. Limbs barred. Throat and under surface of limbs finely speckled. Abdomen white. An orange yellow band on each shoulder.

Total length 25 mm.

Locality.—Jog, Shimoga, Mysore State.

Type and syntype in the Indian Museum.

Bufo.

Two specimens of *Bufo* collected in Coorg appeared to me to be distinct from *B. stomaticus* which I had examined in the Indian Museum in June

1919. Dr. Boulenger to whom they were sent is, however, of opinion that they cannot be separated from *stomaticus*. With a view to verify my position, I have, through the courtesy of the Director of the Zoological Survey of India, been enabled to re-compare my material with the Indian Museum collection. At the end of the reconsideration, I find myself unable to accept the decision of Dr. Boulenger. For reasons given below I consider myself sufficiently justified in regarding the two examples as representing a distinct local race differing from their North Indian congeners in several important particulars. Though I do not possess at present sufficient material to establish their specific distinctness, which may perhaps prove the more correct view to take, I have no doubt about their being racially distinct.

Bufo stomaticus peninsularis var. nov.

Head without bony ridges or feebly marked by minute cornified tubercles. Snout obtuse, rather truncated obliquely. Interorbital space broader than upper eyelid. Tympanum moderate about $\frac{3}{4}$ the length of the upper eyelid. First finger equals the second. Toes half-webbed, subarticular tubercles inconspicuous. Two meta tarsal tubercles,—the inner spade-like. Tarso metatarsal articulation reaches the tympanum. Skin perfectly smooth or covered uniformly by minute tubercles. Under surface non-tuberculate. A feebly marked flask-shaped fold over the occiput. Parotoids much flattened, inconspicuous. Cutaneous pores aggregated in small numbers over the skin. Colour of live specimens either pale buff or olive green more or less speckled with brown. Under surface yellow on a background of dirty white.

From snout to vent 45 mm.

Locality. Mavkote and Watekollé, Coorg.

Type and syntype in the Indian Museum.

The enumeration of characters in which the variety *peninsularis* differs from *stomaticus*, (Indian Museum nos. 16067, 16068, 17254 and 17274) may now be proceeded with. They are all from Northern India. 1. The interorbital space is $1\frac{1}{3}$ or $1\frac{1}{4}$ of the upper eyelid in *peninsularis* and equals the upper eyelid in *stomaticus*. 2. The length of the snout is $1\frac{1}{2}$ the length of the upper eyelid in *peninsularis* and is $\frac{5}{7}$ in *stomaticus*. 3. The mandibulars symphysis form an acute angle in *peninsularis* and is a broad semicircle in *stomaticus*. 4. Inner meta-tarsal tubercle spade like in *peninsularis* and conical in *stomaticus*. 5. The vertical diameter of the tympanum is $\frac{3}{4}$ the length of the upper eyelid in *peninsularis* and $\frac{2}{7}$ in *stomaticus*. 6. The upper eyelid is entire, coterminous with the canthus in *peninsularis* and notched both ends in *stomaticus*.

Bufo parietalis, Boul.

1890 *Bufo parietalis*, Boulenger, Faun. Brit. Ind. Rep. Batr., p. 507.

A single specimen of this species 1.8 inches (*y*) is included in the collection and shows the following peculiar characteristics:—

1. The bony ridges are by no means prominent.
2. There is a distinct occipital and a prefrontal ridge.
3. Toes are considerably less than half-webbed and subarticular tubercles are absent.

Specimen in the Indian Museum.

EXPLANATION OF PLATES.

1. The abnormal *Rana tigrina*.

Fig. 1. The pelvic girdle and the abnormal femur.

Fig. 2. The abnormal femur showing the tubercle and the ridge.

(*y*) Dr. Boulenger's record is 3.25 inches, Faun. Brit. Ind. Rept. Batr., p. 507.



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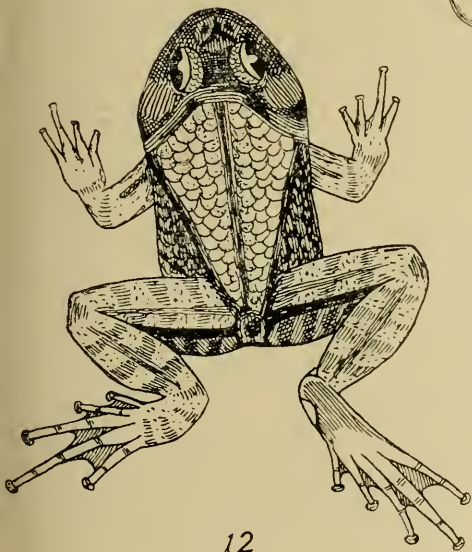
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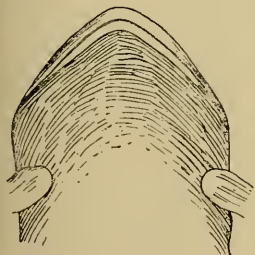
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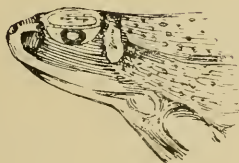
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- Fig. 3. The third vertebra showing the tubercle on the diapophyses and the arcualium.
- Fig. 4. The abnormal ilium with the forward cartilaginous extension.
- Fig. 5. The pectoral girdle showing the forked left corocoid and the keeled omosternum.
- Figs. 6&7. Side views of the skull of the normal *R. tigrina*, showing the relation of the sphenethmoid, the frontoparietal and the parasphenoid bones, and their degrees of development.
- Fig. 8. Lower view of the skull shown in fig. 7. The right vomer is removed to show the bony base of the nasal capsule.

2. *Rana leptodactyla*.

- Figs. 9,10&11. Egg* more than twice ; tadpole* twice ; mouth* more four times magnified.

3. *Nyctibatrachus*.

- Fig. 12. *N. sancti-palustris* sp. nov.
- Figs. 13&14. The under views of *sancti-palustris* and *modestus* var. nov. respectively.
- Figs. 15, 17 and 16, 18. The hind limb and the meta-tarsal tubercle of *sancti-palustris* and *modestus* respectively.

4. *Bufo*.

- Figs. 19, 21 and 20, 22. The throat and profile of *B. stomaticus* No. 17274 belonging to the Indian Museum and *peninsularis* var. nov.

Lettering.—a. Arcualium on the posterior border of the neural arch. ar. articular facet of the tendon of m. vastus externus.

C. cartilaginous bar extending over the transverse processes of the VIII and VII vertebræ.

Cor. corocoid with the forked end.

db. dorsal blade of ilium.

EE. ecto and mesethmoid bones.

ep. epiphyseal connection between the dorsal blade of ilium and sacral diapophysis.

FP. frontoparietal bone.

il. ilium. K. carina on the omosternum. om. omesternum.

PS. parasphenoid bone, r. ridge on the two faces of the femur.

SE. sphenethmoid bone. t. tubercle. v. vomer.

THE BIRDS OF PREY OF THE PUNJAB

BY

C. H. DONALD, F.Z.S.

PART V.

(Continued from page 1020 of Vol. XXVI.)

TYPE G.

FAMILY FALCONIDÆ.

SUBFAMILY FALCONINÆ.

Genus CIRCUS.

No. 1233. *Circus macrurus*. The Pale Harrier.*Characteristics.*

Size medium, wing about $14\frac{1}{2}$ " ; tarsi under 3" ;
Outer web of 2nd, 3rd, and 4th, quills notched,
but not of 5th.

Colouration.

Adult male. "Upper parts pale ashy grey, generally, except in very old birds, more or less tinged with brown on the crown, back, scapulars and quills ; lores whitish ; forehead and above and beneath the eye white ; ear-coverts pale grey streaked with white ; the ruff behind the ear-coverts differing in texture, but scarcely in colour. Primaries ashy grey, 3rd, 4th, and 5th, black or blackish-brown on part of the terminal half, some black on 2nd and 6th, the basal portion of all quills white ; upper tail coverts banded grey and white, middle tail-feathers grey unbarred, the others white, with grey bars ; lower parts white, throat and upper breast with a faint grey tinge" (Blanford).

Adult female. "Above brown, feathers of head and hind-neck broadly margined with rufous or buff, and the smaller wing-coverts with broad pale rufous borders ; forehead whitish, a buffy white supercilium and patch below the eye ; moustachial stripe and ear-coverts brown ; a well marked ruff of small white or buff feathers with broad brown shaft-stripes all round the neck, behind the ear-coverts, and across the throat ; quills brown above buff or whitish below, with blackish-brown cross-bands on both sides ; upper tail-coverts white, brown shaft-stripes or other markings ; middle tail feathers brown, outer feathers buff or rufous-white, all with dark brown cross-bands.

Lower parts white, with rufous-brown shaft-stripes, broadest on the breast ; in old birds these stripes become very narrow, especially on the abdomen and lower tail-coverts.

Young birds resemble the female above, except that the feathers have, at first, rufous edges throughout, there is a white nuchal patch with

throughout, there is a white nuchal patch with brown shaft-stripes, and the ruff is unstreaked, or almost unstreaked buff and very conspicuous; the upper tail-coverts are white, the lower parts throughout are rufous-buff, with faint shaft-stripes. There is a gradual passage from this plumage into that of the adult; nearly adult males are often found with patches of brown on the crown and brown shaft-stripes on the breast" (Blanford). "Bill black; cere greenish; iris yellow in adults brown in the young; legs yellow." (Blanford).

Measurements.

Length of females about 19.5; tail 10; wing 14.5; tarsus 2.9. Length of males 18; tail 8.75; wing 13.75; tarsus 2.7.

I have given the above description of this bird in full, from the Fauna of British India, as it very nearly applies to the next species also, and because I have noticed that these two birds are very frequently taken for each other. In his description of the next species, the Hen-Harrier, Blanford merely gives the difference between it and the present species, so there should be no confusion between them. If it is remembered, in the first instance, that one glance at the wing of the bird, without looking at the plumage at all, is sufficient to keep the two species apart, it would save a great deal of trouble and leave no room for doubt. In the Pale Harrier the 5th quill is *not* notched, whereas in the Hen-Harrier the 5th quill *is* notched. Secondly, look at the upper tail-coverts.

In the Pale Harrier these are always streaked with brown, or edged with brown or buff. In the Hen-Harrier the upper tail-coverts are pure white in both sexes.

Habits, etc.

The Harriers, as a genus, are well known birds and unmistakable as such. Their curious habit of flying low over grass or scrub jungle and dropping silently to the ground, or for a second almost stopping still in mid-air, and then continuing their flight over another bit of grass or scrub is unlike any other Bird of Prey.

All the Harriers appear to do a great deal of work to earn their dinner for it is seldom that one gets a big enough meal in one quarry to satisfy it. Fortunately it is not averse to taking almost anything it can get, from grass-hoppers and insects of all kinds to lizards, mice and birds, but it seldom loses an opportunity of trying for birds when it gets a chance. The writer watched a male of this species, on one occasion, trying for little birds for the better part of two hours, over a dried up water course, overgrown with bullrushes and grass. The water-course was some 3 to 400 yards long and about 30 feet wide: the centre was clear of weeds which only grew on either bank. The Harrier started at one end, flying very slowly and checking at frequent intervals, pre-

paratory to dropping, but each time it did so a few birds would hurry out and drop back into the weeds a little further on. Time after time the Harrier turned and twisted, swooped and rose and its legs were over and over again seen to shoot out as a bird came within striking distance, but each time it missed its prey by inches. Up one bank and down the other it went, times innumerable, but did not succeed in getting a single bird. There was a wide open plain on either side of the water-course and the birds which had taken shelter among the weeds appeared to be very loth to leave it, for they merely flew, when the Harrier got directly above them, for a short distance and went into the rushes again a little further on, only to be flushed again.

The flight is light and graceful but slow, a bout of flapping being followed by sailing and frequent "banking" as the bird half turns from one side to the other, as though unable to make up its mind as to which side it should go. Harriers generally are not very often seen soaring in the winter, but during their bi-annual migrations they may frequently be seen circling high up in the air.

When circling the wings are held very nearly in line with the body, though slightly upwards inclined. Whilst flying over scrub, *i.e.* when hunting, the wings are frequently seen to be held well over the plane of the body for short distances. The tail is long and projects well beyond the line of the wings and the bird somewhat resembles a Goshawk, but the wings are relatively longer and narrower.

The Pale Harrier is a winter visitant to India and nothing is known of its nidification in this country.

On the wing this species can generally be distinguished from the Hen-Harrier by its marked upper tail-coverts, if the back can be seen and in the case of the male by its lighter under parts, as well as the tail-coverts. In the Hen-Harrier a bluish-grey marking will be noticed on the chin and upper breast, whereas this is wanting in the Pale Harrier in which the chin and upper breast are, at most, a very pale grey.

No. 1325. *Circus cyaneus*. The Hen-Harrier.

Characteristics.

Size medium, wing about 14"; tarsi under 5"; outer web of 5th quill notched.

Colouration.

Adult male. Very similar to the preceding species, except that the general colouration is somewhat darker, being a more bluey grey, especially on the upper breast and throat. "There is a distinct white nuchal patch with brown shaft-stripes."

Upper tail-coverts are pure white.

"The adult female is distinguished from that of *C. macrurus* by having the margins of the head and neck-feathers more rufous, by the rufous markings on the wing-coverts and scapulars being larger and

more in the form of spots, by the white around the eyes being more sullied, and the moustachial stripe and ear coverts being rufous with dark streaks instead of uniform brown, and by the upper tail-coverts being pure white. The ruff is well marked. Young birds have the lower parts buff or pale rufous, with distinct broad shaft-stripes and the ruff, though distinct, is always striated."

"Bill black; cere yellow; iris yellow, brown in the young and according to some observers in females; legs and feet yellow" (Blanford).

Measurements.

"Length of male about 18"; tail 9; wing 13; tarsus 2.75. Length of female 21; tail 10.5; wing 15; tarsus 3" (Blanford). N. B.—Usually the tarsus is just under 3".

Habits, etc.

This bird can at all times be separated from *C. macrurus* by its pure white upper tail-coverts and by having its fifth primary notched. The iris of the adult female is yellow, so far as I have seen though in the young bird it is brownish.

The Hen-Harrier is a winter visitor to the Punjab and to be found throughout the Province, during that time. Very like the Pale Harrier in its habits, mode of hunting and flight, but I think, somewhat more given to soaring than the latter. During the spring and autumn it is found at great heights and I have come across him at 15,000 feet and over, beating over the barren hill-sides and chasing accentors and finches.

The adult male can generally be recognised by the darker colouring on the breast, throat and chin in particular, and both sexes by the pure white upper tail-coverts.

Nothing is known of its nidification in the Province and I certainly have never met with this species, even in the higher Himalaya, during the summer months. Blanford states that it has been known to breed at Tso Morari in Thibet.

1237. *Circus ruginosus*. The Marsh-Harrier.

Characteristic.

Size medium; length 21½"; wing 16; tail 9½; tarsus over 3". From cere on culmen to tip of bill is more than 0.75". (in the two preceding species it is under 0.75"). Female dark brown throughout except the head and the male is never so pale as the other two and much more variegated.

Colouration.

"Adult male. Head, neck and breast buff or pale rufous, with dark brown shaft-stripes, broader on the breast; back and most of the wing-coverts dark brown; scapulars still darker, sometimes grey towards the base; smallest coverts along the forearm whitish, with dark brown shafts; outer greater coverts, primary-coverts, and all quills except first 6 primaries dark silvery grey, remaining coverts and very often the tertiaries dark brown; first six primaries black with the basal portion white; upper

tail-coverts white, with rufous and brown mixed in various ways; tail grey above, isabelline below; abdomen and lower tail-coverts ferruginous brown, more or less striped darker.

Females are dark brown except the crown, nape, chin and more or less of the throat, which are buff with brown stripes. There is sometimes a patch of buff on the breast, the wing-coverts and back have buff edges, and the upper tail-coverts are rufous.

The young of both sexes resemble the females except that the buff on the head is sometimes unstreaked and more limited in extent, being confined in some cases to a nuchal patch or even wanting altogether." (Blanford.)

"Bill black; core and base of bill greenish-yellow; iris yellow, brownish-yellow in females and young; legs and feet rich yellow" (Hume.)

Measurements.

"Length of males 21; tail 9.5; wing 16; tarsus 3.4. Length of females 22.5; tail 9.75; wing 16.6; tarsus 3.5" (Blanford).

Habits, etc.

The Marsh-Harrier is a familiar feature of every jheel in the Province and wherever there is a swamp of any kind with reeds, there will be found one or more of this species. Like all other members of this genus this species spends most of its time beating slowly over reeds and grass. The flight is very similar to the others except that the beats of the wing are slower and more deliberate, it is more given to soaring and when so engaged it holds its wings well above the level of the back. Nothing in the way of food comes amiss to this species from a wounded teal to a dead crab or a grasshopper. It is much more given to sitting than any of the others and, in fact, spends a great deal of its time sitting on the bunds of paddy fields or edges of jheels. This species must have a hard struggle for existence and is only saved from starvation by the fact that it is content to eat things which other Raptores do not consider worthwhile to take from it.

Pallas's Fishing-Eagle and the Spotted Eagle are ever on the look out for any tit-bits the Marsh Harrier may find, and unless the latter can hide itself and its quarry in long grass, it stands very little chance of enjoying its breakfast.

There appear to be *many* more specimens in the garb of the female than that of the male, and for every one of the latter one might meet with 10 of the former.

This Harrier, though migratory, breeds frequently in this country and nests have been taken in various places, and the bird is by no means uncommon in the summer. Like all Harriers it builds on the ground and lays 4 or 5 eggs "which are either pure white or slightly spotted and measure about 2" by 1.5" (Blanford.)

GENUS ASTUR.

No. 1243. *Astur palumbarius*. The Goshawk.*Characteristics.*

Size medium, length of female about 24", male 20"; wing 14" (female), 12" (male). Tip of primaries in closed wing reaching only to about half way down the tail. Bill from gape $\frac{2}{3}$ to $\frac{3}{4}$ length of mid-toe, without claw.

Colouration.

Variable. In old birds the whole of the upper parts become a sort of ashy grey-brown, the feathers having paler edges. The crown, area behind eye, ear-coverts, and sides of neck darker, sometimes almost black; forehead, lores, long supercilia, and nuchal patch uniting them behind streaked and mixed with white: quills brown above, whitish below, with dark bars: tail light brown or brown mottled with white above, paler below, crossed by four broad dark brown bars and tipped buffy white: lower parts white, with blackish shafts and brown bars, which become narrower and more numerous in older birds: lower tail-coverts white unbarred. Young birds are brown above, most of the feathers edged or tipped with buffy white; crown nape and hind-neck with broad buff or pale rufous edges: quills as in the adult, but with the barring more distinct above; tail with five dark cross-bars and tipped with buff: lower parts buff or pale rufous, with brown longitudinal oval spots, each having a black shaft-line in the middle. Nestlings are covered with pure white down." (Blanford).

"Bill bluish horny; cere yellow with a greenish tinge; iris and legs yellow" (Blanford).

Measurements.

Length of female 24; tail 11; wing 14; tarsus 3.3; of a male—Length 20; tail 9.5; wing 12.5; tarsus 3.2 (Blanford).

Habits, etc.

The Goshawk is among the best known of the Indian Raptores, not because he is common, but because he is much sought after and far and away the best hawk used in hawking. Every Indian Prince in whose State falconry still survives does not consider his ménage complete without a Goshawk, and it is the zenith of every Indian falconer's ambition to possess one. Most Britishers would probably prefer a falcon, as the spot shown by a hawk is in no way comparable to that of a falcon, but for all that there is no denying the qualities which combine to make the hawk, the Goshawk in particular, the valuable bird it is, Rs. 150 to 200 being paid for a young female a few days after it has been captured.

The Goshawk, during the summer months, is a dweller of the high mountain ranges and to be found in the oak and spruce forests at elevations from 9 to 11,000 ft. Like all true Hawks and Hawk-Eagles, this species does most of its hunting from the boughs of some thickly foliated tree, usually pouncing on its prey before the latter has realised its

danger. I have found this species sitting on a rock on the edge of a plateau, far above the limit of trees, waiting for a covey of snow-patridges to come out and feed among the rocks. They are trapped in large numbers during the late autumn, in long vertical nets stretched along ridges, where small game is plentiful. These nets, or rather a succession of them, cover very often a mile or more of country and vary from 10' to 15' in height.

They are erected much in the same way as a tennis net but the lower end forms a bag into which the victim falls and remains there until the men visit the nest and take it out. Another method adopted to catch this species is by means of three vertical nets, each about 7' x 6' x 5'. They are erected to form 3 sides of a square and a pigeon placed in the centre. The man in charge hides opposite the open side of the square, whence he makes the pigeon flutter by pulling a string, when a hawk is seen.

This is a most effective trap for hawks generally, and placed on the top of a knoll, is visible for miles around, and will attract a Goshawk from very long distances.

This species, though it does most of its hunting among trees, may often be seen circling at great heights. In the Himalayas, hawks will generally be found to soar late in the morning or early in the afternoon. Seldom in the middle of the day, early morning or late evening, and if watched it will be seen that a bout of circling on steady pinions is almost invariably followed by a few quick beats of the wing.

The short rounded wings and the long, projecting tail, proclaim the members of this and the next genus from afar, and though I have found falconers who can differentiate, at a glance, between a sparrow hawk and a shikra, I am afraid I have never succeeded in being able to place them *for certain*.

The Goshawk, if disturbed during the day, drops from his perch to within a couple of feet of the ground and flies low and fast until it approaches the tree it intends to alight in and then rises almost vertically into the branches.

This species, together with the Hodgson's Hawk-Eagle does more damage among game birds than perhaps all the other birds of prey combined. Their numbers appear to be on the decrease and I have questioned several men who have the right to erect nets for them, and they all say that they seldom get more than half a dozen in the year where 15 to 20 used to be caught a couple of decades ago.

On one occasion, while in camp in the Simla Hills, I had a most extraordinary experience with one of these birds. It was late in November and we had had an early fall of snow on the hills. My camp was situated in a valley with a fringe of deodars on

three sides and open on the fourth, and I was working in the verandah of the tent which was enclosed by "chicks" all round, except the centre "chick" which was tied up and acted as a doorway. Suddenly there was a tremendous commotion among the fowls and one old cock came rushing into the verandah with something hanging on to him, rushed past my table and into the tent itself. I followed and pulled the squalling bird out from under the bed and to my surprise found a very ancient male goshawk, still holding on. I naturally thought it must be somebody's tame bird escaped.

The hawk literally fell off the cock as soon as I pulled the latter out from under the bed, and lay on the floor in a sort of fit. I picked him up and found it emaciated to a degree and nothing, but skin and bone. There was a slight wound in one wing, which accounted for his condition, and the poor thing evidently put in every ounce of his remaining strength to get a meal, but the cock was one too much for him in his starving condition. The warmth of the stove revived him and he sat on my fist as though he had been accustomed to it for weeks and, had a feed of raw meat, a small one to begin with followed by another in a couple of hours.

In three or four days the bird began to put on condition and in about a fortnight, the wing having entirely healed, I released him after giving him a good meal. This bird was a very pale blue grey above and pure white below profusely barred with black. A dark grey head and *orange* eyes.

The Goshawk breeds in trees from March to June and lays 3 to 4 eggs. "usually nearly pure white, but occasionally spotted or blotched." I have had youngsters brought to me as late as July and the only nest I have seen was high up in the fork of a Blue Pine (*Pinus excelsa*) at an elevation of about 8,500 feet.

The Goshawk is the only "True" hawk that will follow its quarry for any distance. I have myself seen them follow partridges for 500 yards or so, and Hume quotes Mr. Thompson, a keen falconer, as saying that he has known his Goshawks to take a partridge or quail 800 to 1,000 yards where the hawks were slipped.

No. 1244. *Astur badius*. The Shikra.

Characteristics.

Size small, length from $12\frac{1}{2}$ to 14 inches: wing 7 to $8\frac{1}{2}$; tail 7. Tip of primaries in closed wing only reaching to about half way down the tail: bill from gape $\frac{3}{8}$ to $\frac{3}{4}$ length of mid-toe without claw.

Colouration.

Somewhat similar to the preceding species, generally and varying from it by the upper parts being brown, in the young, with buff edges to the feathers, to a pale ashy grey in old birds.

The under parts of the young plumage are white with brown centres to the feathers, the upper breast being much more marked than the abdomen, and the marking practically disappearing at the lower tail-coverts.

The breast of an old bird becomes almost rusty red, beautifully pencilled and barred, and the upper surface is almost uniformly ashy grey throughout.

"Bill bluish dusky at the tip; cere bright yellow; irides yellow, becoming deep orange in old birds; legs and feet yellow." (Blanford.)

Measurements.

Length of females about 14; tail 7; wing 8.25; tarsus 2; bill from gape 0.8. Males—the length is about 12.5; wing 7. (Blanford.)

Habits, etc.

The Shikra is a common feature of almost every grove and garden in the Punjab. It ascends far up into the Himalayas, but I do not think they are even locally migratory, as I have known couples to breed in the plains, year after year in the same spot. It lives on lizards, mice and small birds in its wild state and I have seen this species eating a frog.

This without exception, is the most easily tamed and trained bird of all hawks and falcons and wonderfully hardy. With care and trouble it is possible to hunt this bird within 10 days of its capture, and I have had one coming to the hand on the third day.

The Shikra might often be seen soaring high up in the heavens and has the same habit as the rest of the true hawks of flapping vigorously after accomplishing a few circles on steady wings. The long tail and short rounded wings show him to be a hawk at once, but the Shikra and the Sparrow-Hawk are not easily separated unless they pass very near.

During the breeding season the Shikra is very noisy and its call of two notes, "titu titu" can be heard all over the place and at this season it assumes a most extraordinary flight at times.

The wings, slightly bent, are held far above the level of the back and it progresses in a succession of very slow deliberate beats.

This species must prey a good deal on the Indian Babbler the "Seven Sister" of the European, in this country, as every Shikra is anxious to get at them as soon as he hears them, but easy though they must be to catch, the Shikra has his work cut out to retain its quarry. The moment one is caught, the remainder of the flock rush to the rescue of their "Sister." With feathers fluffed out and wings drooping and tail spread the entire sisterhood come to the attack and the Shikra is struck from every side of the compass at one and the same time. I have had a tame Shikra knocked clean over on to his back and made to release his hold and seek shelter from the infuriated mob. If he can take his prey

away at once and fly across an open bit of country or get into very thick scrub, he is probably left in peace, but otherwise he finds it no easy matter to retain his meal. Though slow in flight, the babler is extremely quick in sharp sudden attacks at close quarters.

The Shikra breeds in trees from April to June building a nest of twigs and sticks lined with grass, roots and laying usually 3, sometimes 4, smooth, bluish-white eggs, usually unspotted, very rarely with a few small greyish specks, and measuring 1.55 by 1.22.

Like the Goshawk, the Shikra is not lacking in pluck and dash and can be trained to quarry bigger and stronger than itself.

Crows and partridges can be taken by a Shikra and Dr. Blanford quotes Jerdon as stating that even young peafowl and small herons do not come amiss, but personally I have never seen one take anything bigger than a crow or a partridge, though I have seen one pull down a wounded Great Stone-Plover which could just fly.

Genus ACCIPITER.

No. 1247 *Accipiter nisus*. The Sparrow-Hawk.

Characteristics.

Size small, length of female about 15": wing 9½": of male, length about 13: wing 8. Tip of primaries in closed wing reach to about half way down the tail: bill from gape about half mid-toe without claw. There is a vast difference between the tarsi of *Astur* and *Accipiter*, that of latter being very much thinner and the mid-toe longer. "Five or six dark bars, one terminal, on 4th, quill in adults: no gular stripe."

Colouration.

Adult male. "Upper parts slaty grey, some birds darker than others, the white bases of the feathers showing more or less on the nape and supercilia; feathers of scapulars, rump and upper tail-coverts, and sometimes of the back, dark-shafted; quills dark brown above, whitish beneath, with broad blackish cross-bands: tail generally with 4 (sometimes 5) cross-bars on the middle feathers, 5 or 6 on the outer, the last bar broadest and sub-terminal, tips of feathers white; lower parts white or buff, the lower parts more or less distinctly dark-shafted: breast and flanks very often suffused with rusty red, the throat with a few dark shaft-lines; the breast, abdomen and thigh-coverts rather irregularly barred with rufous brown, the bars usually as broad as the interspaces, but in very old birds either rusty red or narrow and dark brown; under tail-coverts white."

Adult females are browner above and less rufous beneath, with the dark shafts to the feathers more conspicuous.

Young birds are brown above, the feathers with rufous edges at first, the white very conspicuous on the nape and supercilia; lower parts white, buff, or brownish-buff, feathers of the breast, abdomen, and lower wing-coverts with dark shaft-stripes and spade or heart-shaped rufous-brown spots with dark edges; these spots pass into bars.

"Bill bluish-grey; cere, legs, and toes yellow, claws black; irides yellow in young birds, orange in old." (Blanford.)

Measurements.

"Sexes very different in size. Length of female about 15"; tail 7"; wing 9.5; tarsus 2.4: mid-toe without claw 1.6; bill from gape .85: in the male, length about 13; tail 6.5; wing 8; tarsus 2.1." (Blanford.)

Habits, etc.

The Sparrow-Hawk, the *Basha* of the Indian falconer, is another favourite and a good many are caught in the nets set for Goshawks, in the Himalayas and brought down for sale. This species is more given to hunting in forests than is the Shikra and may often be seen flying very low to the ground and very fast, in the mornings and evenings. The Himalayan variety (Hume's *melanoschistus*) is a very dark coloured bird, almost black above and deep rusty red beneath. Mr. A. E. Jones, of Simla, has found the species breeding in the vicinity of Mahasu and the Catchment area, (Simla) but how far this "Himalayan variety" extends east or west of Simla I am unable to say.

The flight of the Sparrow-Hawk while hunting is unlike that of a Shikra, but while soaring the two resemble each other very closely.

In the hand, the very thin tarsi and the long thin mid-toe separates this genus from *Astur*, at once.

In the forest, like the Goshawk, this species drops from a branch, flies very low and shoots almost vertically up into the tree it selects to alight in.

The "Basha" is a better bird than the Shikra for purposes of sport, being faster and following its quarry for longer distances. Doves appear to be the favourite food of the female Sparrow-Hawk, in its wild state, and bunches of feathers dotted about among the trees where a pair of these hawks have made their home, tell their own tale.

Hawks and falcons, even when soaring or flying from place to place, have their eyes on every point of the compass, and only the other day, I was watching a Sparrow-hawk, which flew close over my head, when it suddenly turned sharp round, increased its pace and dashed into a tree some hundreds yards away in its rear. A crowd of shrieking parroquets dashed out of the branches and I saw the hawk flutter to the ground as though it had got one in its talons. I went up to see and found it was a dove that had been caught and not a parrot. The hawk had been flying in absolutely the opposite direction

when its keen eyes must have seen the dove go into the tree, as it certainly could not have seen it sitting there, among the branches. The tree was a mango and thickly foliated.

The call of the Sparrow-Hawk is very different to that of the Shikra and is composed of two long notes followed by three or four very short ones repeated in quick succession, something like "tin tin ti titi".

The "bashin" the male of the sparrow-hawk is very much smaller than the female and I have never seen it used for hawking.

This species builds in the Himalayas from about 5,000 ft. elevation upwards, in trees, and Blanford says it often takes possession of a deserted crow's nest and "lays usually 4 eggs, but sometimes as many as 6 or 7. These are bluish-white, oval, much spotted and blotched with rufous-brown, especially towards the broader end, and measure about 1.7" by 1.3."

No. 1218 *Accipiter virgatus*. The Besra Sparrow-Hawk.

Characteristic.

Size small, wing 7 to 8" ; tip of primaries in closed wing reaching only about half way down the tail. Bill from gape about half mid-toe without claw ; a gular stripe usually present ; 7 or 8 bars on 4th quill in adults.

Colouration.

Very similar to the preceding species in some of its various phases of plumage, but usually darker resembling more the Himalayan variety of *A. nisus*, except for the gular stripe and the extra bars on the 4th quill.

"Bill leaden grey, blackish at the tip, cere pale lemon-yellow ; irides bright yellow, orange in old birds ; legs and feet yellow." (Blanford)

Measurements.

"A Himalayan female measures:—length 14.5 ; tail 7" ; wing 8 ; tarsus 2.5 ; mid-toe 1.5 : bill from gape 1.7 ; the male is smaller, tail 5 ; wing 6.75." (Blanford)

Habits, etc.

Personally I am not at all familiar with this species and have only seen two to my certain knowledge.

One little male was identical with the male of *A. nisus* in the dark Himalayan plumage. It lacked the gular stripe but had 7 distinct bars on the 4th quill. The second was a young bird in the possession of a falconer, said to have been caught in the Kangra hills.

The *Bera* and *Dhooti* as the male and female are respectively called, are frequently taken in the nets erected for Goshawks, in the Kangra District, but as often released. My old falconer was familiar with the species and had a very high opinion of it and considered the female better than the *Basha* (*A. nisus*) being faster and more tenacious but others again and particularly some of those who catch and

sell hawks, in the Kangra District, have told me that there is no demand for them and that when caught in the nets they generally release them though they always keep the *Basha*.

Out of the dozens of the smaller hawks I have caught in various parts of the Himalayas, the little male above referred to is the only one that I have ever succeeded in catching, and yet it does not appear to be very rare and is certainly widely distributed all over the Himalayas, Mr. Hume recording specimens from Gurhwal, Murree and Lahore.

Nothing appears to be known of its breeding in the Punjab though Blanford records nests taken in Sikkim and Ceylon, both nest and eggs resembling those of the preceding species.

To be continued.

NOTES ON THE NIDIFICATION OF CERTAIN BIRDS IN LADAK.

BY

F. LUDLOW.

The following notes were collected on a shooting trip from Srmagar to the Tso-Morari Lake in Rupshu, and a return journey *via* the Wakka Nallah, Suru, and the Wardwan, during the spring and summer of 1919.

In the majority of instances where clutches were taken the parent bird was shot off the nest and identified as far as possible with Blanford and Oates. Where doubt existed the bird was skinned and forwarded to the Society for identification, whilst Mr. E. C. Stuart Baker very kindly went through the eggs and gave me the benefit of his expert opinion.

The Raven, *Corvus corax tibetanus*.

Fairly common in Central Ladak and Rupshu where it breeds in cliffs in late winter. Fully fledged young seen out of the nest with the parent birds on the shores of the Tso-Morari Lake in early May.

The Jungle Crow, *Corvus coronoides intermedius*.

Nests at Kargil on 18th April 1919 and at Leh on 23rd April 1919, both in poplar trees.

The Jackdaw, *Corvus monedula collaris*.

The only place at which I encountered this species beyond the Western Himalayan barrier, was at Dras on 15th April 1919 where I observed a pair in the neighbourhood of the rest-house.

The Magpie, *Pica pica bactriana*.

Seen directly one crosses the Zoji La., and never lost sight of in the main or side valleys until the treeless Rupshu country is reached. One of the commonest birds in Ladak. I found a single pair at Gya (Alt. 13,500 feet) inhabiting the only tree the place boasts of. Breeds in willows and poplars and occasionally in bushes. Found it building at Kargil on 18th April 1919 and took a clutch of 6 eggs at Mashoo near Leh on 28th April 1919. Eggs measure 35—34×24 mm. Its more Eastern congener, the Black-rumped Magpie of Thibet was not met with.

The Red-billed Chough, *Pyrrhocorax pyrrhocorax*.

Common in Central Ladak and Rupshu where it lays in April and May. One clutch of 3 incubated eggs taken at Meroo midway between Upshi and Gya, at an altitude of about 13,000, on 14th May 1919. Nest in cliff, built of sticks and lined with wool. Eggs are a very pale salmon pink blotched with brown and with secondary purple markings, not unlike those of the common Sandgrouse in colour. They measure 40·5—41×27·5 mm.

Breeds in the town of Leh itself as on 13th June 1919 I saw parent birds feeding their young in the holes of a large kind of 'Hlato' about 500 yards South of the main bazaar.

The Yellow-billed Chough, *Pyrrhocorax graculus*.

Retires during the latter half of May to breed in the most inaccessible cliffs, one spot being the crags overlooking the village of Bhot Karbu, and another, the stupendous perpendicular cliffs of the Wakka Nallah.

The most accessible breeding haunt of this bird which I encountered was in small cliffs on the left bank of the Wakka River, a mile or so beyond the village of Paskyum near Kargil, but even here ropes would be a necessity.

This chough appears to be more gregarious than *pyrrhocolax*. I do not remember having seen it in Rupshu, although it possibly occurs there.

Hume's Lesser White-throated Warbler, *Sylvia althaea*.

Took a nest containing two fresh eggs at Shushot near Leh on 10th June 1919. Nest cup-shaped, of dried grass lined with a few hairs, and placed in a low bush two feet from the ground. Eggs greenish-white spotted with yellowish-brown at the broad end, and possessed of a few slatish secondary markings. Eggs measure 18.75×12.75 mm. Altitude 10,600 feet.

Tickell's Willow-Warbler, *Phylloscopus affinis*.

Two clutches each containing four eggs taken in the Wakka Nallah on 28th June 1919 and 30th June 1919. Eggs slightly incubated. Nests, elongated ovals composed of dried grass, lined with feathers and with a side entrance, placed in low bushes about two feet from the ground. Eggs white, sparingly spotted with brownish-red. In the second clutch one egg was pure white. Eggs measure $14.75-16 \times 12$ mm. Altitude about 12,500 feet.

The Brown Willow-Warbler, *Phylloscopus collybita tristis*.

Very common above and below Leh between 10,000 and 12,000 feet. Numerous clutches taken in June and July. Normal number in clutch 4. Nest similar to that of *affinis*. Eggs, white, spotted with rusty-red, measure $15.5-16 \times 11.5-12$ mm.

The Plain Willow-Warbler, *Phylloscopus neglectus neglectus*.

A single clutch containing four eggs taken at Marshalong near Leh on 6th June 1919. Nest of the usual *Phylloscopus* type. Eggs, white, spotted with rusty-red, measure $14.5-15 \times 12-12.5$. Altitude about 11,500 feet.

The Olivaceous Willow-Warbler, *Phylloscopus indicus indicus*. ?

A single clutch of 4 eggs taken on 23rd June 1919 at Bhot Karbu. Nest of the usual *Phylloscopus* type but placed on the ground amidst grass in the bed of a river. Eggs similar to those of *tristis* but measure $17-16.5 \times 12-11.75$ mm. The correctness of this identification is open to doubt, as I failed to obtain the parent bird after having had two shots at it. From the colouration, size and general behaviour of the bird, I, however, suspected it at the time to be *indicus*, and Mr. Stuart Baker after having examined the eggs is very much inclined to agree with me.

The Large Crowned Willow-Warbler, *Acanthopneuste occipitalis*.

A single clutch of 4 eggs taken in the Wakka Nalla on 28th June 1919. Nest composed of dried leaves and grass lined with thin soft dry strands of grass placed in a low bank beneath the exposed roots of a willow. Eggs, pure white, bluntly pointed at the fine end, measure $16-15.25 \times 12.50-12.25$ mm. Altitude 12,500 feet.

The Indian Oriole, *Oriolus oriolus kundoo* ?

An oriole straggles as far as Leh during the summer but is far from being common. I never met with its nest or secured a specimen of the bird, and it might possibly turn out to be the European Oriole.

The Siberian Chat, *Enanthe pleschanka*.

Two clutches taken, each containing four eggs. First nest taken on 25th May 1919 in a hole in a rock on the Ooti Plain near the Tso-Morari lake at an altitude of 15,500 feet. Second nest taken in a 'mani' wall at Thugji on the Tsokr Chumo lake on 2nd June 1919 at an altitude of 14,900 feet.

Nests of dried grass lined with a mixture of wool, hair, and feathers. In both instances the eggs were hard set with embryos about a week old. Eggs, light blue, with small brownish-red spots at the broad end, measure $21-22 \times 15.5-16$ mm.

The Desert Chat, *Enanthe deserti atrogularis*.

A single clutch taken at Upshi, 40 miles from Leh, on 6th June 1919. Nest constructed in a hole of a stone support to the bridle path, and composed of the same material as in the case of *pleschanka*. Eggs light blue, very similar to the last named species, but the brownish-red spots tend to fuse into a ring at the broad end. Eggs measure 23 by 16 mm. Altitude about 11,800 feet.

The Indian Redstart, *Phœnicurus ochrurus rufiventris*.

A very common bird indeed from Suru to Rupshu, breeding from May to July in holes in banks and beneath stones on the steep mountain side. In Ladak it has a special predilection for the 'mani' wall as a nesting site. Nests of dried grass lined with wool, hair and feathers. Numerous clutches taken. Normal number in clutch 4-5. Eggs pure cambridge blue, generally unspotted, but I found one clutch at Gya on 5th June 1919 in which the eggs were very faintly marked with minute reddish-brown spots. Eggs measure 22-19.5 × 14-15 mm.

The Indian Blue-throat, *Cyanosylvia suecica abbotti*.

Two nests found at Bhot Karbu on 24th June 1919. The first contained 4 very much incubated eggs, the second 4 newly hatched young. Nests placed on the ground amongst long grass and low bushes, cup-shaped and built of dried grass. The eggs are described by Blandford as being "blue spotted with reddish brown", but the eggs I have before me are *sage green suffused* with reddish-brown. Distinct spots are not apparent. Eggs measure 19.75-20.25 × 14.75-15 mm. Altitude 11,500 feet.

The White Spotted Blue-throat, *Cyanosylvia suecica pallilogularis*.

Nest containing 4 slightly incubated eggs obtained at Mulbek, a day's march from Bhot Karbu on 25th June. Nest and eggs similar to that of *abbotti* except that the eggs are more olive than sage-green. Eggs measure 19.75-20.25 × 14.75-15 mm. Mr. Stuart Baker remarks 'in epistola' "the breeding of these two birds within the above limits is remarkable and points to the fact that they should be regarded as true species and not races." As Ward records this bird as a rare breeder on the Shyok River in Ladak, it appears that the *trinomial*s should be dispensed with.

The Himalayan Ruby-throat, *Calliope pectoralis pectoralis*.

A nest containing 3 fresh eggs was taken at Donore, which lies midway between Suru and the summit of the Bhot Khol Pass on 11th July 1919 at an altitude of about 12,000 feet. The nest was composed of dry grass and placed on the ground underneath a boulder.

Two of these eggs are pale blue very faintly freckled with reddish-brown and are those of *pectoralis*. They measure 22 × 16 mm. The 3rd egg is a specimen of *Cuculuscanorus telephorus* and measures 24.5 × 18 mm. It is pale blue *spotted* with reddish-brown. This cuckoo was not frequently seen and heard around Suru and in the Rungdum Valley, but I did not come across it in the Upper Indus Valley around Leh.

The Grey-headed Ouzel, *Merula castanea*.

Nest of 3 fresh eggs taken at Chengher in the Wardwan Valley on 24th July 1919 at an altitude of about 7,000 ft. Nest, composed of twisted twigs and roots intertwined with dead leaves, and lined with green needles of a pine, was placed on the top of a stump of a tree amongst thick jungle about 5 ft. from the ground. Eggs light green covered with brownish-red smudges; 3 measure 29 22.5 mm.

The Robin Accentor, *Laiscopus rubeculoides*.

Nest with 3 eggs taken toward the head of the Umlah Nallah near Leh on 18th June 1919 at an altitude of about 13,000 ft. Nest placed on the

ground and composed of dried grass lined with hair and small particles of moss. Eggs, turquoise blue, measure $20.5-21 \times 15.5$ mm.

The Rufous-breasted Accentor, *Laiscopus strophiatu*s *jerdoni*.

Nest with 3 eggs taken on 6th July 1919 near Suru at an altitude of about 11,000 feet. Nest and eggs similar to above. Eggs measure $20.5 \times 14.5-15$ mm.

Adam's Mountain-Finch, *Montifringilla nivalis adamsi*.

Nest taken at Mashoo near Leh on 9th June 1919 containing 4 eggs much incubated. Nest on the ground underneath a large stone, built of dried grass and lined with a profusion of feathers. Eggs pure white and measure $22-23 \times 16-16.5$. Altitude 11,500 feet.

A second nest at the foot of the Foti La near Lamayuru in a 'mani' wall contained feathered young on 23rd June 1919. A third nest also with young was found in a cleft in the rocky hillside at the foot of the Namika La on 24th June 1919. This bird is not uncommon in Central Ladak and affects rocky nallah beds, especially those which contain water, at an altitude of 10,000—13,000 feet.

Blandford's description of this bird breeding in *long dykes* in which the Tartars bury their dead probably refers to the 'mani' walls, so common a feature of Ladak scenery; but I do not think they enclose Tartar dead but are erected rather to commemorate some pious Lama.

? House Sparrow, *Passer*?

A species of House Sparrow is common in Central Ladak, and was seen also around the Champa encampments on the shores of the Tsokr Chumo Lake in Rupshu at an altitude of 15,000 feet. I regret I did not secure specimens. *Passer cinnomeus* does not cross the Western Himalayan Range—at least I did not encounter it, although it is common in the Wardwan.

The Eastern Meadow-Bunting, *Emberiza stracheyi*.

Nest containing two fresh eggs taken in the Rungdum Valley near Suru on 4th July 1919 at an altitude of about 13,000 feet. Eggs measure $23.25 - 23 \times 16.50$ mm.

The Crag-Martin, *Ptyonoprogne rupestris*.

Common but nests in most inaccessible places. Took a single egg from a nest in the Wakka Nallah on 27th June 1919, at an altitude of 12,000 feet. Egg white with reddish-brown spots. Measures 20×14.50 mm.

Hodgson's Pied Wagtail, *Motacilla alba hodgsoni*.

Common. Nest, at Bhot Karbu on 23rd June 1919, built on the ground underneath a stone in a dry portion of the river bed, containing 3 newly-hatched young and one egg on the point of hatching. At Bazgo near Leh on 19th June 1919, I saw parent birds feeding young out of the nest.

Hodgson's Yellow-headed Wagtail, *Motacilla citreola citreoloides*.

Common in Central Ladak and Suru in swampy localities between 10,000 and 13,000 feet. Nest in the majority of cases on the ground amongst long green grass and small bushes, occasionally in a bank. Nest composed of dried grass lined with hair. Numerous clutches taken. At Shushot near Leh I found this bird building on 11th June 1919. At Mulbek on 24th June 1919 I took a nest of 4 fresh eggs. At the village of Parkutse above Suru on 5th July 1919 I found this bird breeding in abundance near the water channels in the fields. The normal clutch appears to be 4 but two nests were found here each containing one incubated egg, a third nest with one young one, a fourth with one egg and one young one, a fifth with 3 fresh eggs and a sixth with 4 much incubated eggs.

Half way up the Bhot-Khol Pass, at a spot called Donore, on 11th July 1919, I came across four nests of this bird. The first contained fully fledged birds able to fly, the second feathered young still in the nest, the third three fresh eggs whilst the fourth had only just been built and contained nothing.

Blandford states that "the two sexes of this bird are pretty certain to be alike in plumage." This is not the case in the breeding season at any rate. The ♀ differs remarkably from the ♂, in that the whole undersurface and the head are only tinged with yellow, whereas in the ♂ these parts are deep yellow. Eggs measure 21·50—20·50×16·25—15 mm.

(Note.—Since writing the above my attention has been drawn to the fact that Whitehead in the Ibis of 1909 has written to a similar effect with regard to the colouration of the sexes, and I have been persuaded to let the above stand for the purpose of independent corroboration.)

The Long-billed Horned Lark, *Otocorys longirostris*.

Nest taken in the Rungdum Valley on 5th July 1919 at an altitude of about 12,000 feet. Two eggs in the clutch, much incubated. Nest on the ground underneath a stone, very small, cup-shaped, lined with hair and dry grass. Eggs, a dirty white mottled with chocolate-brown, measure 25·55×17·25 mm.

Elwes's Horned Lark, *Otocorys elwesi*.

Nest with 2 eggs found whilst ascending the Thasangi La in Rupshu on 3rd June 1919 at an altitude of 16,000 feet. Nest built on the ground underneath a small "gabshun" bush, composed of dried grass lined with the pappus growth of the "gabshun" seed. Eggs, of the same colour as *longirostris* but are much less attenuated, measuring 22—22·5×17—17·5 mm.

Large numbers of these birds were seen feeding in the fields of the Indus Valley above Leh early in May at an altitude of about 11,000 feet. When I returned a month later they had all disappeared.

The Sky-Lark, *Alauda arvensis cinerea*.

Common in the Upper Indus Valley above and below Leh wherever there is cultivation. Clutch at Shushot on 10th June 1919 and another at Nimu on 14th June 1919, both with 3 eggs which measure 24×16—16·25 mm.

The Blue Rock-Pigeon, *Columba livia livia*.

This and the next species seem equally abundant both in Central Ladak and Rupshu, breeding for the most part in inaccessible precipices.

The Blue Hill-Pigeon, *Columba rupestris*.

Found an empty nest at Thuji on 2nd June 1919 in cliffs overlooking the Champa encampment. A frail structure composed of a few twigs placed in a hole of the cliff. Common everywhere above and below Leh and greatly preferable to *livia* for the table.

The White-bellied Pigeon, *Columba leuconota leuconota*.

Fairly common in the Wakka Nallah and around Suru but I do not remember having seen it in the Indus Valley above Leh or in Rupshu.

The Thibetan Sand-Grouse, *Syrrhaptes tibetanus*.

I only saw two pairs of this bird during the month I spent in Rupshu.

The Chuckor, *Alecteris graeca pallida*.

Common and breeds everywhere.

The Thibetan Partridge, *Perdix hodgsonia*.

Common between the Polokonka Pass and the Tso-Morari Lake, especially in the Puga Valley near the sulphur and borax deposits. It frequents 'trama' bushes in the valley beds and is very loth to take wing. Not

seen below 15,000 feet. By the end of May it had paired off but had not commenced to nest.

The Black-necked Crane, *Grus nigricollis*.

I saw three specimens of this crane on the Tsokr Chumo Lake in Rupshu on 2nd June 1919. I succeeded in shooting one whose head and wing I brought back for identification. The Champas informed me it bred there. Its call note is very similar to that of *communis*.

The Ibis-bill, *Ibidorhynchus struthersi*.

Saw several specimens of this strange bird in and near the islands of the Maroo River just below Inshin in the Wardwan Valley in July 1919. It is a sure find here as I have seen it in this neighbourhood on two previous occasions.

The Eastern Redshank, *Tringa totanus eurhinus*.

Seen in pairs on the Tsokr Chumo Lake, Puga Valley, Tso-Morari Lake and Ooti Plain, but it does not breed in these places until after the month of May.

Came across large numbers of this bird in the Rungdom Valley above Suru on 5th July 1919. Found two empty nests in the midst of small bushes amongst the swamps. From the behaviour of the parent birds, and the piercing cries they uttered, it appeared as though their young had been hatched.

The Himalayan Solitary Snipe, *Gallinago solitaria*.

Shot a specimen in the Puga Valley in Rupshu where it doubtless breeds.

The Fantail Snipe, *Gallinago caelestis*.

Shot a specimen in May 1919 on the Ooti Plain beyond the Tso-Morari Lake in Rupshu. This was the only specimen I saw in Rupshu.

The Brown-headed Gull, *Larus bruneicephalus*.

Abundant on the Tsokr Chumo and Tso-Morari Lakes, but it had not commenced to lay by the end of May.

The Common Tern, *Sterna hirundo tibetanus*.

Pairs seen in the Rungdum Valley on 5th July 1919 but no eggs taken.

The Bar-headed Goose, *Anser indicus*.

Common on the Rupshu Lakes where it breeds in June.

The Brahminy Duck, *Casarca rutila*.

One of the commonest birds in Rupshu breeding in holes in the surrounding mountains, often at a great altitude and at a considerable distance from water. The Ladaki is an omnivorous feeder but this is one of the few animals he will not touch.

The Goosander, *Merganser castor*.

Fairly common along the banks of the Indus above Leh and on the Rupshu Lakes. The crops of a pair of birds I shot were full of a species of eel-worm. Breeds here.

SOME NEW INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S.

During the year, 1919, quite a number of new species have been added to the list of Indian *Odonata* and amongst them are two new species of *Gynacantha*. One of these, viz., *G. bainbriggi*, was taken by Mr. Bainbrigge Fletcher at Gauhati, Assam, the other species by myself at Poona, of which the following is the description:—

Gynacantha millardi, sp. nov.

Several males and females, Poona, Bombay, Deccan, October-November and February to March.

Male and female alike.

Head labrum, face and frons pale green without any markings. (The usual T-shaped mark is absent in this species.) Eyes in juvenile specimens a deep blue, in adults an olive green with a dark brown cap above.

Prothorax and *thorax* bright foliage green, the female having a brownish tinting on the dorsum. No markings whatever.

Abdomen a pale fawn, the sides of the first three segments green as in the thorax and more so in the male than in the female. Oreillets brown.

Anal appendages very narrow and long, especially in the male, fringed internally with loughish hairs. Legs brown.

Wings long and broad, hyaline, stigma a pale brown. Forewing with 19 annodals, hindwing 14, forewing with 13 postnodals, hindwing 15, hypertrigones with 3 nervures, trigones with 3, the inner with a nervure running from its centre to the proximal side, loop with 10 cells.

Length of hindwing 44 mm., of abdomen 46 mm.

This species is a night-flyer, not appearing on the wing until dusk, after which it can be seen for a long time silhouetted against the sky as it flits swiftly up and down. Its principal food appears to be mosquitoes. There appear to be two broods during the year, the one appearing in October and lasting until the end of November, the other in February when teneral specimens are seen. It is moderately plentiful during the whole of March and disappears abruptly from the beginning of April.

Tribe AGRIONINI.

Mortonagrion, gen. nov.

Head not bearing any post-ocular spots but the eyes margined inwardly and narrowly with bright colouring.

Prothorax simple, the posterior lobe large and prominent, broadly arched.

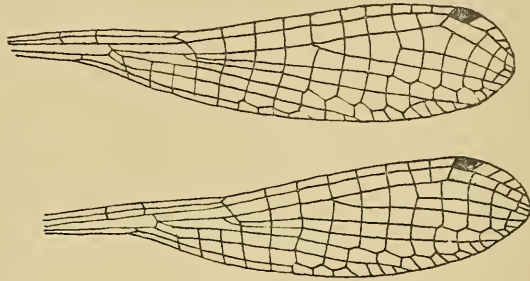
Thorax with the anterior border laminated and projecting forward to mesh with the posterior lobe of the prothorax.

Abdomen very slender, very gradually dilating from the 7th to the 10th segment. Anal appendages highly specialised, 10th segment with a bifid dorsal tubercle.

Wings hyaline, petiolation ceasing proximal to "ac", stigma equal in both wings, rhomboidal but the distal and posterior borders rather longer than the proximal and costal respectively, arc distal to the 2nd antenodal nervure, its distance from that nervure being equal to the length of the costal border of the quadrilateral, postnodal nervures 7 to 9. "ac" nearer to the 2nd antenodal nervure in the hindwing, about midway in the forewing,

meeting "ab" well distal to its commencement, "ab" continued outwardly in the same straight line as "Cu2", that is to say, the junction of the two is not angulated. Quadrilaterals differently shaped in the two wings, that of the forewing being more angulated and with the costal border only half the length of the posterior, that of the hindwing with the costal border two-thirds the length of the posterior. Female without a ventral spine to 8th segment.

Mortonagrion varralli, sp. nov.



Fore-and hind-wings of *Mortonagrion varralli*.

Several of both sexes from Pawai Lake near Bombay, 14th March 1920.

Male. Length of abdomen 23-25 mm., of hindwing 14-15 mm.

Head, labrum and epistome pale blue, vertex pale reddish brown, occiput a similar colour except for a small, oval spot of pale blue bordering the eye inwardly. Eyes slaty blue with a reddish tinge above.

Prothorax reddish brown, pale blue at the sides and narrowly anteriorly.

Thorax pale reddish brown on the dorsum and upper part of sides. A narrow, pale blue humeral stripe. The sides pale blue except for a diffuse pale brown stripe on the 2nd lateral suture. Legs pale brown.

Abdomen similar in colour to the thorax. Fine, apical, dark brown annules to all segments. The ground colour deepens dorsally near the apex of each segment, but there is a clearer annule between this deepening and the brownish black annules. These latter followed by fine, pale blue, basal annules which on the 8th segment lengthens to cover about two-thirds of the segment. The apical border of this conspicuous blue marking deeply notched in the mid-dorsal line. The sides of the 1st and 2nd segment pale blue. Beneath whitish.

The dorsal, apical border of the 10th segment presenting a bifid tubercle very similar to that of *Ischnura senegalensis*. The anal appendages seen from above show the superior divaricating, the inferior converging, superior slightly shorter than the inferior, broad at the base, truncated and directed downwards to almost meet the inferior, the latter broad at the base, tapering strongly and curving inwards so that their tips almost meet, curving upwards.

Female exactly similar to the male except for the blue marking on the 8th segment which covers only one-third of it and has a diffuse unnotched border. No spine on the ventrum of the 8th segment.

Hab. In dark, shady jungles, keeping amongst undergrowth. Never comes out in the sunlight. Breeding apparently in wells. Pawai and Vihar Lakes near Bombay.

Pseudotramea prateri. sp. nov.

1 ♂ from Turzum Tea Estate, Darjiling, coll. O. Lindgren.

Head globular; eyes broadly contiguous, reddish brown above blackish brown at the sides and beneath; suture flush; face broad and flattened yellowish brown, the labrum ochreous and edged with black which has a metallic sheen; vesicle high, flattened at the summit, not notched, ochreous; occiput small, reddish brown.

Prothorax small, hidden completely.

Thorax bulky, coated with long, coarse hair, reddish brown on the dorsum, golden brown at the sides where the lateral sutures are mapped out obscurely with broken, black lines.

Legs black. The hind femora with a row of *ca* 20 short, robust and gradually lengthening spines, tibial spines long and numerous, claw hooks robust, situated near the end of the claws.

Wings long and tapering, reticulation close, node slightly proximal to the middle of wing, trigone in the forewing nearly 3 cells distal to the line of the trigone in the hind, trigone in forewing very narrow, its costal side much less than half the length of the proximal, traversed once only; trigone in the hindwing narrow, entire, its proximal side convex outwards and in line with the arc; sectors of arc separate nearly to their origins in the forewing, a long fusion in the hind; arc between the 1st and 2nd antenodal nervures; antenodal nervures $11\frac{1}{2}$ - $12\frac{1}{2}$, the final incomplete, the distance between the first two much greater than between the others; only 1 cubital nervure to all wings; no supplementary nervures to the bridge; stigma brownish, that of forewing nearly twice as long as that of the hind; 4 rows of cells in the discoidal field which is of even width throughout; sub-trigone in the forewing nearly square, formed of 6 cells; Rspl. very strongly arched, 3 rows of cells between it and Rs.; Mspl. well developed strongly curved in the forewing, flattened in the hind; the Rs. and M4. nervures strongly curved towards the termen near their ends, in the hindwing, M4. and Mspl. approximate at the angulation; loop very long and narrow, the toe not markedly broadened, divided cells at the trigone and external angle; anal area distinctly divided up into an outer area of more open cells and an inner of closely packed, flattened cells arranged in oblique rows. No basal markings whatever to either wing, the whole wing being hyaline except for a single cell in the anal angle which is brown and chitinous. Length of hindwing 46mm.

Abdomen 32 mm., without the anal appendages which are 4 mm. in length. Transverse ridges on the 2nd and 3rd segments, 1st and 2nd segments dilated, especially dorso-ventrally, 3rd and 4th slightly constricted and the remainder tapering to the end, a golden brown in colour, the apices of all segments and the dorsal surfaces of the 8th to 10th segments black. Anal appendages bayonet-shaped, the superior twice as long as the inferior, brown.

Sexual organs of the male, *tramea*-like. Lamina depressed and broad, not fissured; tentaculæ carrot-shaped, long and tapering and ending in a short, downwardly curved spine. The ends divergent, the external tentaculæ obsolete. Lobe long, high and narrow.

This specimen, which is closely allied to *Tramea*, differs from that genus by the greater separation of the sectors of the arc, by the wide space and number of cells between Rs. and Rspl. by having transverse ridges only on the 2nd and 3rd segments and none on the 4th and by the wings being quite immaculate. The latter characteristic is not due to age as the specimen is fully adult. I have named it after Mr. S. H. Prater of the Bombay Natural History Society's staff.

Protosticta lindgreni, sp. nov.

1 ♂ from Turzum Tea Estate, Darjiling.

Head labrum and antoclypeus pale greenish white, the former bordered with black; remainder of head a shiny black with a bluish metallic reflection; the ocelli bright amber and very conspicuous in their dark setting; eyes pale yellow with a black cap above and a narrow, black, equatorial belt.

Prothorax black with a broadish, pale yellow, subdorsal stripe on each side.

Thorax black on the dorsum, yellow at the sides. A black line along the lateral suture. Legs yellow, the extensor surfaces black. Wings hyaline, stigma blackish brown, postnodal nervures in forewing 16.

Abdomen very long and attenuated, almost as long as in *P. gravelyi* Laid. 1st segment black on the dorsum, the sides and an apical annule yellow, 2nd segment broadly black on the dorsum, the sides yellow, 3rd to 10th segments black at the apices, yellow at the base, these two colours gradually blending into one another.

Anal appendages, yellowish, of about equal length, equal to the length of the last two abdominal segments or nearly so. The superior broad at the base and with the outer half bent sharply downwards and shaped like the blade of a kukri; the inferior shaped like the horns of stag-beetle, twisted at the middle and convergent at the apices. A long spiny process springs from just beyond the middle of each process on its inner side and almost meets its fellow across the middle line. At the base of the inferior appendages is a short, stout spine directed backwards and upwards.

This single specimen is named after Mr. O. Lindgren of Darjiling to whom I am indebted for it. It bears a superficial resemblance to *P. himalaica*, Laid. but an examination of the anal appendages serves easily to distinguish them.

A TENTATIVE LIST OF THE VERTEBRATES OF THE
JALPAIGURI DISTRICT, BENGAL.

BY

CHAS. M. INGLIS, F.Z.S., M.B.O. U., W. L. TRAVERS, H. V.
O'DONEL, M.B.O.U. AND E. O. SHEBBEARE, I.F.S.

Part III.

(Continued from page 999, Vol. XXVI).

- Barn-Owl (1152), *Strix flammca*.—Uncommon.
 Grass-Owl (1153), *Strix candida*.—Common in grass land.
 Brown Fish-Owl (1164), *Ketupa zeylonensis*.—Common along riverside forest.
 Forest Eagle-Owl (1170), *Huhua nipalensis*.—Found in the forest, but not often seen.
 Scop's Owl (1173), *Scops giu*.—Common and extends well into the plains.
 [Spotted Himalayan Scop's Owl (1175), *Scops spilicephalus*.—Only shot in the Terai.]
 Collared Scop's Owl. (1178), *Scops bakkamena*.—Very common. This owl has two distinct calls; one the usual call of three or four notes and the other a single note sounding like *wot* repeated at slow intervals.
 Spotted Owlet (1180), *Athene brama*.—Common near habitations, but not in the forest.
 Large Barred Owlet (1183), *Glaucidium cuculoides*.—Noticed in the forest.
 Jungle Owlet (1184), *Glaucidium radiatum*.—Very common.
 Collared Pigmy Owlet (1186), *Glaucidium brodiei*.—Uncommon. It extends well into the plains.
 Brown Hawk-Owl (1187), *Ninox scutulata*.—Very common. It has a fine call note sounding like *pow oof*, *pow-oof*.
 The Osprey (1189), *Pandion haliaëtus*.—A few pairs seen along the principal rivers and occasionally over small pieces of water. The latest date of departure noted by O'Donel was the 9th of June.
 Cinereous Vulture (1190), *Vultur monachus*.—Occasionally descends to the plains.
 Black Vulture (1191), *Otogyys calvus*.—Common.
 Himalayan Griffon (1193), *Gyps himalayensis*.—Common.
 Himalayan Long-billed Vulture (1195), *Gyps tenuirostris*.—Common.
 Indian White-backed Vulture (1196), *Isudogyys bengalensis*.—Common.
 Booted Eagle (1208), *Hieraëtus pennatus*.—Uncommon.
 Rufous-bellied Hawk-Eagle (1209), *Lophotriorchis kieneri*.—Procured by O'Donel, but very rare.
 Black Eagle (1210), *Ictinaëtus malayensis*.—Uncommon, extending well into the plains during the winter.
 Changeable Hawk-Eagle (1212), *Spizaëtus limnaëtus*.—Fairly common.
 Hodgson's Hawk-Eagle (1213), *Spizaëtus nepalensis*.—Noticed during the cold weather.
 Crested Serpent Eagle (1217), *Spilornis cheela*. Very common.
 Pallas' Fishing-Eagle (1223), *Haliaëtus leucoryphus*.—Common.
 Large Grey-headed Fishing Eagle (1226), *Polioaëtus ichthyaëtus*. Fairly common.
 Hodgson's Fishing-Eagle (1227), *Polioaëtus humilis*. A few pairs extend well into the plains along the rivers.

- Brahminy Kite (1228), *Haliastur indus*.—Rather uncommon.
 Common Pariah Kite (1229), *Milvus govinda*.—Common.
 Large Indian Kite (1230), *Milvus melanotis*.—Common.
 Black-winged Kite (1232), *Elanus caerules*.—Seen occasionally.
 Pale Harrier (1233), *Circus macrurus*.—A winter visitor to the plains.
 Hen Harrier (1235), *Circus cyaneus*.—Common during the winter.
 Pied Harrier (1236), *Circus melanoleucus*.—Our commonest harrier. Most individuals disappear during the rains, but a few are undoubtedly resident. O'Donel has notes showing birds met with during every month of the year.
 Marsh Harrier (1237), *Circus æruginosus*.—Uncommon.
 Common Buzzard (1241), *Buteo desertorum*.—Obtained during the winter.
 The Shikra (1244), *Astur badius*.—Common.
 Crested Goshawk (1246) *Lophospizias trivirgatus*.—Shot by Inglis in the forest at Kuntimari at the end of January.
 The Sparrow-Hawk (1247), *Accipiter nisus*.—Uncommon.
 Besra Sparrow-Hawk (1248), *Accipiter virgatus*.—Very common.
 Crested Honey-Buzzard (1249), *Pernis cristatus*.—Very common.
 Black-crested Baza (1251), *Baza lophotes*.—Not uncommon in the plains. It is generally found in pairs but occasionally large parties are seen.
 [Blyth's Baza (1252), *Baza jerdoni*.—Only shot in the Terai.]
 Peregrine Falcon (1254), *Falco peregrinus*.—Obtained near the larger rivers during the winter.
 Shahin Falcon (1255), *Falco peregrinator*.—Occasionally seen during the winter.
 Indian Hobby (1261), *Falco severus*.—Uncommon in the plains but possibly resident as O'Donel has seen a bird as late as the 6th August.
 Red-headed Merlin (1264), *Aësalon chicquera*.—Not uncommon in the plains where it breeds during May and June.
 The Kestrel (1265), *Tinnunculus alaudarius*.—Common in the winter in the plains.
 Red-legged Falconet (1267), *Microhierax eutolmus*.—Not uncommon in the foothills. It does not extend very far into the plains. We have seen it capture a Ruby-throat.
 Bengal Green Pigeon (1271), *Crocopus phænicopterus phænicopterus*.—Found in the forest but not so common there as it is in the open country.
 Ashy-headed Green Pigeon (1273), *Osmotreron pompadora phayrei*.—Not uncommon.
 Orange-breasted Green Pigeon (1278), *Osmotreron biseincta domvillii*.—Not uncommon in the forest.
 Thick-billed Green Pigeon (1281), *Treron nipalensis*.—Not uncommon in the forest. Green Pigeons are very common round Kuntimari at certain seasons and Shebbeare has shot the above four species there.
 Pin-tailed Green Pigeon (1282), *Sphenocercus apicauda*.—Common in the plains and foothills. It breeds freely in the plains during April and May.
 Wedge-tailed Green Pigeon (1283), *Sphenocercus sphenura*.—Common in the hills, plains and foothills, possibly breeding in the plains as well as the hills. These two species are frequently found in the same flock known as the *Kokla*.
 Green Imperial Pigeon (1284), *Carpophaga cæna cæna*.—Common in the plains and foothills, but not noticed in the hills round Buxa. It breeds in the plains. The Nepalese name is *Hukus*.
 Hodgson's Imperial Pigeon (1286), *Ducula insignis insignis*.—Common in the hills round Buxa and in the foothills. This is also called *Hukus* by the Nepalese.

- Bronze-winged or Emerald Dove (1291), *Chalcophaps indica*.—Very common in the forest of the plains. The Nepalese name is *Sim-dukur*.
- Indian Blue Rock-Pigeon (1292), *Columba livia intermedia*.—Apparently only found in the cultivated southern part of the district.
- Ashy Wood-Pigeon (1301), *Alsecomus pulchricollis*.—This has been shot by Mr. W. P. Field and by Shebbeare at Gorumara at an elevation of 300 ft. as already recorded in No. 2, Vol. XXV of this Journal.
- Indian Rufous Turtle-Dove (1304), *Streptopelia turtu meena*.—Very common in the paddy lands during the cold weather. It is locally known as the "Bamboo dove".
- Indian Turtle-Dove (1305), *Streptopelia turtur ferrago*.—This has also been got along with the preceding species.
- Spotted Dove (1307), *Streptopelia suratensis suratensis*.—Exceedingly common in the open country.
- Indian Ring-Dove (1310), *Streptopelia risoria risoria*.—Very common in the open country.
- Indian Red Turtle-Dove (1311), *Enopopelia tranquebarica tranquebarica*.—Very common in parts of the forest especially at Gorumara and numbers are seen in the cold weather in the paddy lands at Kuntimari. The call note is a peculiar croaky sound.
- Burmese Red Turtle-Dove (1311a), *Enopopelia tranquebarica humilis*.—Some birds approach this sub-species more than the last.
- Bar-tailed Cuckoo-Dove (1312), *Macropygia tusalia*.—Common in the hills and extending well into the plains but only found in forest. The Bhutia name for it is *Natti*.
- Common Pea-Fowl (1324), *Pavo cristatus*.—Very local. Common in parts of the district; more so to the east of the Torsa. Where common they breed freely.
- Grey Peacock-Pheasant (1327), *Polyplectron bicalcaratum*.—There are specimens in the British Museum obtained by Mandelli in the Buxa and Bhutan Duars; from the former locality in May and from the latter from February to May. Inglis has received, through the further generosity of Mr. Phillips, a male of this species. It was obtained in March about 4 miles S. E. of Buxa and at a height of 2,000 ft. or thereabouts. Every thanks are due to Mr. Phillips for the great interest and continued help he has given us in obtaining specimens of species, the occurrence of which we were doubtful.
- Burmese Jungle-Fowl (1328), *Gallus bankiva bankiva*.—Common everywhere in the forest and vicinity. Our birds appears to be referable to this species, not having the white ear-lappet.
- Black-backed Kalij Pheasant (1338), *Gennæus melanonotus*.—Very local but scattered in various places all over the northern part of the district in hills and plains alike. It is seen as low as 329 feet above sea level and as far as 16 miles from the foothills. It usually haunts damp evergreen jhoras and without dogs is not often seen and when treed by them is rather difficult to spot. Both O'Donel and Inglis have seen a Kalij with white bars on the rump on separate occasions, in the neighbourhood of Sivoke, and Shebbeare got a similar bird in the adjoining district of Goalpara which Mr. Stuart Baker considers a hybrid between *Gennæus horsfieldi horsfieldi* and *Gennæus melanonotus*. No pheasants with white bars on the rump have been seen by us in this district which lies between the above localities.
- The Monal (1342), *Lophophorus fulgens*.—Sunder gives this as "found between Buxa and Sinchula, but rare." We have so far not been able to get it.
- Blue-breasted Quail (1354), *Excalfactoria chinensis*.

- Common or Grey Quail (1355), *Coturnix communis*.
 Black-breasted or Rain Quail (1356), *Coturnix coromandelica*.
 Inglis' Bush-Quail (1361a), *Microperdix inglisi*.—The type specimens were procured in Goalpara; there is an account of this bird in No. 1, Vol. XIX of this Journal. Primrose has seen the bird in this district not far from the Torsa, and Shebbeare also believes he has seen it. There is a ragged skin in the British Museum said to have been got in the Bhutan Duars. This is evidently the bird mentioned by Lt.-Col. Thornhill as shot by him at Alipur-Duar, *vide* J. B. N. H. S., Vol. XV, p. 527.
- Blyth's Hill-Partridge (1363), *Arboricola rufigularis*.—Common in the undergrowth round Buxa, and the only Hill Partridge obtained by us.
- Red-breasted Hill-Partridge (1366), *Arboricola mandellii*.—Specimens have been obtained in the Bhutan Duars in April, probably in this district, though we have been unable to get it.
- Black Partridge (1372), *Francolinus vulgaris*.—This, like other Game Birds, is fast on the decrease. The Sonthal coolie, introduced in large numbers from Chaibassa of late years, loves shikar and, according to Travers, many and many a partridge is run down by these people.
- Grey Partridge (1375), *Francolinus pondicerianus*.—Sunder says it is found in similar localities as those in which the Black Buck is got.
- Kyah or Swamp Partridge (1376), *Francolinus gularis*.—Getting scarce as suitable localities decrease.
- Burmese Bustard-Quail (1382), *Turnix pugnax plumbipes*.—Resident and breeding in the tea during June and July. This bird has an exceptionally loud note in the breeding season *oof, oof, oof*, strongly boomed.
- [Little Button-Quail (1383), *Turnix dussumieri*.—Almost certain to occur.]
 Indian Button-Quail (1384), *Turnix tanki tanki*.—Recorded from Bhutan Duars. A specimen in the British museum being got there in April.
- Blue-breasted Banded-Rail (1389), *Hypotaenidia striata*.
 Banded Crane (1395), *Rallina supercilialis*.—For the past four years the call of a bird had been puzzling O'Donel during April and May and it was only this year that he was able to shoot it and found it to be this species. He found them inhabiting fairly thick jungle, the favourite place being light tree forest with scrub over which creepers hang. Judging from the number of birds heard calling they must exist in fair numbers. The note "*Kok*" said through one's nose is the exact sound and is uttered during the late afternoon and at night and appears to be the breeding call as bird answers bird, and O'Donel firmly believes that it breeds here. It is easy to get close to the bird, but quite a different thing to see it as the grass is up in the scrub-jungle at this time of the year. The above remarks were all given by O'Donel.
- [Brown Crane (1400), *Amauronis akool*.—Only shot in Goalpara, but probably got in the south of the district].
 White-breasted Water-Hen (1401), *Amaurornis phoenicurus*.—Common.
 [The Moorhen (1402), *Gallinula chloropus*.—Only shot in Goalpara, but certain to be found in the south of the district.]
 [Water Cock (1403), *Gallixrex cinerea*.—Only shot in Goalpara, but probably got in the jheels.]
 Purple Moorhen (1404), *Porphyrio poliocephalus*.—Got in the jheels.
 [Great Indian Bustard (1414), *Eupodotis edwardsi*.—Sunder gives this as common in the grass jungle of high lands in the cold weather. This is most improbable as they have never been found nearly as far east as this district.]

- Lesser Florican or Likh (1416), *Sypheotis aurita*.—Decidedly uncommon. Two were shot at Neora Nuddy tea garden and reported to Travers. This garden is not very far from Baradighi. O'Donel has recorded them from Hasimara in Vol. XXII, No. 1, page 201 of this Journal. He has only seen them in April, May and June.
- Bengal Florican (1417), *Sypheotis bengalensis*.—This fine bird is steadily decreasing owing to the indiscriminate shooting of hens and the increasing acreage under tea. It breeds in March and April, the eggs according to O'Donel, being often laid in tea and consequently destroyed during cultivation. One was shot near Ramshai during the Xmas week of 1918.
- Stone-Curlew (1418), *Ædicnemus scolopax*.—Common.
- Great Stone-Plover (1419), *Esacus recurvirostris*.—Found on the larger rivers and breeds on the Sankos.
- Small Indian Pratincole (1427), *Glareola lactea*.—Common and breeds on the Sankos.
- Bronze-winged Jacana (1428), *Metopodius indicus*.—Common in centre and south of the district.
- Pheasant-tailed Jacana (1429), *Hydrophasianus chirurgus*.—Found in south of the district.
- Red-wattled Lapwing (1431), *Sarcogrammus indicus*.—Very common.
- Indian Spur-winged Plover (1435), *Hoplopterus ventralis*.—Very common.
- Eastern Golden Plover (1439), *Charadrius fulvus*.—Seen in open country.
- Grey Plover (1441), *Squatarola helvetica*.—Seen at Nilpara.
- Kentish Plover (1446), *Ægialitis alexandrina*.
- Little Ringed Plover (1447), *Ægialitis dubia*.
- Long-billed Ringed Plover (1449), *Ægialitis placida*.
- The Ibis-bill (1453), *Ibidorhynchus struthersi*. O'Donel has shot them on the Tista and Torsa rivers. He never saw them beyond two miles from the hills.
- Common Sandpiper (1460), *Totanus hypoleucus*.
- Wood Sandpiper (1461), *Totanus glareola*.
- Green Sandpiper (1462), *Totanus ochropus*.
- The Greenshank (1466), *Totanus glottis*.
- Little Stint (1471), *Tringa minuta*.
- Temminck's Stint (1474), *Tringa temmincki*.
- The Woodcock (1482), *Scolopax rusticola*.—Woodcock are rarer in the Duars than one would expect and although the district is not far from their haunts in the hills, they seldom visit us in the cold weather. Travers has seen one and one was shot by Mr. Whitmore in the Nagrakata district. Mr. R. S. Hutchinson, D.I.G. Police, Jalpaiguri records ten birds put up twice in tiger beats at Gorumara on 11th and 12th April 1920. This is exceedingly late for them to be in the plains; they should be pretty high up in the hills by then.
- Wood-Snipe (1483), *Gallinago nemoricola*.—According to sportsmen who have been in the district many years, this bird was commoner before so much jungle was cleared for tea. O'Donel says it is apparently a very irregular winter visitor. He put up three while out shooting along a forest stream in November 1915 but although he has searched the same stream since then he has never seen any more. Travers has shot one and according to him it is very rare. Stuart Baker mentions it as met with in Buxa and Jalpaiguri and that he got a bird shot in the swamps at the foot of the hills in May but we have found no other records except those mentioned above.
- Common Snipe (1484), *Gallinago caelestis*.

Pintail Snipe (1485), *Gallinago stenura*.

Travers writes that this district is not one where large bags of snipe are made; in the adjoining districts of Dinajpur and Rangpur they are far more numerous. Snipe arrive early in August and some remain as late as May. The 19th of August (Stuart Baker gives the 12th August) and the 5th of May are the earliest and latest dates on which he has actually shot specimens, pintail, in both cases; but he has seen birds a fortnight earlier and later. They have been reported to him in every month of the year and it is probable that a few do summer here and breed in the lower hills in Bhutan and within our limits. In Vol. XXIV, No. 2, page 367 of this Journal, Mr. Hodding wrote that he had caught, on the 12th August 1915, one out of three young Fantail Snipe which were with one of their parents on a nearly submerged piece of grassland on the Tista in the Rangpur district. Travers states that snipe are more numerous in October and November and again in February and March, though in a few favourite places a few remain throughout the cold weather. Pintail remain longer than the fantail and the former are often found in scrub and thatching grass near a feeding ground that has dried to hardness.

Himalayan Solitary Snipe (1486), *Gallinago solitaria*.—With the exception of O'Donel's remarks, those on the Woodsnipe are the same for this species.

Jack Snipe (1487), *Gallinago gallinula*—Uncommon.

Painted Snipe (1488), *Rostratula capensis*.

Indian River Tern (1503), *Sterna szena*.—Found on large rivers.

Black-bellied Tern (1504), *Sterna melanogaster*.—Found on large rivers.

White-shafted Ternlet (1509), *Sterna sinensis*.—Shot on the Sankos.

Indian Little Tern (1510), *Sterna minuta gouldie*. Seen on the Sankos.

Indian Skimmer or Scissors-bill (1517), *Rhynchops albicollis*.—Often seen on the Sankos.

Eastern White Pelican (1520), *Pelecanus roseus* } We have once or twice seen flocks
White or Roseate Pelican (1521), *Pelecanus onocrotalus*.— } of one or other of these pelicans during the cold weather.

Large Cormorant (1526), *Phalacrocorax carbo*.—More common along forest streams, but occasionally seen on the upper reaches of the Torsa river.

[Indian Shag (1527), *Phalacrocorax fuscicollis*.—Only seen in Goalpara.]

Little Cormorant (1528), *Phalacrocorax javanicus*.—Very common everywhere in the plains.

Indian Darter or Snake-Bird (1529), *Plotus melanogaster*.

Black-Stork (1547), *Ciconia nigra*. Observed near Nilpara. A few pairs seen on the larger rivers in winter.

White-necked Stork (1548), *Dissura episcopus*.—A specimen in the British Museum from the Bhutan Duars was got in February.

Black-necked Stork (1549), *Xenorhynchus asiaticus*.—Common in the beds of the rivers and apparently resident.

The Adjutant (1550), *Leptoptilus dubius*.

Lesser Adjutant (1551), *Leptoptilus javanicus*.

Eastern Purple Heron (1554), *Ardea manillensis*.

Great White-bellied Heron (1557), *Ardea insignis*.—Uncommon and keeping to the larger rivers and those running through forest. O'Donel remarks that it disappears from the plains during the rains and that it generally feeds at dusk, but also occasionally does so at mid-day.

Large Egret (1559), *Herodias alba*.—Not uncommon.

- Smaller Egret (1560), *Herodias intermedia*.—A specimen in the British Museum was got in January.
- Cattle Egret (1562), *Bubulcus coromandus*.—Very common.
- Pond Heron (1565), *Ardeola grayi*.—Very common.
- Little Green Heron (1567), *Butorides javanica*—Very common.
- Night Heron (1568), *Nycticorax griseus*.
- Chestnut Bittern (1572), *Ardetta cinnamomea*.—Common.
- [Black Bittern (1573), *Dupetor flavicollis*.—Shot in Goalpara and believed to be found in this district.]
- The Bittern (1574), *Botaurus stellaris*.—Sunder gives it as found on banks and churs of large rivers and jheels. We have never seen it in this district.
- Grey Lag Goose (1579), *Anser ferus*.—
- Red-billed Goose (1579a), *Anser rubri-rostris*.—
- Barred-headed Goose (1583), *Anser indicus*.—Rare. Geese are occasionally seen on the Tista and we believe they have also been seen away from the river.
- Comb Duck (1584), *Sarcidiornis melanonotus*.—One specimen in the British Museum from the Sikkim Terai.
- [White-winged Wood-Duck (1585), *Asarcornis scutulatus*.—Inglis' collector saw a duck on the Neora river. He said it was about the size of a Comb-duck but brown below. It could not have been a Comb-duck as the man knows that bird well and the only bird Inglis thinks it could have been is this species.]
- Ruddy Sheldrake or Brahminy Duck (1588), *Casarca rutila*.—Common on larger rivers.
- Whistling Teal (1589), *Dendrocygna javanica*.—Resident and very common, breeding freely in the district.
- Large Whistling Teal (1590), *Dendrocygna fulva*.—Rare. Travers records one shot at Borara and a pair were also seen there which flew off in company with a large flock of the common whistling teal.
- Cotton Teal (1591), *Nettopus coromandelianus*.—Resident and very common. It breeds in the district.
- The Mallard (1592), *Anas boscas*.—Large bags of ducks are not made in this district. Travers says they are got in large numbers in the adjoining district of Dinajpur and Rangpur and also that many species of duck remain upon little ponds and lakes in October and early November and then depart for the south. A few Mallards are seen in October and are rarer after November, and after December they probably proceed south.
- Falcated Teal (1594), *Eunetta falcata*.—Travers records a bird shot at Borara and a couple were shot a few miles to the south of the district. These birds are probably commoner than they are supposed to be as unless drakes are shot one seldom hears of them.
- The Gadwall (1595), *Chaulelasmus streperus*.—Some years these duck are far more plentiful than others and a fair proportion are sometimes obtained.
- Common Teal (1597), *Nettium crecca*.—This is the commonest of the true teal and large flocks are seen during migration in April.
- The Wigeon (1599), *Mareca penelope*.—Not common. Single birds are often seen.
- The Pintail (1600), *Dafla acuta*.—Large flocks are found in March upon the larger rivers.
- Garganey or Blue-Winged Teal (1601), *Querquedula circia*.—Not as common as the common teal, but large flocks are seen at migration time.

- The Shoveller (1602), *Spatula clypeata*.—Not uncommon.
 Red-crested Pochard (1604), *Netta rufina*.—Not frequently shot.
 The Pochard (1605), *Nyroca ferina*.—Not rare.
 White-eyed Duck (1606), *Nyroca ferruginea*.—The commonest non-resident duck. It comes early and stays late and in this district is a fair table bird.
 Tufted Duck (1609), *Nyroca fuligula*.—Shot in fair numbers.
 The Goosander (1613), *Merganser castor*.—Very common on the larger rivers, but not generally seen more than 13 miles from the hills, though on the Sankos they occur a good deal further off. O'Donel has seen full plumage drakes in December. They take a heavy toll of the fish in the rivers and Travers has seen them in a line across the shallows of a stream and their crops are always, in those shot, crammed full of fish.
 Indian Little Grebe (1617), *Podiceps albipennis*.—Occurs in the south.

CROCODILES.

- The Gharial (1), *Gavialis gangeticus*.—Mostly found in the south, where it attains a very large size in the Sankos.

TORTOISES.

- [*Trionyx gangeticus* (5), According to Dr. Annandale this tortoise is likely to occur but we have not observed it.]
 [*Trionyx leithii* (6), The same remark applies to this species.]
Trionyx hurum (7).
Chitra indica (12).
Emyda granosa (13).
Testudo elongata (16).
Geomyda indopeninsularis.
Geomyda tricarinata (25).
 [*Cyclemys dhor* (27), According to Dr. Annandale this is also likely to occur.
Kachuga tectum (42).

LIZARDS.

- Hemidactylus gleadowii* (86), Known as the "tiktiki."
Gecko verticillatus (103), Known as the "tuktu" or gecko.
 Common Bloodsucker. (145) *Calotes versicolor*.—Known as the "bloodsucker."
Veranus spp.?—At least one monitor lizard (goi-sanp), erroneously called iguana, occurs, probably more than one.
Mabuia carinata (211).

SNAKES.

- Typhlops jerdoni* (27), There is a specimen in the Indian Museum from Buxa Duars.
 Burmese Blind Snake (276), *Typhlops diardi*.—One obtained by Capt. K. L. W. Mackenzie at Buxa, and Col. Wall recorded another which Mr. Jacob obtained in the Jalpaiguri district.
 Common Python (286), *Python molurus*.—Common in certain localities. It grows to a large size, an 18 feet specimen was recorded by Major Begbie as got in Tondu forest which had swallowed a leopard. One was captured some years ago at Baradighi with a recently swallowed barking deer inside it.
 Shaw's Wolf Snake (348), *Lycodon jara*.
 Common Wolf Snake, (351), *Lycodon aulicus*.—Very common in bungalows.
 Collared Dwarf Snake (363), *Polyodontophis collaris*.—A single example was obtained by Capt. K. L. W. Mackenzie at Buxa and three from other parts of the District by Mr. Jacob.

- Striped Kukri Snake (376), *Simotes cyclurus*.—Very common, brick red and brown coloured varieties are obtained.
- White-banded Kukri Snake (377), *Simotes albocinctus*.—Capt. Mackenzie obtained four examples at Buxa.
- Indian Rat Snake (397), *Zamenis mucosus*.—Common.
- Trinket Snake (406), *Coluber helena*.
- Striped-necked Snake (410), *Coluber radiatus*.—Two were obtained by Captain Mackenzie at Buxa.
- Ring-tailed Dhaman, *Coluber cantoris*.—A single example was obtained by Mr. Jacob.
- Golden Tree Snake (463), *Chrysopelea ornata*.—Mr. Jacob obtained a single example and Capt. Mackenzie got one at Buxa. Travers got one in a coolies' house.
- Eastern Bronzeback (417) *Dendrophis pictus*.
- Dibrugarh Bronzeback, *Dendrophis proarchos*.
- Indian Bronzed-backed Tree Snake, *Dendrelaphis tristis*.
- Malayan Bush Snake (431), *Tropidonotus subminiatus*.—Obtained by Capt. K. L. W. Mackenzie at Buxa.
- Himalayan Bush Snake (432), *Tropidonotus himalayanus*.—Recorded from Buxa.
- Hooded Tree Snake (422), *Pseudoxenodon macrops*.
- Buff-striped Keelback (434), *Tropidonotus stolidus*.
- Chequered Keelback (435), *Tropidonotus piscator*.
- Arrow-backed Cat Snake (447), *Dipsadomorphus gokool*.
- Grey Cat Snake, (449), *Dipsadomorphus hexagonatus*.—Recorded from Buxa and also got by Travers.
- Black-barred Cat Snake, *Dipsadomorphus cynodon*.
- Indian Egg Eating Snake, (452), *Elachistodon westermanni*.—Two specimens of this very rare snake were obtained by Travers.
- Mock Himalayan Viper, (453), *Psammodynastes pulverulentus*.—Two examples were obtained by Capt. Mackenzie at Buxa. Travers got at Baradighi.
- Malayan Whip Snake (460), *Dryophis prasinus*.
- Common Green Whip Snake (461), *Dryophis mycterizans*.
- Schneider's Water Snake (467), *Hypsiryhina enhydria*.—Recorded from Jalpaiguri by Wall.
- Banded Krait (484), *Bungarus fasciatus*.—Mr. Jacob shot a specimen attacking a *Dipsadomorphus cynodon*. Travers has got several specimens
- Common Krait (482), *Bungarus candidus*.—Rare in the Duars.
- Lesser Black Krait, *Bungarus lividus*. } A record specimen of *lividus* 41"
 Black Krait, *Bungarus niger*. } long was captured at Baradighi.
- These Black Kraits are found in fair numbers, but no case has been known of any coolie having been bitten by either of them.
- The Cobra (485), *Naia tripudians*.—Duars Cobras are generally monocellate, though spectacled specimens are occasionally met with.
- King Cobra (486), *Naia bungarus*.—Rare. An 8'-8½" specimen pursued some coolies for a short distance at Baradighi. When killed a large monitor lizard was found inside.
- Russell's Viper (520), *Vipera russelli*.
- Common Green Pit Viper (581), *Lachesis gramineus*.

BATRACHIANS.

- Indian Bull Frog (16), *Rana tigrina*.
- Common Indian Toad (115), *Bufo melanostictus*.—This toad frequently enters bungalows.

FISH.

- (Singi, Beng.) (133), *Saccobranchnus fossilis*.
 (Bowali, Beng.) (134), *Wallago attu*.
 (Bachwan, Hind.) (135), *Eutropiichthys vacha*.
 (Tengra, Beng.) (172), *Macrones bleekeri*.
 (Bagara, Beng.; Gunch, Hind.) (207), *Bagarius yarrelli*.
 [*Gagata batasio* (224).—Recorded from the Tista river, not observed by us.]
 [*Nemachilus corica* (253).—Recorded from N. E. Bengal, not observed by us.]
 [*Psilorhynchus balitora* (278).—Recorded from hill streams and rapids in N. E. Bengal, not observed by us.]
 [*Oreinus richardsonii* (233).—Recorded from Sub-Himalayan range and Bhutan, not observed by us.]
 (Rohu, Hind.) (297), *Labeo rohita*.
 (Denkara, Beng.; Goti, Oep.) *Labio pangusia*.
 (Tehr., Nep.) *Labeo* sp.—A hill stream species, so far not identified.
Cirrhina reba (323).
 (Darangni, Mech.) (326), *Semiplotus macclellandi*.
 (Dowka, Mech.) (339), *Barbus chagunio*.
Barbus sarana (341).
Barbus dukai (352).—Recorded from the Tista, not observed by us.
 (Sor-masa, Nep.; Jungi-Mas., Beng.) (353), *Barbus tor*.—There appears to be three varieties of Mahseer in this district, two of which are distinguished by colour alone, the first being lighter, silver and gold, the second darker, slate and copper approaching the colour of *B. hexastichus*, and the third known by its elegant shape and neat mouth. The first type is everywhere the commonest, though in the Sankos, the second is fairly common; the third type is least common; it has been caught in the Jaldhaka and, I think, in the Torsa and Sankos.
 (Katli, Nep.; Buluk, Beng.) (354), *Barbus hexastichus*.—The fish which we get here does not quite tally with the description in the Fauna, the fins being slaty-blue and with no reddish tinge in the caudal and anal. In a freshly caught fish the scales above the lateral row are almost exactly the colour of a freshly minted penny and their bases are bronze-green; those below the lateral row are white with a faint blue-green wash. The upper part of the head is dark olive, almost black, fading to white on the underside.
Barbus chola (374).
Barbus conchoniis (389).
 (Dankoni, Beng.) (411), *Rasbora daniconius*.
Rasbora buchanani (412).
 (Katal-Kusi, Nep., Kursha, Beng.) (413), *Aspidoparia morar*.
Barilius bendelisis (426).
 (Na-musha, Mech.) (431), *Barilius birna*.
Barilius bola (435).—Sometimes known as the "hill trout."
 [*Danio æquipinnatus*. (439).—Observed in the adjoining Terai by Inglis.]
 [*Danio dangila* (440).—Observed by Inglis in the adjoining Terai.]
 [*Danio rerio* (443).—Observed by Inglis in the adjoining Terai.]
 (Moh., Hind., (519).—*Notopterus kaporat*.
 (Kowa, Hind. (536).—*Belone cancila*.
Ambassis nama (628)
Ambassis ranga (629)
Ambassis baculis (630) } One or more of these species occur.
 (Tota, Beng.) (827), *Nandus marmoratus*.
 (Turi, Beng.) (1159), *Mastacembelus armatus*.
 (Sal-Mas., Beng.) (1203), *Ophiocephalus striatus*.—Known as murrel.

[*Ophiocephalus punctatus* (1206).—We think this species is found.]
Anabas scandens (1208).—Known as the climbing perch.
 [*Ospromenus nobilis* (1211).—Recorded from N. E. Bengal, not observed by us.]

Tetrodon cutcutia (1406).

We append a list of native names of fish given by Sunder in his Settlement Report with the hopes that some member may be able to let us know to what fish they refer. We mention what we think some of them may be:—

Chital. (Probably 520), *Notopterus chitala*.

Chandan Koorsha. } (Possibly 295), *Labeo gonius* and (305), *Labeo angra*
 Pani Koorsha }

Baos or Kalbaos (293), *Labeo calbasu*.

Soul. (1198), *Ophiocephalus marulius*.

Airh.

Bag Airh.

Magur. (121), *Clarias magur*.

Moja Tengra. }

Lallua Tengra. } *Macrones* sp.

Kooji Tengra. }

Taki, Sati of Toopkooni.

Khoilsha.

Iis or Ilsa. (Probably 470), *Clupea ilisha*. This is only found here in bazars.

Elanga. *Danio* sp.?

Kuchia. (70), *Amphipnous cuchia*.

Phul bacha. }

Naria bacha. } One of these is probably (135), *Eutropiichthys vacha*.

Foli.

Pabda. (138), *Callichrous bimaculatus* or (14), *Callichrous pabda*.

Khata, viz., Buna Khata and Deo Khatta.

Katna.

Khotti. (Perhaps 417), *Rohtee cotio*.

Bhot Khotti.

Borelli.

Dudua Cheng. }

Hooloo Cheng. } Possibly *Ophiocephalus* sp.

Boora Cheng. }

Barra Isla.

Satasi Isla. }

Bhath Isla. } Asla is the Nepalese for (283), *Oreinus richardsonii*.

Kala Isla. }

Baim. (Perhaps 1159), *Mastacembelus armatus*.

Koochia. (70), *Amphipnous cuchia*.

Tara Koochia.

Choota Gochi.

Falua Gochi.

Tooree Gochi. Turi is the Bengal for (1159) *Mastacembelus armatus*.

Balia.

Batasi. (150), *Pseudeutropius atherinoides*.

Darika.

Bhol.

Tepa. *Tetrodon* sp.

Pangas.

Chella. (Perhaps 449), *Chela gora*.

Puti. Various small species of *Barbus*.

Baspata. (143), *Ailia coila*.
Khorsola. (161), *Macrones corsula*.
Ahela.
Cheku.
Baghi. (Probably 230), *Botia dario*.
Poya.
Ghoor poya.
Jhuri poya.
Moogroosh.
Ghora. (449), *Chela gora* ?
Pogol.
Dhakra.
Badangi or Chapti.
Lengsa.
Tita.
Khoota.

MISCELLANEOUS NOTES.

No. I.—TIGER AND GOAT.

In the Deccan, at any rate, it is uncommon, I believe, for a tiger to be attracted by a goat, so the following incident is perhaps worth mentioning.

One January evening my daughter and I went out to sit up for a panther a mile or so from our camp in the Hyderabad Districts. The machan was placed on a thickish tree in a glade amid fairly heavy jungle. After we were seated, a flock of goats was driven in due course along the foot of the hill, where the panther was supposed to live, and came up behind our tree, bleating lustily. A kid was quickly seized and tied up to a stump in the glade, and the rest of the flock passed on feeding leisurely back in the direction of the village, while the men in charge kept calling as they went, in accordance with the usual procedure to give the panther the idea that the goat left behind was a casual straggler.

The flock had not gone much more than 100 yards when my daughter, her attention attracted by a slight rustling to the rear, nudged me and whispered "Big Tiger!" Glancing back over my shoulder, there sure enough, I saw, not the spots of the panther we were expecting, but the stripes of a full-grown tiger, which was striding stealthily along—ears cocked, and a beautiful picture of alert concentration—in the direction of our machan. Passing out of sight beneath us for an instant, the tiger then ran rapidly on to the kill. My daughter in her anxiety to save the goat fired at the tiger tail-on, rather too soon to get a picked shot, and the beast bounding off into the long grass it became a case of driving in a herd of buffaloes the next day, but that is another story.

The goat, it may be mentioned, was saved by the skin of its teeth, receiving only one claw mark, as the tiger reached out to seize it.

When the incident was discussed afterwards, one well-known old shikari of the neighbourhood was inclined to scout the idea that any tiger would follow up a flock of goats in this fashion. The shikari of the village, however, expressed no surprise and said he knew the tiger in question well as a brute which would go for anything from frogs in the tank to dogs, goats, or even a man.

THE RESIDENCY, HYDERABAD, DECCAN,

S. M. FRASER.

January 1920.

No. II.—LENGTH OF TIGERS AND PANTHERS.

In No. 3, Volume XXVI of the Journal, H. H. The Maharaja of Dhar gives some notes on the length of tigers and panthers, shot in his State. It would be interesting to know how the measurements were taken. Such measurements cannot be considered satisfactory unless taken in a straight line between pegs, the tail being measured separately. Measurements round curves must always be unreliable, as no two people are likely to make them alike. His Highness specifies a tigress 9 feet 10 inches in length. I find my longest tiger recorded as 9 feet 8 inches in length, and tigress 8 feet 6 inches. Out of a long series carefully measured only two of each sex reached even those lengths. Tails are generally three feet, an inch or two more or less. Measurements were taken in a straight line between pegs driven into the ground at the nose and root of the tail. Measurements of skulls in a straight line between uprights from end to end and across the zygomatic arches should also be taken.

In Volume XX of the Journal the length of a panther shot by a villager in Tehri State is given as 9 feet 3 inches, but it is not stated how it was measured.

BAFFORD GRANGE, CHELTENHAM,

R. G. BURTON, BRIG.-GENL.

December 1919.

No. III.—TIGERS IN TREES.

With regard to Mr. Monteath's note on this subject in Journal No. 3, Volume XXVI, some interesting instances of tigers climbing trees are given in the *Bengal Quarterly Sporting Review* for 1843. Two similar instances are also recorded by "Teutonium" in the *India Sporting Review* of 1856. But the most remarkable instance is related in graphic detail in the *South of India Observer* in 1870, when Colonel Christie and Mr. Hadow shot a tigress out of a tree that was perpendicular for 25 feet from the ground and about a foot in diameter. The tigress climbed the tree twice during the hunt, which took place near Ootacamund.

R. G. BURTON, COL.

December 1919.

No. IV.—SCENT.

A fox-hunter writes to the *Times* that the scent of the fox emanates from a sub-caudal gland, and not from the pads, as is commonly supposed.

This opens up an interesting, though unsavoury, field for enquiry. It is probable that all canine species are similarly provided, and observation might elicit whether this is characteristic of all animals.

In following up a wounded Indian wild dog in the Melghat Forest in 1891, I observed a strong ammoniac secretion, which had exuded on to the tail, and the scent of which could be detected from a distance. When the dog was brought to bag, an aboriginal Kurku, observing this, remarked that in pursuing its prey the wild-dog flicks poison with its tail into the eyes of its victim, thus blinding the animal. The Kurkus were eager to obtain the wild dog's liver to make medicine, ascribing to it aphrodisiac properties.

R. G. BURTON, COL.

10th December 1919.

No. V.—FOOD OF THE GREY MUSK SHREW (*CROCIDURA CÆRULEA*).

According to Blanford (*Mammalia, Fauna of British India*), the food of this shrew consists mainly of insects and he says that "experiments made by Anderson on individuals kept alive by him showed that they refused to touch any kind of grain, but devoured insects, especially cockroaches, freely and he found no vegetable food of any kind in the stomachs of several he examined". I have recently had a large number of these shrews caught in my garden, as I found small holes made in the grass lawn. As a result I have caught more than 40 of these shrews and in several cases the bait in the traps—Cocoanut—was in the mouth of the shrew when the trap killed it. The holes in the lawn appear to be made for the purpose of digging up the roots of the 'bimli' grass and I found a lot of this grass lying on the ground, bitten off just below the surface of the ground. The roots of the 'bimli' are bulbs which go down several inches into the ground and it may have been these bulbs that the shrews were after.

In any case I think it conclusively proves that these shrews also eat vegetable matter.

W. S. MILLARD.

BOMBAY, MALABAR HILL,
8th April 1920.

No. VI.—EXPECTED PLAGUE OF FIELD RATS IN 1920.

With reference to Mr. L. J. Sedgwick's note at p. 661 of Vol. XXVI of our Journal on the above subject, and Mr. J. Davidson's note on the same at p. 1041 of the same volume, through the kindness of The Hon'ble Mr. P. J. Mead, C.I.E., I.C.S., I have been favoured with an inspection of these records from the Bombay Secretariat—Part II, P. W. D., Famine Relief Works—Destruction of rats in the Eastern Deccan, October 1879 to May 1880—and a perusal of these records furnish some interesting details which I give below.

HISTORY OF THE PLAGUE OF FIELD RATS AFTER THE FAMINE OF 1877-78.

The Rat Plague appears to have been confined to the area known during the last famine (1877-78) as famine districts, *viz.*—

Nasik.	Satara.	Kaladgi (Bijapur).
Khandesh.	Sholapur.	Belgaum.
Poona.	Ahmednagar.	Dharwar.

The remaining nine districts of the Presidency, namely,

Ahmedabad,	Surat,	Kolaba,
Broach,	Kaira,	Ratnagiri,
Panch Mahal,	Thana,	Kanara,

having been altogether free from this pest.

DATES OF COMMENCEMENT OF RAT-PLAGUE.

The appearance of these vermin seems to have first attracted notice in November 1878 in the Sholapur Collectorate and in the ending of December of that year they appeared also in Kaladgi Collectorate. The Collector of Poona dated their first appearance as late as February 1879, and they occurred at the same time in Ahmednagar District. I cannot find any trace of when they were first noticed in Dharwar, the district which suffered most from this visitation.

The Collector of Kaladgi (Mr. Middleton) states that "the heavy rainfall during the later monsoon had fostered the growth of weeds in the crops which otherwise promised an abundant harvest but for the appearance of rats. For many years there had not been a year in which they could have done so much damage as they did this year (1879). The crop was far above the average and the loss was on that account greater. The origin of the plague is not satisfactorily accounted for. Superstition attributed it to the vengeance of the famine victims whose ghosts returned in the form of rats to claim the food for want of which they had perished. A more credible cause is that the rats, which always abound, found safety and were able to breed in enormous numbers on the fields formerly cultivated but left waste by the deaths of the cultivators during the two previous years. They found shelter while their enemies, the birds of prey, had not increased in equal numbers. Snakes which are useful in destroying rats had probably decreased owing to the absence in 1876-77 of the grass and vegetation which are necessary to conceal them."

BREEDING SEASON.

The plague of rats appears to have temporarily increased after the breeding season at the close of the monsoon, 1879.

The first letter in reference to the decrease of the pest is from the Collector of Sholapur to the Commissioner, Central Division, Poona, dated 3rd October 1879 and mentions that "the number of these vermins had decidedly decreased. Formerly one Waddar would bring in 70 to 80 in a

day, but now the same man will only get perhaps 20. This is so far satisfactory, but I would point out that the present is the breeding season and that in each hole may be found nests of young rats which was not the case in the hot weather or even in July."

As regards the breeding season, Mr. Elphinstone, Acting Collector of Dharwar, in a letter to the Commissioner, S. D., dated 3rd November 1879, says: "the breeding season for rats has commenced a few weeks ago and that in consequence enormous numbers of them are now being killed." He goes on to say that the season is very favourable for cotton sowing "and it would be a pity to endanger what will otherwise be a bumper crop by allowing the rats, which destroyed the American cotton last season, to multiply, which they are still likely to do if the period of rewards is not extended one fortnight longer, say to the 30th instant." In a subsequent letter, dated 6th November 1877, from Mr. J. Elphinstone, it is stated that the number of rats killed during the week ending the 1st November had "again increased to the enormous number of 360,680 and if the period for killing rats is not extended to the end of December the havoc caused by these vermin among the rabi crops is likely to be very great. If Government withheld help at this critical time all the money that has been extended by Government up to the present moment may be lost. The breeding season of rats has commenced in real earnest and I am informed by the District Officers here that the great numbers that are killed, nearly all are young rats."

A Government Resolution, dated 13th October 1879, runs as follows:—

"Owing to the enormous numbers of rats which still threaten the crops in the Dharwar districts, no less than 412,024 having been destroyed in the week ending 27th September 1879, Government are pleased to extend the period of rewards for the extermination of these vermin up to the 15th November 1879."

TERMINATION OF THE RAT-PLAGUE.

The plague of rats diminished about the end of November 1879 and terminated about January 1880.

SPECIES OF RATS.

There appears to have been three species of rats concerned. The Collector of Sholapur reported that "he saw in January 7th, 1879, fields, especially those with groundnuts, completely burrowed by rats and whatever crop was obtainable was that which was dug out of the burrows. The rats were of three species, a small black rat, a larger one and a brown rat or Jerboa. The last is by far the most destructive and it is a serious question for the future if it lives and multiplies. It digs its hole or burrow on higher uplands and in hard soil so that it may not be affected by rain and drowned. The other rats frequent black soil and perish during the rains."

The Collector of Nasik (Mr. Ramsey) reported that he did not consider the vermin to be a rat, but a species of Jerboa, a purely grain eating animal which is found more or less in the Deccan. He attributed this sudden appearance to the exhaustion of the grain stores in underground preserves, termed "Peos" on which these animals used formerly to subsist, and failing this they betook themselves to standing crops.

DAMAGE CAUSED BY THE RATS.

The damage done by these pests was enormous. The Collector of Kaladgi wrote that "the devastation committed by rats was so great that in February 1879, immigrants poured into Kaladgi from the Nizam's territory and relief works were opened in April 1879. It was expected that the rats would perish in the heavy rains of the monsoon, but the

rains held off until past the middle of July, and when the fields were sown the seed was scratched up and devoured by rats."

METHODS OF EXTERMINATION.

Various methods were resorted to in endeavouring to exterminate the rats.

The Collector of Poona (Mr. Richey) reported in July and August, 1879: "Phosphorous paste balls were tried for their destruction in the Indapur taluka, but were found to be utterly ineffectual."

The Collector of Ahmednagar (Mr. King) stated that endeavours were made to extirpate the rats with the Burmese method of catching them and also by suffocating them with fumigation, but neither succeeded.

The Collector of Sholapur writes: "other methods such as by asphyxiation and sulphur squibs were also tried. They were successful as far as they went but would have suited more for a farmstead than for wide country. The disappearance of rats is traced to—

1. Their destruction by the above modes.
2. Rain having choked their holes.
3. A species of vermin or tick which has killed them off."

The most effective of the various measures appears to have been the catching of the rats by the Waddars.

The Collector of Poona writing in reference to this says: "the only agency for their destruction in great numbers was that of the Waddars. These were at first reluctant to offer their services in the hope that the reward of one rupee per 100 rats killed would be increased, but when they were refused employment on relief works, they took to rat killing. The destructive operations continued in this district till 27th December 1879; when the total number killed stood at 365,766 at a cost to Government of Rs. 3,643-13-1."

In a letter, dated 3rd November 1879, Mr. Elphinstone, Assistant Collector of Dharwar, writes: "Waddars employed are the only people who are able to do much execution among the rats. The rats destroyed the American cotton last season, the breeding season for rats commenced a few weeks ago and enormous numbers are in consequence now being killed."

On the 20th January 1880 he reported that rewards were only paid after comparison with the rats or rats tails which were burnt or cut in pieces and buried in the presence of the Mamletdars or the head Karkuns.

TOTAL NUMBER OF RATS KILLED.

The following shows the number of rats killed in the different districts:—

<i>Districts.</i>	<i>Rats killed.</i>
Nasik	243,551
Khandesh	4,742
Poona	365,766
Satara	29,427
Sholapur	1,163,019
Ahmednagar	1,767,414
Kaladgi (Bijapur)	4,130,209
Belgaum	135,226
Dharwar	7,132,453
Total	14,971,807

I give below extracts from the opinions as to the methods adopted for the extermination of the rats.

Report made by the Acting First Assistant Collector, Dharwar, dated February 2nd, 1880: "That this marvellous decrease in the numbers of

rats had resulted from the measures taken in consequence of this issue of the Government's order about rewards cannot well be doubted. On all sides I am told so, as if it were a matter that admitted of no doubt whatever. The cultivators as a body are (it would appear) assured that it is so."

The Collector of Kaladgi writes (21st February 1880): "The destruction of rats brought about by the offer of rewards was most beneficial. They might perhaps have died afterwards from natural causes but they were killed sooner and the destruction of upwards of 4 millions of rats must have saved the crops to a vast extent. Besides the payment of their rewards enabled large number of people who would otherwise have been thrown back on Relief works to support themselves and the money was as profitably spent as any sums were during the famine." The total number of rats killed in the Kaladgi district was 4,130,209. Total rewards paid Rs. 40,437-7-9.

The Collector of Ahmednagar (Mr. King) was by no means sure that their numbers were very appreciably reduced by artificial means. He writes: "Rain is very effectual in killing the vermin either by drowning or causing the soil to swell and to close the burrows. Frost in November and December also appears to have killed them."

The Commissioner, Central Division (Mr. Robertson), "was told that shortly after the rains, in many villages in the Shrigonda taluka, large numbers of rats were seen dead outside, and even in their holes, covered with a species of tick which appears to have killed them in large numbers. Ticks do not attach themselves to dead bodies. On enquiry it was reported that red ticks fastened themselves on the rats while alive and caused their deaths."

The Collector of Poona writes: "the plague has now (21 February 1880) ceased and in the Collector's opinion the rapid fall in numbers killed is not owing to rats having been virtually exterminated but is probably due to natural causes."

The Collector of Sholapur considers that if the rats had not been killed the plague would have ceased all the same but the damage would have been far greater. Possibly the later monsoon rain killed them off, but Mr. Spry is sceptical as to the tick theory.

Khandesh, Satara and Belgaum suffered much less than the other districts referred to.

It appears from the above facts that the concensus of opinion was that the cessation of the plague of rats was due to natural causes and not to the measures which were taken by Government to exterminate them, but it is admitted that the measures by which some 15 million rats were destroyed provided relief for starving people and that they probably saved a large amount of damage to the crops. It is not clear that the ticks were the cause of the rats' disappearance. In regard to the anticipated plague in the cold weather of 1920-1921, the question arises is prevention possible now? Would it be worth while to employ the Waddars in one or more of the districts which was most affected by the famine of 1918-19 to catch the rats now in order to prevent a plague occurring next cold season?

The Mammal Survey which our Society has been carrying on elicited a great deal of valuable information as to the various species of rats found and I should like to endorse Mr. Kinnear's appeal that specimens of all these rats should be sent to our Society, since by determining to what species they belong and their life history, it may be possible that in the future some efficient measures may be feasible to prevent such plagues occurring in the Presidency.

W. S. MILLARD.

No. VII.—FEMALE BLACK-BUCK (*A. CERVICAPRA*) WITH HORNS.



I enclose photo of a freak Black-buck doe shot by me in the Mainpur District (U. P.) in 1908. I am sure the photo will interest members of the Society.

FATEGARH, U. P.,
31st January 1920.

E. G. BROWNE.



[We publish the photo of another head of a female of Black-buck with horns received from Mr. G. J. Griparis. The animal was shot by him at Amraoti, Berar. Further instances of this nature are recorded in our Journal, Vol. XXIII, page 354—Eds.]

No. VIII.—ABNORMAL SAMBHAR HORN.



I enclose a photograph of an abnormal Sambhar Antler in the possession of E. A. Sweetenham, Esq., of the Somerford Orchard, Ramgarh, Naini Tal District, U. P. He got it from a man at the foot of the Hills and the latter said that the Antler had been picked up in the Bhabar, a tract between the foot of the hills and the lower-lying Terrai further to the South. I have never seen anything like this type of abnormality. There seems to me hardly any doubt, but that the animal who carried this, or a pair of such Antlers, must have been a Sambhar as the beam and tines are clearly of this variety of the stag or deer family.

The dimensions are as follows:—

Round beam just below the place where the abnormal growth begins	8 $\frac{1}{2}$ inches.
Round beam just above burr	7 $\frac{3}{4}$ "
The outer curve to tip of longest tine ..	33 "
The abnormal growth measured in a direct line from beam is about 6 or 7 inches.	
The length is a fair size of Antler for the locality though larger have been seen.	

ST. QUENTIN, NAINI TAL, U. P.,
16th August 1919.

G. TATE.

[Further references to abnormal Sambhar horns may be found in our Journal, Vol. XVII, pages 845, 846 and 1020 and Vol. X, p. 534.—Eds.]

No. IX.—BIRDS OF DIFFERENT SPECIES NESTING IN COMPANY.

With reference to Mr. Allen's note on page 1044 of Volume XXVI, it may be of interest to record that in the Ferozpcrre District on the 31st May I came across a medium sized Shisham tree containing nests as follows:—

About 15 feet up. The Black Drongo (*Dicrurus ater*), 4 eggs.

About 1 foot higher up. The Red Turtle Dove (*Oenopopelia tranquebarica*), 2 eggs.

About 4 feet higher still. The Southern Green Pigeon (*Crocopus chlorogaster*), 2 eggs.

And finally, about 30 feet up, the Madras Red-vented Bulbul (*Molpastes hæmorrhous*), no eggs but bird sitting in nest.

The tree was in the compound of a Canal inspection bungalow, and, like many others in the compound, had partly withered for want of water, the bungalow being situated on a sand hill well above the level of the Canal. Below, on both banks of the Canal were rows of fine trees, providing, one would think, far more suitable nesting sites. I imagine that the Drongo chose the withered tree, and the others followed suit to obtain the benefit of his efficient "Chowkidari".

LAHORE,
12th April 1920.

H. W. WAITE,
Indian Police.

No. X.—CURIOUS NESTING SITE OF THE INDIAN HOOPOE (*UPUPA INDICA*).

There is adjoining the cattle pound at Chakwal in the Jelum District a mud building used for storing *bhusa*. This has no windows and a single door, which does not fit properly. The building remained empty for some time, and although the door was kept fastened there was room enough between it and the threshold to allow Hoopoes to creep in and out, which they were seen doing on several occasions. Eventually, on the 8th May, the door was opened, and 8 Hoopoe's eggs discovered, laid amongst the litter of *bhusa* on the floor.

LAHORE,
12th April 1920.

H. W. WAITE,
Indian Police.

No. XI.—BREEDING OF BLACK-NECKED STORK. (*XENORHYNCHUS ASIATICUS*).

I send you the following note as it may be of interest. On the 10th December last, I saw from my tent door a Black-necked Stork,

Xenorhynchus asiaticus, standing on the edge of her nest. She had just flown up from the jheel a little way off and after a bit she settled herself into the nest. I was unable to visit the nest then but next morning I went to the nest, taking a man to climb. The bird was on the nest but flew off as the man went up. On his approaching the nest, to my surprise two nearly full grown young birds got up in the nest, and as the man got close, flew off; they were very shaky and wobbly, evidently their first and a 'forced' flight. The man went on to the nest, and to my surprise said there was an egg. I told him to bring it down, thinking it was an addled one, but on his reaching the ground I saw there were two eggs. On blowing them they proved to be perfectly fresh. Surely this is most curious?

GONDA, 11th March 1920.

F. FIELD.

No. XII.—EGRET AND LIZARD.

I witnessed this morning what appeared to me a rather astonishing performance on the part of a common white Egret (Paddy bird or *Bogla*.)

When I first noticed it, it had caught either a Chamaeleon or a Lizard at least a foot long. This creature was struggling furiously in the Egret's bill. It repeatedly succeeded in escaping but was always recaptured after running a few yards. After a bit its struggles became feeble and I noticed that it was then always caught by the head, whereas at first the bird caught it by any portion of the body it could catch hold of. The Egret now started to try and swallow its head first. The head and front legs went in but it began to struggle furiously with its hind legs and long tail sticking out. The commotion that went on in the bird's neck was now extraordinary to witness. It looked as if the lizard's head or legs must break out through the neck. Several times a black patch appeared on the neck of the bird which looked like the lizard's head coming through but it was only that the skin was stretched very tightly and the colour of the lizard or skin showed through the feathers. At last after fearful efforts the hind legs also went down. The bird then stood working its neck, in which the bulge could still be seen, up and down for about ten minutes. After that it flew away none the worse. When the bird stood holding the lizard in its bill the latter looked quite as long as the bird itself and I would never have believed it could have been swallowed.

KHUMTI, RANCHI DIST.,
CHOTA NAGPUR, 13th May 1919.

H. R. MEREDITH, I.C.S.

No. XIII.—COMMON POCHARD (*N. FERRINA*) AT BANGALORE.

Last Sunday Captain W. Le C. Brodrich while out with me shot a male Common Pochard (*Nyroca ferrina*) in full plumage. Is it not very rare for this bird to be found so far south as Bangalore? Both Oates and Finn say that he is not found south of Bellary.

BANGALORE, 10th March 1920.

E. O. KING, CAPT., I.A.R.O.

[Stuart Baker in "Indian Ducks and their allies" says that the occurrence of these birds in Mysore is very rare—EDS.]

No. XIV.—MESOPOTAMIAN BIRD NOTES.

With reference to the Revd. F. C. R. Jourdain's remarks on my notes on Mesopotamian birds, I submit the following in reply.

Previous to collecting for the British Museum I collected for the Karachi Museum, sending specimens from Ormara (Mekran), Bushire (Persia) and Fao (Mesopot).

Among the specimens sent to the latter institute, was one of a Warbler, which was identified as *Scotocerca inquieta* or to be more correct that name was supplied to me for the specimen sent; at the time I was not in a position to know that this was an error and accepted the identification as being correct, hence my labelling the eggs sent to the British Museum as belonging to this bird. It was only on receiving Dr. Bowdler Sharpe's list published in the Ibis that I knew an error had been made.

Some years later I came to know that some of my specimens from the Gulf got mixed up in the Karachi Museum with some others collected in Sind, with the result that certain specimens from the Gulf were included in the Sind Fauna, and I conclude a specimen of *Scotocerca inquieta* collected in Sind, was taken as part of my Fao collection, which will account for the wrong name being supplied to me.

As to Mr. Jourdain's remarks that *Hypolais pallida* and not *H. languida* breeds in Fao, he is probably correct, for I accepted Dr. Bowdler Sharpe's identification and concluded, without examination, that all the *Hypolais* were *languida*, as certainly were the two I sent home, thus having as I thought established the breeding of *H. languida*.

Lanius fallax, I cannot see that confusion is made worse; Dr. Sharpe originally identified my specimen as *fallax*, later on he thought he had made a mistake and changed the identification to *assimilis*. These names were widely used at the time, but since the revision of nomenclature they have been discarded for the prior names of *aucheri* and *pallidirostris*, respectively, both of which birds are known to occur in Mesopotamia. At the time Dr. Sharpe wrote, these grey shrikes were not so well understood as at present and his confusion of the two races is understandable. As to which race my specimen belongs, Mr. Jourdain can easily satisfy himself, as the specimen should be in the National Collection.

Hartert in "Die Vogel des Paliartic Fauna", page 450, gives *fallax* as a synonym of *L. aucheri*, 1853, and on page 429 *ibid* states "*assimilis*. Brehm. 1854—*pallidirostris*. Casein 1852".

Cumming's Chat—I did not know such a bird existed till about 1908, when asked by a Collector for some skins of *S. cummingi*—the red-tailed Chat—beyond this I knew nothing of the bird till within a few months ago Capt. Ticehurst gave me a description and particulars of it. Dr. Bowdler Sharpe never informed me of the correction and as he identified all my specimens sent to the British Museum, I naturally concluded that on going over the chats at a later time, he identified the bird as new and named it after me.

I have always felt that this would prove to be an individual variety, until I found out that Dr. Hartert in his "Vogel des Paliartic Fauna" states that more than one specimen has been secured.

As to *Garrula*, I do not know what puzzled Mr. Jourdain for as far as I can now recollect, my notes are correct as applying to Fao. The European bird was plentiful as a bird of passage at the time stated, while the Indian bird was a rare visitor actually at Fao, but it may be more plentiful above this station; at no time did I come across more than one or two birds within twenty miles of Fao and then not as a resident.

The nestlings received by me were taken by an Arab about 30 miles up river beyond Fao.

Possibly the Indian bird comes to breed in Mesopotamia for I feel sure the winter is too severe for it to remain on.

W. D. CUMMING.

KARACHI, 7th February 1920.

No. XV.—THE GREAT INDIAN HORNBILL (*DICHO CERROS
BICORNIS*).

Members of the Society and others who have had the pleasure of visiting our small Museum will be sorry to learn of the death on Monday evening, the 3rd May, of the Great Indian Hornbill which had lived in the Museum since August 1894 and was always a source of interest and amusement.

"William", the name affectionately given to this bird, was certainly an appropriate one for if ever there was a big Bill it was to be found here. The power behind this enormous beak is used in the case of the free bird for many purposes amongst which may be mentioned the provision of a nest for the breeding season, but in captivity it was principally used to draw attention to its owner's wants and the noise the bird made by hammering at the roof or sides of its cage (an old disused temporary bath-room) would arouse even the most inattentive of its attendants and servants.

There is a story that many years ago a lady was being shown round the Museum by Mr. Phipson, who was then the Honorary Secretary, and on arriving at the Hornbill's cage the lady was told "You know that bird has something in common with some ladies. He paints himself every day" "Ah Mr. Phipson you won't catch me. I have been told of the stories you tell to visitors" was the lady's reply. Mr. Phipson's was "My dear lady it is the first true story I have told you since you entered the Museum." Whether it was the first or not cannot now be proved but true it was. The Great Indian Hornbill makes good use of the gland, called the 'Uropygial,' above the tail feathers from whence exudes an oily yellow pigment. The bird laying back its head on to the gland would cover its big casque with the yellow paint and take great pride in the operation. The pigment no doubt served to preserve the horny substance of the casque for it is a curious fact that whilst the bird has been named from dead specimens the "concave" casque hornbill—in the living specimens the casque is convex. In the dead specimens the centre of the casque has collapsed.

The Hornbill's original home was Karwar and he was presented to the Society in August 1894 by Mr. H. Ingle. In his early youth "William" was a famous cricketer and could be relied on to equal a Presidency cricketer in his capabilities as a field. Of late years, owing either to old age or perhaps approaching blindness, he seemed however unable to catch anything and the old system of feeding had to be changed and, instead of the fruit on which he lived being thrown to him, the dish had to be held up to him from which he would select those fruits which seemed to his sensitive beak to be sufficiently succulent. In the day time, when he could be observed, "William" hardly ever condescended to take food placed on the floor of the cage.

On only one occasion did this Hornbill ever depart from his life long abstinence from drink of any kind, and on the occasion in question it was *force majeure*. He had playfully extracted a lighted cigar out of a friend's mouth and swallowed it. Mercifully the cigar was promptly extinguished in the process as in order to make the bird disgorge, brandy was poured down its throat! All the liquid nourishment these birds require is obtained from the fruit they eat.

"William" was supposed to have been about six months old when he came to Bombay—so was about 26 years old at the time of his death. He has been carefully skinned and will be sent to England to be mounted by a skilful taxidermist and will eventually occupy a prominent position in the Natural History Museum which it is hoped Government will soon build.

R. A. SPENCE.

BOMBAY NATURAL HISTORY SOCIETY'S MUSEUM,

5th May 1920.

No. XVI.—SUPPRESSION OF THE NAME OF THE SNAKE
DESCRIBED BY ME AS *OLIGODON EVANSI*.

In Volume XXII, page 514, of this Journal, I described a new snake under the name *Oligodon evansi*, the type of which was preserved in our Society's collection. Mr. Prater has drawn my attention to the similarity between this and specimens of *Trirhinopholis nuchalis* Boulenger, and suggests that *Oligodon evansi* is not a valid species. I have revised my notes, and find that Mr. Prater is quite correct, so that my name calls for suppression.

BANGALORE, 3rd May 1920.

F. WALL, LIEUT.-COL., I.M.S.

No. XVII.—OCCURRENCE OF THEOBALD'S KUKRI SNAKE
(*SIMOTES THEOBALDI*) IN ASSAM.

Among the snakes recently presented to this Society by Mrs. Jackson, Tura, Assam, is a specimen of *Simotes theobaldi*. Dr. Boulenger in the Fauna of British India, Reptilia, gives Pegu, U. Burma, as the habitat of this species. Its occurrence in Assam is worthy of record.

BOMBAY NATURAL HISTORY SOCIETY,
3rd March 1920.

S. H. PRATER.

No. XVIII.—COBRA WITHOUT THE CUNEATE SCALE.

Since getting back here I have looked up my notes about the cobra whose head I left with you. It was killed on April 1st, 1920. It was 3'-0" long and had all normal characteristics except it lacked the cuneate scale. I may note that it had no ocellate marks (var *cæca*). I have now had 14 cobras (the longest 5'-2½") brought me here and not one has had ocellate marks. At Manpur (14 miles south of Mhow Cantonment) which I left in March 1919 I used to get both *cæca* and *typica*.

The other cobras I saw in the Museum which had no cuneate scale were not the ordinary species but banded (*fusciata*). So perhaps this case is unusual.

BHOPAL AGENCY, SEHORE, C. I.,
17th April 1920.

C. E. LUARD, LT.-COL.

No. XIX.—ON THE BREEDING OF THE CHECKERED WATER
SNAKE (*TROPIDONOTUS PISCATOR*.)

On April 15th I had a *Tropidonotus piscator* ♀ (var., *quincunciatus*) brought me. She was brought alive with 80 eggs. These examinations shewed were quite lately voided. Each egg was ½" to ¾" long, white, but not glossy. As this seems late in the year I record it.

BHOPAL AGENCY, SEHORE, C. I.,
17th April 1920.

C. E. LUARD, LT.-COL.

No. XX.—THE MYSTERIOUS 'JHOOR.'

During a recent tour through the Gir Forest I overheard a conversation between the forest guards and the cattleherds regarding a strange beast that is supposed to inhabit the deep pools in the forest rivers. I questioned a large number of men who have spent all their lives in the Gir, including Hebat Jamadar, the famous old warder of the lions (now very old, feeble, and probably ninety years of age) and made the following notes. It would be of interest to know if such a belief exists in other parts of India.

"The beast is named the Jhoor, lives in the deep rocky pools scoured out in the beds of the big rivers, and is very seldom seen as it never leaves the water. Hebat and two other men declare they have seen it. It pulls

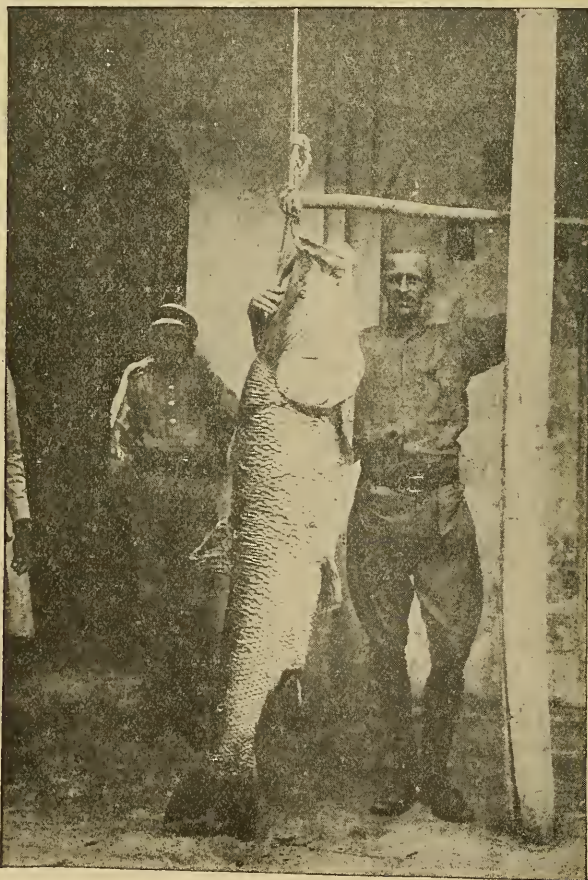
in the largest buffaloes when they go down to drink. If the buffalo should be recovered after a few days, nothing but the skin and bones remain, with a large puncture in the abdomen through which evidently the flesh has been extracted. The Jhoor has a body closely resembling a large turtle, with a long neck, and snake-like head, and four very long flexible legs or tentacles. It seizes its victims by the nose and winds its tentacles round the four legs, places its carepace under the chest of its prey, and levers it into deep water."

I am of opinion that this strange beast is a myth. The deep pools are infested with huge crocodiles which are very destructive to cattle and pull in the largest buffaloes. In several places villages have been deserted owing to the decimation of the flocks by crocodiles at the drinking pools, and the danger of children being dragged in. The Jhoor, I am afraid, carries on his head the sins of his more tangible brother, the crocodile.

JUNAGADH, 4th March 1920.

E. BROOK FOX.

No. XXI.—LARGE CARP FROM MESOPOTAMIA.



I enclose a photo, which may be of interest to you of a 140 lb. Tigris Salmon (so called) which I caught on a 2" spoon at Samarra on 21st

September 1919. I believe this to be a record as regards the size of the fish caught *spinning*, though I know much larger ones have been caught on meat and "atta".

The fish is a species of Barbel, but I should like to know its correct name.

HEAD QUARTERS, 17TH DIVISION,

F. B. LANE, MAJOR.

MESOPOTAMIA,

1st November 1919.

[Photos of large Carp from Mesopotamia appeared in our Journal, Vol. XXVI, No. 2, p. 679. The name of the fish is *Barbus seich*—EDS.].

No. XXII.—A NEW HAWK MOTH.

When on leave in Mussoorie in 1918, I found eggs of a Hawk moth, and young larvæ. Being suddenly ordered away, I only obtained two moths, one of which was later smashed up in the post. The last one reached home safely, and proves to be a new species.

If any member who is visiting Mussoorie or other stations close by during the rains would care to help, I will let him know where he can get eggs and larvæ. The British Natural History Museum would like a series of moths, and incidentally he could get some for himself and the Society. The larvæ are easy to rear, or if eggs were sent to me I would rear them.

F. B. SCOTT, MAJOR, I.A.

FERNDALE, SHILLONG,

2nd March 1920.

No. XXIII.—STRANGE FIND OF THE LARVA OF THE BUTTERFLY
(*TEINOPALPAS IMPERIALIS*).

I was riding up to Sukia, elevation 6,050 feet, when upon the road I chanced to see this fine Caterpillar almost under my pony's foot. I at once jumped off my pony and secured this unknown specimen, unknown then to me, as I had often wished to get this larva of this fine Butterfly, but without success from the Lepcha collectors. What the Caterpillar was doing on the road puzzled me but alongside was a big Oak tree and I had been told the larva of this insect fed on the Oak so it may have fallen down after being attacked by some enemy bird or lizard. I was also aware the larva fed on *Daphne nepalensis*, a large shrub, the bark used by the Nepalese to make a coarse paper, the wood sweet scented. Close at hand, as I expected at this elevation, I looked for several shrubs and found *Daphne papyracea* or *Wallichia* (Chota Aryili, Nepalese) and it may have been the Caterpillar was making for one of these. Anyhow the larva looked fairly full grown. Plucking the leaves of the Oak and "Daphne" I put the insect into a fairly big box with plenty of air holes. The Caterpillar was green with a large thick head, Papilio-shaped, the tail was certainly aggressive when I took hold of it from the ground which made me think I had got some Spingidæ larva yet new to me. On my return home from Darjeeling 2 days after I was exceedingly pleased to find the Caterpillar had turned into a soft pupa, a shape new to me, oval greenish with a strange horn, this was enough to show me that it was no "Spingidæ" larva. The date of turning would be the end of September 1918. The perfect Butterfly did not come out until the following April 1919. 7 months in the pupa state. Whether this insect is second brooded is difficult to say, but I am inclined to think it is. Senchal is the favourite hunting ground, catches are mostly made in August and end of July by Lepcha collectors.

In Lieut.-Colonel Bingham's book, Volume II, Butterflies, page 9, it is recorded

"The larva of this magnificent butterfly, according to Mr. Knyvett, feeds on *Dhaptne nipalensis*, but so far as I know no description of it has been published".

I trust to get hold of some larva this year as well as the larva of other interesting Papilios.

OSCAR LINDGREN.

TURZUM TEA ESTATE, NAGRISPUR P. O.,
DARJEELING HIMALAYAN RAILWAY,
April 1920.

No. XXIV.—LIFE HISTORY OF THE "BUPRESTID" LEAF
MINER (*TRACHYS BICOLOR*, *KERREMANS*)
A PEST ON *BUTEA FRONDOSA* IN MYSORE.

(With a plate).

INTRODUCTION:—*Butea frondosa* trees (Dhak or Palas) are subject to the attack of several insects, viz., leaf eating caterpillars falling under Limacodids, Lycænid and Sphingids, Coleopterous insects such as snout beetles or weevils, and Buprestid beetles and pentatomid bugs. All the above are only very minor pests excepting the Buprestid Beetle—a leaf miner—which is assuming the form of a serious pest in the majority of the places where *Butea* are found in Mysore State. The injury to the plants consists in that the adult beetles feed on the leaves of the plant and that the grubs pass their life as leaf miners feeding on the leaf tissue and forming regular pockets in the leaves, the leaves having a blistered appearance. Almost all the leaves of a plant are affected, they are unable to perform their normal functions, and they look quite dry without even a tinge of green matter and as a consequence many of the plants kept under observation for 4 or 5 years have never made any appreciable growth at all on account of this.

The adult. This beetle is a small oval wedge shaped creature, the head and thorax being of a bronzy colour, the rest of a steel blue colour, with 4 or 5 wavy white lines marked across the elytra. It measures 5.25-5.5 mm. lengthwise and 3.25-3.5 mm. at the broadest part. The beetles are hard to recognize on the plants as they cover themselves up with their excreta and thus resemble the droppings of some small birds. The beetles are commonly found on the plants from about the end of April or the beginning of May and egg-laying and continuous breeding begins from now and continues up to about February-March. There occur as many as 4 or 5 broods in a year.

Oviposition. The female beetle moves about the upper surface of the leaves before egg laying and when a spot is selected at the angle formed by the junction of one of the veins with the midrib on the upper surface of the leaves it first scrapes the epidermis of the leaf with the mouth parts, lays an egg and then covers it with the dirty white excreta with which the beetle is covered. The flattened oval eggs are laid singly as well as in groups of 2 or 3, sometimes 4 or 5 on the upper surface of the leaves. When the eggs are laid in groups they are usually laid overlapping one another.

The Egg. The newly laid egg is colourless, flat, oval and measures 1.75 mm. to 2.25 mm. at its long axis and 1.25 mm. to 1.75 mm. at its short axis. The egg remains colourless for 5 days and on the 6th day it turns to a shining black colour and now the dirty white excreta with which the egg is covered is plainly distinguishable. 13 days after the egg turns to black, i.e., 19 days from egg-laying, the egg hatches out.



Fig. 1. A. Eggs of the Beetle.
B. Pockets in the leaf made by the Grubs.

Fig. 2. Injury to the leaf by the adult Beetles.



Fig. 3. Full grown Grubs.



Fig. 4. Adult Beetles.
1. Ventral side.
2. Dorsal side.

THE "BUPRESTID" LEAF MINER (*TRACHYS BICOLOR*, KERREMANS) A PEST ON *BUTEA FRONDOSA* IN MYSORE.

The Grub. Immediately on hatching, the grub which is of the characteristic Buprestid form—flat, round, wedgeshaped, large head and thorax and the body tapering to a point at the posterior end—splits open a portion of the underside of the egg and begins to eat through into the leaf tissue. The upper side of the egg remains quite intact. The wedgeshaped, flat front portion of the grub is thrust into the tissue of the leaf and the grub works gradually from side to side consuming the substance of the leaf all the time without in any way injuring the epidermal layers of the leaf and thus a small cavity is formed in the leaf. The grub goes on widening the cavity gradually and feeding for about a month by which time a fairly big pocket about half the area of the leaf is formed and pupation takes place within this cavity now. The newly hatched out grub is 2 mm. long and 1 mm. broad at the broadest portion. It is of a pale whitish colour. The fully developed grub is of a dull white colour with a tinge of yellow and measures 11.5 to 12 mm. lengthwise and 2.75 to 3.5 mm. at the broadest part. The centre of the segments 2nd to the 10th behind the head in the grubs, both on the dorsal and ventral sides are marked with peculiar markings in black resembling "shirt" buttons. The larval life is 29 days.

The pupa. Pupation takes place in the larval chamber. The pupa is flat and brownish in colour and is 6 mm. long and 3.5 mm. broad. The pupal life lasts 9 days. The adult beetle on emerging from the pupal stage remains within the chamber for a few hours and then bites a hole through the lower surface of the chamber and escapes out and begins feeding on the leaves.

Natural enemies. Found small black ants *Campylocotus* sp. feeding on freshly laid eggs. A very minute chalcid parasite parasitises the grub. It was found to walk over the upper surface of the pocket of the leaf tapping with antennae the different portions and finally bending its abdomen to pierce the thin wall of the pocket and lay eggs on the grub.

Conclusion. Considering the fact that no mention is made of any insects affecting *Butea frondosa* plants seriously and this is one of the important plants on which lac is raised in India, I venture to record the above facts regarding this insect in the hope that lac growers in India will be particularly interested in the subject.

P. V. SUBRAMANIAM,

ASSISTANT ENTOMOLOGIST,

MYSORE AGRICULTURAL DEPARTMENT.

BANGALORE, 15th March 1920.

No. XXV.—A SHORT NOTE ON THE ATROPHIC ABORTION
OF THE INFLORESCENCE OF THE ONION (*ALLIUM CEPA*, L.)

(With two plates).

In March, 1917, I came across a few peculiar onion bulbs of which three (Figs. 1-4) have been figured here. In external appearance these were indistinguishable from other bulbs of *A. cepa*, but, on closer examination, were found to differ in being easily compressible and in containing abortive inflorescences (Infl.). It is a matter of surprise that no similar case of abortive inflorescence has been either cited or described in either Master's Vegetable Teratology or any other available literature.

Although left for a fairly long time in a grocer's store, curiously enough, these specimens contained inflorescences (Infl.) bearing full-sized (deter-

mined by actual measurement) waxy-white flowers. Fig. 1 shows the inflorescence (Infl.) inside the partially opened bulb of specimen No. 1. Fig. 2 shows the scape (Sc.) (in specimen No. 1) which assumed quite a curious shape. It deviated so much from the type, that, it became solid, fleshy and stunted (its length being only 6.25 cm. whereas a normal scape is 30-60 cm. in length) and it bore the inflorescence along the whole of its left side instead of bearing it on its top. The whole inflorescence thus developed was wrapped up by a membranous covering (Memb.) with prominent parallel nerves. A part of this membrane was found adnate to the left side of the scape. This covering seemed to be nothing but a modified form of a spathe. In the fourth specimen, which has not been depicted here, I noticed two waxy ovate-lanceolate fleshy structures, differing in shape from all the other scale-leaves (SL.), adpressed to the tiny inflorescence (Infl.) inside the bulb. Fig. 3 shows the two kinds of inflorescence (Infl.) met with in specimen No. 2, in which a group of flowers or fascicle (b.) arose directly from the stem below and a small umbel (a), partially hidden by 'b.' was borne by the irregularly zigzag solid scape (Sc) slightly twisted to the left. Except the basal part of a withered normal scape (Sc¹) seen also in Figs. 1-3) no trace of a fresh scape is seen in Fig. 4, all the flowers (Fl.) having taken their origin directly from the stem (St.). Dissections of the flowers (Fl.) from each of the above specimens revealed the fact that, although etiolation had taken place, owing to the partial exclusion of light, still, the perianth and the sporophylls were developed quite up to their normal size and shape. Except in specimen No. 1 (in which the anthers appeared to have dehisced) the anthers in all the other specimens were found to contain scanty pollen grains. The ovaries ('B' and 'D' in Fig. 5) were provided with either a long-styled (D) or a trifid sub-sessile (B) stigma (intermediate forms being noticeable in some of the flowers) and generally three compressed ovate ascending and minutely pitted ovules ('F' and 'E' in Fig. 5) in each cell. As the ovules, particularly those in specimen No. 1 were quite tough (unlike functionless ovules which are easily compressible) and as in some of the anthers the pollen-sacs were almost empty, it seemed probable that at least some of the flowers were self-fertilised. Here, it is obvious, that, no cross-fertilisation could have taken place at all.

Histological differences between a normal (Sc¹) and an abortive scape (Sc. in Fig. 3) were no less marked. The following were the main points worth noticing:—

1. The epidermis (Ep.) of the abortive scape (Fig. 7) was thicker than that of the normal scape (Fig. 6) and was provided with comparatively larger cells, which were not of uniform size and shape throughout. Whereas the cuticle (Cut.) was uniformly thickened in the normal scape, in the abortive scape it was distinctly thicker on the outer or 'dorsal' surface than on the inner or 'ventral' surface. Stomata (Stom.) were often present in the epidermis (very clearly seen in longitudinal sections of the epidermal region) of the abortive scape, whereas no stomata were generally found in that of the normal scape.

2. The ring of sclerenchymatous cells (Scl.) in the abortive scape (Fig. 7) in which the vascular bundles (V. b.) lie scattered, was composed of cells having walls thicker than of those in the normal scape (Fig. 6).

3. The vascular bundles (V. b.) in the abortive scape (Fig. 7) were numerically less than those in the normal scape (Fig. 6), but proportionately greater for the area supported by them.

4. Two distinct groups of large vascular bundles (V.¹ b.¹) were found developed in the ventral area near the centre of the solid abortive scape (Fig. 7), whereas in the normal scape (Fig. 6) the central portion was hollow.

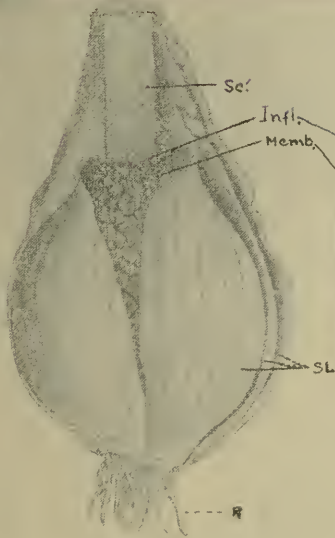


Fig. 1
(specimen no.1)
NAT. SIZE.

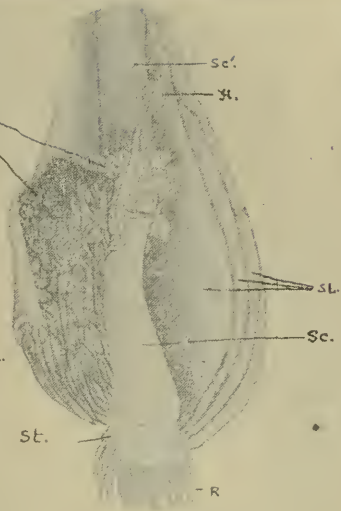


Fig. 2
(specimen no.2)
NAT. SIZE.

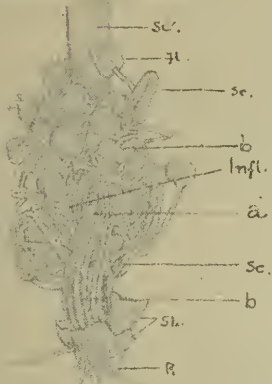


Fig. 3
(specimen no.2)
NAT. SIZE.



Fig. 4
(specimen no.3)
NAT. SIZE.

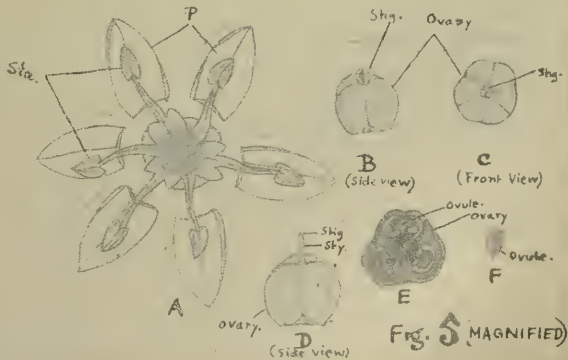


Fig. 5 (MAGNIFIED)

Allium Cepa L.

Del. F.E.D.

ABORTIVE INFLORESCENCES OF
ALLIUM CEPA L.

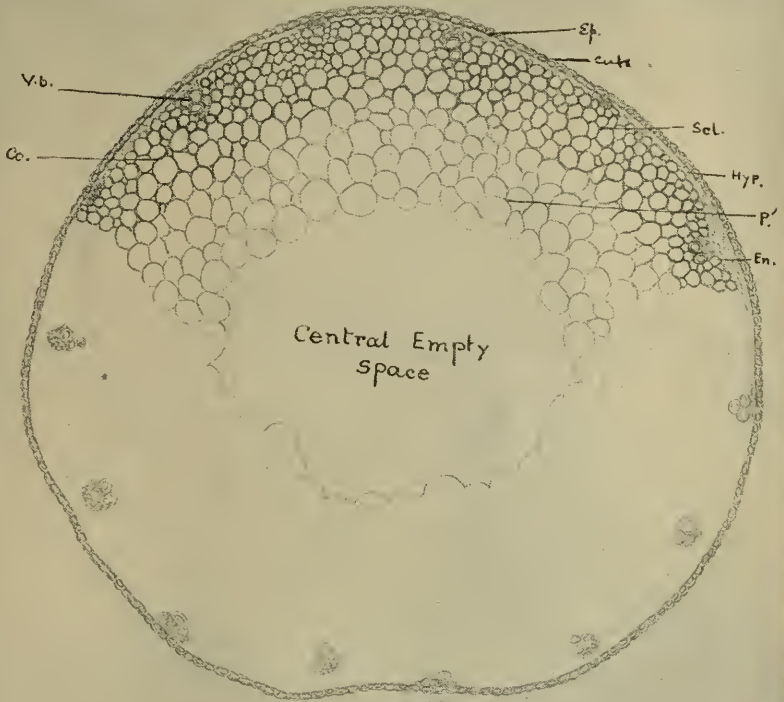


Fig. 6
Transverse Section of a normal Scape.
(x nearly 35)

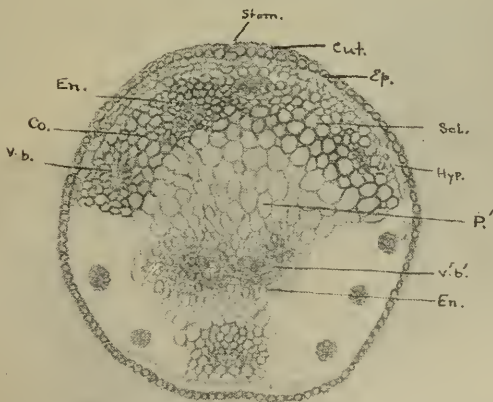


Fig. 7
Transverse Section of an abortive Scape (x nearly 35)

A. Cepa L.

D. L. P. M. D.

5. A transition from relatively large rounded to small elongated cells was distinctly noticeable in the pith (P.) in the section of the abortive scape (Fig. 7), whereas in the normal scape (Fig. 6), the cells of the innermost part were distinctly rounded and generally big.

It will be worth while to consider the causes which have contributed to check the growth of the inflorescences in these specimens. It is quite obvious that, as the bulbs were never planted out on soil and as these could not derive any nourishment from any extraneous source, these had to suffer ultimately from starvation. For the supply of the plastic materials necessary for the development of the scapes, flowers and ovules etc., for the continuation and preservation of the stock, the bulbs had to depend solely on the reserve materials stored in the fleshy scale leaves (SL). These being nothing but limited sources of supply, could serve to provide nourishment only for a limited period of time. Although, stored in a grocer's shop, still, these bulbs were not totally deprived of all those necessary external stimuli, *e.g.*, Light, Heat, Air and Moisture, etc., which serve to stimulate development. These forms of energy, however, were not, in the long run, sufficient for inducing the production of normal development of all the organs. Hence, we find that in specimens Nos. 1 and 2 (Figs. 1—3) abortive scapes were developed and that in specimens Nos. 2 and 3 (Figs. 3 and 4) some or all the flowers were arranged in sessile fascicles instead of in umbels. The reason why the scapes and flowers could not find an opportunity of seeing the light of the day is this, that,—as much of the vigour of these bulbs was spent, without being ultimately recouped, in furthering the development of the inflorescences and scapes (where these were present) the pressure exerted inside the bulbs by these growing organs was not sufficient to overcome the resistance offered by the outer coating of dried scale-leaves. The thickened cuticle on the outer edge, the thicker-walled sclerenchymatous ring in the cortex and the sub-central vascular bundles appear to be nothing but the outcome of an effort, on the part of the poorly nourished growing scapes, to gain an additional strength to withstand the pressure exerted by the shrinking scale-leaves.

My sincere thanks are due to Dr. H. G. Carter, M.B., Ch.B., Economic Botanist in the Botanical Survey of India, for some useful suggestions.

Explanation of Figures.

Fig. 1.—Specimen No. 1 partially opened to show the abortive inflorescence (Infl.) covered by a membranous covering (Memb.). Natural size.

Fig. 2.—A fuller view of the solid scape (Sc.) and inflorescence (Infl.) in specimen No. 1. Natural size.

Fig. 3.—A portion of the scale leaves (SL.) removed to show the fascicle (c.) arising directly from the stem and the zigzag scape (Sc.) supporting an umbel (a) in specimen No. 2. Natural size.

Fig. 4.—Some of the frontal scale leaves removed to show the fasciculate inflorescence (Infl.) in specimen No. 3. Natural size.

Fig. 5.—A flower from an abortive inflorescence dissected to show the different parts. (A) Front view of a flower without the ovary. (B) Side view of an ovary. (C) Front view of an ovary. (E) Transverse section of an ovary. (F) Ovules. All magnified.

Fig. 6.—Transverse section of a normal scape. Magnified.

Fig. 7.—Transverse section of an abortive scape (Sc.) from specimen No. 2 (See Fig. 3). Magnified.

P. M. DEBBARMAN, B. sc., M.R.A.S.,
SYSTEMATIC ASSISTANT IN THE
BOTANICAL SURVEY OF INDIA.

EDITORIAL.

Members will learn with regret of the retirement of Mr. Millard from the post of Honorary Secretary. Mr. Millard became Joint Honorary Secretary with Mr. Phipson in 1898 and took on the work single handed when the latter retired in 1905, and he remained Honorary Secretary until April 1919 when he retired to England on medical advice. Those who have been brought in contact with him realise the extent of the Society's obligation for the manner in which he has conducted its affairs for the last 20 years. To use his own words "To him it was a labour of love". Unsparingly he devoted his time and energy to the advancement of the Society's interests and we are glad the Journal enables us to record the Society's gratitude.

Although Mr. Millard has retired from India he is continuing to work for the Society, and in England will act as our representative. There is a great amount of work to be done at home in connection with the forthcoming publications of the Society and with the selection and choice and approval of plates. All this Mr. Millard will look after, and he will be in close personal touch with the officials at the Natural History Museum and at the Zoological and Botanical Gardens. Members in England who would like to communicate with Mr. Millard on Society's business should address correspondence to c/o Grindlay and Co., London.

Another loss sustained by the Society has been the resignation of Mr. N. B. Kinnear from his post as Keeper of the Museum and one of the Editors of the Journal. Mr. Kinnear joined us in 1907 and the care of the Museum remained in his hands till October 1919 when he went to England on 6 months' leave. Mr. Kinnear did splendid service for the Society not merely in the Museum but also in the way he encouraged members to collect for us and helped them in their difficulties. During the war Captain Kinnear was Intelligence Staff Officer to the Bombay Brigade but, despite the long hours of work this entailed, all his spare time from military duties was given to the Society. During the periods Mr. Millard was on leave Mr. Kinnear acted as Joint Honorary Secretary, and at these times the Editorial work of the Journal fell mainly on him.

At a Committee meeting held on the 22nd of March 1920 it was resolved that a vote of thanks be passed to Mr. Wroughton for his work on behalf of the Society at the British Museum, particularly in connection with the Mammal Survey.

A similar vote was recorded in favour of Mr. T. B. Fry for his work at the British Museum in keeping the registers and identification lists of the Mammal Survey specimens sent home.

The pages of this Journal have for several years past recorded some of the work done by Mr. Wroughton, but only those actually working in connection with the Society knew the amount of hard, willing, and entirely honorary work these two old members have put in for the Society.

We have recently received a letter expressing the thanks of the Trustees of the British Museum for the donation of several interesting specimens. These included mammals from India, Burma, Persia and Arabia, and among them were the skin of a rare Flying Squirrel (*Eupetaurus cinereus*) from Chitral, a female example of the new form of Blood Pheasant (*Ithagene kurseri*) from near Htawgaw, between the Kachin Hills and China, and 51 small mammals from Persia, collected by Col. J. E. B. Hotson, C.I.E., including the type of a new Bat (*Myotis myotis risorius*).

Members resident in England will be interested to learn that the Committee have decided to open a Banking account in London in the name of the Society, with the National Bank of India there, and to accept subscriptions from members resident in England at two shillings exchange, so that

the annual subscription, including postage on Journals and registration, is £1-15-9 payable in London. Members in England having money transactions with the Society are asked to pay cheques drawn on English Banks into our Bankers at home, and so obviate any loss to the Society through varying exchange.

We would draw the attention of members to the appeal from Mr. E. C. Stuart Baker for information regarding eggs and nesting habits of Partridges, which he requires for his paper on these birds in his serial on Game Birds now current in the Journal. It would be very advantageous if members who have the opportunity for making observations or collecting eggs would communicate with Mr. Stuart Baker. It is on the activities of its members that a Society like ours must chiefly rely. It is due to their efforts that so much has been accomplished in the past and we look to their continued assistance and support in the future.

Butterfly collectors will be interested in Col. C. H. Ward's offer of a collection of Indian butterflies. Col. Ward has been collecting for several years and his collections offer a great opportunity to members interested.

With the view to assist in the ready identification of poisonous snakes, the Society has in course of preparation a chart by means of which poisonous and non-poisonous snakes may be readily distinguished. The use of technicalities has been entirely avoided; the object of the chart being to offer to the layman, by the use of simple diagrams, an easy method by which he may tell whether a snake is poisonous or not. The chart has already been approved by several Provincial Governments for use in their schools and hospitals and dispensaries. For the individual member we are preparing a folding pocket chart which he can carry with him on shikar trips or for use on occasions when information on this point might be of vital importance. For the medical cure of snake bite it is essential that the species of snake should be known. Generally the snake which caused the injury is killed and by means of this chart an easy method of identification will be found. Instances are on record where people have died of fright after being bitten by a perfectly harmless species. Such a chart as this should go far towards spreading knowledge of a subject which is of great importance to people resident in India. We expect to have copies ready by next cold weather; the price will be low and members can register their names for copies now if desired.

Mr. Stuart Baker is preparing a Hand List of the Birds of the Indian Empire which will summarise the extent of our present day knowledge of Indian Avifauna. The list will show the various races, will include the many recently described species, and will give short notes as regards distribution and locality where the types were obtained. The list will be published in our Journal and on completion will be issued separately and ought to be a welcome addition to the library of all those interested in ornithology.

A similar list is being prepared by Col. Wall in connection with the snakes. Both these lists will be useful supplements to the volumes in the Fauna of British India Series which, owing to the advancement of our knowledge in recent years, have in many instances been rendered practically obsolete.

Members who were in Mesopotamia, and those especially who helped with the collection, will be sorry to learn that the Society's entire collection of Mesopotamian Lizards was lost in transit after having been identified at the British Museum. We take this opportunity of appealing to those still stationed in Mesopotamia to remedy the loss by sending us fresh specimens. Specimens should be put into fairly strong spirits of wine and after "pickling" for some time they can be taken out and wrapped in cotton soaked in the spirit, and soldered up in a tin for despatch by post.

The various collections of Birds, Mammals, etc., from Mesopotamia are now all in England where they are being worked out. The lists of identifications will be published in the Journal and on completion of the whole Mesopotamian series they will be bound together and be available as a separate publication, and as such will form a handy work on the Fauna of that country.

It is hoped that these editorial notes, which it is proposed to continue, will by giving members a wider knowledge of our affairs and activities increase their keenness and interest, as it is on these that the life and progress of a Society like ours depend.

Capt. J. A. Budden wrote to us from England a short time ago with regard to the Journal, and in his letter he says—"I fully understand that your Journal is for the scientific advancement of Natural History in India but I make a plea that you cater for the ordinary lover of the jungle. Why not get known reliable members to write popular articles on their shoots and observations, etc., which would be full of interest to many subscribers who are out of touch with the highly scientific side of Natural History. Many Forest Officers—good observers, hunters and writers—would interest us all."

Capt. J. A. Budden's suggestions are excellent and there is no doubt that many of our members could send us very valuable articles which would be of an intensely interesting nature and whilst valuable from the scientific point of view would appeal to the ordinary non-scientific member. Our trouble in the past has been that so few of our members who can write could be encouraged to write. The Miscellaneous Notes at the end of each number offer a means for bringing about the end aimed at, and we appeal to all members who have facilities for making notes and observations on Natural History subjects, either on shikar trips or any occasions when brought in contact with Jungle life, to send in their observations. Help in this direction will tend greatly to popularise the Journal and so would be to the advantage and benefit of our Society.

PROCEEDINGS

OF A MEETING HELD ON 22ND JANUARY 1920.

A meeting of members and their friends took place on Thursday, the 22nd January, Colonel C. H. Ward presiding.

The election of the following 53 new members since the last meeting was announced:—Mr. Bjarne Hagem, Bombay; Mr. E. Chapple, Bangkok; Mr. George Brown, Ceylon; Capt. A. B. Gibson, Bombay; Lt.-Col. M. Henderson, Quetta; Capt. R. G. Bignell, Aden; Mr. R. W. D. Willoughby, I.C.S., Khery, Oudh; Mr. H. R. Cox, Simla; Lt.-Col. H. Brooke Smith, D.S.O., R.F.A., Bombay; the Mess President, Officers' Mess, King's Own Yorkshire Lt. Infy., Mhow, C. I.; Lt. W. H. C. Jones, Belgaum; Major E. H. B. Stanley, I.M.S., Lahore Cantonment; Major G. Petit, R.A.M.C., Bombay; Major P. B. Arbuthnot, I.A., Secunderabad; Mr. A. R. Ubsdell, Calcutta; Lt. A. P. Beatty, Jullunder; Lt. R. E. Boothby, Meerut, U. P.; Capt. W. R. Ward, O.B.E., Bombay; Sir Lakhajiraj, K.C.I.E., Rajkot; Mr. G. S. Napier-Ford, Vandiperiyar; Mr. Malik Sahim Abdul Haq, Jullunder; Capt. E. C. Sylvester, R.F.A., Vandiperiyar; Miss L. D. Greene, M.A., Lahore; Mr. C. F. Cunningham, Bombay; Mr. C. S. Chaston, Topolia, P. O.; Lt.-Col. A. W. N. Bowen, R.A. M.C., Ahmednagar; Mr. K. B. Mazagonwalla, B.A., Bombay; Mr. H. F. Lodge, Bombay; Mr. C. F. C. Steward, Mirik, P. O.; Major Sidney Smith, R.G.A., Karachi; Mr. Chas. F. Morris, Bombay; Mr. A. N. Campbell, Bombay; Dr. R. N. O'Moynan, Bilaspur, C. P.; Mr. L. E. Aspinall, Rangoon; Mr. E. C. Dowson, Ceylon; Lt. J. G. Miller, Kandri: the Librarian, Bureau of Science, Manila, P. I.; Mr. W. G. Beagle-Atkins, Sadiva; Brig.-Genl. A. C. Wauchope, Mesopotamia; Major D. G. Oliver, Bombay; Thakur Rameshwar Singh of Bandanwara, Ajmer; Mr. E. E. G. L. Searight, Bombay; Mr. E. G. Browne, Fatehgarh, U. P.; Mr. P. G. Gilliam, Bagdogra, P. O.; Mr. T. E. T. Upton, Calcutta; Mr. J. J. Macpherson, Jalpaiguri; Mr. R. C. Lowndes, Bombay; Mr. C. Dover, Calcutta; Mr. C. M. Harlow, I.F.S., Calcutta; Mr. Allan Mackenzie, Bengal; Mr. W. H. Woodhouse-Adolphus, Coimbatore; Capt. H. Bullock, I.A., Salonica; and Major H. R. P. Dickson, C.I.E., Bahrain.

The following contributions to the Museum were received since the last meeting:—

Contribution.	Locality.	Donor.
76 Mammal skins and skulls ..	Mogokchung, Assam.	Mr. J. P. Mills.
213 Mammals	Shiraz, Persia ..	Lt.-Col. J. E. B. Hotson.
10 Birds		
Botanical specimens .. .	Ladak and Tibet .	Mr. F. Ludlow.
3 Urial skins (<i>Ovis vignei</i>) .. .		
5 Marmots (<i>Arctomys sp.</i>) .. .		
1 Pale Weasel (<i>P. alpinus</i>) .. .		
1 Mouse Hare (<i>Lagomys sp.</i>) .. .		
9 Birds skins		
2 Indian Gerbilles (<i>G. indica</i>) .. .	Montgomery, Punjab.	Mr. W. A. Phillips.
1 Hare (<i>Lepus sp.</i>)		
1 Jackal (<i>C. indicus</i>)		

Contribution.	Locality.	Donor.
2 Chinkara skulls (<i>Gazella benetti</i>).	Cutch	H. H. The Rao of Cutch.
12 Mammals}	Ceylon	M. J. W. B. Goodfellow.
1 Bird skin}		
6 Blackbuck (<i>A. cervicapra</i>) ..	Dhar, C. I. ..	H. H. The Maharaja of Dhar.
1 Hamster (<i>Cricetulus sp.</i>) ..	Menjil, N. Persia.	Capt. C. M. Ingoldby
1 Fox (<i>Vulpes sp.</i>)	Mesopotamia ..	Lt. W. H. O. Shortt.
1 Little Malay Chevrotain (<i>Tragulus k. rarus</i>).	Tavoy	Mr. C. Hopwood.
1 Pine Marten (<i>M. flavigula</i>).	Simla	Mr. A. E. Jones.
2 Weasels (<i>Mustela canigula</i>)		
1 Bat (<i>Pepistrellus sp.</i>) ..		
22 Mammals, 2 Birds and 3 nests with eggs.	Imaw Bum Range N. Burma.	Mr. F. Kingdon Ward.
1 Wild Dog (<i>C. dukhunensis</i>) ..	Hasimara. Bhutan Duars.	Mr. H. V. O'Donel.
1 Hamster (<i>Cricetulus sp.</i>) ..	Kasin, N. Persia.	Capt. P. A. Buxton.
1 Pigmy Shrew (<i>Pachyura sp.</i>).	Mesopotamia ..	Capt. E. A. Glennie.
1 Pale Hedgehog (alive) (<i>Erinaceus micropus</i>).	Baroda	Dr. R. N. Jadav.
1 Bat (<i>Myotis sp.</i>) in al.	Darjeeling ..	Mr. O. Lindgren.
1 Coronetted Sandgrouse (<i>P. coronatus</i>).	Punjab, Sind and Baluchistan.	Capt. C. Ticehurst.
1 Turnstone (<i>S. interpes</i>) ..		
12 Small Mammals}	Mesopotamia and the Punjab.	Major F. E. W. Venning.
23 Birds' skins}		
1 Wood Snipe (<i>G. nemoricola</i>).	Chapra	G. J. Monahern.
28 Birds' eggs}	Museyeh, Mesopotamia.	Capt. C. R. Pitman.
1 Pale Harrier (<i>C. cyaneus</i>) ..	Do.	Capt. T. R. Livesey.
2 Birds}	Basra	Major W. M. Logan Home.
1 Wood Snipe (<i>G. nemoricola</i>) .	Imphal, Manipur.	Mr. C. Gimson.
1 Short-toed eagle (<i>C. gallicus</i>).	Thana, Bombay..	Mr. W. R. Clarke.
2 Goosander (<i>M. castor</i>) ..	Garhwal	Capt. A. S. Brooke
1 Black-barred Cat Snake (<i>D. cymodon</i>).	Tura, Assam ..	Dr. J. Ahlquist.
9 Snakes}	Do.	Mrs. Jackson.
1 Banded Coral Snake (<i>C. macclellandi</i>).	Maymyo, Burma.	Lt. B. H. Hayes.
1 Snake (<i>Aspidura trachyprocta</i>).	Haputale, Ceylon.	Mr. James Erskine.
2 Shrimps and 1 Fish ..	Madras	Mr. Rodgers.
1 Scorpion and a few insects, etc.	Mesopotamia	Lt.-Col. H. D. Peile, I.M.S.

Minor contributions from:— Capt. H. R. Rishworth, Mr. C. Beeson, J. Erskine, H. French, Mrs. Jackson, Lt.-Col. Tupe, O. C. Ollenback, Major Kunhardt, R. E. Haslam, Col. A. B. Dew, O. Lindgren, Capt. F. B. Scott, Lt.-Col. A. W. Bowen, Mrs. Cocke, W. R. Clarke, T. H. Cameron, J. Makeig Jones, Mr. Ackworth and Mr. Baretto.

CONTRIBUTIONS TO MUSEUM.

The Society has to acknowledge a large number of contributions received since the last meeting. Our thanks are due to Col. J. E. B. Hotson for his continued efforts on our behalf, his recent collections from Baluchistan have been of great scientific value, several new forms and species having been discovered. The Society has since received from him a further consignment of 213 mammals, several birds and pressed plants obtained around Shiraz in Southern Persia.

EXHIBITS FROM MESOPOTAMIA.

Since demobilization the number of contributions from Mesopotamia, &c., has dwindled down, but the Society still continues to receive some specimens. Among these are 28 bird skins from Major W. M. Logan Home and 23 from Major F. E. W. Venning (the latter number including a few skins from the Punjab). Several birds' eggs were presented by Capt. C. R. S. Pitman and a Pale Harrier from the banks of the Euphrates by Capt. T. R. Livesey; Lt. W. H. O. Shortt sent a fox from Baghdad and Capt. Glennie, a Pigmy Shrew. A Scorpion and a few insects were contributed by Lt.-Col. H. D. Peile, I.M.S. The Society has received a number of skins of that curious rodent the Grey Hamster (*Cricetulus*). The Hamsters are Palearctic and yet have been recognised as practically identical with a genus found in North America, formerly described under the name *Hesperomys*. A large series of these were received from Col. Hotson and specimens have also been collected for us by Capt. P. A. Buxton, R.A.M.C., Capt. C. M. Ingoldby, R.A.M.C., and Capt. C. B. Tichurst, R.A.M.C., from Persia and Baluchistan.

EXHIBITS FROM INDIA, BURMA AND CEYLON.

The most outstanding feature of our contributions from within Indian limits is a collection of skins from Mr. J. P. Mills, I.C.S., Mokokchung, Assam. Mr. Mills' collection includes examples of the White-handed Gibbon, Small-toothed Palm-Civet, Ferret-Badger, various Tree Shrews and Bamboo Rats. Another valuable collection is that obtained for us by Lieut. Kingdon Ward in the Imaw Bum Range on the Burmo-Yunnan frontier. Among the specimens sent are examples of Anderson's Squirrel, several Brown-toothed Shrews, Pere David's Vole, a Weasel and Bamboo Rats. A Chinese Blood-Pheasant and a Laughing-Thrush were also collected by him in the same locality. The collector is a useful supplement to the work of the Mammal Survey in Burma. The Society records its obligations to Mr. F. Ludlow for a series of Marmot skins collected by him in Tibet. These animals have been for a long time very greatly needed for the proper working out of this genus, of which practically little is known scientifically. Mr. Ludlow also presented us with the skins of 3 Oorials, 3 Hares and a Pale Weasel. Twelve mammal skins from Ceylon were received from Mr. G. W. B. Goodfellow. Mr. C. Hopwood, I.F.S., contributed a Malay Chevrotain from Tavoy and Mr. A. E. Jones a Pine Marten, two Weasels and a Bat from the Simla Hills. Six Blackbuck heads and skins were received from H. H. the Maharaja of Dhar. His Highness has already sent a number of these skins and has

kindly promised to continue to send specimens shot at different periods of the year with a view to ascertaining any seasonal colour variation in these animals.

Amongst various additions to our bird collection are two very fine examples of the Goosander by Capt. A. S. Brooke, Gharwal. Contributions to our collection of Reptilia include 9 snakes from Mrs. Jackson and a Black-barred Cat Snake from Dr. Ahlquist, Tura, Assam ; a Diamond-backed Rat Snake from Peshawar from Mr. Makeig-Jones ; a Banded Coral Snake from Lt. B. H. Hayes, Maymyo ; and 9 frogs from Mr. F. J. Mitchell, Srinagar, Kashmir.

Prof. F. Hallberg read some Notes, illustrated with photographs, on the plants of North Canara.

A vote of thanks was passed to Professor Hallberg for his interesting paper and for the excellent photographs exhibited by him.

PROCEEDINGS.

OF THE MEETING HELD ON 26TH FEBRUARY 1920.

ANNUAL MEETING.

A meeting of members and their friends took place on Thursday, the 26th February 1920, the Hon. Sir George Carmichael, K.C.S.I., presiding.

The election of the following 24 new members since the last meeting was announced:—The Director of Agriculture, Gwalior Government, Gwalior, C.I.; Mr. H. R. Cooper, B.Sc., F.C.S., Assam; Mr. J. M. Wilson, Badlipar, Assam; Mr. R. F. Stephen, Badlipar, Assam; Mr. F. A. Hill, Badlipar, Assam; Mr. R. Stanley, Badlipar, Assam; Mr. J. J. Perry, Tavoy; Mr. Manek M. Manekji, Tavoy; Mr. H. Brian C. Hill, Chabua, Upper Assam; Lieut. S.G. Butler, I.A.R.O., Calcutta; Captain H. M. Stanford, R.F.A., M.B.O.U., Mesopotamia; Mr. Raymond W. d'Adhemar, Delhi; Mr. M. C. Mc. Leod, Calcutta; Mr. J. G. Brooker, Mirpurkhas; Mrs. W. Ouseley, Dhukrani; Mr. J. Ribeiro, L.C.E., Bombay; Mr. Wm. Theobald, Mysore; Mr. G. L. Shaw, Banarhat, Jalpaiguri; the Honorary Secretary, Club of Western India, Poona; and Colonel H. N. Dunn, A.M.S., Bangalore.

The following gentlemen were elected as office-bearers for the present year: President,—H. E. the Right Hon'ble Sir George Lloyd, G.C.I.E., D.S.O.; Vice-Presidents—Mr. J. D. Inverarity, B.A., LL.B.; the Hon. Sir Norman Macleod, and H. H. the Maharao of Cutch, G.C.S.I., G.C.I.E.

Managing Committee:—Mr. T. Bainbrigge Fletcher, F.E.S., Mr. T. R. Bell, C.I.E., Rev. E. Blatter, S.J., Mr. E. Comber, F.Z.S., Colonel G. H. Evans, C.I.E., F.L.S., Lieut-Col. W. H. Evans, R.E., Major M. L. Ferrar, I.A., C.B.E., Major F. C. Fraser, I.M.S., M.D., Lieut.-Col. J. E. B. Hotson, I.A.R.O., C.B.E. (I.C.S.), Mr. C. M. Inglis, Professor V. N. Hate, Lieut.-Col. W. Glen Liston, C.I.E., I.M.S., Mr. F. M. Mackwood, the Hon. Mr. P. J. Mead, C.I.E., I.C.S., Mr. H. P. Macnaghten, B.A., Mr. R. A. Spence, Lieut.-Col. F. Wall, I.M.S., C.M.G., C.M.Z.S., Lieut.-Col. H. J. Walton, I.M.S., C.M.Z.S., and Mr. John Wallace, C.E.

Mr. H. F. Lodge, Honorary Treasurer and Mr. W. S. Millard, Honorary Secretary.

The following contributions to the Museum were received since the last meeting:—

Contribution.	Locality.	Donor.
Wild dog pup (<i>Cuon dukhunensis</i>)	Gonda, U. P. ..	Mr. F. Field.
4 Blackbuck skins with horns (<i>A. cervicapra</i>).	Dhar, C. I. ..	H. H. The Maharaja of Dhar.
8 Mammals	Naga Hills, Assam.	Mr. J. P. Mills.
1 Himalayan Black Bear (<i>Ursus himalayanus</i>).	Manipur ..	Col. G. W. Row.
2 Desert Foxes (<i>Vulpus sp.</i>) } 1 Jungle Cat (<i>Felis sp.</i>) .. }	N. Baghdad ..	Lt. W. H. O. Shortt.
1 Crested Pochard (<i>Nyroca rufina</i>).	20 miles from Babylon.	General Wauchope.
1 White-eyed Duck (<i>N. fuligula</i>).		

Contribution.	Locality.	Donor.
2 Hobbys (<i>Falco subuteo</i>) ..	Pegu	Mr. S. E. F. Jenkins.
2 Arabian Chukor (<i>C. melan- ocephala</i> .)	Aden, Arabia ..	Capt. R. G. Bignel.
1 <i>Echis coloratus</i> (Arabian Saw- scaled Viper).	Aden	Do.
Skull of a Grampus (<i>Orca sp.</i>) ..	Bushire	Major F. C. Fraser, I.M.S.
1 Scorpion}	Rangoon	Dr. H. H. Marshall.
1 Centipede}		
2 Spiders}	Assam	Mr. H. W. Wells.
234 Mammals}		
15 Birds}		
1 <i>Rattus. r. rufescens</i>}	Southern India ..	Mr. A. F. Martin.
1 <i>Golunda ellioti</i>}		
1 <i>Zamenis diadema</i> (Diamond- backed Rat Snake).	Mesopotamia ..	Lt. W. H. O. Shortt.

ACCOUNTS FOR 1919.

Mr. H. F. Lodge, the Honorary Treasurer, in presenting the accounts for the year ended 31st December 1919, said that a copy of the audited balance sheet was on the table for the inspection of members and this would as usual be published in the Society's journal. The following, however, were the main features of the accounts of the past year. On 1st January 1919, the Society opened with a credit balance of Rs. 14,727-5-8 and during the year this figure was increased to Rs. 15,168-12-11, the cash balance shown on the 31st December 1919. The receipts during the year under review amounted to Rs. 33,767-4-8 which shows a decrease of Rs. 2,203, when compared with the corresponding figures of the previous year. The expenditure during the year 1919 amounted to Rs. 34,196-14-8 and this figure shows an increase of Rs. 9,719-10-11 over the corresponding figures for 1918.

The increase in expenditure was easily understood as the Society in common with every other institution had lately had to pay considerable more for every thing required to carry on its work. In spite of this the Society had not increased the annual subscription which remains at Rs. 15 and it was hoped to avoid having to do so. Indications for 1920 pointed to the fact that expenditure generally would be still further increased and to counteract the rise in prices every effort ought to be made to increase the revenues of the Society and this can best be done by the enrolment of new members. It is therefore hoped that members would do their best to interest their friends who were not already members in the work of the Society with a view to their being enrolled as members.

Since the close of the year ended 31st December 1918, 125 members had joined the Society and 52 had resigned or died, making a net increase of 73 to the membership of the Society which now totalled 1,821. During the year 1918 the membership of the Society had been increased by 84. The slight decrease in the number of new members during 1919 must not be taken as an indication that the Society was losing its popularity. The Society was full of vitality and its members were to be found in all parts of India, Burma and Ceylon. Now that we had come to the end of the first year of

peace and the process of settling back again into peace-time conditions was well under weigh, it was hoped that the year 1920 would show a marked increase in the Society's general prosperity both as regards new members and cash balances.

As regards the Mammal Fund, the balance at the commencement of the year was Rs. 8,684-7-2 and the closing balance Rs. 12,389-2-5. During the year under review the Mammal Survey was dormant till October 1919 except in Baluchistan where Lieut.-Col. Hotson at his own expense defrayed half the charges of Mr. Baptista to carry on the Survey work in that area and very valuable work was done. Col. Hotson is now continuing the work with the same assistance in S. Persia. As soon as it was discovered that neither the services of Messrs. Shortridge nor Crump, who were in charge of the Survey before the war, were again available Mr. Wells was brought out from England and proceeded straight to Assam. We have only just received his first collection of specimens. If funds will permit, it is proposed to engage another Collector in order that this very valuable survey may be the more quickly completed.

CONTRIBUTIONS.

As regards contributions received for the Museum since the last meeting :—

Two foxes and a jungle cat were presented by Capt. W. H. O. Shortt from Baghdad, Mr. J. P. Mills, I.C.S., sent in a further lot of Mammal skins from Assam, these include bamboo rats, flying squirrels, water shrews, a marten, and a wild dog. A black bear skin and skull was received from Lieut.-Col. G. W. Row, Manipur, Assam. The Society has obtained a few bears' skins, from the Assam Hill Ranges. These have proved of great interest and it is intended to have them examined and worked out at the British Museum, so as to establish the identity of the various species found in those hills. 4 black bucks' skins and skulls were presented by H. H. the Maharaja of Dhar. Two very fine examples of the Arabian chukor (*C. melanocephala*) were sent to us from the neighbourhood of Aden, by Captain R. Bignell. This species is the largest of the chukor partridges and is a remarkably handsome bird. An Arabian saw-scaled viper was also received from him. Two Indian Hobbies were presented by S. E. F. Jenkins, Pegu, and Major F. C. Fraser, I.M.S., contributed a perfectly preserved skull of a grampus from Bushire.

MAMMAL SURVEY.

The first consignment of specimens since the restarting of the Mammal Survey, which was in abeyance during the war, has just been received from Mr. H. W. Wells, the Society's Collector. Mr. Wells commenced work in October last, starting at Margherita in Assam; he collected for some time along the Assam-Burmese border but found the jungle very thick and heavy; he is now at Tura in the Garo Hills. The collection just unpacked consists of some 234 species and is extremely interesting. It includes some remarkable monkeys and a fine series of shrews. The collection will shortly be sent to the British Museum (Natural History) for identification and return. Vast tracts of Assam present practically a virgin field to the Zoological Collector and the work of the Mammal Survey will, it is hoped, be productive of some remarkable additions to our knowledge of the fauna of that interesting region.

The Society is anxious to bring out a second collector and so complete the Survey more quickly if only sufficient funds can be obtained.

THE GEOLOGY OF WORLI HILL.

Mr. Ribeiro read a very interesting paper on the above subject and illustrated it with several very fine examples of various minerals and fossils collected by him at Worli.

He said Worli Hill at no distant date formed by itself one of the seven isles which go to make up our present City of Bombay. It is a very interesting spot geologically, in fact the most interesting in Bombay. The Hill is made up of two lava flows, between which is sandwiched a 30-foot thick bed of sedimentary deposits. The lava beds are similar to the trap rock in the other parts of the island, but the aqueous strata contain a large amount of interesting relics from which important facts can be deduced.

An examination of the beds of trap above and below the sedimentary rock shows that the latter is older than both the trap flows, and the occurrence of a very large amount of frog fossils goes to prove that the aqueous deposits took place under fresh water, probably in a lake or a river.

Mr. Ribeiro said that he had secured a fine collection of rock, mineral and fossil specimens from the Hill, but it was very much to be regretted that owing to the non-existence in a City like Bombay of a standard collection of minerals and geological specimens, it is not possible to give the specific names of them beyond saving that they consist of Calcite quartz and Zeolites.

The full text of Mr. Ribeiro's paper will be published in the Society's Journal.

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FRANCOLINUS FRANCOLINUS MELANONOTUS.

The Assam Black Partridge.

(♂ Natural Size.)

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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

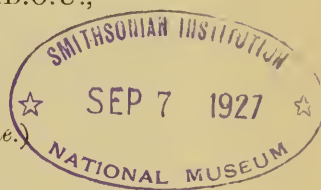
E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.,

PART XXX.

With a Coloured Plate.

(Continued from page 24 of this Volume.)

Genus—*FRANCOLINUS*.



The genus *Francolinus* contains a very large group of African, European and Asiatic Game-birds which in general appearance are very like the true Partridges (*Perdix*) but have 14 tail feathers instead of 16 or 18. The legs also are longer and stouter and, in the males, are generally furnished with a spur.

The wing is longer than the tail, but is short and rounded. The third or fourth primary is longest, and the fifth and sixth almost as long. In some species the sexes are alike, in other dissimilar.

Only five species of *Francolin* are known in India, but three of these are further divided into two or three geographical races, many of which Hartert has recently discussed at length in *Novitates Zoologicae*.

KEY TO SPECIES AND SUB-SPECIES.

- A. Quills transversely barred or spotted with buff on both webs.
- a. Scapulars with a conspicuous buff submarginal band.
- a'. Males with chestnut collar and females with chestnut nuchal patch.
- a". Darker *F. f. asiæ.*
- b". Much paler *F. f. henrici.*
- c". Darkest, much black above and below .. *F. f. melanonotus.*

- b'. No chestnut collar or patch.
 d''. Darker *F. p. pictus*.
 e''. Paler *F. p. pallidus*.
- b. No submarginal buff band on scapulars *F. chinensis*.
- B. Quills without transverse bars or spots.
- c. Breast buff with narrow black cross-bars.
 c'. Darker, centre of throat ochraceous *F. p. pondicerianus*.
 d'. Paler, centre of throat creamy white *F. p. interpositus*.
 e'. Palest, more grey and less chestnut *F. p. mecranensis*.
- d. Breast brown, with broad longitudinal white stripes *F. gularis*.

In giving the synonymy of the various races I have as far as possible worked them out geographically, but in many cases the areas and countries referred to overlap, whilst in some no definite locality is given. References to forms which do not occur within the limits of the Indian Empire have not been given.

FRANCOLINUS FRANCOLINUS ASIÆ.

The Northern Indian Black Partridge.

Francolinus asiæ.—Bonap., Compt. Rendu. XLII., p. 882 (1856) (Asia), Bree., Ibis, 1863, p. 115.

Francolinus orientalis europæus.—Buturlin., Orn. Monatsb., p. 81 (1907) (?) (Greece).

Tetrao francolinus.—Linn. Syst. Nat. I., p. 275 (1766); Gmelin, Syst. Nat. I., (2), p. 756 (1788) (S. Asia).

Perdix francolinus.—Lath. Ind. Orn. II., p. 644 (1790) (Europe, Africa, Asia); Temm. Pig. et Gal. III., p. 340 (1815) (part); Vieill. Tabl. Ency. Meth. I., p. 214 (1823); Jard. Nat. Lib. Orn. IV., p. 110 (1834) (part).

Francolinus vulgaris.—Blyth, Cat. B. Mus. Asiat. Soc. p. 251, (1849) (N. India, Persia, etc.); Adams, P. Z. S., 1858, p. 502 (Bombay, Bengal, etc.); id, ibid, 1859, p. 186; Irby, Ibis, 1861 p. 236 (Oudh. and Kumaon); Jerd. B. of I. III., p. 558, (1864); Tytler, Ibis, 1868, p. 203, (Simla to Mussoorie); Pelz., Ibis, 1868, p. 383, (Koteghur); Hume, N. & E. In. Birds, p. 537 (1873); Ball, Str. Feath. II., p. 427 (1874) (Chota Nagpore); Butler, ibid, IV., p. 5, (1876) (Deesa); Ball, ibid, VII., p. 225, (1878) (Ganges to Godaveri); Hume and Mars. Game-birds, II., p. 9 (1879); Reid, Str. Feath., X., p. 62 (1881) (Lucknow); Marshall, Ibis, 1884, p. 423 (Chamba); Taylor, Str. Feath, X, p. 530 (1881); St. John, Ibis, 1889, p. 175 (Afghanistan); Oates, ed. Hume's N. & Eggs III., p. 428 (1890); Blanf. Fauna B. I. IV., p. 136 (1898); Jesse, Ibis, 1901, p. 604 (Lucknow); id, ibid, 1902, p. 475 (Fyzabad); Inglis, Jour. B. N. H. S., XIV., p. 563 (1902) (Behar); Jesse, Ibis, 1903, p. 153 (Gogra-Ganges); Whympser, Jour. B. N. H. S., XVII., p. 232 (1906) (Naini-Tal); Ward, ibid, p. 944 (1907), (Jhelum); King, Jour. B. N. H. S., XXI., p. 100 (1911) (Saugor); Osmaston, ibid, XXII., p. 544, (1913) (Gorukpur); Brooking, ibid, XXVI., p. 677 (1919) (Euphrates Valley).

Francolinus francolinus.—Ogilvie-Grant, Cat. B. M. XXII., p. 132 (1893).

Francolinus francolinus asiæ.—Hartert, Nov. Zool. XXIV., p. 288 (1917).

VERNACULAR NAMES.—Tetra Kalo-tetra (*Garhwal*); Kala-titar (*Hin.*)

Description—Adult Male.—Crown to nape sandy or rufous brown, the feathers centred dark brown, supercilium and feathers round the eye black; a broad white band from lower lores, cheeks and ear-coverts white; chin, throat and broad patch below ear-coverts running up to nape black; feathers of nape showing a little black and white mottling. A broad chestnut collar all round the neck; behind the collar the back and sides are black, each feather with white spots on either web; back, scapulars and smaller wing-coverts, and innermost secondaries brown, each feather with a sub-marginal black-edged band of buff or sandy rufous, the transition from the black upper back being very gradual and not abrupt. Lower back, rump, upper tail-coverts and tail feathers black with narrow white or fulvous-white bars, the outer tail feathers with the terminal third unbarred black. Primaries, outer secondaries and greater coverts, dark brown with spots or broken bars of rufous buff.

Below, the breast is black, unspotted in very old males in the centre, but with oval white spots on the sides; flanks black with larger, longer, oval, white spots, rarely running to longitudinal bars on the posterior flanks and generally with narrow brown fringes; lower breast and thigh-coverts black to blackish brown with very large white spots or bars; centre of abdomen and vent light chestnut with whitish bars, under tail-coverts chestnut, rarely having a few bars of white or fulvous.

Under wing-coverts and axillaries mottled fulvous and dark brown.

Colours of Soft Parts.—Irides hazel-brown to dark brown; bill black or dark horny brown, the tip of the lower mandible whitish; legs and feet reddish brown to orange red or brick red, always brighter and redder during the breeding season than at other times; claws black or horny brown; spur dark horny, often paler at the tip.

Measurements.—Length about 13 inches (330mm.); wing 145·5 to 168 mm.; average 80 birds, 155·3 mm.; tail 77 to 110 mm.; tarsus about 45 to 50 mm.; bill at front about 24 mm., and from gape 27 mm.

Birds from various districts vary greatly in size. Thus 41 birds from Gurgaon average under 153, whilst others from Kumaon and Simla average in wing measurement a full 158 mm.; Deccan birds are very small.

“Weight 10 to 20-ozs.” (Hume).

Hume remarks on the weight “I have shot males in good condition in Gurgaon scrub weighing only 10-ozs. and others in the Kadar of the Ganges, in the Marut district, weighing fully 20-ozs.”

In addition to being smaller, birds from Gurgaon and the Plains generally have darker heads than those from the hills and the white and black mottling of the neck seems to extend further down the back.

Adult Female.—Above similar to the male, but paler and duller; the black and white cheeks and supercilia are replaced by dull, pale buff; the ear-coverts are brown or buffy brown, and the cheeks are more or less speckled with dark brown. The chestnut collar is replaced by a duller chestnut nuchal patch, sometimes freckled or slightly barred with brown. Rump, upper tail-coverts and central tail feathers dull pale brown, with narrow wavy bars of pale buff edged with black; outer tail feathers as in the male.

Below, chin, throat and foreneck white or buffy-white; breast and flanks white or pale buff, sometimes with a rufescent tinge, with wavy arrow-shaped bars of black, narrowest on the neck and upper breast, and gradually becoming broader on the posterior flanks and lower breast, but again fewer and more narrow on the abdomen where they occasionally disappear altogether. Ventral region pale dull chestnut, sometimes with faint brown bars and sometimes with whitish tips, under tail-coverts chestnut.

Colours of Soft Parts.—As in the male, but the legs never become a bright brick-red or orange-red as do those of the male in the breeding season. The bill is paler, more a horny-brown, than black, and the base and gonyx is paler still.

Measurements.—Length about 12 inches (300 mm.) or rather more; wing from 138 (one specimen, Gurgaon) and 144 to 167 mm.; average 149.9 mm. Tarsus and bill a little smaller than in the male, and the former only very rarely with a spur, though there is often a tiny knot to indicate the place where it should grow.

“Weight 8 to 17-ozs.” (Hume).

Young Males are like richly-coloured females, but with dark, almost black supercilia and white cheeks, the rufous nuchal patch is darker and more pronounced and the breast is black, though the two white spots take up practically the whole visible portion of each feather.

The black throat and foreneck is soon assumed, but the chin remains white for some time longer.

Chick in first Plumage is a peculiarly lark-like little bird, pale rufous buff everywhere with broad dark brown bars and spots. Below the buff is paler, almost albescent, and the spots are smaller.

Chick in Down.—Head bright rufous with darker crown and with paler supercilia and cheeks and dark line through the eyes, above brown with a very pale buff streak on either side of the back and rump; chin whitish, neck and throat fulvous-white, and rest of body below dull earthy white.

At a slightly older stage when the wing quills grow, the brown of the crown seems to become more defined and darker as well as greater in extent.

Distribution.—Excluding Sind and the extreme N. W. Frontier of India, the whole of Northern India as far East as W. Nepal in the Hills and East to and including Behar, but not B ngal and Orissa. Birds from these two provinces and also from E. Nepal are somewhat intermediate between *asie* and *melanonotus*, but are nearer the latter, and I agree with Hartert in retaining them with this race.

Southwards it extends to Deesa, Gwalior, Sambalpur, the Central Provinces to Saran, Pargua and Udaipur and Western Bengal to Chota Nagpore.

Type Locality.—Asia. To restrict this further, I now designate Gurgaon, India, as the type locality for this race.

Nidification.—The Indian Black Partridge breeds principally in May and June and early July, but the breeding season extends over a very protracted period. I have had eggs taken in early April in the Deccan, and in late September in Behar, whilst Whympers records finding hardset eggs near Naini-Tal at 5,000 feet on the 21st October. In the South it would appear that the favourite nesting month is April, over the central and western portions of its habitat June and perhaps July, and in the drier portions of Behar not until September at the end of the rains.

I think in some parts of its breeding range two broods are reared in the year, for though most of the eggs sent me from Behar have been taken in August and September, I have had others taken in April.

They make their nests in grass, tamarisk or scrub jungle, sometimes in sugar-cane, crops or indigo, but most often in the two first named. The nest itself is generally a rather flimsy affair, composed merely of a small amount of grass added to the fallen material and collected in some hollow, either natural or scratched out by the birds themselves. Occasionally, however, the nest is quite a compact affair, a thick pad some two or three inches deep, being formed of grass, dead leaves and odd fallen twigs.

The number of eggs laid is, I think, most often 6 to 8, but Hume says from 6 to 10, and Jerdon writes of 10 to 12 or even 15 in a clutch. Certainly clutches of 4 and 5 only are by no means rare, and I have frequently had such sent to me which had been advanced in incubation.

The eggs vary in colour from a pale stone colour, which is rare, to a deep olive chocolate brown. The majority are a rather pale olive brown, and in some almost an olive green, in fact they are very much like the eggs of the common pheasant, but the range of variation is proportionately far greater. I have, however, seen no eggs of the beautiful blue variety occasionally taken in clutches of pheasants' eggs. Many eggs, more especially the darker ones, have numerous white specks and blotches formed by a calcareous

deposit, apparently deposited on the egg immediately prior to expulsion, and after the deposition of the colouring matter has been completed. These spots are easily removable with a sharp knife, and the egg then appears to be unicoloured.

The texture is stout, but fine and generally rather glossy, and it is noticeable that the greener the egg the higher the gloss.

Hume's expression of spherico-conoidal exactly expresses the shape of most eggs, others are more oval, whilst at the other extremity some may be found which are of quite exaggerated peg-top shape, the big end being almost flat.

Hume who does not divide the races, gives the average of 70 eggs as 39.8×33.0 mm., practically, however, the whole of these are typical *asiæ* as he seems to have had no eggs from Sind, and only 5 taken by Cripps in the Duars which might be attributed to *mel-anonius*. He gives the variation in length as 34.7 to 45.8 mm., and in breadth as 29.9 to 35.0 mm.

The average of 40 eggs which have passed through my hands is 35.9×31.3 mm. The longest and broadest are 38.6×31.0 mm. and 36.3×32.3 mm., the shortest and narrowest are 32.6×30.4 and 35.2×29.4 .

The majority of my eggs are, however, from Behar, where the birds are smaller than in the Western area.

General Habits.—The one essential for the Black Partridge is cover and lots of it, and if this cover is near water, so much the better, but it is not a *sine qua non*, for many parts of its habitat are very arid and dry. Rajputana and other districts frequented by the Black Partridge elsewhere are very devoid of water except during the rains, yet it seems to hold its own there quite well.

As regards cover, it really does not seem to matter much what this is, but possibly its favourite consists either of grass a few feet high or scrub jungle, which is fairly thick. They haunt thin forest, date and scrub groves, dense *ekra* and *nal* of river beds and swamps, plains of short grass, not two feet high, and practically any kind of cultivated crop which affords sufficient concealment.

I fear that shooting and trapping by natives at all seasons of the year has greatly decreased the numbers of this fascinating bird over most of its range; civilization has destroyed many of its favourite haunts, and the crops which have taken the place of the seas of grass and jungle, though forming quite sufficient cover, have brought with them the ever-hungry native. Hume writes of places where he could make sure of bagging 50 couple to his own gun in one day, though even then he adds where "in past times 60, 70 and 80 brace have been thus brought to book." Hume also tells us of how in six days he and Home shot $177\frac{1}{2}$ brace of Black Partridge in the Aligarh District besides nearly 200 head of other game. I fear that such

shoots are no longer possible, but still good bags can be had with time available and proper arrangements made, and the charm is as great as ever.

The very cry of this Partridge is a sporting one: "Che-chirree chick-chirree" ringing out in the early morning before the sun is up or the dew off the grass urges the sluggard out of bed. Sometimes the first two words are repeated twice, but generally only the six syllables are uttered, the emphasis being placed on the "chick" and the last syllable of the cry. It is so joyous and musical a call that it cannot but appeal to every lover of Nature, even if he is not a sportsman bent on the murder of the utterer of the cry.

The Black Partridge is a satisfactory bird to shoot, for he rises quite well for an Indian game-bird, gets away fairly quickly, and flies strong and straight, though not at the pace of an English Partridge. Moreover he does not require such hard hitting as one generally takes him as he flies away from the shooter and so he does not present the tough shield of breast feathers presented by the driven bird.

Big coveys are the exception, for the birds soon separate when the young are old enough to look after themselves, and though the cocks and hens keep together throughout the year, even they often wander about some distance apart, so that often shots can be obtained at more than one member of a covey or at both the two birds of a pair.

Shooting with a few beaters in grass or crops is the form of sport with this bird most often indulged in, and from a shooting point of view is certainly the easiest, but birds can also be driven from one piece of cover to another, and then afford faster, harder shots, more like those obtained at a drive of Partridges at home.

In the hills which they ascend certainly up to 6,000 or 7,000 feet, Dodsworth records them at 8,000 in the Simla Hills, one must use dogs to work the heavier jungle which they there frequent, and even then one can hardly hope for bags of any size judging by the standard of the Plains.

Hume describes the joys of a Black Partridge shoot from elephants a sport often indulged in even now, but generally at the end of some tiger or big game shoot, when it no longer matters about disturbing or frightening away the real object of the day's outing. He says that Black Partridge are easy to shoot in such circumstances, and that he saw a Col. Congreve kill with ball cartridge in consecutive shots 6 Black Partridge!!

The natives trap the males in very large numbers to keep as pets. The method adopted is the universal one of surrounding a decoy bird with nooses so that when the wild bird hears the challenge of

the tame he rushes in and gets caught. They are great fighters, and occasionally a tame decoy gets killed by a wild bird that has avoided the nooses, for they are very savage in their attacks, and their long sharp spurs soon inflict a fatal wound.

In captivity they are not used for fighting purposes, or at least they are very seldom so used, though Capt. C. R. S. Pitman informs me that round about Ferozepore they are some times trained for this purpose, but they become tame rapidly, and can be allowed loose in a very short time. They run at a great pace, and their predilection for this form of movement seems even stronger in captivity than when wild as they always answer their master's call on foot rather than by flight.

They crow in captivity all through the months of March, April and May and again, though less often, in August and September, calling continuously through the early morning and after the cool of the evening. In their normal state they are said to call occasionally throughout the year, though principally in March and April, but wherever they are I think that when heard calling they will also be found to be breeding.

The Black Partridges are principally grain and seed-feeders, but also eat any small insects and a good deal of green food. As a dish for the table, most people consider them rather dry and flavourless, but they are not a bad change from endless fowl or goat when one is in camp.

FRANCOLINUS FRANCOLINUS HENRICI.

The South Persian Black Partridge.

Francolinus henrici.—Bonap, Compt. Rendu. XLII., p. 882 (1856) (Sindh).
Francolinus orientalis bogdanovi.—Zarudny, Orn. Monatsb. XIV., pp. 151, 152, (1906) (Mesopotamia).

Francolinus orientalis arabisticus.—Zarudny, & Harms., Orn. Monatsb. XXI, p. 54 (1913) (Zagrossische and Mesopotamische Gebiete Persiens).

Perdix francolinus.—Lath. Ind. Orn. II., p. 644 (1790) (part); Temm., Fig. et Gal. III., p. 340 (1815) (part); Vieill. Tabl. Ency. Meth. I., p. 214 (1823).

Francolinus vulgaris.—Blyth, Cat. B. Mus. Asiat. Soc., p. 251 (1849) (N. India, etc.); Adams, P. Z. S. 1858, p. 502 (Bombay, Bengal, etc.); id, ibid, 1859, p. 186; Irby, Ibis, 1861, p. 236 (Oudh & Kumaon); Jerd., B. of I. III., p. 558 (1864); Filippi, Viag. Pess. I., p. 351 (1865) (Persia); Hume, N. & E. In. Birds, p. 537 (1873); Hume, Str. Feath. I., p. 226 (1873) (Sind); Le Mes., Str. Feath. III., p. 379 (1875) (Sind); Schalow, Jour. f. Orn., 1876, p. 186. (Persia); Blanf., East Persia II., p. 273 (1876) (Baluchistan, etc.); Doig., Str. Feath. VIII., p. 371 (1879) (E. Narra); Butler, Cat. B. of Sind, p. 54 (1879); Hume & Mars. Game-Birds. II., p. 9 (1879); Murdoch, Str. Feath. X., p. 168, (1881), (Sind); Swinh. Ibis, (1882.) p. 119 (S. Afghanistan); Oates ed. Hume's N. & Eggs III., p. 428 (1890); Rattray, Jour. B. N. H. S. XII., p. 345, (1898) (Thull); Blanf., Fauna. B. I. IV., p. 136 (1898); Cumming; Jour. B. N. H. S. XVI., p. 692 (1905) (Seistan); Whitehead, Ibis, p. 269 (1909) (Kurram); id., Jour. B. N. H. S. XX., p. 969 (1911) (Kurram).

Francolinus francolinus.—Ogilvie-Grant, Cat. B. M. XXII., p. 136 (1893).

Francolinus francolinus henrici.—Hartert, Nov. zool. XXIV., p. 289 (1917).

VERNACULAR NAMES.—Kala-tetur or Kala-tetri (*Hin*); Taru (*Pushtu*).

Description.—*Adult Male*.—Similar to *F. f. asiæ*, but paler everywhere. This is more especially the case in regard to the small Sind birds. As regards the extent of the barring, this appears to me to vary individually to such an extent that it is of no value as a sub-specific character. The under tail-coverts are a darker chestnut than they are in *asiæ*, and there is hardly ever any trace of barrings.

Colours of Soft Parts.—As in *asiæ*.

Measurements.—Birds from Persia and Afghanistan seem to run larger than those from Sind and Baluchistan, the former measuring in their wings from 164 to 175 mm., and the latter from 148 to 163 mm. In colour they agree very well, and I do not consider it necessary to again sub-divide them. The Afghanistan and Sind birds are the palest, whilst the Baluchistan birds, though as small as those from Sind, agree with the Persian birds in being perceptibly darker.

Adult Female.—Differs from the female of *F. f. asiæ* in being paler.

Colours of Soft Parts.—As in *asiæ*.

Measurements.—The only Sind female I have seen has a wing of 149 mm., others of this race vary between 153 and 160 mm.

Chick in Down from Fao in Persia varies from the chick of *asiæ* far more than the adults do from one another. Above it is a pale whitish fawn, the central markings more narrow, though longer in shape than they are in *asiæ*. The quills have many light bars and narrower dark ones, making these feathers appear much lighter than they do in the other races. The head is of the palest fawn with a narrow darker centre, and below it is unmarked creamy white.

Distribution.—Southern and South-Eastern Persia to Fao and Bagdad, Baluchistan, Afghanistan and Sind.

A specimen from Chitral is undoubtedly of this race, and probably all those found in the hills of the N.-W. Frontier of India as far North as Quetta will prove to be the same.

Type Locality.—Sind.

Nidification.—There is practically nothing on record about the breeding of this race, but as it is a resident bird, it will be found nesting wherever it occurs.

In Baluchistan and the foot hills of the N.-W. Frontier it breeds, apparently in the thin scrub jungle, and, where there is any, in grass patches. In South Persia it breeds in the sparse grass bordering the rivers and river beds, and also in amongst a species of *Polypodium*, which grows over an enormous area of country during the rains, forming the staple food of Sand Grouse, and perhaps also of this partridge.

The only two eggs I have seen are two in my collection sent me from S. Persia, and taken on 27th April 1917. They are typical normal Black Partridge's eggs, and measure 37.0×31.0 and 37.3×31.0 mm.

Whitehead and Rattray both found it breeding on the N.-W. Frontier.

General Habits.—The Persian Black Partridge inhabits much the same kind of cover as the last bird, but within its Indian limits generally haunts much more broken ground. It is found everywhere in suitable places in the Baluchistan and Afghan Hills up to at least 7,000 feet, and is common up to 4,000 feet in most localities along the frontier.

In Persia it is said to be common along many of the river beds in the Tamarisk and heavy grass which grows so luxuriantly on their banks.

Capt. C. R. S. Pitman informs me that these partridges drink very regularly every morning and evening.

FRANCOLINUS FRANCOLINUS MELANONOTUS.

The Assam Black Partridge.

Francolinus melanonotus.—Hume, Stray Feath. XI., p. 305 (1888) (Assam and Manipur).

Perdix francolinus.—Lath., In. Orn. II., p. 644 (1790) (Part); Lesson, Traite d'Orn., p. 505 (1831), (Bengal, etc.).

Francolinus vulgaris? var *brevipes.*—Hodg. in Grays Zool. Misc., p. 85, (1844), (Nepal, nomen nudum.); id, Icon. ined. in B. M. Nos. 630; Bonap, C. B. XLIII., p. 414 (1856).

Francolinus vulgaris.—Stephen in Shaw's Gen. Zool. XI., p. 319, (1819), (Bengal, etc.); Adams, P. Z. S., 1858, p. 502 (Bombay, Bengal, etc.) id, ibid, 1859, p. 186; Irby, Ibis, 1861, p. 236 (Oudh and Kumaon); Jerd, B. of I., III., p. 558 (1864); Blyth., Ibis, 1867, p. 157 (Manbhum); Beavan, Ibis, 1868, p. 383 (Manbhum); Hume, N. & E. In. Birds, p. 537 (1873); Scully, Str. Feath. VIII., pp. 348, 367 (1879) (Nepal Valley); Hume and Mars., Game-Birds, I' p. 9 (1879); Hume, Str. Feath. XI., p. 304 (1888) (Manipur); Oates ed., Hume's N. & Eggs III., p. 428 (1890); Blanf., Jour. B. N. H. S., IX., p. 186 (1894) (Bengal); Stuart Baker, ibid, XII., p. 492 (N. Cachar); Blanf., Fauna. B. I. IV., p. 136 (1898); Stuart Baker, Jour. B. N. H. S., XVII., p. 971 (1907), (Khasia Hills); Higgins, ibid, XXIII., p. 368 (1914) (Manipur).

Francolinus francolinus.—Ogilvie-Grant, Cat. B. M. XXII., p. 132 (1893).

Francolinus francolinus melanonotus.—Hartert, Nov. Zool. XXIV. p. 290 (1917).

VERNACULAR NAMES.—Kais-tetur (*Nepalese*); Tetri-sorai (*Assamese*); Kemi (*Manipuri*); Dao-chirree (*Cachari*); Inrui-jirip (*Katcha-Naga*).

Description.—*Adult Male.*—Similar to *F. f. asiæ*, but very much darker both above and below; the feathers of the upper parts have the centres very dark brown, sometimes almost black, with their paler edges very narrow and very rufous; the white bars on the rump, upper tail-coverts and tail are very narrow. Below the white spots are generally less round and more oval in shape; on the extreme

lower breast at the sides these bars become longitudinal in shape, the outermost running round the submargin of the feather. The under tail-coverts are darker chestnut, and are unbarred.

The spurs are said to be smaller, and sometimes absent, but I have not noticed this amongst the many I have shot, and this seems to be more a matter of age and individuality.

Colours of Soft Parts.—As in *asiæ*, but I think the legs very often seem to be a brighter, richer red in old birds. On the other hand, I have seen some specimens—not in the breeding season, whose legs I should have described as horny-brown. Probably these were young males of the first year.

Measurements.—Wings 143 mm. to 155 mm. Birds from Assam and Manipur average a little smaller than those from Sikkim and Nepal, *i.e.*, 149·6 mm. against 152 mm. The former birds are also darker and more richly coloured, the latter are, however, much nearer true *melanotus* than *asiæ*. Birds from Bhagiratti and Bengal are also a trifle larger and paler than those from Assam.

Adult Female.—Similar to the Female of *asiæ*, but much darker, and the breasts are much more regularly and profusely barred with black.

Colours of the Soft Parts.—As in *asiæ*.

Measurements.—Wings 141—149 mm.

Chick in Down.—There are none in the British Museum collection, but they are well-known to me, and I think there is a greater contrast between the chicks of the three races than there is in the adults. The chicks of *melanotus* are very richly coloured, the dark portions including the crown are broader in extent, a richer darker chestnut brown, whilst the fulvous below is also much deeper.

Distribution.—Eastern Nepal, Sikkim, the whole of Assam and Eastern Bengal and the Hill tracts of Tippera and Chittagong. The birds of Central and West Bengal must also be placed with this race, as must those from Northern Orissa, though both are somewhat intermediate. On the other hand those found in the drier climate of Behar are nearer *asiæ*.

Type Locality.—Manipur.

Nidification.—The breeding season of this Black Partridge commences in early April, and continues until the first few days of July. Undoubtedly April is the month in which most eggs will be found, and those taken in July will, in many cases, be second broods, for many birds lay twice. In North Cachar, where the birds were very common in the wonderful park-like lands in the North, practically every egg was laid in April immediately after the first light rain had brought on a fresh growth of grass on the burnt lands. In Northern Assam and the Plains of Cachar, Sylhet, etc., the birds occasionally laid in the end of March, and more often in May, and then again in

July. In the Eastern Duars and the foot hills of Nepal, June and May seem to be the two months principally affected as breeding time, but in the higher ranges they once more revert to April.

Everywhere the time is governed by the abundance of food, and this in turn depends on the rainfall and the time of year the natives burn off the grass.

The nest varies considerably. As a rule it is a slight ill-formed pad of dead leaves and grass collected in some small hollow in grass or scrub jungle, but now and then one finds quite a well-made nest. I once came across one near Shillong on the 6th June 1907 placed between grass roots on a small stony grass-covered hill close to the station. Cattle had been feeding in this grass forming little deep tracks amongst the roots, and the nest in question was wedged into one of these. The base of the nest was a thick compact mass of dead leaves, bracken-fronds and grass, and over this was placed a thick lining of grass worked up on either side so that the nest was almost semi-domed. The nearest bracken grew at least 100 yards from the nest, so that in this instance the birds must have gone to some trouble to make their nest comfortable.

They breed up to 6,000 feet, but not often over 4,000, and probably their favourite altitude is under 2,000. They almost always select sun-grass land in which to nest, and seem to prefer such as is from 1 to 3 feet high. A few breed in high grass, ekra, elephant grass and scrub jungle, but even in these instances they are invariably near grass land and, almost equally invariably, the patches themselves are small and not too dense.

The nests are easy to find, for the Cock-bird calls long and cheerily morning and evening close to it, and if one has a little patience it can soon be located, moreover the hen sits very close in the cool of these hours and seldom rises until one almost steps on her, when away she goes with a tremendous whirr of wings and loud protests against being disturbed. In the heat of the day the cock-bird is silent and the hen leaves the nest, so that finding the nest then becomes a mere matter of luck.

As far as my own experience goes this Partridge does not lay large clutches, and I think 4 to 6 is the number most often found, and more than once I have known 3 eggs only to be incubated. I have never seen more than 8 eggs in a clutch, and that only once, and perhaps half-a-dozen times 7 eggs. I think 16 days is the period of incubation, but it may be a day or two more.

The eggs are, as might be suspected, indistinguishable from those of *F. f. asiæ*, and vary over about the same range of colour as does that bird, but on an average they are darker, and, I think, browner and less olive. At the same time I have had one or two clutches a very distinct dark olive-green.

100 eggs average 36.5×30.9 mm.; the longest and shortest measure respectively 39.0×33.0 mm. and 34.0×28.3 mm., the broadest and most narrow 37.6×33.3 mm. and 34.3×27.7 mm.

Like all *Francolinus* the cock-bird is monogamous and probably the birds pair for life.

General Habits.—The Assam Black Partridge is principally a bird of grass lands, seldom frequenting the scrub and tree jungle so often haunted by the birds of the South and West. This is probably due to the fact that in the humid regions of the North-East, all forests are of such dense and lofty growth that they are not suited to the habits of the birds as are the sparse "Sal" and other forests of the North-West of India.

They are very common in many of the grass lands, both North and South of the Brahmapootra, being found in the long elephant grass and thick reeds close to the river, and in the wide stretches of sun-grass which cover miles upon miles of the plains at the foot hills of the Himalayas. Nowhere, however, do they—as far as I know—exist in numbers sufficient to supply a full day's sport to anyone out to make a bag, but for the man who wants a day with Nature and his gun, they suffice to supply an excuse and much hard work with a few birds to bring home in the evening.

Many years ago—in 1883 to be exact,—there were still a few birds left in Nadia, some 40 miles from Calcutta but though no one ever shot there, and I never heard of their being trapped, they and the last of the Black Buck disappeared altogether a few years later.

In Sylhet, Cachar and Manipur they were fairly numerous, in the two last places in the grass plains at about 2,000 feet.

Personally I hardly ever shot these birds, as the places they frequented were also the grazing grounds of the Gaur and Buffalo, which one dare not disturb with a shot. The country they were found in North Cachar was extraordinarily beautiful. Great rolling downs, covered with short brilliant green grass and scattered oak-trees, whose great black trunks showed up effectively against the green. Here and there meandered tiny streams, their banks edged with long semi-withered sun-grass which had, from its position, been able to withstand the fires which had burnt the rest of the grass for many miles in all directions. In these strips and in the damper pockets the Black Partridges took up their quarters, and the greetings of their cheery calls as one started out in the early dawn after big game is a sound I shall never forget.

The call made one feel that the birds were full of the absolute joy of life, and it was easy to understand the Mahomedan version of the call "Subhan tere kudrut" (All powerful, who shall describe thy power), the early morning hymn of praise which the Mahomedans say all birds and beasts raise to their Creator.

From the crests of the hill one could see the birds afar off out in the open scratching about and feeding like small barn-door fowls, and every now and then the cock-bird would mount to the crest of an ant-hill or the top of some fallen stump and ring out his hymn of praise. Even in the breeding season and when the cock-birds were calling from many directions, I never saw a calling bird attacked, or, indeed, approached by another, and it never seemed to be either uttered by the birds or accepted by others as a challenge to fight.

They appeared to feed in the open only in the very early mornings and again for about an hour in the evenings before sunset, but they continued to crow much later and to start again earlier, whilst, during the months of March, April and May, one might often hear an odd call at almost any hour of the day.

On the rare occasions I shot them for the pot I found them quite nice eating, but I nearly always had them in a stew-pot, as roast they were rather dry. Birds of the year after they have been feeding in the mustard fields on the young shoots are excellent eating however cooked.

When the hill rice is ripe they are very fond of lying up in the thick cover it affords, and birds shot from them always have their crops full of rice.

The family parties seem to break up in November or early December, but the grass was always so dense and high in these months that it was not easy to know whether one had flushed the whole party or not.

They are very easy to keep in captivity, and become so tame that they can be allowed almost total freedom without fear of losing them except during the breeding season when they naturally require closer looking after.

FRANCOLINUS PICTUS PICTUS.

The Southern Painted Partridge.

Perdix picta.—Jard. and Selb., Ill. Orn., pl. 50 (1828) (Bangalore); Jard., Nat. Libi. Orn. IV., p. 103, pl. III. (1834).

Perdix hepburnii.—Gray, Ill. Ind. Zool. 1, pl. 55, Fig. 1 (1830-32).

Francolinus pictus.—Gray, Gen. B. III., p. 505 (1846); Jerd., B. of I., II., p. 561 (1863) (part); Blyth, Ibis, 1867, pp. 157-8; Holdsw., P. Z. S., 1872, p. 469 (Ceylon); Hume, N. and E. Ind. Birds, p. 538 (1873); Fairbank, Str. Feath. IV., p. 262 (1876) (Deccan); Dav. & Wen., ibid, VII., p. 87 (1878) (Deccan); Hume & Mars., Game-B. Ind. II., p. 19 (1879) (part); Legge., B. of Ceylon III, p. 744 (1880); Butler, Cat. B. of S. Bom., p. 68 (1880); Vidal, Str. Feath X., p. 160 (1881) (Western Ghats); Davidson, ibid, p. 316 (1882) (W. Khandesh); Macgregor, ibid, p. 440 (1887) (Deccan & S. Mahratta); Taylor, ibid, p. 530 (1887); Oates ed., Hume's N. & Eggs III., p. 430 (1890) (part); Ogilvie-Grant, Ibis. 1892, p. 40 (part); id., Cat. B. M. XXII., p. 138 (1893); id., Man. Game-

B. I., p. 106 (1895) (part); Oates, Man. Game-B. I., p. 160 (1898) (part); Blanf., Fauna., B. I. Aves. IV., p. 137 (1898); Butler, Jour. B. N. H. S. X., p. 312 (1896) (Ceylon); Davidson, *ibid*, XII., p. 64 (Kanara); Oates, Cat. Egg. B. M. I., p. 37 (1901) (part).

VERNACULAR NAME.—Kakera Kodi (*Telegu*).

Description—*Adult Male*.—Crown black with narrow rufous-buff margins to the feathers; forehead, supercilia and sides of the head ferruginous red; nape and neck like the crown but with the buff margins wider and more conspicuous; upper back blackish with oval white spots; wing-coverts blackish brown with buff spots and scapulars the same, but with rufous buff margins. Wing-quills and greater coverts brown with rufous buff bars, broken on the primaries, complete on the inner secondaries on which the brown is almost as dark as on the scapulars. Lower back, rump, upper tail-coverts and central tail feathers black with narrow bars of white, the latter sometimes more or less tinged with buff; outer tail feathers more or less black on the terminal third.

Below, chin white or rufous, more or less marked on the sides with tiny black specks, sometimes forming a line from the corner of the lower mandible; foreneck darker rufous, more boldly streaked with black; breast and flanks black with large white drops increasing in size towards the lower breast and posterior flanks; centre of abdomen and vent dull pale rufous brown, more or less tipped with dirty whitish; under tail-coverts chestnut.

Colours of the Soft Parts.—Irides dark brown; legs reddish or yellowish brown; bill dark brown to black, the tip always blackish, the base and gape paler or horny white.

Measurements.—Length about a foot, wing 132 to 148 mm., average of 30 specimens 138.5 mm., tail from 66 to 89 mm., generally about 80 mm.; bill from front about 26 mm.; tarsus about 40 mm.

The spurs are rudimentary or absent.

Weight "8.5 to 12.7 ozs." Hume. This is apparently for both sexes.

Adult Female.—Like the male, but with the lower back, rump, upper tail-coverts and tail dull pale brown with narrow bars of white bordered with darker brown. The throat is generally white, and the markings on the flanks and lower breast generally form black arrow head shaped central bars on a pale buffy brown.

Colours of the Soft Parts.—As in the male, but duller, the legs are never as red in the reddest legged males, and are rarely even a dull horny brown; the bill is brown rather than black, and with a greater depth of whitish at the base.

Measurements.—There seems to be no difference in size between the males and females, though the latter probably weigh distinctly less on an average. I can find no recorded weights.

Distribution.—The typical Painted Partridge is found only in Ceylon and in the South of India. In the west and central portion of its range it only occurs well to the south, but on the east works further North. Its northern limits may be taken as Khandesh and Raipur, working up on the east into Behar. The specimens in the British Museum come from Ceylon, Belgaum, Khandesh, Deccan, Raipur, Chanda and Behar. In Ceylon, according to Wait, it is confined to the Ura basin and the eastern and south-eastern slopes of the hills.

Type Locality.—Bangalore.

Nidification.—Throughout practically the whole area over which both races of this Partridge breed, the breeding season seems to be from the time the rains break, *i.e.*, the middle or end of June up to the end of September, July and August being the months in which most eggs are laid. There are very few eggs of this sub-species in Museums, and the Hume series consists wholly of eggs of *pallidus*, the northern form, but Col. Sparrow sent me a few from Trimulgherry taken in August and September, and I have others from the Buchanan and Bulkley collections taken from July to September. In Ceylon it is said to lay "about Xmas time."

The Painted Partridge appears to select patches or strips of grass and scrub jungle in between cultivated fields and open country rather than extensive stretches of grass-land in which to breed, and its favourite ground is perhaps such as is evergreen with rather thin grass two or three feet high, more or less mixed with bushes. Jerdon, who was not much interested in nidification, long ago remarked on this Partridge's predilection for laying its eggs under the shelter of some bush and my correspondents inform me that they think the majority of nesting sites selected are of this nature. The nest itself is very primitive, merely a few pieces of grass and a few dead leaves on the ground, sometimes in a hollow, sometimes on quite flat ground, where the eggs are only kept from rolling about by the fallen rubbish around them.

The eggs appear to vary in number from 4 to 7 or 8 in a full clutch, and I can find no satisfactory evidence to prove the assertions sometimes made that they lay 10 or 12.

In shape they are very similar to those of the Black Partridge, but whilst some are quite as peg-top in shape as the most pyriform of the eggs of that bird, some are much more of a true oval than any I have seen of *Francolinus francolinus*. In colour they are, on the whole *much* paler, much less brown and more inclined to a pale stone colour or very pale olive-grey. A few eggs are almost a pure grey, and I have seen no eggs of the comparatively dark olive-brown so common in the eggs of the Black Partridge.

In texture they are fine and close, and the surface has a distinct gloss sometimes quite highly developed. They are much more fragile than the eggs of the *Francolinus francolinus*, a difference strikingly great between two species so very closely allied.

The average size of 15 eggs, all I have been able to examine of true *pictus*, is 35.9×30.9 mm. The smallest egg both in length and breadth measures 33.6×28.6 mm., the longest is 37.8×31.9 mm., and the broadest is 36.5×32.0 mm.

The Hen-bird is a very close sitter, and will not move until almost trampled on.

The Cock-bird is monogamous, and like the rest of his genus, probably pairs for life.

They breed only in the Plains, and nowhere do they ascend the hills for more than a few hundred feet, and even that only as stragglers.

General Habits.—The habits of the Painted Partridge are very similar to those of the Black Partridge, but whereas the latter prefers good cover combined if possible with a certain amount of dampness, the Painted Partridge likes very dry jungle, and does not mind its being rather thin. It never enters the heavy forest of the Western Coast, but wherever cultivation has taken the place of forest, and grass has grown up over the abandoned areas, there almost to a certainty, the Painted Partridge will sooner or later put in an appearance.

Perhaps its favourite haunts are short grass on broken, stony plateaus and plains, or thin scrub jungle, and in either place trees are desiderata, for this bird is much more fond of perching than the Black Partridge. They call like that bird from some elevated, perch but more often from trees rather than from ant-hills boulders and fallen stumps.

Hume says that the Painted Partridge “often, if not generally, roosts on bushes and trees, whence I have shot them after dusk and have disturbed them before dawn”, and he adds that they may often be *seen* perched on some conspicuous part of the tree whilst the hen sits modestly—and wisely—hidden in the thicker foliage.

They are often found in such crops as offer suitable cover, or if the crops themselves are too thin they hide in the adjacent scrub or grass and wander out into the fields in the mornings and evenings to feed, scratching about in the earth and picking up grain, seeds and insects, or feeding on green shoots, etc. White ants are a very favourite food with this bird, as indeed with almost all birds, and it is said to be a foul feeder when living anywhere near villages.

Pitman found that it drank regularly every evening about six o'clock in July in the Central Provinces, but he did not notice it drinking in the morning as the Black Partridge always did.

Although never getting big bags, he obtained very fair sport with the Painted Partridge by driving the grass and scrub round cultivation. The birds were very clever at squatting close until the beaters were almost on them, when they doubled back through their legs or rose and doubled back over their heads, giving no chance of a shot. At other times they rose well and gave capital shots as they crossed the open.

In Hume's time Laird wrote : " 7 or 8 brace of Painted Partridges with 15 brace of Quail, etc., would be here (Belgaum) reckoned a good bag for one gun ", and probably much the same would be the case now. In a few other localities they may be rather more numerous and rather larger bags possible, but I have heard of no place where much over 20 couple can be hoped for in a day's shoot.

Hume says that they fly faster and take more hitting than the Black Partridge, and are about the equal in pace to the English Partridge.

Other sportsmen say that it does not fly nearly so fast as our home bird, and that though it may make more fluster and fuss as it rises, it is much easier to hit, and takes less hitting to bring down than that bird does.

Possibly a Painted Partridge walked up in grass or scrub is not much slower than a common Partridge walked up with dogs through crops affording good cover, but is nothing like as fast as a driven bird coming up with the wind and an inherited instinct of what to expect in front of him.

The call of this bird is not unlike that of the Black Partridge. It has been syllabised by many writers, but perhaps Jerdon's " Chee-kee-kerray Chee-kee-kerray " gives as good an idea of its sound as it is possible to put in words. The birds, both sexes apparently, have also a call to one another sounding like " chuck chuck " repeated softly several times ; this may only be a call note to the young. The latter, according to a writer in the Bengal Oriental Magazine, " begin to call soon and to chirrup like Crickets ", and this cricket-like note is one also uttered by the young of the Black Partridge. I often heard the latter in North Cachar when out big-game shooting, and it was sometime before I found out its origin by putting up a family party of two old birds and three chicks who, on re-settling, commenced chirruping loudly until the whole family was satisfactorily re-united.

The chicks of the Painted and Black Partridges grow their wing quills very rapidly, and can fly as well as their parents for a short distance when they are little larger than sparrows.

The flesh of the Painted Partridge is rather dry, but quite pleasant, and has sometimes been described as excellent.

(To be continued.)



74



75a



75



74a



77



76



76a



77a



78a



78



80



80a



79



79a

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

Horace Knight, del.

Henschel-Colourtype.

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

EXPLANATION OF PLATE M.

Figs. 74, 74 a,	<i>Taractrocera ceramas</i>	♂	♀
„ 75, 75 a,	<i>Telicota bambusæ</i>	♂	♀
„ 76, 76 a,	<i>Taractrocera mœvius</i>	♂	♀
„ 77, 77 a,	<i>Parnara mathias</i>	♂	♀
„ 78, 78 a,	<i>Udaspes folus</i>	♂	♀
„ 79, 79 a,	<i>Suastus gremius</i>	♂	♀
„ 80, 80 a,	<i>Hesperia galba</i>	♂	♀

THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, I.F.S.

(Continued from page 32 of this Volume.)

PART XXVI.

With plate M.

Family—*HESPERIIDÆ*.

“All six legs perfect. Wings with the discoidal cell of hind wing slenderly and often incompletely closed; veins 8, 9, 10, 11, all emitted from subcostal nervure before the end of cell and ending on costal margin; all other veins direct from the cell, none branched either in the fore wing or in the hind wing. Of comparatively small size, generally very robust build and rapid flight. Antennæ wide apart at base, with a thick club or strong, curved hook at the tip. Palpi short, broad, closely pressed against the face, densely scaled on the first and second joints. Hind legs generally with a pair of moveable spurs or spines at the end of tibiæ and another pair at the middle; middle legs with a pair of moveable spines at end of tibiæ.”

The above is more or less in the words of Marshall and deNicèville in their “*Butterflies of India, Burmah and Ceylon*”. Colonel Bingham characterizes the family thus, as already given in the key to the *Butterflies* at the beginning of these papers:—

“Antennæ wide apart at base; hind tibiæ generally with a medial as well as terminal pair of spurs; all veins in the fore wing from base or from cell; none forked or coincident beyond.”

To this may be added that the eggs are generally few and nearly always more or less dome-shaped, either smooth or longitudinally ribbed more or less strongly, sometimes serrate along the ribs, sometimes tuberculate (rarely).

The larvæ are fusiform, the anal end rounded, sometimes flattened, the head always conspicuously broader and higher than the neck; no projections of any sort either on the head or on the body in the mature state though (*Gangara* for example) there may be a cereous excretion taking the form of threads that rub off easily.

The pupæ are moth-like in all cases, nearly always smooth, without processes of any kind and are attached by the tail and a body-band.

The habits of the butterflies differ somewhat according to genera and species but the flight is very rapid in the great majority and of a jerky nature in all. Some of the insects are diurnal, some crepuscular in their habits, a few, apparently, even nocturnal (*Ismene goma-ta*). The larvæ live in cells formed of leaves or sections of leaves in various characteristic ways and the pupation takes place often within them, though many larvæ wander and make special arrangements; *Baoris*, *Udaspes* pupating more or less in the open

on the under side of a leaf, part of which is drawn together by a few silks to form a concave depression; *Ampittia maro* head-down, absolutely in the open, on a stalk of rice or grass near the ground.

'A proposed Classification of the *Hesperiidæ*, with a Revision of the Genera,' by Lieut. E. Y. Watson, Madras Staff Corps, F.Z.S., F.E.S., which appeared in the 'Proceedings of the Zoological Society, of London,' January 17, 1893, is practically the latest effort at arranging the skippers scientifically into, first, more or less natural groups and, secondly, into proper genera. The work deals with all known species, both from the old world as well as the new world and is based on the study of 234 generic names of which 49 were sunk by the author as synonyms, while 45 new genera were described. He states at the same time that it is based entirely upon the collection of the British Museum while he acknowledges that "in addition to the collection of the British Museum, free access has been afforded me to the valuable collection of Messrs. Godman and Salvin." His time being limited, a certain number of species mentioned were not separated into genera but were included in those to which they seemed to be most nearly allied.

Watson says that, before 1874, no serious attempt had ever been made to arrange the genera of the family into natural groups but that it had been done later for limited faunæ. He then states that the only suggested arrangement that seemed to him to be a perfectly natural one was that of Scudder in the 'Bulletin of the Buffalo Society of Natural Science' (1874). According to this, two sub-divisions were erected for the *Hesperiidæ* of New England in America, namely the *Hesperiidi* and the *Pamphilidi*, based to a very large extent upon the secondary sexual characters of the males, the egg, larva and pupa supplying subsidiary characters. Watson approves of these and then alludes to an amplification of Scudder's arrangement by Mabille in 1878 in the 'Annales de la Société Entomologique Belge' which suggest a third tribe called the *Pyrrhopygini*, which he adopts. Speyer then, in 1879, in 'Genera of the Hesperiidæ of the European Fauna' published in the 'Stett. ent. Zeitung' made a suggestion that has proved to be of the greatest importance in the classification of genera, namely that the position of vein 5 of the fore wing in relation to veins 4 and 6 would be a character of value. Watson makes full use of this character in his keys. He alludes to the very superficial way in which many authors have characterized their genera and has adhered to the decisions of Scudder in his 'Historical Sketch of the Genera of Butterflies' absolutely to fix the doubtful ones. For genera described after Scudder's work and for which no type was specified, the species that best agreed with the genus was taken as type. He then refers to the male secondary characters on the wings: the costal fold, discal stigma and tufts of hair which he concludes

are of great importance as indicating groups or subfamilies but are of little use as generic characters. All butterflies possessing a costal fold belong to his own *Hesperiinae*, all possessing a discal stigma to his *Pamphilinae*. The *Pyrrhopyginae*, on the other hand, have no secondary male characters of either description on the fore wing, and are confined altogether to the New World.

The characters of the three subfamilies are enumerated in the following key :—

Fore wing with vein 5 usually nearer to 4 than to 6 ; with cell invariably more than two-thirds the length of costa ; without costal fold or discal stigma. Antennæ with club thick, ending in a blunt point usually more or less bent into a hook. Wings held horizontal when at rest *Pyrrhopyginae*.

Fore wing with vein 5 nearly always nearer to 6 than to 4 ; cell rarely more than two-thirds the length of costa ; costal fold sometimes present. Antennæ rarely blunt, nearly always ending in a fine point. Wings nearly always held horizontal in repose *Hesperiinae*.

Section A.—Fore wing with vein 5 slightly nearer either to 4 or to 6, never conspicuously close to either ; cell always more than two-thirds the length of costa. Hind wing with vein 5 never fully developed except in a few Old World genera. Antennæ usually bent into a hook, sometimes sickle-shaped, always ending in a fine point. Third joint of palpi never curving over vertex of head. Wings at rest held horizontal or erect over back

Section B.—Fore wing with vein 5 nearer to 6 than to 4 ; cell less than two-thirds the length of costa. Hind wing with vein 5 never fully developed. Antennæ seldom hooked, sometimes bluntly pointed. Third joint of palpi never curving over head.

Fore wing with vein 5 nearer to 4 than to 6 ; cell almost always less than two-thirds the length of costa ; males never with a costal fold but sometimes with discal stigma. Hind wing with vein 5 well developed or not. Antennæ almost invariably ending in a fine point. Palpi with the end joint long or short, directed variously, sometimes curving over the head-vertex. The wings are always held closed perpendicularly over the back in complete repose . . *Pamphilinae*.

Section A.—Fore wing with, except in some aberrant Australian forms, vein 5 slightly nearer to 4 than to 6 ; cell always less than two-thirds the length of costa ; no costal fold and rarely a discal stigma. Hind wing with vein 5 never well developed. Antennæ various, never much hooked, usually sharply pointed. Palpus with third joint usually inconspicuous, rarely long and slender when it is always erect and never horizontal. Wings held erect in repose.

Section B.—Fore wing with vein 5 much nearer 4 than 6 ; cell less than two-thirds costa ; no costal fold but often a discal stigma. Hind wing with vein 5 rarely developed. Antennæ never hooked, the club sometimes without crook, sometimes with. Palpi in a few genera with the third joint curving over vertex, long and slender ; in most it is minute. The butterflies, when basking, depress the hind wings and elevate the fore wings, “ an attitude peculiar to this section ” (*Watson*).

Section C.—Fore wing with vein 5 equidistant between 4 and 6 or nearer 6 ; cell from half to just over two-thirds the length of costa ; no costal fold but with various other sexual male marks on wings and legs. Hind wing with vein 5 usually well developed. Antennæ with the club of varying stoutness, always

tapering to a fine point; sometimes hooked. Palpi with the second joint upturned, resting against the face; the third joint long, thin, naked and projecting in front of the face. The wings are always held closed over the back when at rest.

The above key is for all the *Hesperiidæ* of the world. The *Pyrrhopyginæ* are wholly confined to the American continents. Section A of the *Hesperiinæ* has but seven genera out of 50 which are of the Old World and only five that are Indian, namely *Orthophætus*, *Capila*, *Calliana* and *Hantana*, *Crossiura*. Section B contains about 42 genera out of which some 16 are Indian, 5 African, 1 Australian, and the rest American. Section A of the *Pamphilinæ* contains about 34 genera of which 13 are Indian, 6 African, 4 Australian, 3 North Asian and the rest American; Section B, 59 genera; 20 Indian, 6 African, the rest American; Section C, 5 genera, all of the Old World and confined to Eastern Asia, India, Burma to the Philippines and Australia.

Later on, in the Journal of this Society (B. N. H. S.), Capt. Watson as he then was, published a supplementary paper called 'A Key to the Asiatic Genera of the *Hesperiidæ*,' being an excerpt of his original work, written for the convenience of workers in India (Vol. IX, part 4, p. 411; 20th June 1895). The original keys have been modified to suit the restricted fauna. They are as follows:—

Fore wing with vein 5 nearer to 6 than to 4; male occasionally with a costal fold but never with stigma. Male with a tuft of hair at proximal end of hind tibiæ in nearly every case. Wings in repose always horizontal . . . *Hesperiinæ*.

Fore wing with vein 5 nearer to 4 than to 6; male never with a costal fold but often with patches of modified scales on upperside. Male without tuft on hind tibiæ. All species rest with their wings closed over the back . . . *Pamphilinæ*.

Captain Watson has, as formerly, divided this latter subfamily into three sections; the first two, in this case, founded on a slight difference of neurulation, being purely artificial, have only been adopted for convenience. "The third section, however, consists of a closely allied group of genera which appear to have no near allies among the *Pamphilinæ*, so much so that it is questionable whether it would not be advantageous to form them into an additional subfamily under the name of *Ismeneinæ*, the species contained under which would stand in much the same relation to the remainder of the Old World *Hesperiidæ* that the *Pyrrhopyginæ* do to those of the New World. The name (but with a much more extended meaning) has been made use of by M. Mabille in a paper on the *Hesperiidæ* of the Brussels Museum published in the 'Annals of the Entomological Society of Belgium, Vol. XXI (1878).' These sections of the *Pamphilinæ* he characterises as follows:—

Section I.—Palpi various but never as in Section III. Vein 5 of fore wing straight throughout its length and not arising markedly nearer to vein 4 than to

vein 6, the middle discocellular being, therefore, only slightly longer than the lower one.

Section II.—Palpi various but never as in Section III. Vein 5 of fore wing deflected at origin and consequently arising much nearer to vein 4 than to vein 6, the middle discocellular being, therefore, much longer than the lower one.

Section III.—Palpi with the third joint long, slender and naked, porrected horizontally in front of the face. Species robust. Habits often crepuscular.

Watson then gives keys for all the Asiatic genera of Skippers consisting of the following genera under the different sections :—

<i>Section I.</i> —Pamphila,	Taractrocera,	Itys,
*Heteropterus,	Ochus,	Zographetus,
Baracus,	Ampittia,	Isma,
Astictopterus,	Æromachus,	Matapa,
*Apostictopterus,	Sebastonyma	*Sepa,
Sancus,	Pedestes,	Pudicitia,
Koruthaialos,	Lophoides,	Acerbas,
Suada,	Hyarotis,	*Zea,
Suastus,	*Isoteinon,	Erionota,
Iambrix,	*Idmon,	Gangara,
*Ge,	Arnetta,	Paduka,

and states that all, with the exception of those marked with an asterisk, are recorded from Indian limits. These 26 Indian genera contain some 60 species.

<i>Section II.</i> —Kerana,	Hidari,	Telicota,
*Ancistroides,	*Eetion,	Padraona,
Pirdana,	Pithauria,	Halpe,
Plastingia,	Notocrypta,	Onryza,
Lotongus,	Udaspes,	Iton,
Creteus,	Actinor,	Baoris,
*Zela,	*Gehenna,	Gegenes,
*Zampa,	Cupitha,	Erynnis,
*Mimas,	Augiades,	*Adopæa,

of which those with an asterisk are not Indian : 20 genera with some 87 species.

<i>Section III.</i> —Ismene,	Hasora,	Rhopalocampta,
Bibasis,	Badamia,	

all 5 represented in India by some 23 species.

He gives the affinities and ranges of the different sections stating that, in Section I, "*Pamphila* and *Heteropterus* are closely allied to one another and also, apparently, to *Hesperia* and the closing genera of the preceding subfamily, i.e., *Thanaos*, *Gomalía* and *Carcharodus*." Of Section II he says that the arrangement of the genera appears to be fairly natural and that it connects satisfactorily with the preceding section ; that *Kerana* to *Eetion* appear to be closely allied and to show relationships with *Erionota*, *Sancus*, *Koruthaialos* and *Astictopterus* of Section I ; "*Pithauria* is rather out of place, but appears to be close to *Hidari* and is probably a near ally of *Baoris* ; *Notocrypta* and *Udaspes* are certainly closely related to each other but show no particular affinity to any other genera. *Actinor*, *Gehenna*, *Cupitha* and *Onryza* appear to be allied to *Halpe* which is itself close to *Iton* and *Baoris* ; *Padraona* and *Telicota* are hardly generically distinct and are certainly close to *Augiades*, *Erynnis* and *Adopæa* ; while *Gegenes* appears to be allied to both *Baoris* and *Erynnis*." On the affinities of Section III he remarks that it is a well-marked group of closely-allied genera showing no near relationship with any others of the family ; but that the habits and general *facies* agree best with the *Pamphilinæ* ; adding, however, that their neuration appears to have more resemblance to that found in the sub-family *Hesperiinæ* ; and suggests that they might with advantage be treated as a distinct subfamily.

It might be of interest to repeat here what Watson says about the ranges of the different groups. The last or third section, the *Ismeneinæ* (to make a

subfamily of it as Watson suggested and as has actually been done by Swinhoe in *Lepidoptera Indica*, the latest work on Indian Skippers and Indian butterflies generally) is confined to Asia, Africa and Australasia; *Ismene* and *Bibasis* have not been recorded out of Asiatic limits; *Hasora* is chiefly Malayan and extends as far as Australia; *Badamia* also extends to that continent; *Rhopalocampa* is a very large genus almost entirely confined to Africa, only two or three species being found within Asiatic limits.

In Section II of the *Pamphilinæ*, the genus *Gehenna* has only two species, one from Borneo, one from Sumatra; *Ancistroides*, in similar case, is confined to islands of the Malay Archipelago; *Zela*, *Zampa*, *Eetion* are Malayan; *Mimas* from New Guinea; *Adopæa* is northern, Holarctic. Extra information given is that *Taractrocera*, *Telicota* extend to the Australasian region; *Ampittia*, *Baoris*, *Baracus* to Africa; *Padraona* to Australia, doubtfully to Madagascar and S. America; *Adopæa*, *Erynnis* are Holarctic.

Section I: all the genera, with the exception of *Pamphila*, *Heteropterus* are Asiatic; the former being European, the latter Holarctic. *Heteropterus*, *Isoteinon*, *Ge*, *Idmon*, *Sepa*, *Zea*, *Apostictopterus* have not been recorded from Indian limits. *Isoteinon*, *Heteropterus* are confined to Northern Asia; *Ge*, *Idmon*, *Zea*, *Sepa* are from Malacca and Sumatra; *Apostictopterus* has a single species found in China.

Watson's subfamily of *Hesperiinæ* is divisible into two quite natural parts, one consisting of those insects that keep their wings erect in repose, the other containing the species that keep them open and stretched horizontally out.

His *Pamphilinæ* can be at once divided into two quite natural groups, one consisting of Sections I and II, the other of Section III as has already been mentioned by him.

The latest work on the *Hesperiidæ*, from the pen of Colonel C. Swinhoe, has appeared comparatively recently as the climax to the truly monumental *Lepidoptera Indica*, originally started by Moore more than twenty years ago. It occupies part of volume IX and the whole of volume X and is accompanied by fine, coloured plates in which are depicted all the butterflies described with a goodly number of their caterpillars and chrysalides. The author has erected twelve new subfamilies but gives no keys to them. These are:—

Ismeneinæ,	Pamphilinæ,	Matapinæ,
Achalarinæ,	Astictopterinæ,	Notocryptinæ,
Celænorrhinæ	Suastinæ,	Plastingiinæ,
Hesperiinæ,	Erionotinæ,	Erynninæ.

In this arrangement he restricts the subfamily *Hesperiinæ* of Watson to the genera *Carcharodus*, *Gomalia*, *Hesperia* and *Thanaos*, in which the insects do not spread their wings horizontally when at rest; dividing those that do so rest into *Achalarinæ* and *Celænorrhinæ*. He finally divides off Section III of Watson's *Pamphilinæ* as the subfamily *Ismeneinæ* and erects eight subfamilies for Sections I and II. These two sections Watson himself has allowed to be purely artificial as has been seen above, whereas Swinhoe believes his subfamilies to be fairly natural and, therefore, a better arrangement.

Based upon certain knowledge of the earlier stages of members of all of these, the probabilities are that Swinhoe's belief is correct; but this knowledge also suggests that certain alterations therein must be made. To start with, therefore, a more natural sequence of the above subfamilies is suggested as follows:—

Achalarinæ,	Erynninæ,	Erionotinæ,
Celænorrhinæ,	Plastingiinæ,	Matapinæ,
Hesperiinæ,	Suastinæ,	Astictopterinæ,
Ismeneinæ,	Pamphilinæ,	Notocryptinæ,

with the first two subfamilies in which the insects sit with wings horizontally spread in natural sequence to the New World *Pyrrhopyginæ*. Then follow all

those resting with wings closed over their backs, connected by the *Hesperinæ* which occasionally rest with wings in abnormal positions; as, in *Gomalia* and *Thanaos*, where the position adopted is, occasionally, neither one nor the other. In these two genera the wings are held in a "pent-house" attitude as in the great majority of moths, sloping at an angle along the body; *Gomalia albifasciata*, for example, occasionally rests with the wings in the pent-house position and the abdomen curled up so characteristic of the noctuid genus *Eutelia*. All these butterflies, however, often hold their wings in the normal, erect way characterising the great majority of the subfamilies. In the genus *Hesperia* also, the imagines have the habit of basking with the wings half open, that is with the fore wings slightly opened from the erect position and the hind wings still more separated as do many of the insects of the genera *Telicota*, *Baoris*, *Halpe*, &c.

Although the above represents the most natural sequence of Col. Swinhoe's subfamilies, there are various objections to be made to the groups themselves and to their internal constitution. These twelve groups are best discussed in detail in order:—

Achalarinæ.—Will have to stand as nothing is known about the earlier stages: on a general view of the pictures of the insects composing it as given in Colonel Swinhoe's *Lepidoptera indica* the subfamily seems to be quite a natural one.

Celenorrhinæ.—Is a natural group and will also stand, even to the component genera and their species. Out of the 13 genera of which it is composed 7 are known in their early stages of egg, larva and pupa and show strong affinities; all the insects rest with horizontally spread wings as do the *Achalarinæ*.

Hesperinæ.—Also natural within certain limits. The transformations of most of the genera are known and show certain affinities; the insects rest with their wings perpendicularly raised over their backs except in the case of the genera *Gomalia* and *Thanaos* which at night and in dull weather hold them "pent-house" rather like moths of the genus *Eutelia* and even, like these, curl the abdomen up. However these insects also occasionally close the wings over the back. All the subfamily have eggs with strong meridional ridges except *Gomalia* which has them strongly and densely coarse-tuberculate (the tubercles are, however, arranged in radiating rows) with a 7-sided lid on the top through which the larva emerges—all, indeed, of the eggs are characterized by the fact that the larva emerges through the very top.

Ismeneinæ.—Is a very natural group as may be gathered by what has already been said about it. The transformations of *Ismene*, *Rhopolocampta*, *Bibasis*, *Hasora* and *Badamia* are known.

Erynninæ.—There is not much to be said for this group as it contains elements that are quite irreconcilable with each other. To begin with the whole of what may be called the Baorine section must be taken out of it: the genera *Baoris*, *Caltoris*, *Chapra* and *Gegenes*; *Erynnis* will remain. These excerpted genera together with others of the subfamily *Matapinæ* will form a new subfamily which may be styled *Baorinæ*. Colonel Swinhoe's *Matapinæ* will disappear as explained below, the genera *Hyarotis*, *Acerbas*, *Arnetta*, *Zographetus*, *Scobura*, *Sebastomyia*, *Itys*, *Iton* and *Isma* going to *Notocryptinæ* while *Aëromachus* (and Swinhoe's new genus *Machachus* erected for one of the sections) go to *Pamphilinæ*; the only remaining genus which is the type-genus, *Matapa*, going naturally into *Erionotinæ* with which (as evidenced by the earlier stages of *Gangara thyrasis* and *Matapa aria*) it has every affinity.

Plastinginæ.—Is seemingly a natural group but, as only a single representative, namely *Plastingia submaculata*, of the various genera contained therein has been bred, it is difficult to say. This particular butterfly is very like *Suastus gremius* in facies and has similar eggs, larva and pupa besides making its cell in the same way so that, from its earlier stages, it should go into *Suastinæ* from which, however, it is separated in the perfect state by having an inconspicuous

third joint to the palpus (although the palpus is very robust and rather long) instead of the long, naked, prominent third joint of *Suastus*, *Iambrix*, *Baracus* and *Suada*; it also has exceptionally long antennæ with an exceptionally long and very much hooked tip to the club; the antennæ of *Suastus*, *Iambrix*, *Baracus* and *Suada* are somewhat shorter and have much shorter hooks or bends.

Suastinæ.—Is not a good subfamily but has been separated for the above reasons of palpi; the genus *Suastus* has a strongly few-ribbed egg; *Iambrix* has a smooth one, finely cellular-reticulate under a lens; *Baracus* one with a minutely tuberculate surface under magnification and 17 very fine meridional ribs; in fact the three species representing these three genera are a heterogeneous collection offering nothing much in common except the naked third joints of the palpi. The subfamily will be omitted.

Erionotinæ.—Quite a natural group and only requires the addition of *Matapa* to complete it. The transformations of *Gangara thyrsis*, *Matapa aria*, *Erionota thrax* and *Paduka lebadea* are known and serve to characterize it.

Pamphilinæ.—Contains *Pamphila*, *Taractrocera*, *Ampittia* and *Ochus*. The genera *Aëromachus* and *Machachus*, both formerly known as *Aëromachus* but recently split by Swinhœ, must be added. The transformations of *Taractrocera*, *Ampittia* and *Pamphila* are known. The habits of the insects are similar.

Astictopterinæ.—Is untenable. The habits and early stages of *Sancus* are identical with those of *Notocrypta* and *Udaspes* so that *Sancus* must go into *Notocryptinæ* into which *Astictopterus*, *Koruthaialos* and *Watsoniella* should be put. *Suada* fits better into *Plastingiinæ*.

Notocryptinæ.—Is a natural group into which *Sancus*, *Iambrix*, *Astictopterus*, *Koruthaialos* and *Watsoniella* should be put.

So far, then, superseding Swinhœ's arrangement, there will be the following subfamilies to be considered:—

- | | | |
|------------------|------------------|-------------------|
| 1. Achalarinæ, | 5. Plastingiinæ, | 9. Baorinæ, |
| 2. Celænorrhinæ, | 6. Erionotinæ, | 10. Notocryptinæ, |
| 3. Hesperiinæ, | 7. Pamphilinæ, | |
| 4. Ismeneinæ, | 8. Erynninæ, | |

in which his *Astictopterinæ*, *Suastinæ* and *Matapinæ* have disappeared, while a new subfamily, the *Baorinæ*, has been created. These subfamilies will also, with the exception of numbers 1, 2, 3 and 4, all be slightly different from his in their constitution as regards genera. Their composition, after this reconstruction, is given below, making use of Colonel Swinhœ's genera, but marking with an asterisk (*) all the new genera created by him—he has made a good few, basing them chiefly upon "male-marks", such as a stigma on the wing or a tuft of hairs. He considers such sex-marks to be of generic importance: a matter of opinion about which there has been no little controversy.

Subfamily *Achalarinæ* (1).

Genus *Achalarus*, Scudder,
Calliana, Moore,
Pisola, Moore,
Crossiura, deN.,
Hantana, Moore.

Subfamily *Celænorrhinæ* (2)

Genus *Celænorrhinus*, Hubner.
Charmion, deN.,
Daimio, Murray,
Satarupa, Moore,
Tagiades, Hübner,
Odina, Mabille,
Odontoptilum, deN.,
Ctenoptilum, deN.,
Darpa, Moore,
Abaratha, Moore,
Gerosis, Mabille,
Coladenia, Moore,
Sarangesa, Moore,
Tapena, Moore.

Subfamily *Hesperiinae* (3).

Genus *Hesperia*, Fabr.,
Pyrgus, Hübner,
 **Spialia*, Swinh.,
Gomalia, Moore,
Carcharodus, Hübner,
Thanaos, Boisduval.

Subfamily *Ismeneinae* (4).

Genus **Pola*, Swinh.,
 **Gecana*, Swinh.,
 **Tothrix*, Swinh.,
 **Burara*, Swinh.,
Rhopalocampa, Wall.,
Bibasis, Moore,
Hasora, Moore,
Parata, Moore,
Badamia, Moore.

Subfamily *Platingiinae* (5).

Genus *Platingia*, Butler,
Lotongus, Dist.,
Zela, deN.,
Hidari, Dist.,
Pirdana, Dist.,
Erane, El. & Edw.,
Creteus, deN.,
Pithauria, Moore,
Pil'auriopsis, W.-M. & deN.,
Pedestes, Watson,
Suastus, Moore,
Suada, deN.,
Arnetta, Watson,
Isma, Dist.
Scobura, El. & Edw.,
Itys, deN.,
Sebastonyma, Watson,
Zographetus, Watson.

Subfamily *Erionotinae* (6).

Genus *Erionota*, Mabilie,
Gangara, Moore,
Pudicitia, deN.,
Paduka, Dist.,
Matapa, Moore.

Subfamily *Pamphilinae* (7)

Genus *Pamphila*, Fabr.,
Taractroera, Butler,
Ampittia, Moore,
Ochus, deN.,
 **Aëromachus*, deN.,
Machachus, Swinh.

Subfamily *Erynninae* (8).

Genus *Erynnis*, Schrank,
Augiades, Hübner,
Telicota, Moore,
 **Corone*, Swinh.,
Padraona, Moore,
Halpe, Moore,
 **Thoressa*, Swinh.,
Onryza, Watson,
Actinor, Watson,
Baracus, Moore,
Cupitha, Moore.

Subfamily *Baorinae* (9).

Genus *Baoris*, Moore,
 **Caltois*, Swinh.,
Chapra, Moore,
Parnara, Moore,
Gegenes, Hübner,
Iton, deN.

Subfamily *Notocryptinae* (10).

Genus *Notocrypta*, deN.,
Sancus, deN.,
Udaspes, Moore,
Hyarotis, Moore,
Iambrix, Watson,
Acerbas, deN.,
 **Tamela*, Swinh.,
Astictopterus, Felder,
Koruthaialos, Watson,
Watsoniella, Bery.

Some justification of the subfamilies resulting from the foregoing analysis is called for. The series begins with those insects which rest with the wings horizontally outspread and never hold them closed together perpendicularly over

the back when in repose, exemplified by the two groups *Achalarinæ* and *Celænorrhinæ*. It is true that nothing is known of the early stages of the first but Colonel Swinhœ quotes Doherty's statement about *Calliana pieridoides* that "it flies in the darkest parts of the forest towards the end of the afternoon, alighting with outspread wings; in the morning it lies concealed, adhering closely to the underside of leaves; then floats lazily up and down the bed of a stream." What is true of one species will probably be true of the others and, if the group be a natural one as it surely has the appearance of being, what is true in respect of the resting position of the members of one genus will be true of the others. The general *facies* of all the species of the subfamily suggest strongly the known species of *Celænorrhinus* of the second subfamily, to which Doherty's remark will equally apply.

Celænorrhinæ.—The larval stages of seven out of fourteen genera are known. The eggs are dome-shaped, distinctly ribbed; the larvæ feed upon dicotyledonous vegetation; the chrysalides have well-marked and prominent expansions to the spiracles of segment 2 and the proboscis free beyond the wings and the pupal cell is closed. The butterflies rest with wings horizontally spread.

Hesperiinæ.—The eggs are dome-shaped and strongly ribbed; the larvæ feed upon dicotyledonous plants; the pupæ are like those of the preceding family, in that they have strong expansions to the spiracles of segment 2, a free proboscis, and they all are formed in closed cells. The butterflies rest with their wings erect over their backs in repose except that, in the genera *Gomalia* and *Thanaos*, as exemplified by the species *G. albifasciata* and *T. tages* (a home insect), they have the habit of sitting in dull weather and at night with the wings "pent-house" after the manner of noctuid moths, that is with them held slanting, the inner or abdominal margin along the body, the wing thus hiding the body from the side-view; *Gomalia*, indeed, even curls the abdomen up like moths of the noctuid genus *Eutelia*. This latter insect occasionally holds the wings erect while Frohawk says *Thanaos* basks with them outspread. There is thus some abnormality in the group.

Ismeneinæ.—Have dome-shaped, ribbed eggs. The larvæ are stout and brightly coloured and feed upon dicotyledons; the pupæ are stout, pink or green in colour, have no prominent expansions to the spiracles of segment 2 and the proboscis is not produced beyond the wings.

Plastingiinæ.—Have ribbed eggs as far as the members of it are known—and only *Plastingia* and *Suastus*, a single species of each, have been bred. The larvæ are found on palms (*Calamus*, Cane and *Phoenix*, the Date Palm as well as other palms); the pupæ are fairly stout and have well-developed spiracular expansions to segment 2, a frontal "boss" and a short, free end to proboscis. Butterflies rest with erect wings.

Erionotinæ.—Have very finely ribbed eggs, the ribs very numerous and not easily seen; the larvæ feed upon bamboos and palms; the pupæ are formed in closed, spirally coiled, roomy cells and have the proboscis produced free beyond the wings (immensely long in *Gangara*), no prominent spiracular expansions, and possess a rounded bow between the eyes. Insects rest with wings erect.

Pamphilinæ.—Eggs finely ribbed or minutely rough-tuberculate, a transition between the ribbed and smooth eggs. Larvæ feed upon grasses. Pupæ formed in more or less laxly made cells, with a somewhat accentuated boss or point between the eyes; proboscis free beyond the wings or not; a well-marked though not prominent spiracular expansion. The wings are held erect in repose.

Erynninæ.—Eggs smooth or with very fine ribs with the single exception of the genus *Cupitha* which has eggs similar to those given for the *Plastingiinæ*. The larva of *Cupitha* also feeds upon dicotyledons while those of all the other genera of the subfamily feed upon monocotyledons—palms, bamboos and grasses; it also has an opaque skin whereas all the others have more or less thin skins

through which the tracheæ can be seen. In fact this genus is abnormal and really fits into no subfamily properly. Pupæ of all the others as well as that of *Cupitha* are rather like each other, have well-developed expansions to spiracles of segment 2, mostly funnel-shaped; the proboscis slightly produced and a slight boss between the eyes. The pupal cell is closed and often, as in the genera *Halpe*, *Thoessa*, is cut free from the plant and falls to the ground. All the insects hold their wings erect in repose and often bask with them separated from that position slightly.

Baorinae.—Eggs quite smooth. Naked-looking, whitish larvæ feeding upon bamboos, grasses or palms. Pupa naked, with a long beak between the eyes, light green with a slight powdering of waxy excretion; no spiracular expansions; a long, spatulate cremastral segment. It is formed on the underside of a leaf or blade with tail-pad and body-string, quite unprotected, except that the edges of the blade are drawn towards each other slightly by a few silks—they are never brought together completely. There is a single exception in *Parnara bada* where the pupa is of the erynnine type and the cell is tightly closed. Indeed, this insect should be included in that subfamily preferably. *Parnara canaraica* has its pupa and cell and larva normal for *Baorinae*. The insects all rest as in *Erynnine* and bask similarly.

Notocryptinae.—Eggs limpet-shaped, smooth except that numerous tiny, short ribs (as many as 40 and over) are discernible on the narrow ring or band upon which the eggs stand—they are often brown-red in colour. The larvæ resemble those of the preceding family but have smaller heads. The pupæ are precisely similar but the method of making the cells is different in the earlier stages though the pupal cell is similar. The food plants of the larvæ are grasses or palms or belong to the family *Scitamineæ*, the Gingers, and, therefore, are monocotyledons. The butterflies rest with wings erect.

All the above may be stated in tabular form, based upon the eggs and food-plants of the caterpillars—the larvæ and pupæ will fit in all right:—

Eggs ribbed.		
Larvæ feeding upon dicotyledons	..	..Subfamilies 1, 2, 3, 4.
Larvæ feeding upon monocotyledons	..	..Subfamilies 5, 6, 7.
Eggs more or less smooth.		
Larvæ feeding upon monocotyledons	..	..Subfamilies 8, 9, 10.

And some such arrangement as follows might eventually be found to be the most natural for all the skippers of the world:—

- Family *Hesperiidæ*.
- Section *Pyrrhopygides*.
- Group *Pyrrhopygines*.
- Subfamily *Pyrrhopyginae*.
- Section *Hesperiides*.
- Group *Celænorrhines*.
- Subfamily *Achalarinae*.
- Subfamily *Celænorrhinae*.
- Group *Hesperiines*.
- Subfamily *Hesperiinae*.
- Subfamily *Ismeneinae*.
- Section *Baorides*.
- Group *Baorines*.
- Subfamily *Baorinae*.
- Subfamily *Notocryptinae*.

It would be absurd, however, to lay down that the above arrangement will eventually prove correct, for the knowledge of the earlier stages of the Skippers of the world is still very scanty. That for the Indian insects of the family is

very incomplete. The number of larvæ recorded of the different subfamilies are :—

<i>Achalarinæ</i>	.. 0		
<i>Celænorhincæ</i>	.. 4 out of 23	<i>Celænorrhinus.</i>	Representing 7 out of 14 genera and 14 species out of 75.
	2	14 <i>Tagiades.</i>	
	1	1 <i>Tapena.</i>	
	2	8 <i>Coladenia.</i>	
	2	4 <i>Abaratha.</i>	
	1	2 <i>Odontoptilum.</i>	
	2	6 <i>Sarangesa.</i>	
<i>Hesperinæ</i>	.. 1	4 <i>Spialia.</i>	Or 2 of 7 genera ; 2 out of 12 species.
	1	1 <i>Gomalia.</i>	
<i>Ismeneinæ</i>	.. 1 out of 2	<i>Gecana.</i>	Or 7 out of 9 genera and 10 out of 24 species.
	1	5 <i>Burara.</i>	
	2	2 <i>Rhopalocampa.</i>	
	1	1 <i>Bibasis.</i>	
	2	4 <i>Hasora.</i>	
	2	5 <i>Parata.</i>	
	1	1 <i>Badamia.</i>	
<i>Plastinginæ</i>	.. 1 out of 8	<i>Plastingia.</i>	2 out of 12 genera and 2 out of 30 species.
	1	2 <i>Suastus.</i>	
<i>Erionotinæ</i>	.. 1 out of 3	<i>Erionota.</i>	4 out of 5 genera and 4 out of 11 species.
	1	1 <i>Gangara.</i>	
	1	1 <i>Paduka.</i>	
	1	5 <i>Matapa.</i>	
<i>Pamphilinæ</i>	.. 1	2 <i>Pamphila.</i>	3 out of 5 genera ; 4 of 19 species. The <i>Pamphila</i> is a home species.
	2	8 <i>Taractrocera.</i>	
	1	2 <i>Ampittia.</i>	
<i>Erynninæ</i>	.. 1 out of 1	<i>Erynnis.</i>	All genera ; 9 species out of 27. The <i>Erynnis</i> known is the home one (<i>comma</i>), the Silver-spotted Skipper.
	3	3 <i>Telicota.</i>	
	1	2 <i>Augiades.</i>	
	1	7 <i>Padraona.</i>	
	1	1 <i>Cupitha.</i>	
	1	1 <i>Baracus.</i>	
	1	2 <i>Machachus.</i>	
<i>Baorinæ</i>	.. 1 out of 2	<i>Baoris.</i>	Or 5 out of 14 genera and 10 out of 47 species.
	4	17 <i>Calloris.</i>	
	2	5 <i>Chapra.</i>	
	2	5 <i>Parnara.</i>	
	1	2 <i>Gegenes.</i>	
<i>Notocryptinæ</i>	.. 2 out of 6	<i>Notocrypta.</i>	Amounting to 5 genera out of 8 and 6 species out of 16.
	1	1 <i>Sancus.</i>	
	1	1 <i>Udaspes.</i>	
	1	2 <i>Iambrix.</i>	
	1	1 <i>Hyarotis.</i>	

which means that, all in all, something is known of the earlier stages of 42 genera out of a total of 81 and 61 species out of a total of 261.

As an example of how little has been done in breeding these insects and studying their life-histories it is interesting to know that out of the 64 species of Indian *Hesperiidæ* bred, 57 have been discovered in the Kanara District of the Bombay Presidency alone and that by only three individuals. The earlier butterfly breeding operations in Kanara were published in this Society's Journal (Bombay Natural History Society) in the year 1890 (Vol. V, pp. 260, 349) and continued

in the year 1896 in Vol. X, page 237, again at page 372, further at page 568 and finished in Vol. XI, page 22 in the following year. The part dealing with the Skippers is this last and it is accompanied by some coloured plates of larvæ and pupæ.

There are about 2,350 species of *Hesperiidæ* known to exist in the whole world to-day according to Seitz's great work, the *Macrolepidoptera of the World* of which some 1,000 species are American, 350 African, 200 Palæartic and 800 Oriental. Swinhoe enumerates 761 species from the Oriental Region, excluding Australia and, of these, 283 are purely Indian, by which he understands India, Burma, Ceylon and the Andaman Islands. These belong to 88 genera which he groups into 12 sub-families. These twelve sub-families have been above shown to be reducible to 10.

Out of the 283 species only 62 come into the present papers as butterflies of the Plains and Bombay Hill Stations. All but seven of these have been bred, their transformations and life-histories being carefully noted. Those still remaining to be studied are *Daimio milliana*, Swinh., a single specimen of which was caught on the Ghats in the Kanara District of Bombay in the monsoon at a place called Anshi and *Zographetus ogygia* (Hewits.) of which, similarly, only a single individual was taken near the sea-coast; *Corone (Telicota) palmarum*, Swinh., *Telicota augias*, (Linn.), *Arnetta vindhiana*, (Moore), insects of the drier parts of the country: and *Suastus bipunctus*, (Swinh.), which was also once caught in Kanara. This makes six, but the larva of *Corone palmarum* has really been recorded once as feeding on Date Palm although no descriptions or drawings were seemingly kept (*Indian Museum Notes*, Vol. V No. 3, p. 126, pl. IX) as only the male and female insects are there figured. Similarly the larva of *Rhopalocampta benjamini*, (Guerin), is known to feed upon *Meliosma pungens*, Wall. and *Sabia campanulata* Wall. (Family *Sabiaceæ*) in the Himalayas as discovered by de Rhè-Philipe at Dehra Dun who figured the larvæ and pupa but apparently wrote no descriptions (J. B. N. H. S., Vol. XI, 1898, page 602, pl. W, figs. 30, 30b larvæ; 30c pupa). A list of the 62 species is subjoined, those still requiring attention being marked with an asterisk (*).

<i>Celænorrhinus ambareesa</i> , (M.)	<i>Hasora badra</i> , M.
<i>leucocera</i> , (Koll.)	<i>chabrona</i> , Plötz.
<i>area</i> , (Plötz.)	<i>alexis</i> , M.
<i>Satarupa milliana</i> , Swinh.	(= <i>Parata</i>)
(= <i>Daimio</i>)	<i>butleri</i> , Aurivillius.
<i>Tagiades obscurus</i> , Mabilie.	(= <i>Parata</i>)
<i>litigiosa</i> , Möschler.	<i>Bibasis sena</i> , M.
<i>Odontoptilum angulatum</i> , M.	<i>Badamia exclamationis</i> , (Linn.)
<i>Abaratha ransonnetii</i> , Felder.	<i>Rhopalocampta benjamini</i> , Guérin.
<i>Coladenia indrani</i> , M.	<i>Plastingia submaculata</i> , Staud.
<i>Sarangesa dan</i> , (Fabr.)	<i>Suastus gremius</i> , Fabr.
<i>dasahara</i> , M.	<i>bipunctus</i> , Swinh.
<i>purendra</i> , M.	<i>Arnetta vindhiana</i> , (M.)
<i>Tapena thwaitesi</i> , M.	<i>ogygia</i> , Hewits.
<i>Hesperia galba</i> , Fabr.	<i>Gangara thyrsis</i> , Fabr.
(= <i>Spialia</i>)	<i>Matapa aria</i> , M.
<i>Gomalia albofasciata</i> , M.	
<i>Ismene fergussoni</i> , deN.	
(= <i>Gecana</i>)	
<i>gomata</i> , M.	
(= <i>Burara</i>)	

<i>Taractrocera mævius</i> , Fabr.	(= <i>Calloris</i>)
<i>ceramas</i> , Hewits.	<i>seriata</i> , M.
(= <i>nicévillei</i> , Swinh.)	(= <i>Calloris</i>)
<i>Ampittia dioscorides</i> , (Fabr.)	<i>conjuncta</i> , Herr.-Schäff.
<i>Aeromachus jhora</i> , deN.	(= <i>Calloris</i>)
(= <i>Machachus</i>)	<i>colaca</i> , M.
<i>Telicota-bambusæ</i> , M.	(= <i>Calloris</i>)
<i>augias</i> , Linn.	<i>mathias</i> , M.
<i>palmarum</i> , M.	(= <i>Chapra</i>)
(= <i>Corone</i>)	<i>subochracea</i> , M.
<i>mæsoides</i> , Butler.	(= <i>Chapra</i>)
(= <i>Padraona</i>)	<i>canaraica</i> , M.
<i>Padraona gola</i> , M.	(= <i>Parnara</i>)
<i>Halpe moorei</i> , Watson.	<i>bada</i> , (M.)
<i>hyrtacus</i> , deN.	(= <i>Parnara</i>)
<i>astigmata</i> , Swinh.	<i>Gegenes nostradamus</i> , Fabr.
(= <i>Thoressa</i>)	<i>Notocrypta restricta</i> , M.
<i>honorei</i> , deN.	<i>fishamelii</i> , (Boisd.)
(= <i>Thoressa</i>)	<i>Sancus sulfasciatus</i> , (M.)
<i>Baracus hamptoni</i> , El. & Edw.	<i>Udaspes folus</i> , Cramer.
<i>Cupitha purreea</i> , M.	<i>Hyarotis adrustus</i> , (Cramer.)
<i>Baoris farri</i> , M.	<i>Iambrix salsala</i> , M.
<i>kumara</i> , M.	

These insects will arrange themselves in their proper subfamilies as under :—

Subfamily <i>Celenorrhinæ</i> (1).	Subfamily <i>Ismeneinæ</i> (3).
Genus <i>Celenorrhinus</i> 1.	Genus <i>Ismene</i> 11.
Species <i>ambareesa</i> (1).	Species <i>fergussoni</i> (16)
<i>leucocera</i> (2).	(<i>Gecana</i>)
<i>area</i> (3).	<i>gomata</i> (17)
<i>Satarupa</i> 2.	(<i>Burara</i>)
(= <i>Daimio</i>)	<i>Hasora</i> 12.
<i>milliana</i> (4).	<i>badra</i> (18).
<i>Tagiades</i> 3.	<i>chabrona</i> (19).
<i>obscurus</i> (5).	<i>alexis</i> (20).
<i>litigiosa</i> (6).	(<i>Parata</i>)
<i>Odontoptilum</i> 4.	<i>butleri</i> (21).
<i>angulatum</i> (7).	(<i>Parata</i>)
<i>Abaratha</i> 5.	<i>Bibasis</i> 13.
<i>ransonnetii</i> (8).	<i>sena</i> (22).
<i>Coladenia</i> 6.	<i>Badamia</i> 14.
<i>indrani</i> (9).	<i>exclamationis</i> (23).
<i>Sarangesa</i> 7.	<i>Rhopalocampa</i> 15.
<i>dan</i> (10).	<i>benjamini</i> (24).
<i>purendra</i> (11).	Subfamily <i>Plastingiæ</i> (4).
<i>dasahara</i> (12).	Genus <i>Plastingla</i> 16.
<i>Tapena</i> 8.	Species <i>submaculata</i> (25).
<i>thwaitesi</i> (13).	<i>Suastus</i> 17.
Subfamily <i>Hesperinæ</i> (2).	<i>gremius</i> (26).
Genus <i>Hesperia</i> 9.	<i>bipunctus</i> (27).
(= <i>Spialia</i>)	<i>Arnetta</i> 18.
Species <i>galba</i> (14).	<i>vindhiana</i> (28).
<i>Gomatia</i> 10.	<i>Zographetus</i> 19.
<i>albofasciata</i> (15).	<i>ogygia</i> (29).

- Subfamily *Erionotinae* (5).
 Genus *Gangara* 20.
 Species *thyrsis* (30).
 Matapa 21.
 aria (31).
- Subfamily *Pamphilinae* (6).
 Genus *Taractrocera* 22.
 Species *mævius* (32).
 ceramas (33).
 = *nicévillei*.
 Ampittia 23.
 dioscorides (34).
 Æromachus 24.
 (*Machachu*)
 jhora (5).
- Subfamily *Erynninae* (7).
 Genus *Telicota* 25.
 Species *bambusæ* (36).
 augias (37).
 palmarum (38).
 (*Corone*)
 mæsoïdes (39).
 (*Padraona*)
 Padraona 26.
 gola (40).
 Halpe 27.
 moorei (41).
 hyrtacus (42).
 astigmata (43).
 (*Thoressa*)
 honorei (44).
- (*Thoressa*)
Baracus 28.
 hampsoni (45).
Cupitha 29.
 purreea (46).
- Subfamily *Baorinae* (8).
 Genus *Baoris* 50.
 Species *farrî* (47).
 kumara (48).
 seriata (49).
 conjuncta (50).
 colaca (51).
 mathias (52).
 subochracea (53).
 bada (54).
 canarica (55).
Gegenes
 nostradamus (56).
- Subfamily *Notocryptinae* (9).
 Genus *Notocrypta* 52.
 Species *restricta* (57).
 feisthamelii (58).
 Sancus 33.
 subfasciatus (59).
 Udaspes 34.
 folus (60).
 Hyarotis 35.
 adrastus (61).
 Iambrix 36.
 salsala (62.)

Although the above is the most natural grouping of sub-families, it is not easy to make a key to them all. The first four come in quite easily but the last five are very difficult to co-ordinate. The key is as follows:—

- A.—Insects in repose with wings extended horizontally.
Fore wing : with vein 5 always nearer to 6 than to 4. Eggs strongly ribbed. Larvæ feeding on dicotyledonous plants *Celænorrhinæ*.
- B.—Insects with wings in repose either held erect over the back or slanting along the body. *Fore wing* : with vein 5 various.
- a. Insects with wings either erect or slanting.
Fore-wing : vein 5 always nearer to 6 than to 4. Small butterflies never more than 37mm. in expanse. Eggs strongly ribbed. Larvæ feeding on dicotyledonous vegetation *Hesperinæ*.
- b. Insects with wings invariably held erect when resting. *Fore wing* : vein 5 various.
- a1. *Fore-wing* : vein 5 various. *Palpi* : robust, the second joint held pressed against face, erect, the third joint naked, long and directed out horizontally, or nearly so, in front of head. Eggs all strongly ribbed. Larvæ feeding upon dicotyledons. Robust, large insects, with an expanse of wing from 45mm., at least to 75mm. *Ismenerinæ*.

- b1. *Fore wing* : vein 5 never nearer to 6 than to 4 ; sometimes from or very nearly from the middle of the discocellulars, *i.e.*, half way between 4 and 6 ; mostly nearer to 4. *Palpi* : never as in *Ismeneinæ*. Eggs various. Larvæ feeding upon monocotyledons ; the only exception is *Cupitha purrea*, placed in the *Erynninæ*.
- a2. *Antennæ* : with the tip of club blunt, never with a point, be that point ever so small *Pamphilinæ*.
- b2. *Antennæ* : with the tip of the club with a point, well-marked in the great majority of cases, sometimes small, but always present.
- a3. *Eyes* : bright blood-red. Eggs extremely finely ribbed, the ribs indistinct ; dome-shaped, about double as broad as high. Larvæ feeding upon palms, bamboos or on plantains, the pupa makes a spiral cell and that of *Gangara* has an enormously long proboscis. *Erionotinæ*.
- b3. *Eyes* : never red.
- a4. Breadth of head divided into the length of antenna, always over 2·1mm., the least number being 2·3mm. In all these insects the head is small, the antennæ rather long. The larvæ are very similar to those of the *Baorinæ* and the pupa is also very like those of that subfamily and is naked and formed in an open cell made by a silk or two fixed across a half cylinder so to speak, this half cell being caused by the shrinking of the silks: on the undersides of the leaves for *Udaspes*, *Nociocrypta* and *Sancus*. The eggs are all limpet-shaped, blood-red, quite smooth standing on a narrow, shelving, basal ring or band. The foodplants are grasses and gingers (*Scitamineæ*, formerly known as *Zinziberaceæ*) as far as is known *Nociocryptinæ*.
- b4. Breadth of head divided into length of antenna never over 2·3mm ; nearly always 2mm., or less, down to 1·4mm. All insects with broad heads, especially so in the subfamilies *Baorinæ* and *Erynninæ*. Eggs ribbed or more or less smooth—always ribbed and strongly so in *Plastingiinæ* ; quite smooth in *Baorinæ* and less so in *Erynninæ*.
- a5. *Hind wing* : underside with *white* dots at most, never with bands, *black* dots or large spots and never with dark clouding or *fasciæ* or streaks of

any kind. Eggs all smooth. Larvæ all white with broad anal segment. Pupæ like those of *Notocryptinæ*: naked, green, with a long, conical snout in front, a proboscis free beyond the wings and no spiracular expansions. The cell is formed as for that sub-family. The foodplants of all the larvæ are bamboos and grasses. *Baorinæ*

b5. *Hind wing*: never as in *Baorinæ* on the underside.

a6. *Hind wing*: underside with black dots. Eggs few, and strongly ribbed, with an apical ring. Larvæ as in *Erynninæ*. Pupæ also similar. Cell formed by cutting out an oval piece of blade with the midrib as one side, tightly closed all round and cutting it free so that it falls to the ground. Foodplants of larvæ are bamboo, palms or cane

.. .. *Platinginæ*.

b6. *Hind wing*: underside not as above. Eggs smooth or ribbed, generally the former. Larvæ with thin skins. Pupæ with large spiracular expansions to segment 2. Cell tightly closed. Foodplants, grasses and bamboos

.. *Erynninæ*.

(To be continued.)

BIRDS OF THE INDIAN EMPIRE.

BY

E. C. STUART BAKER, O.B.E., F.L.S., F.Z.S., M.B.O.U., C.F.A.O.U.

It is now 22 years since the last volume of Blanford's and Oates' Avifauna of British India appeared and it is to be hoped that before very long the Secretary of State for India may see his way to sanction a new edition of the Fauna. Pending this, however, it seems desirable that something should be done to show our workers in India what has been accomplished since that excellent series was published. With this idea in view I have compiled the following Catalogue.

It does not for a moment pretend to be complete for much yet remains to be done in working out species, genera and even the families of our Indian Birds. On the other hand our advance in Indian ornithological knowledge has been great since 1898 and many ornithologists have contributed to this advance. First and foremost must be placed Dr. E. Hartert of Tring Museum whose wonderful work on Palaearctic birds (*Die Vogel Palaëartischen Fauna*) contains an endless wealth of information on all our Indian visitors from Northern climes in addition to much on more purely tropical forms. The late Col. H. H. Harington did useful work amongst the *Timeliidæ* and others, including the writer, have from time to time worked out certain families, genera and species.

The classification adopted is that of Oates' but certain birds have been removed from one family to another on account of discoveries made since the Fauna was written. Especially has this been the case in the sub-family *Brachypteryginae* which has been transferred almost *en bloc* to the *Turdidae*.

The Catalogue has been arranged principally with a view to economy in space and contains only the following details. The scientific and trivial name of each bird; the first reference with date; when the name in the reference is identical with that given in the Catalogue it is not repeated but when trinomials are used in the Catalogue and only binomials in the reference the initial letter of the generic name is given and not the name in full and where the generic name differs from the Catalogue name the reference is then given in full. Serial numbers are given and following these the number in brackets according to the Fauna of British India. When one number covers more than one race or species in the Fauna it is repeated in the Catalogue but when a species or sub-species is given which is not referred to at all in the Fauna the second number is left blank. After the reference the date is given and then the type locality in brackets and, in some cases where it is necessary to narrow the type limits given, a second locality is noted and *underlined* and this second name must be considered the type locality in future.

This is required as in some instances, such as "Himalayas", "India", etc., the one locality may cover numerous races and it is therefore imperative to designate more clearly the area of the bird originally described.

The distribution is given in all cases in which Blanford's and Oates' species are divided into geographical races or in which the distribution as given in the Fauna has had to be amended or added to.

Details of reasons for alterations to names or for sub-divisions into sub-species are, of course, impossible in the space available and have been left out for future articles on particular families and genera.

When the Catalogue is completed a table will be given showing the full name of all the references.

The Society intends, I understand, to bring out the Catalogue in book form and this, especially if interleaved, should form a useful hand list to collectors in which to note down their collections and an easy book to annotate and keep up to date as further species are worked out.

HAND-LIST OF THE "BIRDS OF INDIA."

Order PASSERES.

Family CORVIDÆ.

1. (1) **Corvus corax laurencei.** *The Punjab Raven.*
C. laurencei, *Hume, Lahore to Yarkand*, p. 235 (1873), (*Punjab*).
Punjab, Bombay, U. P., N. W. P. Rare straggler Kashmir and C. P.
2. (1) **Corvus corax tibetanus.** *The Himalayan Raven.*
C. tibetanus, *Hodg., Ann. Mag. Nat. His., 2nd Series*, 3, p. 203 (1849), (*Sikkim*).
Himalayas from Kashmir to E. Tibet.
- 3.* (2) **Corvus corax umbrinus.** *The Brown-necked Raven.*
C. umbrinus, *Sunder., K. Vet. Acad. Forh. Stockh.* p. 199 (1828), (*Senaar*).
Sind, Baluchistan, S. Persia, Arabia, Palestine and ? N. E. Africa.
4. (3) **Corvus corone orientalis.** *The Eastern Carrion Crow.*
Eversm., Add. Pal. Zool. fasc. ii, p. 7 (1841), (*Buchtarma*)
Kashmir, N.-W. Frontier, Siberia, Yenesei to Japan.
- 5† (4) **Corvus coronoides levaillanti.** *The Indian Jungle-Crow.*
C. levaillanti, *Less., Traite d'Orn.* p. 328 (1831), (*Bengal*).
Northern India S. of Himalayas.

* The Indian Brown-necked Raven does not seem to me to be identical with all the African birds which probably form several races, one of which is *ruficollis*.

† The various races of Indian Jungle-Crow are only sub-species of the Australian *coronoides*.

6. (4) **Corvus coronoides intermedius.** *The Himalayan Jungle-Crow.*
C. intermedius, Adams, P.Z.S., 1850, p. 171 (Sikkim).
 Himalayas E. to Sikkim and Bhutan.
7. (4) **Corvus coronoides andamanensis.** *The Burmese Jungle-Crow.*
C. andamanensis, Beavan, Ibis, 1866, p. 420 (Andamans).
 Assam, Burma, Siam, Malay States and Andamans.
8. (4) **Corvus coronoides culminatus.** *The Southern J Crow.*
C. culminatus, Sykes, P. Z. S., 1832, p. 96 (Deccan).
 India from the Deccan South to Ceylon.
9. (5) **Corvus frugilegus tschusii.** *The Eastern Rook.*
Hartert, Vog. Pal. 1., p. 14 (1903), (Gilgit).
 Afghanistan, Baluchistan, Kashmir, Ladak.
10. (6) **Corvus cornix sharpei.** *The Eastern Hooded Crow.*
C. sharpei, Oates, Fauna B. I. i, p. 20 (1889), (Peshawar).
 W. Siberia, Turkestan, Afghanistan, Baluchistan.
 Winter N. W. India.
11. (7) **Corvus splendens splendens** *The Indian House-Crow.*
C. splendens, Vieill, Nouv. Dict. d'His. Nat. viii, p. 44 (1817), (Bengal).
 All India except Sind.
12. (7) **Corvus splendens zugmeyerii.** *The Sind House-Crow.*
Laubm., Orn. Monatsb. xxi, p. 93 (1913), (Las Bela, S. E. Baluchistan).
 Sind, Baluchistan. Winter adjoining N. W. F. P.
13. (8) **Corvus splendens insolens.** *The Burmese House-Crow.*
C. insolens, Hume, Str. Feath. ii, p. 480 (1874), (Tennasserim).
 Burma, Siam and Malay Peninsula.
14. (8) **Corvus splendens protegatus.** *The Ceylon House-Crow.*
Madar. Orn. Monatsb. xii, p. 195 (1904), (Colombo).
 Ceylon.
15. (9) **Corvus monedula collaris.** *The Kashmir Jackdaw.*
C. collaris, Drum., A. M. N. H. xviii, p. 11 (1846), (Macedonia).
 From E. Russia to Turkestan, Persia, N. W. India and Kashmir.
16. (10) **Pica pica bactriana.** *The Kashmir Magpie.*
P. bactriana, Bp. Consp.
 N.-W. India to Kashmir.

17. (10) **Pica pica sericea.** *The Chinese Magpie.*
P. sericea, Gould, P.Z.S., 1845, p. 2 (Amoy, China).
Shan States, Kachin Hills into China.
18. (11) **Pica pica bottanensis.** *The Black-rumped Magpie.*
P. bottanensis, Deless., Rev. Zool., 1840, p. 100 (Butan).
N.-E. Sikkim into Tibet.
19. (12) **Urocissa erythrorhyncha erythrorhyncha.** *The Chinese Red-billed Blue Magpie.*
Corvus erythrorhynchus, Gmel., Sys. Nat. i, p. 372 (1788),
(China).
Yunnan into China.
20. (12) **Urocissa erythrorhyncha occipitalis.** *The Red-billed Blue Magpie.*
Psilorhinus occipitalis. Blyth, J. A. S. B. xv, p. 27
(1846), (N. W. Himalayas).
N. W. Himalayas to Assam.
21. (12) **Urocissa erythrorhyncha magnirostris.** *The Burmese Red-billed Blue Magpie.*
Psilorhinus magnirostris. Blyth, J. A. S. B. xv, p. 27
(1846), (Ya Ma Dong Mt.).
Burma and Siam.
22. (13) **Urocissa flavirostris flavirostris.** *The Yellow-billed Blue Magpie.*
Psilorhinus flavirostris, Blyth, J. A. S. B. xv, p. 28 (1846)
(Darjiling).
N.-E. Himalayas to Nepal, Sikkim and Tibet.
23. (13) **Urocissa flavirostris cucullata.** *The Western Yellow-billed Blue Magpie.*
U. cucullata, Gould, B. of A. V., pl. 51 (1861), (Kutu Valley).
N.-W. Himalayas and W. Nepal.
24. (14) **Cissa chinensis chinensis.** *The Green Magpie.*
Coracias chinensis, Bodd., Tabl. Pl. En., p. 38 (1783),
(China).
India and Burma to China.
25. (15) **Cissa ornata.** *The Ceylon Magpie.*
Pica ornata, Wagler, Isis, 1829, p. 749 (Ceylon).
Ceylon.
26. (16) **Dendrocitta vagabunda.** *The Indian Tree-Pie.*
Coracias vagabunda, Lath. Ind. Orn. i., p. 171 (1790),
(India), (Calcutta.)
India, Burma and S. China.
27. (17) **Dendrocitta leucogastra.** *The Southern Tree-Pie.*
D. leucogastra, Gould, P. Z. S., 1833, p. 57 (Malabar Coast).
Southern India, North to the Wynaad Hills.

28. (18) **Dendrocitta sinensis himalayensis.** *The Himalayan Tree-Pie.*
D. himalayensis, *Blyth, Cat.* p. 92 (1865), (*Himalayas*).
N. W. Himalayas to Chin Hills and Arrakan.
29. (18) **Dendrocitta sinensis assimilis.** *The Burmese Tree-Pie.*
D. assimilis, *Hume, Str. Feath. v.*, p. 117 (1877), (*Muleyit*).
Burma S. of Chin Hills, Shan States and Siam.
30. (19) **Dendrocitta frontalis.** *The Black-browed Tree-pie.*
D. frontalis, *McClell., P. Z. S.*, 1839, p. 163 (*Assam*).
Nepal to E. Assam N. & S. of the Brahmapootra River.
31. (20) **Dendrocitta bayleyi.** *The Andaman Tree-Pie.*
D. bayleyi, *Tyler, J. A. S. B.* xxxii., p. 88 (1863), (*S. Andamans*).
Andamans.
32. (21) **Crypsirhina varians.** *The Black Racket-tailed Magpie.*
Corvus varians, *Lath. Ind. Orn. Supp.* xxvi, (1801) (*Java*).
Lower Burma, Siam, Cochin China, to Java, Sumatra, Borneo.
33. (22) **Crypsirhina cucullata.** *The Hooded Racket-tailed Magpie.*
C. cucullata, *Jerdon, Ibis*, 1862, p. 20 (*Thayetmyo*).
Central South Burma, Siam and N. Malay Peninsula.
34. (23) **Platysmurus leucopterus.** *The White-winged Jay.*
Glaucoptis leucopterus, *Temm., Pl. Col. no.* 265 (1824), (*Sumatra*).
Extreme S. of Burma, Siam, Malay Peninsula, Sumatra.
35. (24) **Garrulus lanceolatus.** *The Black-throated Jay.*
Vigors, P. Z. S., 1830, p. 7 (*Himalayas*).
36. (25) **Garrulus leucotis leucotis.** *The Burmese Jay.*
G. leucotis, *Hume, P. A. S.*, *Bengal*, 1874, p. 443, (*Kaukaryit*).
N. W. Burma, Chin and S. Shan Hills to S. Burma.
37. (25) **Garrulus leucotis oatesi.** *Sharpe's Jay.*
G. oatesi, *Sharpe, Bull., B. O. C. v.*, p. 44, 1896 (*Chin Hills*).
N. E. Burma, E. Chin and Kachin Hills, N. Shan States.
38. (26) **Garrulus bispecularis bispecularis.** *The Himalayan Jay.*
G. bispecularis, *Vigors, P. Z. S.*, 1831, p. 7 (*Himalayas*).
N. W. Himalayas to Nepal.

39. (26) **Garrulus bispecularis interstinctus.** *The Sikkim Jay.*
Hartert, Nov. Zool. xxv, p. 430 (1918), (Darjiling).
 Sikkim, Eastern Nepal.
40. (26) **Garrulus bispecularis persaturatus.** *The Khasia Hills Jay.*
Hartert, ibid (Shillong).
 Hills South of Brahmapootra.
41. (26) **Garrulus bispecularis rufescens.** *The Yunnan Jay.*
G. rufescens, Reichenow, Orn. Monatsbr., p. 123 (1897),
(N. Yunnan).
 Yunnan.
42. (26) **Garrulus bispecularis haringtoni.** *The Chin Hills Jay.*
G. haringtoni, Rippon, Bull. B. O. C. xv., p. 97 (1905), (Mt. Victoria).
 Chin Hills, Kachin Hills and ? N. Shan States.
43. (27) **Nucifraga caryocatactes hemispila.** *The Himalayan Nutcracker.*
N. hemispila, Vigors, P. Z. S., 1830, p. 8 (Himalayas).
44. (28) **Nucifraga multipunctata.** *The Larger Spotted Nutcracker.*
Gould, P. Z. S., 1849, p. 23 (N. W. Himalayas).
45. (29) **Pyrhocorax pyrrhocorax.** *The Red-billed Chough.*
Upupa pyrrhocorax, Linn., Syst. Nat., p. 118 (1758),
(England).
46. (30) **Pyrhocorax graculus.** *The Yellow-billed or Alpine Chough.*
Corvus graculus, Linn., Syst. Nat., p. 158 (1766), (Swiss Alps).
47. **Podoces hendersoni.** *Henderson's Ground-Chough.*
Hume, Ibis, 1871, p. 408 (Yarkand).
48. **Podoces humilis.** *Hume's Ground-Chough.*
Hume, Ibis, 1871, p. 408 (Sanju Pass, Yarkand).

Family PARIDÆ.

49. (31) **Parus major cinereus.** *The Indian Grey Tit.*
P. cinereus, Vieill, Nouv. Dict. d'His. Nat. xx., p. 316
(1818), (Java).
 N. India, Assam, W. Burma, Sunda Is, Java.
50. (31) **Parus major intermedius.** *The Afghan Grey-Tit.*
P. boharensis var. intermedius, Sarudny, Bull. Proc. Nat.
Moscow (No. 3.) Vol. 3, p. 789 (1890), (S. W. Transcaspia).
 Baluchistan, Afghanistan, N.-E. Persia and S.-W.
 Transcaspia.

51. (31) **Parus major kaschmirensis.** *The Kashmir Grey-Tit.*
Hartert, Vog. Pal. 3, p. 345 (1905), (Gilgit).
 Kashmir, Garhwal, Simla and hills of the N.-West.
52. (31) **Parus major planorum.** *The Punjab Grey-Tit.*
Hartert, Nov. Zool. xii, p. 499 (1905), (S. Punjab).
 Plains of N.-W. India and South Punjab.
53. (31) **Parus major mahrattarum.** *The Southern Grey-Tit.*
Hartert, ibid, p. 499 (Ceylon).
 South India and Ceylon.
54. (32) **Parus major tibetanus.** *The Tibet Grey-Tit.*
Hartert, Vog. Pal. 3, p. 346 (1905), (Chaksam).
 S. E. Tibet, Yunnan and ? Kauri Kachin Hills.
55. (32) **Parus major commixtus.** *The Burmese Grey-Tit.*
P. commixtus, Swinhoe, Ibis, p. 63 (1868), (S. China).
 Tennasserim, Eastern Burma, Shan States and South China.
56. (33) **Parus nuchalis.** *The White-winged Black-Tit.*
P. nuchalis, Jerdon, Madr. Jour. L. S. xiii, p. 131 (1844),
(Eastern Ghats).
57. (34) **Parus monticolus.** *The Green-backed Tit.*
Vigors, P. Z. S., 1831, p. 22 (Himalayas), (Simla).
58. **Parus cyanus tianschanicus.** *The Tianschan Blue-Tit.*
Cyanistes cyanus var tianschanicus, Menzbier, Bull. Z. S.,
France, ix, p. 276 (1884) (Mt. bordering the deserts of
Central Asia).
59. **Parus palustris korejewi.** *The Turkestan Marsh-Tit.*
P. communis korejewi, Zarud. and Harms., Orn. Monatsb. x,
p. 54 (1902), (Karatau Turkestan).
 Turkestan, Afghanistan, Baluchistan and extreme N.
 W. India.
60. **Parus palustris pœcilopsis.** *The Yunnan Marsh-Tit.*
P. Pœcilopsis, Sharpe, Bull. B. O. C. 13, p. 11 (1902),
(Chatung, W. Yunnan).
 S. W. China and Yunnan.
- *61. (35) **Ægithaliscus concinna iredalei.** *The Red-headed Tit.*
Stuart Baker, Bull. B. O. C. xli, p. 2 (1920), (Simla).
 Himalayas from Chitral to the Mishmi Hills over
 5,000 ft.

* *Æ. erythrocephalus* is invalidated by Linnes *Parus erythrocephalus* x ed, p. 191 (1758). The generic name will therefore be *concinna* of Gould 1855 and a new name has to be given to the Indian race.

62. (36) *Ægithaliscus concinna manipurensis*. *Hume's Red-headed Tit*.
A. manipurensis, *Hume, Str. Feath.* 2, p. 254 (1888), (*Manipur*).
 Hills South of the Brahmaputra over 4,000 ft.
63. (36) *Ægithaliscus concinna pulchellus*. *The Shan Red-headed Tit*.
A. pulchellus, *Rippon, Bull. B. O. C.* p. 2 (1900) (*Nanoi, Shan States*).
 Southern Shan States.
64. (36) *Ægithaliscus concinna talifuensis*. *Rippon's Red-headed Tit*.
A. talifuensis, *Rippon, Bull. B. O. C.* 14, p. 18 (1903) (*Gyidyin, North Shan States*).
 Mts. E. of Talifu, Yunnan, S. W. China, N. Shan States.
65. *Ægithaliscus bonvaloti bonvaloti*. *The Chinese Black-headed Tit*.
A. bonvaloti, *Oustalet, Ann. P. Nat. Zool.* (7) xii, p. 286 (1891), (*Ta-tsiensu*).
 Western China, Yunnan and N. E. Shan States.
66. *Ægithaliscus bonvaloti sharpei*. *Mt. Victoria Black-headed Tit*.
A. sharpei, *Rippon, Bull. B. O. C.* xiv, p. 84 (1904), (*Mt. Victoria*).
 Mt. Victoria, Chin Hills.
67. (37) *Ægithaliscus leucogenys*. *The White-cheeked Tit*.
Orites leucogenys, *Moore, P. Z. S.* xxii, p. 139 (1855), (*Afghanistan*).
68. (38) *Ægithaliscus niveogularis*. *The White-throated Tit*.
Orites niveogularis, *Gould. (Mocro), P. Z. S.* xxii., p. 140 (1855), (*North India*).
69. (39) *Ægithaliscus ioschistus*. *The Rufous-fronted Tit*.
Parus ioschistos, *Hodg., Jour. A. S. B.* xviii, p. 943 (1844), (*Nepal*).
70. (40) *Sylviparus modestus modestus*. *The Yellow-browed Tit*.
S. modestus, *Burton, P. Z. S.*, 1835, p. 154 (*Nepal*).
 Nepal, Sikkim and Hills N. of Brahmapootra.
71. (40) *Sylviparus modestus saturator*. *The Chinese Yellow-browed Tit*.
S. saturator, *Rippon, Bull. B. O. C.* xvi, p. 87 (1900), (*Mt. Victoria*).
 Burma, China and Assam Hills S. of Brahmapootra.

72. (40) *Sylviparus modestus simlaensis*. *The Simla Yellow-browed Tit*.
Stuart Baker, Bull. B. O. C. xxxviii, p. 8 (1917), (Simla).
 Hills about Simla, Kashmir and probably hills further N.-W.
73. (41) *Maclolophus spilonotus spilonotus*. *The Indian Black-spotted Yellow Tit*.
Parus spilonotus, Blyth, Cat. B.M. A. S. xvi, p. 445 (1849), (Himalayas) N. Cachar.
 Nepal to Miri Hills and Hills South of Brahmapootra.
74. (41) *Maclolophus spilonotus subviridis*. *The Burmese Black-spotted Yellow Tit*.
Parus subviridis, Tick (Blyth), J. A. S. B. xxiv, p. 265 (1855), (Tennasserim.)
 Burma, Chin Hills, Shan States.
75. (42) *Maclolophus xanthogenys xanthogenys*. *The Yellow-cheeked Tit*.
Parus xanthogenys, Vigors, P. Z. S., 1831, p. 23 (Himalayas) (Murree).
 Murree to Nepal and Sikkin.
76. (43) *Maclolophus xanthogenys aplonotus*. *The Southern Yellow-cheeked Tit*.
Parus aplonotus, Blyth, J. A. S. B. xvi, p. 444 (1847), (Mt. of Central India).
 Mt. of S. India as for N. as Behar and Chota Nagpore.
77. (255) *Melanochlora sultanea sultanea*. *The Sultan Tit*.
Parus sultaneus, Hodg., Ind. Rev., 1836, p. 31 (Nepal).
 Himalayas from Nepal to Burma, Shan States and N. Siam.
- 78.* (255) *Melanochlora sultanea flavocristata*. *The Malayan Sultan Tit*.
Parus flavocristatus, Lafresn., Mag. Zool., 1837, pl. 80 (Tennasserim).
 South Burma, Siam and Malay States.
79. (44) *Lophophanes melanolophus*. *The Crested Black Tit*.
Parus melanolophus, Vigors, P. Z. S., 1831, p. 23 (Himalayas).
80. (45) *Lophophanes ater æmodius*. *The Himalayan Cole Tit*.
Parus æmodius, Hodg. (Blyth), J. A. S. B. xiii, ii, p. 943 (1844), (Nepal).
81. (46) *Lophophanes rubidiventris*. *The Rufous-bellied Crested Tit*.
Parus rubidiventris, Blyth, J. A. S. B. xvi, p. 445 (1847) (Nepal).

* A very poor sub-species distinguished by its slightly smaller size.

82. (47) **Lophophanes rufonuchalis rufonuchalis.** *The Simla Black Tit.*
Parus rufonuchalis, *Blyth, J. A. S. B. xviii*, p. 110 (1849),
 (Simla).
 Turkestan, Himalayas, Chitral to Garhwal.
83. (48) **Lophophanes rufonuchalis beavani.** *The Sikkim Black Tit.*
Lophophanes beavani, *Blyth, Jerd. B. I. ii.*, p. 275 (1863),
 (Sikkim).
 Nepal, Sikkim, Tibet and W. China.
84. (49) **Lophophanes dichrous dichrous.** *The Brown Crested Tit.*
Parus dichrous, *Hodg. Blyth, J. A. S. B. xiii*, p. 943 (1844),
 (Nepal).
 Himalayas, S. Kashmir to Sikkim.
85. (49) **Lophophanes dichrous wellsii.** *The Yunnan Brown Crested Tit.*
Stuart Baker, Bull. B. O. C. xxxvii, p. 8 (1917), (Yunnan).
 Yunnan and ? N. Shan States.
86. **Remiz coronata.** *The Turkestan Penduline Tit.*
Ægithalus coronatus, *Severtz., Izr. Obs. Moskov. viii*, 2, p.
 136 (1873), (*Syr Darya*).
 Transcaspia, West Turkestan, East Persia to Sind
 and N. W. P.

Family PARADOXORNITHIDAE.

87. (50) **Conostoma æmodium.** *The Great Parrot-billed Babbler.*
C. æmodius, *Hodg., J. A. S. B. x*, p. 857 (1841), (Nepal).
88. (51) **Paradoxornis flavirostris.** *Gould's Parrot-billed Babbler.*
Gould, P. Z. S., 1836, p. 17 (Nepal).
89. (52) **Paradoxornis guttaticollis.** *Austen's Parrot-billed Babbler.*
A. David, Nouv. Arch. Mus. vii, *Bull.*, p. 14 (1871), (Setchuan Moupin).
90. (53) **Suthora unicolor.** *The Brown Suthora.*
Heteromorpha unicolor, *Hodg., J. A. S. B. xii*, p. 448
 (1843), (Nepal).
91. (55) **Suthora nipalensis.** *The Ashy-eared Suthora.*
Hodg., Ind. Rev. ii, p. 32 (1838), (Nepal).
92. (55) **Suthora poliotis poliotis.** *The Ashy-breasted Suthora.*
S. poliotis, *Blyth, J. A. S. B. xx*, p. 522 (1851), (Cherrapoonji)
 Hills S. of Brahmapootra to Kachin Hills.

93. (54) **Suthora poliotis humii** *The Black-fronted Suthora.*
S. humii, Sharpe, *Cat. B. M.* vii, p. 487 (1883), (Nepal).
 Nepal, Sikkim to Darjiling.
94. (54) **Suthora poliotis feæ** *Salvadori's Suthora.*
S. feæ, Salvadori, *Ann. Mus. Civ. Genoa* vii, p. 364 (1889),
 (Karennee).
 Karennee, S. Shan States.
95. (56) **Suthora poliotis ripponi.** *Rippon's Suthora.*
S. ripponi, Sharpe, *Bull. B. O. C.* xv., p. 96 (1905), (Mt.
Victoria)
 Chin Hills.
96. **Suthora verreauxi craddocki.** *Bingham's Suthora.*
S. craddocki, Bingham, *Bull. B. O. C.* xiii., p. 54 (1904),
 (Loipang-Nan).
 Hills of the Mekong watershed 8,500 feet.
97. **Suthora webbiana brunnea** *Anderson's Suthora.*
S. brunnea, Anderson, *P. Z. S.*, 1871, p. 211 (Momien
Yunnan).
 Yunnan and the Kachin Hills, E. of Bhamo.
98. (37) **Suthora fulvifrons.** *The Fulvous-fronted Suthora.*
Blyth, J. A. S. B. xiv, p. 579 (1845), (Nepal).
99. (58) **Suthora ruficeps ruficeps.** *The Red-headed Suthora.*
Chleuasicus ruficeps, Blyth, *J. A. S. B.* xiv, p. 578 (1845),
 (Sikkim).
 Sikkim and Hills N. of Brahmapootra E. to Daffa Hills.
100. (59) **Suthora ruficeps atrisuperciliaris.** *The Black-browed Suthora.*
Chleuasicus ruficeps var. *atrisuperciliaris*. Godw.—Aus.,
P. A. S. B., 1877, p. 147 (Sadiya, Assam.)
 Hills S. of Brahmapootra and E. of Dibong R. to
 Shan States.
101. **Neosuthora davidiana thompsoni.** *Thompson's Suthora.*
Suthora thompsoni, Bingham, *Bull. B. O. C.*, xiii., p. 63
 (1903), (Kyatpin).
 Lalang State, Burma.
102. (60) **Psittiparus ruficeps ruficeps.** *The Red-headed Parrot-billed Babbler.*
Paradoxornis ruficeps, Blyth, *J. A. S. B.* xi, p. 177 (1842),
 (Sikkim).
 Sikkim and Assam E. to Abor Hills N. of Brahmapootra.
103. (60) **Psittiparus ruficeps bakeri.** *Baker's Parrot-billed Babbler.*
Scæorhynchus ruficeps bakeri, Hartert, *Nov. Zoo.* vii., p. 548
 (1900), (N. Cachar).
 Hills S. of Brahmapootra to Chin Hills

104. (61) **Psittiparus gularis gularis.** *The Grey-headed Parrot-billed Babbler.*
Paradoxornis gularis (Horsf.), *Gray, Gen. B. ii., p. 389*
 (1849), (*Sikkim*).
 Sikkim to the extreme E. of Assam N. of Brahma-
 pootra.
105. (61) **Psittiparus gularis transfluvialis.** *Hartert's Parrot-Billed Babbler.*
Scæorhynchus gularis transfluvialis, *Hartert, Nov. Zool.*
vii., p. 548 (1900), (*N. Cachar*).
 Hills S. of Brahmapootra, Manipur, Chin Hills.

Family TURDOIDIDÆ.

Sub-family *Turdoidinæ*.

106. (62) **Dryonastes ruficollis.** *The Rufous-necked Laughing-Thrush.*
Ianthocincla ruficollis, *Jard. and Sel., Ill. Orn 2nd S., pl.*
 21 (1838), (*Himalayas*).
107. (63) **Dryonastes nuchalis.** *Ogle's Laughing-Thrush.*
Garrulax nuchalis, *Godw.—Aus., Ann. Mag. Nat. His. (4)*
xviii., p. 411 (1876), (*Dibrugarh, Assam*).
108. (64) **Dryonastes chinensis.** *The Black-throated Laughing-Thrush.*
Lanius chinensis, *Scop., Del. Flor. et Faun. Insubr. ii, p. 86*
 (1786), (*China*).
109. (65) **Dryonastes cœrulatus cœrulatus.** *The Grey-sided Laughing-Thrush.*
Cinelosoma cœrulatus, *Hodg., As. Res. xix, p. 147* (1836),
 (*Nepal*).
 Nepal, Sikkim, Assam, Naga and Cachar Hills and
 Manipur.
110. (66) **Dryonastes cœrulatus sub-cœrulatus.** *The Shillong Laughing-Thrush.*
Garrulax sub-cœrulatus, *Hume, Str. Feath. vii. p. 140*
 (1878), (*Shillong*).
 Khasia Hills only.
111. **Dryonastes cœrulatus kaurensis.** *The Kachin Laughing-Thrush.*
D. kaurensis, *Rippon, Bull. B. O. C. xii, p. 13* (1901),
 (*Bharno*).
 North and Central Kachin Hills.
112. (67) **Dryonastes sannio.** *The White-browed Laughing-Thrush.*
Garrulax sannio, *Swinh., Ibis, 1867, p. 403* (*China*).

113. (68) **Dryonastes gallanus.** *Austen's Laughing-Thrush.*
Garrulax gallanus, Godw.-Aus., P. Z. S., 1874, p. 44
(Manipur).
 Manipur and Chin Hills.
114. (69) **Garrulax leucolophus leucolophus.** *The Himalayan White-crested Laughing-Thrush.*
Corvus leucolophus, Hardw., Trans L.S.xi, p. 208 (1815).
(Mt. above Hardwar).
 Himalayas from Simla to N. Chin Hills, Kachin Hills and N. Burma.
115. (70) **Garrulax leucolophus belangeri.** *The Burmese White-crested Laughing-Thrush.*
G. belangeri, Less., Trait. d'Orn., p. 648 (1831).
 Pegu, Shan States, S. Chin and Kachin Hills.
116. (71) **Garrulax leucolophus diardi.** *The Siam White-headed Laughing-Thrush.*
Turdus diardi, Less., Trait d'Orn. p. 408 (1831), (Siam)
(Bangkok).
 S. Yunnan, Siam, Cambodia, Cochin China and S. E. Tennasserim.
117. (72) **Garrulax pectoralis pectoralis.** *The Black-gorgeted Laughing-Thrush.*
Ianthocincla pectoralis Gould, P. Z. S., 1835, p. 186
(Nepal).
 Nepal to extreme E. Assam, N. Burma and N. Shan States.
- 118.* (72) **Garrulax pectoralis semitorquata** *Grant's Laughing-Thrush.*
G. semitorquata, O. Grant, Bull. B. O. C. x, (1900)
(Five Finger Mt. Hainan).
 South Burma, S. Shan States, Yunnan, Siam, Hainan.
119. (73) **Garrulax moniliger moniliger.** *The Necklaced Laughing-Thrush.*
Cinclosoma moniligera, Hodg., As. Res. xix, p. 147 (1836),
(Nepal).
 Nepal to E. Assam, Arrakan, Chin Hills and N. Shan States.
120. (73) **Garrulax moniliger fuscata.** *The Burmese Necklaced Laughing-Thrush.*
Stuart Baker, Bull. B. O. C. xxviii, p. 64 (1918), (Tavoy).
 Southern Burma and Siam in the Peninsula and S. Central Burma.
121. (74) **Garrulax gularis.** *McClelland's Laughing-Thrush.*
Ianthocincla gularis, McClell., P. Z. S., 1839, p. 150
(Cachar).

* *G. leucotis* of Blyth is a synonym of *G. pectoralis* and *G. meridionalis* of Kloss (Ibis, 1920, p. 11) does not seem to be distinguishable from *semitorquata*.

122. (75) **Garrulax delesserti.** *The Wynaad Laughing-Thrush.*
Crateropus delesserti. Jerd., Madr. Jour. L. S. x, p. 256
 (1839), (*Wynaad, S. India*).
123. (76) **Garrulax albogularis.** *The White-throated Laughing-Thrush.*
Ianthocincla albogularis, Gould, P. Z. S., 1835, p. 187
 (*Nepal*).
124. (77) **Garrulax strepitans.** *Tickell's Laughing-Thrush.*
G. strepitans, Blyth, J. A. S. B. xxiv, p. 268 (1858), (Mt. Muleyit).
125. (78) **Ianthocincla ocellata ocellata.** *The White-spotted Laughing-Thrush.*
Cinclosoma ocellatum, Vigors, P. Z. S., 1831 p. 55 (Himalayas).
126. (79) **Ianthocincla cineracea cineracea.** *The Ashy Laughing-Thrush.*
Trochalopteron cineraceum, Godw.—Aus., P.Z.S., 1874,
p. 45 (Naga Hills).
 Cachar, Manipur, Naga Hills East into Chin Hills.
127. **Ianthocincla cineracea styani.** *Styan's Laughing-Thrush.*
Trochalopteron styani, Oustalet, Bull. Mus. Paris 6, p. 226
 (1898), (*Ta-tsién-lu*).
 Yunnan and Eastern Shan States.
128. (80) **Ianthocincla rufogularis rufogularis.** *The Rufous-chinned Laughing-Thrush.*
Ianthocincla rufogularis, Gould, P. Z. S., 1835, p. 48
 (*Himalayas*) (*Sikkim*).
 Nepal, Sikkim, Bhutan and Hills N. of Brahmapootra.
129. (80) **Ianthocincla rufogularis assamensis.** *Hartert's Laughing-Thrush.*
Hartert, Vog. Pal. i, p. 635, (1910) (Margherita).
 Hills S. of Brahmapootra, E. to Lakhimpur, S. to Chit-tagong.
130. (80) **Ianthocincla rufogularis occidentalis.** *The Kashmir Laughing-Thrush.*
Hartert, Vog. Pal. i, p. 635 (1910) (Dehra Doon).
 Kumaon, Kashmir and N.-W. Himalayas.
131. (81) **Ianthocincla austeni austeni.** *The Cachar Laughing-Thrush.*
Trochalopteron austeni, Godw.—Aus., J. A. S. B. xxxix, ii.,
p. 105 (1870), (Hengd ng Peak, Cachar Hills).
 Khasia, Cachar and Naga Hills.

132. (81) **Ianthocincla austeni victoriae**. *The Chin Hills Laughing-Thrush*.
I. victoriae, Rippon, *Bull., B. O. C.* xvi, p. 47 (1906),
 (Mt. Victoria).
 Chin Hills.
133. (82) **Trochaloptery erythrocephalum erythrocephalum**. *The Red-headed Laughing-Thrush*.
Cinclosoma erythrocephalum, Vigors, *P.Z.S.*, 1831, p. 171
 (Himalayas), (Chamba).
 Himalayas, Chamba to West and Central Nepal.
134. (85) **Trochaloptery erythrocephalum nigrimentum**. *The Sikkim Red-headed Laughing-Thrush*.
Trochaloptery nigrimentum (Hodg.) Oates, *Hume's N. and E. 2nd Ed.* 1, p. 57 (1889), (*Nepal*).
 Eastern Nepal, Sikkim and East Assam to the
 Dibong R.
135. (83) **Trochaloptery erythrocephalum erythrolæma**.
Hume's Red-headed Laughing-Thrush.
T. erythrolæma, Hume, *Str. Feath.* xi, p. 163 (1881),
 (*Matchi, Manipur*).
 Manipur and Chin Hills.
136. **Trochaloptery erythrocephalum godwini**.
Godwin-Austin's Red-headed Laughing-Thrush.
Harington, Bull. B. O. C. xxxiii, p. 92 (1914), (*N. Cachar Hills*).
 Cachar and Naga Hills and ? E. in the Hills S. of
 Brahmapootra.
137. **Trochaloptery erythrocephalum woodi**. *Wood's Red-headed Laughing-Thrush*.
Stuart Baker, Bull. B. O. C., xxxv, p. 17 (1914), (*Loi-Sing, N. Shan States*).
 Northern Shan States and Kachin Hills.
138. (84) **Trochaloptery erythrocephalum chrysoptery**.
The Shillong Yellow-winged Laughing-Thrush.
Ianthocincla chrysoptera, Gould, *P. Z. S.*, 1835, p. 48
 (*Khasia Hills*).
 Khasia Hills only.
139. (86) **Trochaloptery erythrocephalum melanostigma**.
Blyth's Red-headed Laughing-Thrush.
Garrulax melanostigma, Blyth, *J. A. S. B.* xxiv, p. 268
 (1855), (*Mt. Muleyit*).
 Karennee, Mt. Muleyit, Tennasserim.
140. (87) **Trochaloptery phœniceum phœniceum**. *The Nepal Crimson-winged Laughing-Thrush*.
Ianthocincla phœnicea, Gould, *Icon. Av.*, pl. 3 (1837),
 (*Nepal*).
 Nepal, Sikkim and Hills North of Brahmapootra.

BIRDS OF THE INDIAN EMPIRE.

141. (87) **Trochalopteron phœnicium bakeri.** *The Assam Crimson-winged Laughing-Thrush.*
Hartert, Bull., B. O. C. xviii, p. 10 (1909), (N. Cachar).
 Hills South of Brahmapootra, Manipur and Chin Hills.
142. (87) **Trochalopteron phœnicium ripponi.** *The Burmese Crimson-winged Laughing-Thrush.*
T. ripponi, Oates, Bull. B. O. C. xi, p. 10 (1900), (Kachin Hills).
 Kachin Hills, Shan States North and South.
143. **Trochalopteron milnei sharpei.** *The Burmese Red-tailed Laughing-Thrush.*
T. sharpei, Rippon, Bull. B.O.C. xii, p. 13 (1901), (Kengtung State).
 Kachin Hills and N. Shan States.
144. (88) **Trochalopteron subunicolor.** *The Plain-coloured Laughing-Thrush.*
Trochalopteron subunicolor, (Hodg.) Blyth, J. A. S. B. xii p. 952 (1843), (Nepal).
145. (89) **Trochalopteron affine affine.** *The Black-faced Laughing-Thrush.*
Garrulax affinis, (Hodg.) Blyth, J. A. S. B. xii, p. 950 (1843), (Nepal).
 Nepal, Sikkim and Bhutan.
146. **Trochalopteron affine oustaleti.** *The Yunnan Black-faced Laughing-Thrush.*
Hartert, Vog. Pal. i, p. 633 (1909), (Tsekore).
 Yunnan.
147. (90) **Trochalopteron variegatum variegatum.** *The Eastern Variegated Laughing-Thrush.*
Cinlosoma variegatum, Vigors, P. Z. S., 1831, p. 56 (Himalayas), (E. Nepal).
 Eastern Himalayas from Chamba to Nepal.
148. (91) **Trochalopteron variegatum simile.** *The Western Variegated Laughing-Thrush.*
Trochalopteron simile, Hume, Ibis, 1871, p. 408 (Far N. West), (Gilgit).
 Western Himalayas, N.W. Kashmir, Gilgit to Chitral.
149. (92) **Trochalopteron squamatum.** *The Blue-winged Laughing-Thrush.*
Ianthocincla squamata, Gould, P. Z. S., 1835, p. 48 (Himalayas), (Sikkim).
150. (93) **Trochalopteron cachinans cachinans.** *The Nilgiri Laughing-Thrush.*
Crateropus cachinans, Jerd., Madr. Jour. x, p. 255, pl. 7 (1839), (Nilgiris).
 Nilgiris.

151. (94) **Trochalopterus cachinans cinnamomeum.** *Davidson's Laughing-Thrush.*
T. cinnamomeum, Davison, Ibis, 1886, p. 204 (unknown).
 Davison suggests Palni Hills.
152. (95) **Trochalopterus jerdoni jerdoni.** *The Banasore Laughing-Thrush.*
Garrulax jerdoni, Blyth, J. A. S. B. xx, p. 522 (1851),
(Banasore Peak).
 The Hills of Coorg, Wynaad, Palghat, Palni.
153. (96) **Trochalopterus jerdoni fairbanki.** *The Travancore Laughing-Thrush.*
T. fairbanki, Blanf., J. A. S. B. xxxvii, ii, p. 175 (1868),
(Palni Hills).
 Hills of South Travancore.
154. (97) **Trochalopterus jerdoni meridionale.** *Blanford's Laughing-Thrush.*
T. meridionale, Blanf., Hume Str. Feath. vii, p. 36 (1878),
(Travancore).
 Hills of North Travancore.
155. **Trochalopterus elliotti yunnanense.** *The Yunnan Laughing-Thrush.*
T. yunnanense, Rippon, Bull. B. O. C. xix, p. 32 (1906),
(Yangtze, Yunnan).
 Hills of Yunnan.
156. **Trochalopterus henrici.** *Prince Henry's Laughing-Thrush.*
T. henrici, Oustalet, Ann. Sci. Nat. (7) xii, p. 274 (1891),
(Tibet).
 Tibet.
157. (98) **Trochalopterus virgatum.** *The Manipur Streaked Laughing-Thrush.*
Godw.-Aus., P. Z. S., 1874, p. 46 (Razami).
 Hills South of Brahmapoetra, Manipur, Looshai and Chin Hills.
158. (99) **Trochalopterus lineatum lineatum.** *The Himalayan Streaked Laughing-Thrush.*
Cinclosoma lineatum, Vigors, P. Z. S., 1831, p. 56 (Nepal).
 Nepal and Sikkim.
159. (99) **Trochalopterus lineatum griseicentior.** *The Simla Streaked Laughing-Thrush.*
Hartert. Vog. Pal. i, p. 636 (1910), (Simla).
 S. Kashmir. Simla to Hazara.

160. (99) **Trochalopteron lineatum gilgit.** *The Gilgit Streaked Laughing-Thrush.*
Hartert, *Vog. Pal. i*, p. 636 (1910), (Gilgit).
Gilgit, Chitral and N. Kashmir.
161. (100) **Trochalopteron lineatum imbricatum.** *The Bhutan Streaked Laughing-Thrush.*
Garrulax imbricatus, *Blyth, J. A. S. B. xii*, p. 951 (1843),
(Bhutan)
Bhutan.
162. (101) **Grammatoptila striata striata.** *The Striated Laughing-Thrush.*
Garrulus striatus, *Vigors, P. Z. S.*, 1830, p. 7 (Himalayas),
(Naini Tal).
Himalayas, from Sutlej Valley to Bhutan.
163. (102) **Grammatoptila striata austeni.** *Austen's Striated Laughing-Thrush.*
G. austeni, *Oates, Fauna B. I. i*, p. 104 (1889), (Dofla Hills).
Hills North and South of the Brahmopootra.
164. (103) **Stactocichla merulina.** *The Spotted-breasted Laughing-Thrush.*
Garrulax merulinus, *Blyth, J. A. S. B. xx*, p. 521 (1851),
(Manipur).
Hills South of Brahmopootra to Looshai.
- 165.* **Babax lanceolatus lanceolatus.** *The Chinese Babax.*
Pterorhinus lanceolatus, *Verr., Nouv. Arch. Mus. Paris, vi*,
Bull., p. 36 (1871), (Chinese, Tibet).
West China, Yunnan and Kachin Hills.
166. **Babax lanceolatus bonvaloti.** *The Small Tibet Babax.*
B. bonvaloti, *Oustt., Ann. Sci. Nat. vii*, p. 273 (1892), (So. Tibet).
So. Tibet. "Tara in Tibet" (Hartert).
167. **Babax koslowi koslowi.** *Bianchi's Babax.*
Kagnakowia kozlowi, *Bianchi, Bull. Ac. Peters* (5), *xxiii*,
p. 45 (1905), (Dzetschu, S. E. Tibet).
South Tibet, The Watershed of the Mekong.
168. **Babax koslowi victoriæ.** *The Mt. Victoria Babax*
B. victoriæ, *Rippon, Bull. B. O. C. xv*, p. 97 (1905), (Mt. Victoria).
Chin Hills.

* I cannot separate *B. I. lanceolatus* and *B. I. yunnanensis*.

169. **Babax waddelli.** *The Giant Tibetan Babax.*
B. waddelli, *Dresser, P. Z. S.* (1905) *i.*, p. 54 (*Tsangpo*).
South and Central Tibet.
170. (104) **Argya eari.** *The Striated Babbler.*
Malacocercus earlii, *Blyth, J. A. S. B.* *xiii.*, p. 369 (1844),
(*Calcutta*).
171. (105) **Argya caudata caudata.** *The Common Babbler.*
Cossyphus caudatus, *Dumont, Dr. Sci. Nat.* *xxix.*,
p. 266 (1823), (*no loc.*). (*Behar*).
Practically the whole of India.
172. (105) **Argya caudata huttoni.** *The Afghan Babbler.*
Malacocercus huttoni, *Blyth, J. A. S. B.* *xvi.*, p. 476
(1847), (*Kandahar*).
Afghanistan, Baluchistan, Quetta.
173. (106) **Argya gularis.** *The Burmese White-throated Babbler.*
Chatarrhoea gularis, *Blyth, J. A. S. B.* *xxiv.*, p. 478 (1855),
(*E. side of Bay of Bengal*).
174. (107) **Argya malcolmi.** *The Large Grey Babbler.*
Timalia malcolmi, *Sykes, P. Z. S.*, 1832, p. 88 (*Dukkun*).
175. (108) **Argya subrufa.** *The Rufous Babbler.*
Timalia subrufa, *Jerd. Madr. Jour. L. S.*, p. 259 (1844),
(*Wynaad*).
176. (109) **Argya longirostris.** *The Slender-billed Babbler.*
Pycorhis longirostris, (*Hodg.*) *Moore, P. Z. S.*, 1854,
p. 104 (*Nepal*).
177. (110) **Turdoides terricolor terricolor.** *The Bengal Babbler.*
Pastor terricolor, *Hodg., J. A. S. B.* *v.*, p. 771 (1836)
(*Nepal*).
N. India from Sind to Bengal.
178. (110) **Turdoides terricolor malabaricus.** *The Southern Indian Jungle Babbler.*
Malacocercus malabaricus, *Jerd., B. of I.* *ii.*, p. 62
(1877), (*Malabar*).
South India from Orissa to Bombay.
179. (110) **Turdoides terricolor sindianus.** *The Sind Babbler.*
Ticehurst Bull. *B. O. C.*, Vol. *xl.*, No. *cclii.*, p. 156 (1920)
(*Karachi, Sind*).
Sind, Mt. Aboo, Punjab.

180. (111) **Turdoides griseus griseus.** *The White-headed Babbler.*
Turdus griseus. *Gm., Sys.Nat. i*, p. 824 (1788), (*Carnatic*).
South India E. as far North as Ellore and Belgaum.
181. (112) **Turdoides griseus striatus.** *The Ceylon Babbler.*
Malacocercus striatus, *Swains, Zool. Ill.*, p. 127 (1831),
(*Ceylon*).
Ceylon only.
182. (113) **Turdoides griseus somervillei.** *The Bombay Babbler.*
Timalia somervillii, *Sykes, P. Z. S.*, 1832, p. 88 (*Bombay*).
Travancore to Bombay on the West Coast.
183. (114) **Turdoides rufescens.** *The Ceylon Rufous Babbler.*
Malacocercus rufescens, *Blyth, J. A. S. B. xvi.*, p. 453
(1847), (*Ceylon*).

(To be continued.)

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

No. XXIII.

By

OLDFIELD THOMAS, F.R.S.

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A NEW BAT OF THE GENUS MYOTIS FROM SIKKIM.

In Mr. Wroughton's Report No. 26, on Darjiling Mammals, a note by me is published (Journ. B. N. H. S., xxiv, p. 779, 1916) on two specimens of *Myotis sicarius*, with a comment that one of them is a good deal smaller than the other, with specially smaller teeth.

We have now received from the Bombay Society two further specimens of this group, male and female, and both of them precisely agree with that smaller specimen, and as both sexes are represented I cannot but consider that the series includes two species, of which one needs description as new.

Although the first discovery was made by Mr. Baptista, it is to the two recent specimens that the clearing up of the confusion is due, and as the Society owes them to Mr. C. Primrose, I take the liberty of forming the specific name as follows:—

MYOTIS PRIMULA, sp. n.

General characters of *M. sicarius*, but smaller and with smaller teeth.

Colour and external characters apparently quite as in *sicarius*. Fur of back about 7 mm. in length. General colour above mummy-brown, the ends of the hairs glossy and rather paler. Undersurface greyish white, the bases of the hairs slaty; medium ventral area more or less tinged—perhaps stained—with yellowish.

Skull shaped as in *sicarius*, but smaller; [compare the skull measurements below with those published by Mr. Wroughton (J. B. N. H. S., Vol. XXIII, p. 608)]. Canines shorter and considerably more slender, their antero-posterior diameter in *sicarius* 1.3mm. in *primula* 1.0mm. Small premolar even smaller in proportion to the anterior one, quite internal to the tooth row. Below, this difference is accentuated, for the middle lower premolar is in *sicarius* in the tooth row and of about one-third the area in cross section of the anterior tooth, while in *primula* the two are as in the upper jaw, the middle one quite internal and only about one-tenth the area of the first.

Dimensions of the type, the starred measurements taken in the flesh.
Forearm :—46mm.

Head and body 47*, tail 39*, ear 15*, lower leg and hind foot (c. u.), 31.5.

Skull, greatest length 17.2, basi-sinual length 13.1, zygomatic breadth 11.8, interorbital breadth 4.5, breadth of brain case 8.5, palato-sinual length 7.8, front of canine to back of m³ 6.9, front of p¹ to back of m² 4.6, breadth across outer corners of m² 7.3.

Hab. of type.—Pashok, Darjiling, 3,500', of Mr. Primrose's specimens, Teesta Valley Tea Estate, 3,000'.

Type.—Adult male B. M. No. 16.3.25.30. Original number 500. Collected 30th July 1915 by N. A. Baptista. Presented to the National Museum by the Bombay Natural History Society.

No. XXIV.

THE MAINLAND REPRESENTATIVE OF RATUFA M. DANDOLENA.

BY R. C. WROUGHTON.

Messrs. Robinson and Kloss in a "Nominal List of the SCIURIDAE, of the Oriental Region, with a list of specimens in the Collection of the Zoological Survey of India" published in the records of the Indian Museum, xv. p. 171 *et seq.* 1918, revive the name *albipes*, Blyth, for two specimens of *Ratufa*, the one from the Nilgiris and the other from the Shevaroy Hills. The recent receipt of six specimens of a *Ratufa*, collected by Mr. Stoney from "the foot of Hills to the West of Srivilliputtur," has led me to investigate the proposal to revive Blyth's name in this connection.

Blyth bases his original description on a stuffed skin and skeleton in the Calcutta Medical College, the origin of which was unknown, and which are now, it would seem, no longer available. The description commences by likening the new form to *macroura*, Pennant, *i. e.* to *macroura dandolena*, Thos. and Wrought. (cf. The Giant Squirrels of Ceylon, J. B. N. H. S., xxiv. p. 34, 1915.) and goes on to say that it is "of an uniform dull brown colour above and on the outside of the limbs down to the feet" and further "Paws whitish with black hairs intermixed upon the toes" and finally goes on to say "However the latter (*i. e.* '*macroura*' or *dandolena*) may vary the forelimbs from the elbow are invariably white, and a corresponding portion of the hind limbs. . . . I take that now described to be a particular race, equivalent to many others that are named; but the habitat remains to be ascertained."

I have now seen 8 specimens from Madura, collected by Mr. Stoney, and without exception, exactly as in *dandolena*, they have the forearm to the elbow and the lower leg to the knee white, and therefore, as Blyth points out cannot be *albipes*.

I have not of course seen the two specimens in the Indian Museum, but one of them collected by W. Daly is almost certainly conspecific with a specimen (same collector and locality) presented to the British Museum by Blanford, which in its turn is absolutely inseparable from the Madura series.

R. albipes was, it follows from his description, a generally brown animal, the lower half of whose face was whitish, and whose body colour extended along the limbs to the wrists and ankles, the feet being white. This clearly does not apply to either the Ceylon or the mainland *macroua* and Blyth's species can only be one of the forms of *insignis*, Miller, with which the description nearly agrees. But with which form the description is not detailed enough to decide. Under the circumstances Blyth's *albipes* might be shelved as being unrecognisable in the absence of type and type-locality.

I have carefully compared the Madura series with the large series of *dandolena* obtained by the Survey from Ceylon and I have failed to find any character in skin or skull to differentiate the members of one from those of the other, so that the island and mainland forms must both equally bear the name *Ratufa macroua dandolena*.

DESCRIPTION OF A NEW SNAKE OF THE GENUS
ZAMENIS FROM PERSIA.

BY

G. A. BOULENGER, LL.D., D.Sc., F.R.S.

Zamenis hotsoni.

Snout moderately prominent, obtuse. Eye moderately large. Rostral broader than deep, the portion visible from above measuring one-fourth or one-third its distance from the frontal; internasals as long as or a little shorter than the præfrontals; frontal broader than the supraocular, once and a half to once and two-thirds as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal as long as deep; one præocular, not reaching the frontal, with a subocular below it; two postoculars; temporals 1 + 2; seven upper labials, third and fourth entering the eye, fourth in contact with the anterior temporal; four lower labials in contact with the anterior chin-shields; posterior chin-shields as long as or a little longer than the anterior, separated from each other by scales. Scales smooth, with a single apical pit, in 17 rows. Ventrals not angulate laterally, 196; anal divided; subcaudals 90. Pale fawn-colour or greyish above, each scale, except the outermost, with a black central shaft; head without markings; upper lip, præ- and postoculars, outer row of scales, and lower parts yellowish white.

Two specimens, the larger measuring about 500 millim. from Shiraz, presented by Major J. E. B. Hotson.

Distinguished from *Z. gemonensis* and *Z. dahlii* by the smaller eye; from the former by the single scale-pits, from the latter by the number of rows of scales on the body and the less slender form.

DESCRIPTION OF A NEW LAND-TORTOISE
FROM NORTHERN PERSIA.

BY

G. A. BOULENGER, LL.D., D. SC., F.R.S.

Testudo buxtoni, sp. n.

Shell moderately convex, a little more than twice as long as deep the posterior border expanded, slightly reverted and feebly serrated. Nuchal shield 3 times as long as broad; supracaudal completely divided; 11 marginals on each side; vertebrals all broader than long, the third once and a half as long as broad and as broad as the corresponding costal. Plastron large, the lobes much shorter than the

width of the bridge and nearly twice as broad as long; front lobe truncate and slightly notched in front, hind lobe openly notched behind. Suture between the gular shields a little longer than that between the humerals; pectorals forming a very narrow band in the middle, their outer border about half the length of that of the abdominals, the median suture between which is as long as its distance from the anterior border of the plastron and once and one-third its distance from the anal notch; suture between the femorals shorter than that between the anals, which equals that between the numerals; axillary shield small, inguinal large. Head moderate; beak neither hooked nor notched, feebly serrated on the sides; alveolar ridge of upper jaw short and feeble; a large cordiform præfrontal shield, with a narrow shield on each side between the eye and the rhinarium, followed by a large but somewhat smaller frontal. Fore limb with 5 claws, with 4 longitudinal series of large imbricate, rounded scutes in front; a large, claw-shaped tubercle on the back of the thigh. Shell yellowish brown, with irregular and ill-defined blackish blotches; soft parts dark brown, the scutes on the fore limb blackish at the base, the claws pale horn-colour, blackish at the base.

The single specimen, stuffed, appears to be a female. Its measurements are as follows:—

Length of shell	..	..	..	..	280 mm.
Width „ „	..	..	..	..	180
Depth „ „	..	..	..	..	130
Length of plastron	..	..	..	..	220
„ „ front lobe of plastron	..	..	..	..	60
„ „ hind „ „	..	..	..	..	65
Width of bridge	..	..	..	..	110
Length of head	..	..	..	..	48
Width „ „	..	..	..	..	37

This Tortoise was found at Manjil, between Resht and Kasuin, South Coast of the Caspian Sea, on a hill-side about 7,000—7,500 feet, by Captain P. A. Buxton, and presented to the Bombay Natural History Museum by Capt. C. M. Ingoldby.

It is very closely related to *T. ibera*, Pall., and *T. zarudnyi*, Nikolsky, both of which are inhabitants of Persia, but it is easily distinguished from them by the divided supracaudal shield and the extremely narrow pectorals.

I am not certain whether *T. zarudnyi* deserves specific-recognition; at any rate the characters pointed out by Siebenrock (1909) are worthless. A specimen from Zirkuck, E. Persia, received from the Petrograd Museum in 1899 as *T. zarudnyi* has the first vertebral shield a little broader in front than behind, the third vertebral not broader than the third costal, and the posterior margin of the carapace not more strongly serrated than in some individuals of *T. ibera*.

INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S

(With 10 *Text-figures*)

(Continued from page 56 of this Volume.)

Part VIII.

Genus—*THOLYMIS*, Fabr.

Tholymis, Hagen, Stettin, ent. Ztg., 28, p. 221 (1867)—Brauer, Zool. bot. Wien, 18, pp. 365, 712 (1868)—Kirby, Trans. Zool. Soc. Lond. 12, pp. 258, 265-1889)—Calvert, Biol. C. A. Neur, pp. 199, 219 (1905-1906).

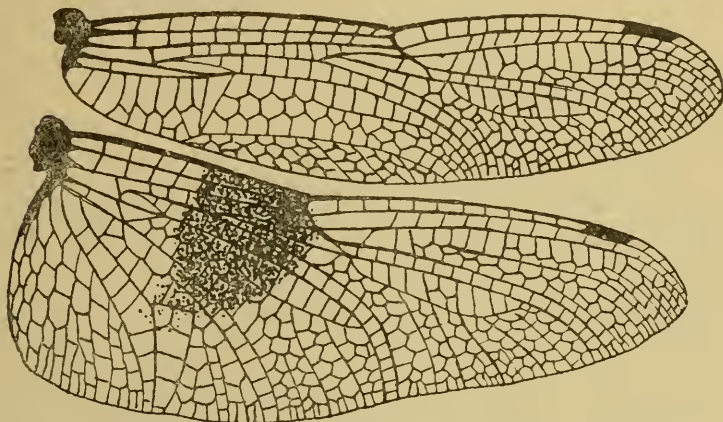


Fig. 58.—Wings of male *Tholymis tillarga* (x 2½).

Head relatively large, eyes contiguous for a long distance, rather more than the antero-posterior diameter of the occiput, forehead rounded and without prominent foreborder, suture flush, vesicle high and deeply fissured.

Prothorax with a very small posterior lobe, almost hidden by the apposition of the head with thorax.

Thorax robust, somewhat cubical and shortened. Legs slim and long, hind femora with a row of fine, gradually lengthening, sparse spines, mid femora with a similar row but fewer in number, tibial spines numerous, very fine, claw-hooks robust, situated near the middle of claws.

Abdomen dorso-ventrally swollen and less so from side to side, then tapering gradually to the end. 4th segment with a transverse ridge.

Wings moderately long and broad, rounded at the apices, reticulation very close, trigone of forewing slightly distal to the line of the trigone in the hind, traversed once, long and narrow, trigone of the hindwing at the arc, entire, its distal side slightly concave, arc between the first and second antenodal nervures, antenodal nervures $10\frac{1}{2}$, the final incomplete, sectors of the arc with a moderately long fusion in the forewing, a longer fusion in the hind, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all hypertrigones entire, 4th nervure markedly undulated, 2 rows of cells between 5 and 5a, 7a well formed, 8th nervure very flat and the discoidal field therefore much contracted, 3 rows of cells in the discoidal field, loop very long and very narrow, open at its apex, the inner border running straight to the termen, anal field very broad, the narrow cells composing it arranged in transverse rows. Membrane large. Stigma large, the anterior usually the same size as the posterior, but occasionally very slightly larger.

Sexual organs. See under species.

Only one species taken within Indian limits.

70. *Tholymis tillarga*.—Hagen, Stett. Ent. Ztg., 28, p. 220 (1867)—Brauer, Zool. bot. Wien. 18, p. 712 (1868)—Selys, Mitt. Mus. Dresden, 1878, p. 293.—Id. Ann. Mus. Civ. Genov. 14, p. 305 (1879)—Kirby, Trans. Zool. Soc. Lond. 12, p. 265 (1889)—Id. Cat. p. I (1890)—Selys, Ann. Mus. Civ. Genov. 30, p. 439 (1891)—Kirby, Linn. Soc. Journ., Zool. 24, p. 547 (1893)—Martin, Mem. Zool. France, 9, p. 101 (1896)—Kirby, Ann. Mag. Nat. Hist. (7) 2, p. 230 (1898)—Martin, Mem. Soc. Zool. France, 19, p. 221 (1901)—Laidlaw, Proc. Zool. Soc. Lond. 1902, 1, p. 65—Martin, Mission Pavie (p. 4. sep.) (1904)—Kirby, Ann. Mag. Nat. Hist. (7) 15, p. 271 (1908).

Libellula bimaculata, Desjardins, Ann. Soc. Ent. France, 4, p. IV (1835).

Libellula pallida, Palisot de Beauvais, Ins. Africa, America, p. 171, tab. 2, fig. 2 (1805).

Tholymis pallida, Hagen, Stett. ent. Ztg. 28, p. 221 (1867)—Kirby, Cat. p. 1 (1890).

Libellula tillarga, Fabr. Suppl. Ent. Syst., p. 285 (1798)—Burmeister, Hand. Ent. 2, p. 852 (1839)—Rambur, p. 39, Neur. (1842)—Calvert, Trans. Amer. Soc. Ent. 25, p. 69 (1898).

Pantala tillarga, Brauer, Zool. bot. Wien. 14, p. 162 (1864).

Zygomma tillarga, Brauer, Novara, p. 104 (1866)—Id. Zool. bot. Wien. 17, pp. 288, 505 (1867).

Expanse 70 mm. Length 43 mm.

Male: head, eyes bright red or reddish brown above, lilaceous at the sides and beneath, occiput brown or reddish, vesicle reddish, frons and upper part of epistome reddish or bright ochreous, labrum ochreous, labium yellow.

Prothorax ochreous, no markings.

Thorax golden yellow or with a bright reddish tinge on the dorsum, paler at the sides.

Abdomen bright red or bright ochreous with a reddish suffusion along the dorsum.

Wings hyaline, the bases tinged with light golden yellow. In the hindwing a large discal spot which is most intense at the node where it abruptly ends in an almost straight border, running back for rather more than half the diameter of the wing. Inwardly it gradually fades, until lost just distal to the trigone. In the adult, external to this spot, a large, diffuse, opalescent whitish spot develops, which viewed from above in the gloaming, has a deceptively, phosphorescent appearance.

Sexual organs. Lamina depressed, slightly arched, its border shallowly notched and fringed with long yellow hairs, external tentaculæ obsolete internal very compact, triangular, the hook short and thick and turning a little outwards, lobe broad and oval.

Anal appendages long and slim, of about the length of the two final segments of abdomen.

Female: eyes brown above, olivaceous at the sides and beneath, occiput olivaceous brown, vesicle and face ochreous, paler below, labrum and labium yellow.

Prothorax and thorax, an olivaceous brown, somewhat greenish at the sides, legs ochreous.

Abdomen olivaceous brown.

Wings hyaline, the basal marking very obscure. The discal marking only just visible and without the opalescent outer marking. Stigma, as in the male, reddish brown.

Sexual organs: border of the 8th segment not dilated, 8th ventral plate prolonged into a long, depressed, vulvar scale which at the end is

split into two leaf-like, triangular processes; 9th ventral plate prolonged as a tongue-like process, extending to the end of the 10th segment. This process strongly carinated and furnished at its base with two small hooks.

Hab.—Throughout India, Ceylon, Burma, Thibet, Indo-Malaysia and Indo-China.

This insect is one of our few night-flying dragonflies. Occasionally it may be seen flying in the day-time in shady groves or dark jungles, but usually it prefers to wait for sundown, at which time it quite suddenly appears in great numbers, flying low over water. Of great interest is the opalescent patch on the hindwings of the male which serves the purpose of a recognition mark for the females. After it has become too dark to distinguish the insect, the pale, lambent glow of this patch may be seen flitting like a Will-o-the-Wisp over the surface of the waters, where the insect is busily engaged hunting mosquitoes, whilst keeping one eye open for a chance female.

Genus—*ZYXOMMA*, Rambur.

Zyxomma, Rambur, Neur. pp 26, 30 (1842)—Hagen, Stett. Ent. Ztg., 10, p. 171 (1849)—Brauer, Zool. bot. Wien. 18, pp. 364-712 (1868)—Kirby, Trans. Zool. Soc. Lond. 12, pp. 258, 301 (1889)—Foerster, Kahr. Mannheim, 71-72 (p. 3 sep.) (1906).

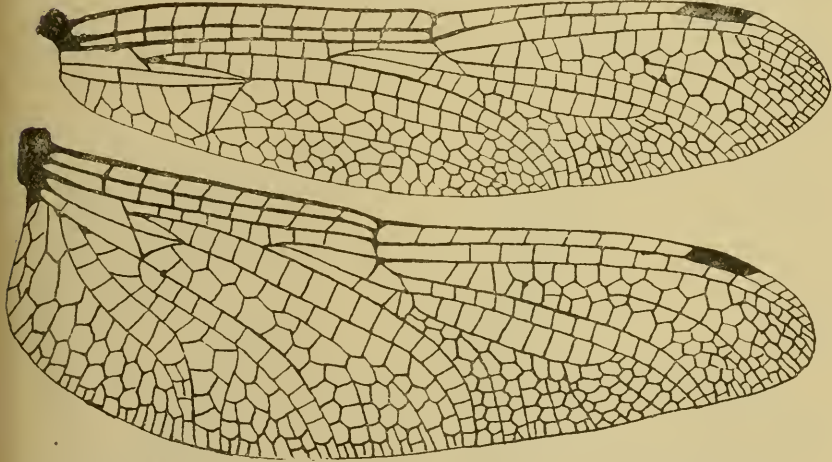


Fig. 59.—Wings of male *Zyxomma petiolatum* showing neuration (x3).

Head relatively large and globular, eyes contiguous for a very long distance and resembling those of an *Anax*, occiput very small, vesicle rounded above and overhanging the central ocellus so that this is invisible when viewed from above, forehead prominent and deeply notched in front of the ocellus, as if to give a free field of vision to the latter.

Prothorax slightly arched, very small, its posterior lobe fringed with short hairs.

Thorax small, cubical, short, coated thickly with short hairs.

Legs: hind femora with a row of very small, closely-set spines and one much larger spine at the distal end, mid femora with similar armature, tibial spines slim and numerous, claw-hooks robust, situated near the middle of the claws. Armature of the female very similar.

Abdomen very long and slim. The first 3 segments markedly tumid from side to side and ventro-dorsally, the remainder cylindrical, very slim and parallel-sided to the end. The joints of the segments markedly swollen.

Anal appendages very long and slim, nearly as long as the two last abdominal segments.

Wings long and moderately broad, reticulation close. Trigone of the forewing slightly distal to the line of that of the hind, its relation to the hypertrigone about a right angle, traversed once, very narrow, trigone of

hindwing at the arc, entire, its distal side very slightly concave, sectors of the arc fused for a short distance in the forewing and for a long distance in the hind, a shorter fusion in the female, arc between the 1st and 2nd antenodal nervures, antenodal nervures $10\frac{1}{2}$ in the male, $11\frac{1}{2}$ in the female, the final incomplete, 1 cubital nervure to all wings, not usually supplementary nervures to the bridge but in two of my specimens there is one accessory in each right, hind-wing, 8th nervure in the hindwing from the anal angle of the trigone; in the fore, very flatly curved so that the discoidal field is contracted at the termen, discoidal field with 3 rows of cells, all hypertrigones entire, 4th nervure not noticeably undulated, 1 row of cells between 5 and 5a, anal loop long and narrow, its apex open, resembling in this respect *T. tillarga*, bifurcated cells at the outer angle only (occasionally at the trigone also), anal field broad, its cells not markedly differentiated but arranged in transverse rows. Membrane and stigma moderately large.

Sexual organs: male, lamina broad, slightly depressed, its free border bifid and furnished with two triangular processes, its surface coated with long hairs, external tentaculæ cupped, small, almost obsolete, internal tentaculæ a short, hooked spine turning strongly out and backwards, its surface furnished with minute spines, lobe quadrate, broad and short. The whole of these organs very small. Female: border of 8th segment not dilated, 8th ventral plate split for about two-thirds of its length, prolonged in to a long vulvar scale which reaches nearly to the end of the 9th segment, 9th ventral plate bent ventralwards and furnished with a tuft of black hairs.



Fig. 60.—Male sexual organs of *Zygomma petiolatum* ($\times 12$).

71. *Zygomma petiolatum*, Rambur, Neur. p. 30, tab. 2, fig. 4d (1842)—Hagen, Zool. bot. Wien, 8, p. 479. (1858)—Brauer, *ibid.*, 17, p. 287 (1867)—*Id.*, *ibid.*, 18, p. 712 (1868)—Selys, Mitt. Mus. Dresden (1878) p. 293.—*Id.*, Comptes end. Soc. Ent. Belg., 7, VII, 88 (sep.)—Kirby, Trans. Zool. Soc. Lond. 12, p. 308, tab. 57, fig. 10. (1889)—*Id.*, Cat. p. 335 (1890)—Selys, Ann. Mus. Civ. Genov., 30, p. 439 (1891)—Kirby, Linn. Soc. Journ. Zool. 24, p. 554 (1893)—*Id.*, Ann. Mag. Nat. Hist. (6) 14, p. 19 (1894)—Tillyard, Proc. Zool. Soc. Lond. 1902, p. 64—Martin, Miss. Pavie (p. 7. sep.) (1904).

Zyxomma seychellarum, Martin, Mew. Soc. Zool. France, 9, p. 103 (1896).

Expanse 67mm. Length 48mm.

Male and female similar.

Head: eyes rich olive green, of uniform depth above and beneath, occiput reddish brown, vesicle dark brown, epistome, frons and labrum a pale brown.

Prothorax pale brown.

Thorax pale brown, rather darker on the dorsum. No markings.

Abdomen light warm brown with moderately broad, blackish annules at the intersegmental nodes. Legs brown.

Wings hyaline or a little smoky, the apices usually but variably suffused with brown as far inwards as the middle of stigma, a brownish ray in the superior costal space not reaching the 1st antenodal nervure and a similar ray in the cubital space extending out as far as the cubital nervure. A small triangle of the same colour at the anal angle in the hind-wing. Membrane greyish black. Stigma brown.

Hab.—Throughout the plains of India probably as far north as the foot hills of the Himalayas. Karachi, common at the sewage farm. Bombay and Madras, Poona. This insect is another one of our night-flying dragonflies. It has a very short duration of flight, usually of not longer than half or three quarters of an hour. In Poona, specimens are seen on the wing for the first time at about 7 p.m. and go to rest at about 7-45 p.m. In Bombay they appear rather later and are seen until darkness obscures them. I have seen them on the wing on several occasions during the day-time but only in situations, where an artificial twilight reigned, such as down deep wells or actually in the precincts of buildings where they were hawking mosquitoes in the darkened corridors. Occasionally they may be put up from bushes whilst beating dense jungle. Their nocturnal habits may have some connection with the large size and uniform colouring of the eyes and also the hood-like vesicle which shades in the central ocellus and thus cuts off peripheral rays of light. Their food appears to be exclusively mosquitoes. It is a curious coincidence that the apex of the loop is open as in *Tholymis tillarga*, another night-flying species.

Genus—CAMACINIA, Kirby.

Camacinia, Kirby, Trans. Zool. Soc. Lond. 12, pp. 260 266 (1889)—Karsch Berlin, Ent. Zts. 33, pp. 356, 359 (1890)—Kruger, Stett. Ent. Ztg., 64, p. 253 (1903).

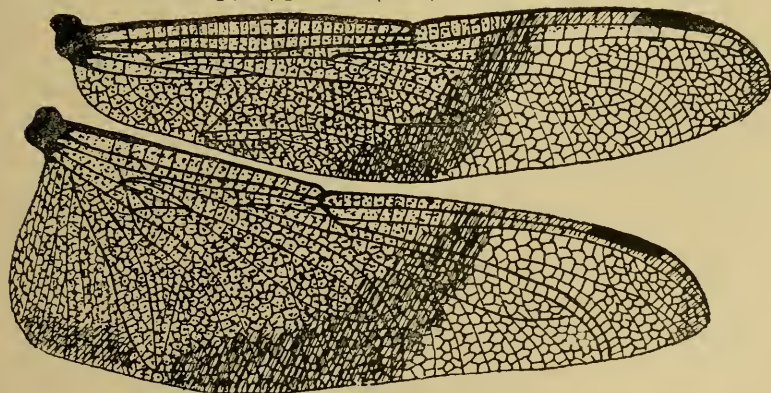


FIG. 61.—Wings of male *Camacinia gigantea*, showing neuration (x 2).

Head large and broad, the lower face projecting, bull-dog-like, forehead rounded, suture moderately deep and splitting the frons into two horse-shoe shaped, flattened areas, vesicle high and overlapping the central ocellus as in *Zyxomma*.

Prothorax with a very small posterior lobe, the free border of which is slightly fissured.

Thorax robust, deep and long. Legs robust, long, hind femora with a row of widely set, gradually lengthening spines, mid femora with a similar row of rather longer spines, tibial hairs fine and numerous, claw-hooks robust, situated about the middle of claws. Armature of the female very similar.

Abdomen short but very robust, flattened from side to side and strongly, dorso-ventrally dilated at the base tapering gradually to the anal end.

Wings long and broad, main nervures very massive, reticulation very close, due largely to a development of secondary neuration, trigone in the forewing about 2 cells breadth distal to the line of the trigone in the hind, its costal side lengthened; traversed many times, its relation to the hypertrigone about a right angle, trigone in the hindwing traversed several times, its distal side strongly concave, situated at the arc, hypertrigone in the forewing traversed several times; in the hind, usually only once, subtrigone in the forewing prolonged proximally, traversed many times, sectors of the arc separated, but running close together for a considerable distance, arc between the 1st and 2nd antenodal nervures, 8th nerve in the hindwing at the anal angle of trigone, antenodal nervures very numerous, from 24 to 30, final antenodal, complete or incomplete, 4th nervure undulated more or less, the end steeply curved towards the termen, 1 to 4 rows of cells between 5 and 5a, 2 cubital nervures in the hindwing, 1 to 6 in fore, numerous supplementary nervures to the bridge, 8th nerve in the forewing variable, either flat or moderately curved, discoidal field variable, commencing with 2 or 3 up to many cells, either contracted or dilated at the termen, anal field very broad, loop long and narrow, the middle nervure very obtusely angled, nearly straight, filled with a close a reticulation, the anal field filled with a close reticulation of secondary nervures, the cells ranged in transverse rows. Stigma large, membrane large.

Sexual organs of male very small, tentaculæ with internal and external tentaculæ. For details, see under species. Of the female, border of 8th segment not dilated, vulvar scale very small.

KEY TO SPECIES.

- i. 3 rows of cells between 5 and 5a, 5 to 8 rows of cells in discoidal field.
Discoidal field contracted *C. gigantea*.
 - ii. 1 row of cells between 5 and 5a, or a few doubled cells.
Discoidal field beginning with a row of 4 or 5 cells and then continued as rows of 3 cells.
Discoidal field dilated *C. harterti*.
72. *Camacinia gigantea*, Kirby, Trans. Zool. Soc. Lond. 12, p. 367 (1889)
—Id., Cat. p. 2 (1890)—Karsch Ent. Nach 17, p. 42, (1891)—Kirby, Ann. Mag. Nat. Hist. (6), 14, p. 112 (1894)—Laidlaw, Proc. Zool. Soc. Lond. (1902) 1, p. 65.—Kruger, Stett. Ent. Zei. 63, p. 105 (1902)—Martin, Miss Pavie (p. 4. sep.) (1904).
- Neurothemis gigantea*, Brauer, Zool. bot. Wien, 17, p. 8 (1867)—Id., ibid., 18, p. 717 (1868)—Hagen, Stett., Ent. Zeit., 30, p. 94 (1869)—Selys, Mitt. Mus. Dresden (1878) p. 293—Id., Ann. Mus. Civ. Genov., 14, p. 292, (1879).

Length 58 mm. Expanse 94 to 104 mm. Abdomen of female rather shorter.

Head: eyes reddish brown above, puce coloured at the sides and beneath, occiput ochreous, vesicle, frons and face brownish red, labrum and labium golden yellow.

Prothorax golden yellow.

Thorax reddish brown above, golden yellow at the sides. Legs bright ochreous.

Abdomen reddish brown on the dorsum, golden yellow laterally, the borders dark reddish brown and the distal borders of segments dark brown.

Wings rich golden yellow from the base to a little more than halfway between the node and stigma, from which point it slopes steeply back to reach the termen at the 6th nervure. The outer borders of this basal area suffused broadly with brown as far as the tornus, but with an interruption at the apex of the loop in the hindwing and the whole of termen in the frontwing, from the level of the inner end of the bridge to the tornus. The area external to this hyaline, except for the extreme apices of wings which are tipped with brown and suffused with saffron for a narrow extent. Stigma reddish brown. Reticulation in the coloured area bright yellow. Discoidal field contracted in the forewing, 5 to 8 rows of cells, 3 rows of cells between 5 and 5a, 3 rows of cells between 7 and 7a, basal reticulation in the hindwing of male much closer than that in the female.

Sexual organs very small, lamina depressed, broadly arched, external tentaculæ broad and rounded, internal tentaculæ small, outwardly directed hooks, lobe very small, strongly arched and tapering.

Anal appendages as long as the 9th segment, spined beneath, ochreous.

Female very similar to the male but the coloured area in both wings rather smaller and brighter in colour. The apices of the wings diffusely brown as far as the inner end of the stigma. In juvenile specimens the bordering of the coloured area is merely a deeper yellow than the rest instead of brown or there may be some small diffuse spots along the hinder margin. Reticulation, especially in the basal area, much more open than in the male.

Sexual organs: border of the 8th segment not dilated, 8th ventral plate not prolonged greatly but at its end, split into small, tumid, rounded processes, 9th ventral plate tumid, broad, and furnished with two small pointed processes near its base.

Hab. Burma.

The formation of secondary reticulation as seen in this insect and in species of *Neurothemis*, etc., is evidently due to sexual selection, as it is much more pronounced in the male than in the female. I do not think that sufficient stress has been laid on the influence of this factor, the study of which may throw considerable light on several anomalies in the neurulation map of the dragonflies wing. In these species, we find two influences warring against each other, one tending to simplify the neurulation by reduction and the other tending to complicate and increase it. The construction of a colour scheme in which the basis is a network of fine golden or crimson threads can only be brought about by an increase in the neurulation.

73. *Camacinia harterti*, Karsch, Berlin Ent. Zthr., 33, p. 359 (1890)—Kirby, Cat., p. 177 (1890)—Kruger, Stett. Ent. Ztg., 63, p. 107 (1902).

Camacinia harmandi, Martin, Bull. Mus. Hist. Nat., 1900, p. 103—Id., Miss. Pavie (p. 4 sep.) (1904)—Id., Bull. Soc. Ent. Ital. 60, p. 196 (1908).

Expanse 90 to 95 mm. Length 44 to 48 mm.

Head: eyes reddish brown above, paler at the sides and beneath, vesicle, frons and upper epistome reddish brown, labrum and labium ochreous, somewhat darker over the lateral lobes, occiput brown.

Prothorax ochreous.

Thorax reddish or golden brown with a coppery iridescence, paler at the sides. Legs dark brown, coxæ and base of femora ochreous.

Abdomen ochreous, the borders dark brown or blackish.

Wings hyaline, base of forewing golden yellow to a little distal of the trigone, and black rays in the inferior intercostal and cubital spaces, base of hindwing golden yellow as far out as 4 or cells distal of the trigone and black rays in the same spaces as in the forewing, extending respectively as far as the 1st antenodal nervure and the distal end of trigone, reticulation at the base very close and compact, extending into loop and proximal end of discoidal field, $17\frac{1}{2}$ or 17 antenodal nervures, the end being either complete or incomplete, 1 cubital nervure in the forewing, 2 in the hind, 1 or 2 accessory nervures to the bridge, only 1 row of cells between 5 and 5a, or a few doubled cells, the discoidal field considerably dilated, 4 or 5 cells at the trigone, followed by 2 or 3 rows of cells for a long distance.

Sexual organs: lamina depressed, the border curling a little outwards and slightly notched, external tentaculæ directed out and back, broad and rounded, internal tentaculæ moderately long and slightly curled hooks, lobe small and linear.

Anal appendages as long as the 9th segment, ochreous.

Female very similar to the male, but rather paler in colour. Wings at the base reticulated rather more than in the male, extending into the outer angle of the loop and for a longish piece of the discoidal field. The dark rays less extensive, the reticulation at the base, bright yellow. The outer half of the wings smoky, especially along the borders and at the apex.

Stigma dark brown. Membrane grey.

Sexual organs: border of 8th segment not dilated, vulvar scale very small, split distally into two roundish processes.

Hab.—Bengal, Sikkim.

Genus.—ÆTHRIAMANTHA.

- Æthriamantha*, Kirby, Trans. Zool. Soc. Lond. 12, pp. 262, 283 (1889)—Karsch, Berlin Ent. Zthr., 33, p. 376 (1890)—Selys, Ann. Soc. Ent. Belg., 41, p. 81 (1897)—Forster, Jahr. Mannheim, 71-72 (p. 1: sep.) (1906).
Dieranopyga, Karsch, Berlin Ent. Zthr., 33, pp. 282, 356 (1890).

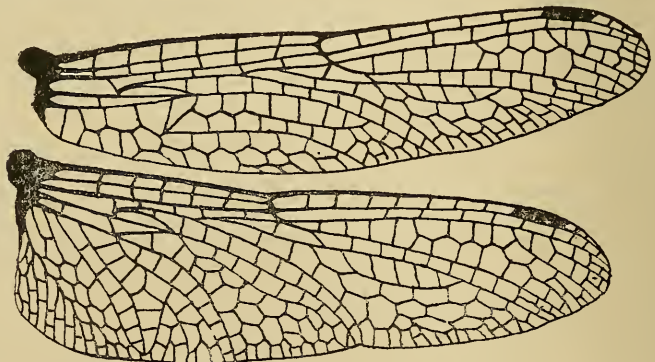


Fig. 62.—Wings of *Æthriamantha brevipennis* showing neuration (x 3).

Head relatively small, eyes contiguous for a considerable extent, forehead rounded, with no definite foreborder, vesicle prominent, suture deep.

Prothorax with a small, rounded, hidden lobe.

Thorax long and narrow. Legs long and narrow, hind femora with a row of widely-set, short spines and a few slightly longer ones at the distal end, mid femora with a row of gradually lengthening spines, tibial spines long and numerous, claw hooks robust, situated just distal of the middle of claws.

Abdomen relatively broad and rather short, somewhat depressed in the male, cylindrical in the female, tapering to the end in the male, more parallel sided in the female.

Wings short and broad, reticulation very open and indistinct, trigone in the forewing just distal to the line of the trigone in the hind, entire, very broad, the costal and proximal sides being subequal, its relation to the hypertrigone rather more than a right angle, trigone in the hindwing at the arc, entire, arc between the 1st and 2nd antenodal nervures, its sectors separated in the forewing and joined for but a short distance in the hind, 8th nervure arising from the anal angle of the trigone, or slightly separated, 6 antenodal nervures, the end one complete, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all hypertrigones entire., 4th nervure in the forewing with a very flat convexity, 1 row of cells between 5 and 5a, 8th nervure in the forewing short, strongly curved, 2 rows of cells in the discoidal field, the latter dilated at the termen, loop moderately short and straight, its mid-rib nearly straight, no divided cells at the trigone but occasionally some at the outer angle, cells in the anal area long and narrow, arranged in oblique rows, stigma medium sized, membrane large.

Sexual organs: male: lamina depressed, tentaculæ small, not projecting as much as the lobe, broadly triangular, the hook turning back and outwards, lobe small and rounded. Female: 8th abdominal segment not dilated, vulvar scale projecting, split into two processes.

74. *Ethriamantha brevipennis brevipennis*, Ris., Coll. Zool. Baron de Selys, Fasc. XVI, 1913.

Libellula brevipennis, Ramb. Neur, p. 114 (1842).

Diplacina brevipennis, Brauer, Zool. bot. Wien, 18 p. 733 (1868).

Ethriamantha brevipennis, Kirby, Trans. Zool. Soc. Lond. 12, p. 283, tab. 53, fig. 3 (1889)—Id., Cat., p. 24 (1890)—Selys, Ann. Ent. Soc. Belg., 41, 82. (1897)—Ris, Jena, Denkschr., 13, p. 346 (1908).

Urothemis brevipennis, Selys. Ann. Mus. civ. Genov. 30, p. 468 (1891).

Expanse 54 mm. Length 30 mm.

Male: eyes reddish above, lilaceous at the sides and beneath: face and epistome ochreous: vesicle yellow: occiput olivaceous.

Prothorax pale brown.

Thorax reddish brown, no marking. Legs black, the hind femora having a bright crimson spot at the base.

Wings hyaline with the extreme base a light golden yellow, this colour extending out as far as the 1st antenodal nervure, the cubital nervure, and for a few cells in the anal field adjacent to the membrane, in the hindwing, the extent of this colour is rather more, going beyond the 1st antenodal nervure but not reaching the arc or the trigone. There are also some dark brown rays in the intercostal and cubital spaces and a spot in the anal field. Stigma reddish brown.

Abdomen red on the dorsum, ochreous or yellow at the borders.

Anal appendages ochreous, the superior small, narrow and furnished with some small spines, the inferior slightly smaller.

Female very similar to the male but the eyes olivaceous brown above and the body ochreous or dull yellow. No reddish colour on the abdomen.

Hab.—This insect has been reported from Bengal, Upper Burma and Ceylon. Barkuda Island, Chilka Lake, Ganjam.
It appears to be widely distributed, but uncommon.

Genus—UROTHEMIS.

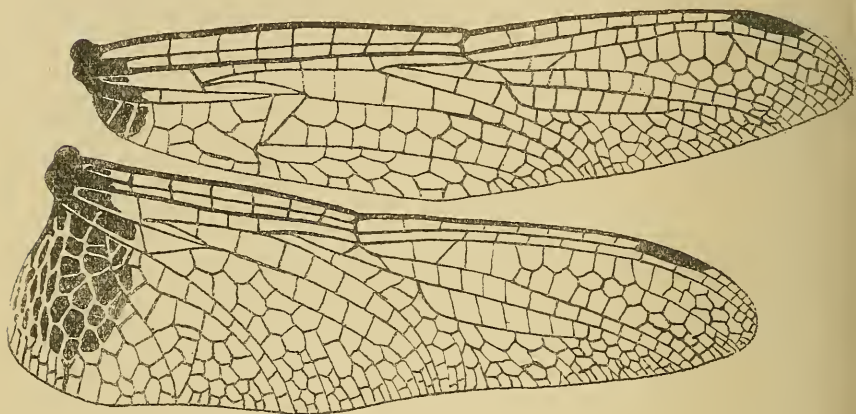


FIG. 63.—Wings of *Urothemis signata signata* (x 3).

Genus *Urothemis*, Brauer, Zool. bot. Wien. 18, pp. 175, 368, 737 (1868), Kirby Trans. Zool. Soc. Lond., 12, pp. 262, 282 (1889), Kasch, Selys and Forster, Ris. Coll. Zool. du Selys p. 1016, Fasc. XVI (1913).

Head large, eyes broadly contiguous, somewhat longer than the occiput from before back, forehead without any marked foreborder and split by a very deep suture into two rounded eminences, vesicle high, but slightly notched, occiput small.

Prothorax with a small posterior lobe.

Thorax robust, somewhat cubical. Legs moderately long and slim, hind femora with a row of very small, closely set spines and a single longer one at the end, mid femora with a row of longer, less numerous, more widely set and gradually lengthening spines which reach to the end of the femur, tibial spines numerous, long and slim, more numerous in the fore and mid-femora than in the hind, claw hooks robust, situated near the end of the claws. Armature of the female very similar.

Wings long and moderately broad, especially the hind, reticulation close, trigone in the forewing slightly distal to the trigone in the hind, costal side of trigone in the forewing about half the length of the proximal, relation of the trigone to hypertrigone slightly less than a right angle, trigone in the hindwing at the arc, arc between the 1st and 2nd antenodal nervures, its sectors separated in the forewing but fused for a moderate distance in the hind, 8th nervure arising from the anal angle of the trigone in the hindwing, 7 antenodal nervures, the final complete, the distance

between the 1st and 2nd nervures greater than the following, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all hypertrigones entire, 4th nervure slightly undulated, 1 row of cells between 5 and 5a, 8th nervure in the forewing very flat, 2 rows of cells in the discoidal field, sides of latter parallel, the end of field a little contracted or dilated, loop short and straight, its mid-rib nearly straight, divided cells at the outer angle and trigone, cells in the anal area split into an outer area of moderately large cells arranged in oblique rows and an inner area of narrow, longish cells arranged in transverse rows, stigma and membrane moderately large.

Abdomen moderately short, broad and depressed, slightly constricted at the 3rd segment, more or less fusiform in the male, the sides parallel sided in the female, the 4th segment without ridges.

Sexual organs: male: lamina depressed, small, external tentaculæ obsolete, internal tentaculæ triangular, with a broad base and an almost straight hook, which is less projecting than the lobe, lobe small, oval or pointed. Female: border of the 8th abdominal segment not dilated, 8th ventral plate longer than broad, projecting markedly and prolonged as a tubular vulvar scale nearly to the end of the 9th ventral plate, split for the greater part of its length, 9th ventral plate prolonged into a notched, tongue-like process, 10th segment very small.

Only one species found within Indian limits.

75. *Urothemis signata signata*, Ris, Coll. Zool. du. Selys, p. 1016, Fase. XVI (1913).

Libellula sanguinea, Burm. Handbk. Ent. 2, p. 858 (1859)—Hagen, Zool. bot. Wien, 8, p. 480 (1858)—Calvert, Trans. Amer. Ent. Soc., 25, p. 87 (1898).

Urothemis sanguinea, Brauer, Zool. bot. Wien, 18, p. 737 (1868)—Kirby, Cat. p. 23 (1890)—Id., Linn. Soc. Journ. 24-p. 552 (1893)—Selys, Ann. Soc. Ent. Belg. 41, p. 75 (1897)—Martin, Mission Pavie (p. 5 sep.) (1904)—Forester Jahr. Nassau, 59, p. 316 tab. A, fig. 1. (1906)—Ris, Jena. Denkr., 13, p. 344 (1908).

Libellula signata, Ramb. Neur., p. 117 (1842).

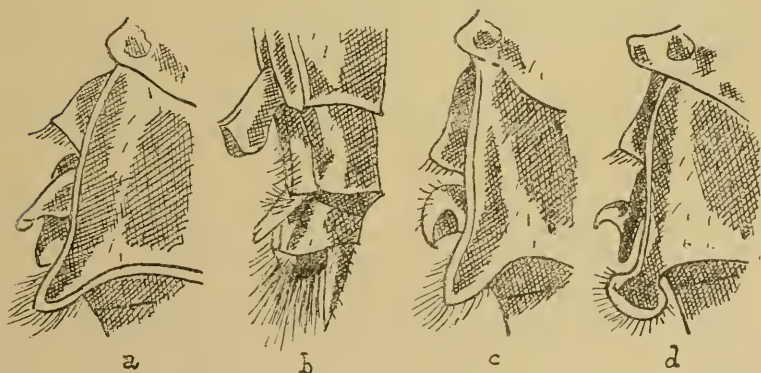


Fig. 64.—Male genital organs of—*a. Urothemis signata signata*, *c. Macropdiplex cora*, *d. Camacinia gigantea*, and Female organs of *Urothemis signata signata*.

Expanse 75 to 78 mm. Length 40 to 44 mm. Male: eyes bright, blood-red above, olivaceous at the sides and beneath, labium yellow, with dark brown borders, labrum reddish yellow, face, forehead and vesicle red with a very narrow, black, basal line to the forehead, occiput red.

Thorax reddish, golden brown, marked laterally with 3 interrupted or broken black lines.

Abdomen red marked with black, small, transversely linear, black spots on segments 4 to 7, on either side of the dorsal carina at the distal end of each segment and small, dark dorsal stripes on segments 8 and 9, expanding laterally in the distal half of segment 8 and broadening at the proximal end of segment 9.

Anal appendages ochreous. Legs black, the femora yellowish at the proximal ends of the flexor surfaces.

Wings hyaline, the extreme apices faintly smoky, a basal, amber coloured spot at the bases of both wings. In the forewing, extending halfway to 1st antenodal nervure and cubital nervure and from thence of even width to the anal border. In the hindwing this area extends as far out as the 1st antenodal and the cubital nervures. In the latter also, there are some blackish brown rays and a variably sized spot of the same colour as follows:—rays in both costal spaces extending as far as the 1st antenodal nervure and another in the cubitus extending as far as the arc, a large spot in the anal area extending from the base outwards as far as the line of the arc, its outer border curving gently to meet the base at a variable distance in front of the tornus. There is usually a small, triangular area lying between this spot and the ray in the cubital space where the wing is hyaline. The nervures in the dark spot are beautifully depicted as a golden network.

Sexual organs as for genus.

Female: head; eyes reddish brown above, olivaceous at the sides and beneath, occiput golden yellow, labrum pale yellow, labium and lower part of epistome olivaceous, vesicle and forehead bright yellow, the latter with a much better defined, black, basal line than that of the male.

Prothorax and thorax pale olivaceous at the sides or even with a greenish tinge, olivaceous brown above. An undulating, black, post-humeral line and a black line on the second lateral suture and lastly, an irregular black spot on the spiracle. Two black lines crossing the tergum between the bases of the wings.

Abdomen olivaceous or greenish yellow with diffuse, broad, blackish lines at the distal border of each segment, which coalesce at the last four segments.

Anal appendages ochreous.

Wings similar to the male but the dark spot in the anal area usually less extensive. The apices of the wings rather more extensively smoky than in the male. Stigma reddish brown with heavy, black borders.

Legs black, the anterior femora yellow on the flexor surfaces.

Hab.—I have specimens from Assam, Madras, Bangalore, Poona, Bombay and Ceylon. It is also reported from Bengal and should be found throughout Burma. A line drawn from about Dinapur to Bombay would probably demarcate its northern limits. It is a dragonfly of the plains, usually occurring in the moister areas and favouring swamps and shallow tanks in preference to streams and running water. It is a very active creature and difficult to capture. The female is very retiring and comparatively rare, the few specimens taken usually being found *in cop.*

Genus—MACRODIPLAX, Brauer (1868).

Macrodiplax, Brauer, Zool. bot. Wien., 18pp. 366, 737, (1868—Kirby Trans. Zool. Soc. Lond., 12, pp. 261, 262 (1889)—Karsch, Berlin, Ent. Zthr. 33, p. 356 (1890)—Selys, Ann. Soc. Ent. Belg., 41, p. 72 (1897).

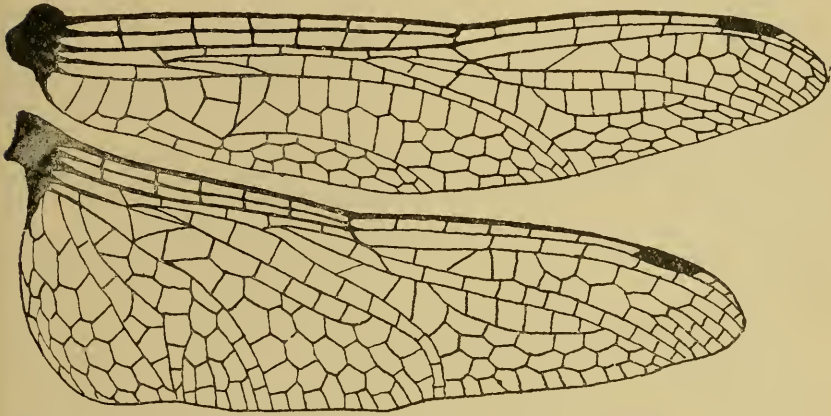


Fig. 65.—Wings of *Macrodiplax cora* (x about $2\frac{1}{2}$).

Head large, eyes contiguous for a long distance, this longer than the depth of the occiput, forehead prominent and rounded, no marked fore-border, suture broad and deep, vesicle prominent and slightly notched, a distinct temporal projection at the side of the eyes. Prothorax with a very small posterior lobe which is rather hidden beneath the head, flatly arched and not fringed with hairs.

Thorax robust, somewhat cubical as in *Urothemis*. Legs long and slim, hind femora with a row of very small, evenly sized and moderately closely set spines, with a longer one at the distal end, mid-femora with a row of more widely spaced and gradually lengthening spines. Tibial spines numerous, slim and long, claw-hooks robust, situated near the end of the claws. Armature of the female very similar.

Abdomen moderately short and robust, the base dilated ventro-dorsally and laterally, a slight constriction at the 3rd segment, then depressed, fusiform and tapering towards the end. In the female the sides of the abdomen are nearly parallel. No transverse ridges to the 4th segment.

Sexual organs, *see* under species.

Wings long and broad, reticulation fairly wide, trigone in the forewing slightly distal to the line of the trigone in the hind, broad, its costal side more than half as long as the proximal and its distal side somewhat angulated outwards, relation of the trigone to the hypertrigone, a little more than a right angle, subtrigone in the forewing 2 or 3 cells, trigone in the hindwing at the arc or a little proximal, sectors of the arc in the forewing separated, in the hind fused for a variable distance, arc between the 1st and 2nd antenodal nervures, 6 to 7 antenodal nervures, the final complete, 8th nervure in the hindwing at the anal angle of trigone, 4th nervure not undulated, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all trigones and hypertrigones entire, 1 row of cells between 5 and 5a, both 5a and 7a very highly developed, 8th nervure in the forewing short and very strongly convex, the discoidal

field beginning with 2 rows of cells and strongly dilated at the termen, loop with divided cells at the anal angle of trigone and at the external angle, the anal area split up into an outer area of 5 or 6 rows of large cells, not arranged distinctly in transverse rows, and an inner area more closely reticulated, of narrow cells arranged in transverse rows. Stigma small. Membrane large.

Only one species found within Indian limits.

76. *Macrodiplax cora*—Brauer, 18, p. 737 (1868)—Selys, Mitt. Mus. Dresden (1878), p. 294 (ex Brauer)—Id., Ann. Soc. Spain., II. (p. 15 sep.) (1882)—Id., Ann. Soc. Ent. Belg., 41, p. 72—Ris, Tijds. v. Ent., 55, p. 168 (1912).

Diplax cora, Brauer Zool. bot. Wien. 17, pp. 20, 289 (1867).

Libellula lycoris, Selys, Pollen and Van Dam, Madagas, Inn., p. 22 (1869) Id.,—Comptes Ent. Belg., 4. v. (sep.) (1878).

Urothemis lycoris, Kirby, Cat. p. 24 (1890).

Macrodiplax lycoris, Selys, Ann. Soc. Ent. Belg., 41, p. 73 (1897)—Tillyard, Proc. Linn. Soc., New South Wales, 31, p. 484 (1906).

Libellula nigrilabris, Selys, Mitt. Mus. Dresden, 1878, pp. 94, 304—Kirby, Cat. p. 23 (1890).

Urothemis vittata, Kirby, Linn. Soc. Journ., 24, p. 552, tab. 42, fig. 2 (1893).

Macrodiplax vittata, Laidlaw, Proc. Zool. Soc. Lond. (1902)—Mac Lachlan, Nat. Hist. Socotra, p. 399, tab. 24 A, fig. 4, 4a (1903)—Kirby, Ann. Mag. Nat. Hist. (7), 15, p. 271 (1905).

Expanse 62 to 70 mm. Length 36 to 38 mm.

Head: eyes reddish brown above, slate coloured beneath and at the sides, vesicle pale yellow, tipped with bright pink in front, occiput reddish, face pale yellow, the upper part of the epistome suffused with red, labrum dark brown, labium pale yellow, with black borders.

Prothorax pale brown.

Thorax uniform olive brown in front, pale greenish yellow at the sides, with two irregular, black stripes laterally, the anterior of which crosses the spiracle and is incomplete in its upper half.

Legs black, all coxæ and bases of the femora yellowish on the flexor surface.

Abdomen bright reddish orange very similar to *Pantala* and with a broad middorsal, black stripe which broadens in front and behind on each segment and has a more or less diffuse border.

Anal appendages yellow or ochreous.

Wings hyaline, the base of the hind bearing a large amber, tinted spot, which extends 1 cell into the loop and to just beyond the cubital nervure. Stigma yellow, of equal size in fore and hindwings. Membrane white.

The female very similar in colour to the male, its abdomen a duller ochreous tint and the black markings narrower. The base of the abdomen, somewhat greenish.

Sexual organs: male: lamina depressed, its free border with a double notch, external tentaculæ almost obsolete, the internal a very small hook, lobe depressed and narrow.

Female: border of 8th abdominal segment not dilated, the end of the 8th ventral plate prolonged into a small, somewhat projecting vulvar scale, flat and convex, overlapping the 9th segment but slightly, 9th ventral plate furnished with two small, widely diverging hooks about its middle, the 10th segment prolonged into a short, blunt projection.

Hab.—Ceylon and Southern India. I have taken this species in Madras, but it is not common and very difficult to distinguish from *Pantala flavescens* when on the wing. It is somewhat smaller than the latter insect, but resembles it closely otherwise. It frequents open situations such as grassy commons or hovers over low scrub. I have never seen it over water.

In the key to the genera of the Libellulinæ on page 618, Vol. XXV, No. 4 of the Journal, Natural History Society, Bombay, I wrongly described *Macrodiplax* as "dull coloured," the descriptions having been made from faded specimens. Since then also, I have decided to include a Mesopotamian species, viz., *Selysiothemis nigra*, and so now make the following alterations to the key:—In line 4, "3 cells" should be altered to "2 or 3 cells," and all below that line, in the key, should be deleted and the following substituted:—

- X. Only 6 antenodal nervures.
 x¹ Neuration of wing greyish white and almost invisible. Stigma bicolourous.
 Discoidal field but slightly dilated. . . . *Selysiothemis*.
 x² Neuration of wing black and distinct.
 Stigma unicolourous.
 Discoidal field widely dilated *Macrodiplax*.
 Y. Nearly constantly 7 antenodal nervures.
 Discoidal field, but slightly dilated *Urothemis*.

Genus—SELYSIOTHEMIS.

Selysiothemis, Ris, Ann. Soc. Ent. Belg., 41, p. 47 (1897)—Selys, *ibid.*, p. 70 (1897).

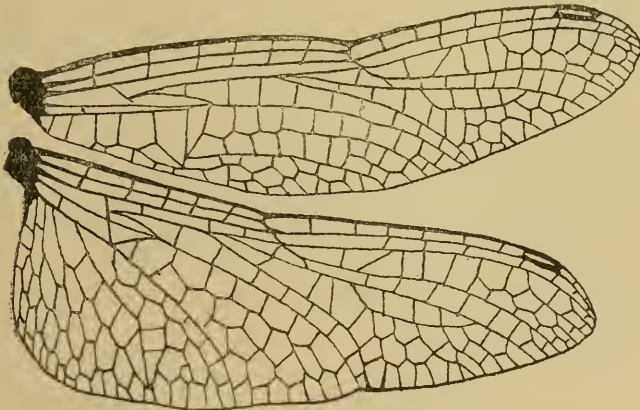


Fig. 66.—Wings of *Selysiothemis nigra* (x 3).

Head large; eyes broadly contiguous, the optic suture longer than the occipital triangle; no distinct temporal projection to the eyes as in *Macrodiplax*, only a slightly arched projection; forehead without a sharp foreborder, a little flattened in front; suture deep; vesicle large, broadly arched and rounded.

Prothorax with a small posterior lobe, depressed and spherically arched. Thorax narrow. Legs long and tolerably slim. Male; hind femora with a row of very closely set and very small spines; mid-femora with ca. 10

moderately robust spines. Female: hind femora with a row of gradually lengthening spines in the distal third; mid femora with a row of spines which are very short in the proximal half and lengthening gradually in the distal half. Tibial spines moderately long, very slim. Claw-hooks long, slightly distal to the middle.

Abdomen moderately short, the base very slightly tumid, slightly constricted at the 3rd segment, then slim and cylindrical to the end, 4th segment without a transverse ridge.

Wings broad, reticulation wide; trigone in the forewing about 1 cell distal to the line of the trigone in the hind; arc between the 1st and 2nd antenodal nervures; sectors of the arc in the forewing separated,

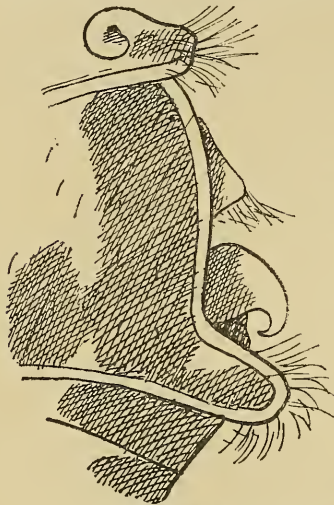


Fig. 67.—Male sexual organs of *Selysiotthemis nigra*.

in the hind fused for a short distance; antenodal nervures 5-6, the last incomplete, the distance between the 1st and 2nd considerably greater than between the others; 8th nervure in the hindwing at the anal angle of the trigone; 1 cubital nervure to all wings; no supplementary nervures to the bridge; trigone in the forewing free, broad, the costal side rather more than half of the proximal, the distal side strongly angulated at the point where the nervure dividing the first discoidal cells joins it; relation of the trigone to the hypertrigone rather more than a right angle; trigone in the hindwing free, slightly proximal to the arc, its costal side bent back slightly at the distal end; 1 row of cells between 5 and 5a; 4th nervure with but a slight convexity; 8th nervure in the forewing short and strongly curved; 7a well formed; 2 rows of cells in the discoidal field, the latter moderately dilated at the termen; loop extending about 1

cell beyond the outer angle of the trigone, its apex very blunt, only occasional divided cells at the outer angle and none at the trigone, its midrib very straight; a supplementary nervure springing from the inner border of the loop, but the differentiation of cells in the anal field by no means distinct. Stigma very small, indistinct. Membrane relatively large.

Sexual organs of the male without any external tentaculæ. The female with a very small, vulvar scale.

77. *Selysiotthemis nigra*, Ris, Ann. Soc. Ent. Belg., 41, p. 48 (1897)—Seyles, *ibid.*, p. 71 (1897)—Barteneff Ann. Mus. Zool. Acad. Imp. St. Petersburg, 16, p. 411 (1912)—*Id.*, Mid Caucasus, Mus., 7, p. 108 (1912).
- Libellula nigra*, Van der Lind, Monog., p. 16 (1825)—Selys, Monog., pp. 29, 55, 209 (1840)—Hagen, Syn. Lib. Eur., p. 37 (1848)—Ramb. neur. p. 118 (1842)—Selys-Hagen Revue, des Odonates, p. 65 (1850).
- Urothemis nigra*, Selys, Comptes rendus Soc. Ent. Belg., 4 v. (sep.) (1878)—*Id.*, Ann. Soc. Ent. Belg., 31, p. 77 (1887)—Kirby, Cat. p. 23 (1890).
- Trithemis nigra*, Brauer, Zool. bot. Wien, 18, p. 736 (1868).

Urothemis advena, Selys, Comptes rendus Soc. Ent. Belg., 4. v. (sep.) (1878)—Id., Ann. Soc. Ent. Belg., 31, p. 69 (1887)
—Kirby, Cat. p. 24 (1890).

Expanse 52 mm. Length 30 mm. Hindwing 25 mm. Abdomen 20 mm.

Male: head: eyes blackish brown above, paler or lilaceous at the sides and beneath, in teneral specimens the eyes are dark ochreous and paler beneath and with a purplish tinge, the females are always of this colour, labrum ochreous, labium, and lower part of face pale olivaceous, upper part of face and forehead with some blackish. In teneral specimens, the labrum is pale yellow and the rest of the face and forehead is a waxy white, as is also the vesicle. In adult specimens a dark band develops on the forehead and is prolonged down at the sides of the eyes and the vesicle becomes dark olivaceous.

Prothorax and thorax black in the adult, the ventral side more or less pruinulent, in teneral specimens they are of a waxy white with obscure brown mid dorsal, humeral and lateral lines. The legs are straw coloured on the flexor surfaces and blackish brown on the extensor but in the adult they become wholly black. The bases of the femora yellowish.

Abdomen black in the adult with the ventrum pruinulent. In the teneral condition a waxy white with blackish brown markings on the dorsum. These markings diffuse, broadening apically and more extensive on the anal segments. In the last few segments, a prolongation of the brown goes forward from the distal end of the segments laterally, to enclose a spot of the ground colour. The last 3 segments are almost entirely brown on the dorsum.

Anal appendages yellowish or white, the superior strongly curved downward and equal in length to the inferior.

Wings peculiarly invisible owing to the venation being a pale or dirty white in colour. The stigma is bordered in front and behind with well-defined black, the intervening part is almost translucent or slightly opalescent.

Female: very similar to the teneral male, but the brownish markings on the thorax almost obsolete and the black markings of the abdomen replaced by bright ochreous. Legs paler. Wings similar to the male.

Sexual organs: male: lamina depressed, fissured and furnished with short hairs; tentacula short, triangular and the apex prolonged into a recurved hood. The external tentacula represented only by a small protuberance.

Lobe square. Female: border of 8th segment not dilated; the vulvar scale very small, depressed. Appendages small, white or creamy.

Hab.—Lower Mesopotamia and Persian Gulf. Bushire. Very few specimens appear to have found their way into collector's hands before the war, a surprising fact when one considers how very common an insect it is in its native country. I have seen it in countless swarms at Basra and the lower Shat-el-Arab whilst it frequently takes to the sea and may be seen in great numbers coming aboard steamers trafficking in the Gulf. I saw one such swarm come on board the Ambulance Transport VARSOVA on 19th August 1919, quite one hundred miles south of the bar of the Shat-el-Arab, but at the end of the same month not a single specimen was to be seen on land at Basra. I saw a similar swarm in 1917 on board a ship a few miles south of the Shat-el-Arab, all of which were teneral specimens. It is quite possible that this species will eventually establish itself in Sind and North-West India.

On land it has habits similar to *Diplacodes* and is always found settling on the ground or low shrubs. Barren, open desert lands appear to be preferred.

(To be continued.)

THE FLORA OF THE INDIAN DESERT.
(JODHPUR AND JAISALMER.)

BY

E. BLATTER, S.J., AND PROF. F. HALLBERG.

PART VI.

With 3 plates.

(Continued from page 47 of this Volume.)

PART II.

ECOLOGICAL NOTES.

1. METEOROLOGY.

The Indian Desert forms the east end of the greatest desert district of the world, extending from the Atlantic coast of Africa and including the Sahara, part of Arabia, S. Persia and Baluchistan.

The climate of our region is characterised by excessive drought, the rainfall being scanty and irregular. The winter rains of Northern India rarely penetrate into the region, and there is thus only one rainy season: that of the south-west monsoon.

We give a list of meteorological data, obtained from the Government Observatory, Colaba.

A few remarks are necessary to show the extreme irregularity of the rainfall. The year 1917 was a record year, during which about three times as much rain fell as the statistics of about forty years would lead one to expect. On the other hand, not a single cent was registered at either Khabha or Ramgarh, Jaisalmer State, in 1899. During the year in question 26 cents was received at Jaisalmer, and the whole of this in April. In August 1881 ten inches fell in a single day at Jodhpur.

The cold season—from about the middle of November to the middle of March—is characterised by extreme variations of temperature, and the temperature is frequently below freezing point at night. During April, May and June the heat is intense and trying, and scorching winds prevail with great violence, sand-storms with great desiccating action being frequent. The relative humidity of the atmosphere is always low.

The meteorological conditions during our tour were very unusual, and for this reason we think it worth while giving our observations in detail, in spite of their fragmentary nature. We were held up for several days at Bhikamkor on account of the Jodhpur-Phalodi railway line having been washed away in places by the rain.

In general, the region possesses a healthy climate, except during the period after the rains. As was to be expected, the year 1917 was particularly bad in this respect. At the time of our visit, practically the entire population was suffering from malaria.



A.—At Loharki. To the right : Dune (invading the plain) with *Aerua* sp.
To the left : *Crotalaria burhia*. Along edge of dune and in the centre :
Calotropis procera. In the background Loharki village with cultivated
trees.



B.—Two miles west of Jaisalmer town. *Crotalaria burhia*, *Calotropis*
procera.—Herd of cattle.

Meteorological Data.

Stations.	MEAN MAXIMUM TEMPERATURE.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Jodhpur ..	76.1	80.0	91.1	100.7	106.5	104.6	97.7	93.3	94.9	96.9	89.7	79.7	92.6
Pachbhadra ..	78.4	83.2	94.6	106.3	107.8	105.7	97.7	94.8	97.2	98.7	90.7	81.5	94.7
	(1) MEAN MINIMUM TEMPERATURE.												
Jodhpur ..	49.6	53.0	62.9	72.6	80.2	82.7	80.5	78.0	75.5	67.5	58.5	52.7	67.8
Pachbhadra ..	45.1	48.9	58.3	69.6	77.5	81.1	79.7	77.3	75.2	64.9	54.1	46.3	64.9
	(2) MEAN RELATIVE HUMIDITY OF THE AIR.												
Jodhpur ..	%	%	%	%	%	%	%	%	%	%	%	%	%
Pachbhadra ..	46.1	33.1	33.7	34.3	42.7	52.4	66.8	70.1	64.5	46.2	38.1	42.9	48.1
	(3) MEAN RAINFALL.												
Jaisalmer ..	0.21	0.20	0.15	0.13	0.22	0.69	2.17	2.28	0.83	0.01	0.04	0.07	7.00
Barmer ..	0.11	0.14	0.07	0.05	0.32	1.22	3.51	3.13	1.52	0.02	0.08	0.05	10.22
Pachbhadra ..	0.23	0.15	0.10	0.08	0.51	1.28	3.64	3.71	2.02	0.05	0.06	0.10	11.96
Jodhpur ..	0.17	0.22	0.06	0.14	0.25	1.23	4.21	4.31	2.40	0.11	0.10	0.14	13.34
Phalodi ..	0.15	0.23	0.13	0.08	0.21	1.06	3.04	3.16	0.78	0.00	0.02	0.09	8.95

Meteorological Data—contd.

Stations	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
(5) MEAN NUMBER OF RAINY DAYS.													
Jaisalmer	0.6	0.7	0.4	0.3	0.6	1.3	3.7	3.7	1.4	0.0	0.1	0.2	13.0
Barmer	0.5	0.3	0.2	0.2	0.5	1.8	4.3	4.0	2.3	0.1	0.2	0.2	14.6
Pachbhadra	0.7	0.5	0.3	0.3	0.9	2.1	5.2	4.9	2.4	0.2	0.2	0.3	18.0
Jodhpur	0.5	0.6	0.2	0.5	0.7	1.9	5.0	5.7	2.5	0.2	0.2	0.5	18.5
Phalodi	0.7	0.5	0.4	0.1	0.5	1.7	3.7	4.4	1.2	0.0	0.0	0.2	13.4
(6) ACTUAL RAINFALL FOR 1917.													
Jaisalmer	0.00	0.00	0.00	1.33	1.73	2.17	0.60	8.44	7.73	0.62	0.00	0.02	22.64
Barmer	0.00	0.00	0.30	0.20	1.24	1.64	7.01	6.21	4.20	2.70	0.00	0.00	23.50
Pachbhadra	0.00	0.00	0.00	0.10	3.07	6.50	8.08	5.19	3.88	5.00	0.00	0.00	31.82
Jodhpur	0.04	0.20	0.10	1.12	4.15	4.75	5.78	14.20	5.74	6.02	0.00	0.25	42.35
Phalodi	0.00	0.00	0.00	1.79	2.41	1.74	0.30	10.24	6.50	2.70	0.00	0.00	25.68
(7) NUMBER OF RAINY DAYS, 1917.													
Jaisalmer	0	0	0	3	3	2	3	13	9	1	0	0	34
Barmer	0	0	1	1	2	3	3	10	7	2	0	0	29
Pachbhadra	0	0	0	1	5	5	4	4	6	1	0	0	26
Jodhpur	0	1	1	4	6	2	5	10	14	3	0	1	47
Phalodi	0	0	0	4	4	4	1	14	8	1	0	0	36

Place of Obs.	Date.	Time of Obs.	Bar. Pressure (uncorrected.)	Temperature.			Wind.	
				Dry Bulb.	Wet Bulb.	Min.	Max.	Dir.	Vel.
Jodhpur ..	Oct. 19	7.0	740.7	63.0	59.1	61.5	..	..
		14.40	740.5	87.3	67.5	..	..	..
	20	20.0	740.7	77.8	66.7	..	87.5	..
		6.15	742.0	61.5	57.1	57.0	..	..
	21	20.0	740.5	71.1	61.6	..	88.0	..
		7.0	742.1	59.8	54.5	56.0	..	..
Balarwa ..	23	14.15	740.2	85.7	66.3	..	..	..
		8.0	737.0	71.0	63.0	..	..	..
	6.0	736.2	67.8	60.5	62.0	..	..
Osian ..	..	8.45	731.3	71.0	63.0	..	..	..
		12.45	729.7	85.5	73.0	..	..	..
		20.15	730.0	73.0	66.5	..	..	..
Bhilkamkor ..	25	6.30	729.2	65.4	64.3	62.0	..	E 3
		13.0	730.0	67.5	65.5	..	..	..
		17.45	729.0	67.0	65.0	..	..	NE 5
	26	7.15	724.5	64.1	63.0	..	..	NNE 3
		14.15	725.7	67.6	66.3	..	..	N 3
27	..	17.35	726.7	65.7	64.4	..	..	N 2
		7.0	728.7	64.3	63.7	58.0	..	SW 3
		14.15	728.6	76.3	65.2	..	..	SW 1
	28	18.45	729.0	71.2	64.0	..	..	SW 0
		6.35	730.6	59.6	57.5	56.0	..	.. 0
		18.15	730.0	68.3	61.2	..	..	.. 0
6.15	730.6	54.3	50.2	48.0	..	.. 0		

Meteorological Observations during our tour—contd.

Place of Obs.	Date.	Time of Obs.	Bar. Pressure (uncorrected.)	Temperature.			Wind.		
				Dry Bulb.	Wet Bulb.	Min.	Max.	Dir.	Vel.
Phalodi	Oct. 29	18.30	738.7	76.0	61.4	..	..	0
		5.45	740.0	57.3	51.7	..	..	0
Bap Shihad	Nov. 1	12.15	739.5	79.2	57.8	..	..	0
		20.15	738.6	71.3	56.4	..	..	0
		4.45	741.4	56.0	52.7	..	..	0
		20.0	739.5	64.4	56.9	..	..	0
Loharki	2	4.15	739.3	54.8	52.7	..	..	1
		12.30	742.5	81.8	64.3	..	W	1	
		19.50	742.7	64.4	58.6	..	..	0
Sodakoer	3	4.0	742.4	58.5	54.0	..	..	1
		13.15	740.3	81.5	64.3	..	..	0
Jaisalmer	5	19.20	745.5	71.0	60.0	..	..	0
		12.30	744.1	79.8	59.1	..	W	3	
Jaisalmer	6	20.15	744.2	73.0	52.8	..	ENE	1	
		6.45	744.8	50.2	47.3	..	..	0
Jaisalmer	7	12.45	744.6	80.0	54.3	..	W	3	
		21.0	744.1	68.5	50.8	..	NE	1	
Jaisalmer	8	7.0	745.3	57.5	40.3	..	E	1	
		14.0	745.3	76.5	55.4	..	NE	4	
		20.30	745.0	68.3	52.5	..	NNE	1	
		15.15	744.0	75.2	55.0	..	NNE	1	
Devikot	9	20.30	744.4	68.3	49.6	..	..	0
		11.0	744.9	66.5	52.3	..	..	0
Vinjorai	10	20.30	743.7	58.4	50.4	..	..	0
		14.30	739.0	77.7	54.8	..	..	0
		14.45	738.0	78.2	58.5	..	..	0
Devikot	11	20.15	738.3	68.7	54.9	..	..	0



A.—Sandy plain West of Jaisalmer town with scrub vegetation. To the right : Small pond with *Acacia arabica*. On the hill in the background : Jaisalmer Fort.



B.—Low lime-stone hills near Jaisalmer town, rising abruptly from the above plain. Predominant plant : *Crotalaria burhia*.

The direction of the wind indicates the point from which it blows. The direction within brackets after a species of cloud below indicates the point towards which the cloud moves, the accompanying number its velocity on a decimal scale. The amount of clouds is also indicated on a decimal scale, 0 meaning a nearly clear, 10 an overcast sky. The abbreviations refer to the international system for cloud names.

Jodhpur.

- October 19. Sky Clear.
 October 20. 6-30 a.m. Sky : 0 ; Ci.
 All day an increasing quantity of light Ci.
 October 21. 7-0 a.m. Sky : 3 ; Ci.
 2-15 p.m. Sky : 2 ; Ci.

Balarwa.

- October 23. 8-0 p.m. Sky : 10 ; Str.-Cu., *Al.-Cu.*, *Al.-Str.*
 8-0 p.m.—9-30 p.m. Halo 23° round moon.
 October 24. 6-0 a.m. Sky : 10 ; Str.-Cu., *Al.-Cu.*, *Al.-Str.*

Osián.

- October 24. 8-45 a.m. Sky : 10 ; Str.-Cu., *Al.-Cu.*, *Al.-Str.*
 0-45 p.m. Sky : 10 ; Str.-Cu., Str.-Cu.-Lent., *Al.-Cu.*, *Al.-Str.*
 1-45 p.m.—5-0 p.m. Sky : 10 ; Nb., *Str.-Cu.*, *Al.-Str.*
 A few drops of rain.
 8-15 p.m. Sky : 10 ; *Al.-Str.*
 10-0 p.m. Fine rain.
 October 25. 6-30 a.m. Amount of rain fallen : 0·03 inch.
 Sky : 10 ; Str. [W 7], *Al.-Str.* [E 0].
 Fine rain.

Bhikamkor.

- October 25. 10-15 a.m. Sky : 10 ; Nb. [W 7].
 1-0 p.m. Sky : 10 ; Nb.
 Upto 5-30 p.m. Fairly strong rain, afterwards
 finer. 5-45 p.m. Amount of rain fallen ; 1·11
 inch. Sky : 10 ; Nb. [SW 7].
 About midnight : Thunder-storm.
 October 26. 7-15 a.m. Amount of rain fallen : 3·62 inch.
 (rain gauge full).
 Sky ; 10 ; Nb. [SSW 6].
 9-0 a.m. Amount of rain fallen ; 0·07 inch.
 2-15 p.m. Sky : 10 ; Nb. [S 5], *Al.-Cu.*
 5-35 p.m. Sky : 10 ; Nb. [S 4], *Al.-Cu.* [NNE 2]. *Al.-Str.*
 The rain has stopped. About 0·5 inch. may be
 assumed to be lost.
 5-50 p.m. Fragments of double rainbow in the clouds in SE.
 Fine rain. Nb. dispersing. Mamm.-Nb. vi-
 sible at sunset.
 October 27. 7-0 a.m. Sky : 10 ; Str. [SW 8].
 Fog and heavy dew.
 2-15 p.m. Sky : 0.
 6-45 p.m. Sky clear.
 October 28. All day : Sky clear.
Phalodi.
 October 29. 6-30 p.m. Sky : 0 ; Ci.-Str. (in S).
 October 30. All day : Sky clear.
Bap.
 November 1. Early morning : Sky : 1 ; Ci.
Shihad to Vinjorai.
 November 1 to Nov. 11. Sky clear.

2. CLIMATE AND VEGETATION.

From what has been said above, it is clear that the climate is hostile to all vegetation, only plants possessing special adaptations being able to establish themselves. These adaptations are in general of two types, having two distinct objects in view: to enable the plant to obtain water, and to retain it when obtained. Those interested in the anatomical peculiarities of the plants of the region are referred to the paper by T. S. Sabnis: "The Physiological Anatomy of the Plants of the Indian Desert," at present appearing in the Journal of Indian Botany.

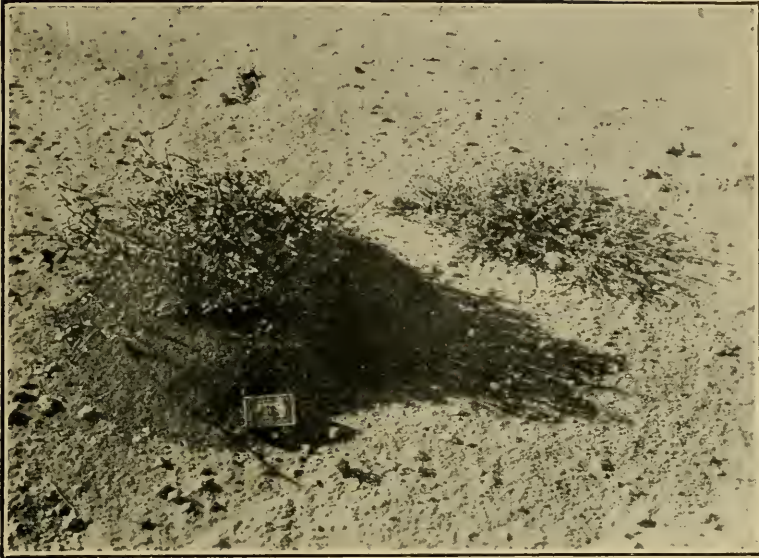
The struggle for existence between the plants, of the same or of different species, is practically non-existent, there being plenty of vacant spaces, and the formations being generally of the open type. The chief exceptions to this rule are the following parasites:—*Cuscuta hyalina* (growing on many host-plants, see Vol. XXVI, p. 543), *Striga ocobancheoides* (on *Lepidagathis trinervis*), *Striga euphrasioides* (on grasses, etc.), *Cistanche tubulosa* (on *Capparis decidua*, see plate XXII-B).—The case of *Crotalaria burhia* is discussed under the sand formation. Possibly the abundance of this plant may have something to do with nitro-bacteria, living in symbiosis with the plant in its root nodules.

Many seeds fail to germinate, and numbers of seedlings are destroyed, thus never reaching maturity.

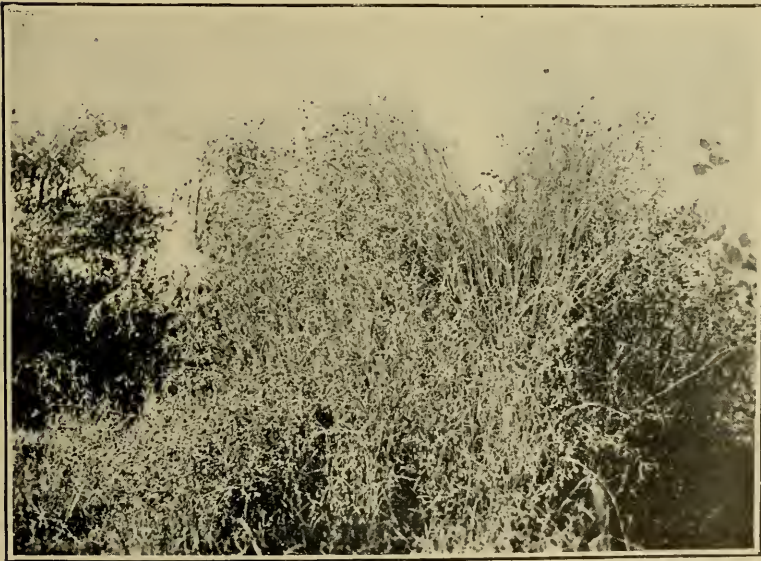
The bulk of the vegetation consists of a kind of scrub made up of shrubs and perennial herbs, capable of great drought resistance and of a period of comparative rest, extending throughout the greater part of the year. There are few trees to be seen, and these are stunted and generally thorny or prickly, thus protecting themselves against plant-feeding animals. Of the latter, there are vast herds of camels, cattle, sheep and goats, forming the chief wealth of the rural population, and appearing to thrive in spite of the arid nature of the country (Plate XXXII-B). The presence of these herds is a factor of some importance in the economy of the region, certain plants being kept down, while others remain untouched. Thus it is sometimes impossible to find a fairly complete specimen of many plants over large areas, the branches being eaten, and only the woody base left. Plate XXXIV-A. shows a case, where a specimen of *Heliotropium undulatum* (the plant to the left) has escaped total destruction owing to its being accidentally protected by an ant-hill. On the other hand, the specimen of *Sericostoma pauciflora* to the right is not touched although unprotected, in spite of its being a close relative of the former plant. Sometimes a spiny shrub protects a plant, otherwise greedily eaten by animals. A case of this is shown in Plate XXXIV-B., where a fine specimen of the grass *Andropogon annulatus*, reaching the unusual height of eight feet, has taken refuge among the branches of the very prickly *Zizyphus rotundifolia*. The luxurious growth of the grass is due to the local presence of moisture in the gravelly soil. Of unprotected specimens in the same habitat, practically only the roots were left. Below we give a list of the plants especially liked by camels: *Capparis decidua*, *Salvadora oleoides*, *Haloxylon salicornicum*, *Fagonia cretica*, *Crotalaria burhia*, *Clerodendron phlomidis*, *Calligonum polygonoides*, *Indigofera ovalifolia*.

The proper desert plants may be divided into two main groups: those depending directly upon rain, and those depending on the presence of subterranean water.

The first group consists again of two types: the "ephemerals" and the "rain perennials."—The ephemerals are delicate annuals, apparently free from any xerophilous adaptations, having slender stems and root-systems and often large flowers. They appear almost immediately after rain, develop flowers and fruits in an incredibly short time, and die as soon as the surface layer of the soil dries up. We did not come across any plants of this type, which may however have been due to the fact that our visit took place towards the end of the rainy season.



A.—*Heliotropium undulatum*, partly eaten by animals, and surrounded by an ant hill. To the right: *Sericostoma pauciflora*. (Gravel plain near Devikot, in Jaisalmer State).



B.—On moist ground near Devikot village. *Andropogon annulatus* protected by *Zizyphus rotundifolia*.

The few annuals observed have generally a comparatively long taproot, the exceptions from this rule being best regarded as accidental visitors to the region (such as *Spermacoce stricta*, *Asphodelus tenuifolius*).—The rain perennials are also visible above ground only during the rainy season, but have a perennial underground stem. Here belong the bulbous Monocotyledons, of which *Dip-cadi erythraeum* is a representative from our region, also various *Cyperaceæ*.

By far the largest number of the indigenous plants are capable of absorbing water from deep below the surface of the ground by means of a well developed root system, the main part of which generally consists of a slender, woody tap-root of extraordinary length. This adaptation in some cases enables a plant to dispense with all xerophilous characteristics. A noteworthy example is *Citrullus colocynthis*, one of the *Cucurbitaceæ*, which remains green throughout the year, in spite of its long, trailing branches, which often reach 50 ft. in length, and bear a fair number of large leaves. A fruiting specimen of the plant is shown on Plate VII-A.

Generally, however, various other xerophilous adaptations are resorted to such as reduced leaves, thick tomentum, succulence, coatings of wax, thick cuticle, protected stomata, etc., all having for their object a reduction of transpiration. The plants belonging here are chiefly more or less woody perennials. A few annuals occur, however, such as the rare *Monsonia heliotropioides*.

3. FORMATIONS.

It was originally our intention to adopt the nomenclature used by F. E. Clements in his work "Plant Succession" (Washington 1916) for our description of the vegetation of the Indian Desert. For many reasons, into the details of which we cannot enter here, this plan has been abandoned. Accordingly the term "consocieties" used on some of the earlier plates (Pl. VII-B., X-A.) should be replaced by the term "family." Similarly the words "in the consocieties" under Pl. X-B. should go out.

The uniformity of the climate of our region causes a corresponding uniformity of the vegetation. The formations may therefore be taken as exclusively edaphic, and it is convenient to adopt Schimper's definition: "The communities of plants as determined by the qualities of the soil are termed formations."

Accordingly, we distinguish the following five formations: Aquatic, Sand, Gravel, Rock, Ruderal.

For the sub-divisions of the above formations we use the term association, following Warming's definition: "An association is a community of definite floristic composition within a formation."

We shall further use the term family, introduced by Clements, but in the following generalized sense: A family is a community of individuals belonging to a single species, and occupying a definite area of whatever shape or size, the boundaries of which are determined by the numerical distribution of the individuals, no account being taken of the eventual occurrence of other species within the area.

Thus Pl. X.-A. shows a single family of *Eclipta erecta* with abrupt boundaries, the change in numerical distribution within the occupied area being continuous. In Pl. X.-B. we have several isolated families of the same plant. In the case discussed no other plant occupies the same locality, and we may therefore describe the local vegetation as a pure association of *Eclipta erecta* consisting of several families. A pure association may coincide with a family, as in Pl. XXIV-A., XXV-B. (*Cyperus arenarius*), or form part of a family, as in Pl. XXV-A. (*Calotropis procera*) or VII-B. (*Indigofera argentea*). The area occupied by a family of *Aristida hirtigluma* shown in Pl. XIX-B. contains also other species and hence the plant does not form a pure association; this is of course the rule.

Aquatic Formation.

Water is naturally scarce within our region and has to be collected during the monsoon for irrigation purposes. Wherever possible artificial basins are constructed, preferably with a rocky bottom, since a sandy or gravelly bottom retains the water only with difficulty. At the time of our visit the amount of water in these tanks was unusually great owing to the exceptionally heavy rains. Just before the rainy season, the smaller ones are generally empty and during ordinary years, the maximum water level must be far lower than that observed by us.

The chief tanks visited by us are :

- (1) Kailana Lake near Jodhpur (Pl. V-A.) occupies a comparatively large rocky valley and supplies Jodhpur city with water. The dam is shown in Pl. I B., and the luxurious vegetation on the outside forms a striking contrast to that of the surrounding arid hills. The lake itself contains masses of *Algae*, among which various species of *Chara* were noted. The *Naiadaceae* were represented by *Potamogeton crispus* and *Naias australis*.

There were hardly any semi-aquatic associations along the shores of the lake at the time of our visit, although they probably would be well developed after the partial drying up of the water. Below the dam, however, we found *Bergia ammannioides* and *B. odorata* associated with *Ammannia baccifera* and *A. multiflora*.

- (2) The tank above the Balsamand Garden near Jodhpur is a small rock basin in which *Trapa bispinosa* was collected. We have not observed this plant in any other locality and conclude that it must have been cultivated here.
- (3) The lake near Mandor (Pl. VI-A.) is a large shallow expanse of water in the plain, and is rather difficult of approach on account of its marshy shores. Mandor was our best locality for *Cyperaceae* and many of these plants occurred in the neighbourhood of the lake. The vegetation on the banks along the muddy irrigation canals leading from the lake is best described as ruderal. The lake as shown on the photograph is probably much larger than in ordinary years.
- (4) A small pond surrounded by marshy ground about 8m. north of Phalodi (Pl. XXIV-B.) was filled with muddy water devoid of vegetation, except for a number of immature specimens of *Vallisneria spiralis*, a plant not observed in any other locality. The shores were covered by high *Cyperaceae* partly associating with *Andropogon annulatus*. The surrounding damp gravel was a favourite habitat of *Bergia odorata*.
- (5) The small village tank at Bap has a gravel bottom and partly marshy shores. The submerged association observed by us consisted of *Potamogeton pectinatus*, *Naias graminea*, *Naias Welwitschii*, and *Chara sp.*
- (6) Gharsisar Lake outside Jaisalmer town (Pl. XII-A.) is not of much interest botanically.
- (7) The same may be said of Amarsagar and Bada Bag tanks, both artificially dammed rock basins (Pl. XII-B., XI-B.), although the shores may have a rich vegetation in the middle of the dry season. Both irrigate extensive gardens. In the Bada Bag (Pl. XI-A.), a large muddy field of almost pure *Ammannia baccifera* association was observed.
- (8) A small artificial pond with gravel bottom between Seu and Badka had a flora different from the ordinary type. There was found an association of *Nymphaea lotus* and *Limnanthemum parvifolium*, neither of which was observed elsewhere. We noted also a zone of *Chara sp.*
- (9) A few drying-up pools near Barmer railway station were bordered by pure families of *Eclipta erecta* (Pl. X-A. & B.). Although this plant is ruderal rather than aquatic, it is mentioned here owing to the fact, that

a habitat of this type seems necessary for it to thrive in this region. It attains its maximum development about 2-3 feet above the surface of the water nearer which young plants and seedlings only are found, so that zones and islands result.

- (10) Many smaller pools or tanks were met with, but proved very uninteresting. There is generally one or two near every village. Rivers containing water there were none. We crossed a river-bed 2 miles East of Sodakoer (Pl. XXX), the vegetation of which hardly differed from the surrounding gravel area. A sandy river-bed at Barmer was totally devoid of vegetation.

From the above may be seen that the submerged flora is, as might have been expected, rather poor, and very local. The semi-aquatic flora consists mainly of certain *Cyperaceae*, *Lythraceae* and *Elatinaceae*, and is often well developed as regards number of individuals. The almost complete absence of *Hydrocharitaceae* is noteworthy. The genus *Rotala*, too, is absent. There are hardly any aquatic grasses. *Desmostachya bipinnata* may perhaps be referred here. It frequents irrigated gardens and margins of tanks.

The occurrence of *Naias australis* and *Naias Welwitschii* within our region is very interesting, both plants being new to India.

(To be continued.)

THE BIRDS OF PREY OF THE PUNJAB.

BY

C. H. DONALD, F.Z.S., M.B.O.U.

PART VI.

(Continued from page 140 of this volume.)

Type H.

This chapter of the "Birds of Prey of the Punjab" deals with 3 genera, comprising 11 species, of what must be far and away the best known of Raptores by name at least.

All the species in this Type (H) have three characteristics in common which separate them from the members of all other Types, at a glance. The first mentioned of these characteristics is by far the most important, and in itself sufficient to differentiate them and to place them in this Type. These characteristics are :—

- (a) Upper mandible *toothed* and sometimes a festoon is also present behind the tooth; nostril circular with a central tubercle.
- (b) Irides some shade of brown, usually very deep and almost black in some lights.
- (c) Wings long and pointed but not always reaching to tip of tail.

The three genera are :—FALCO, ÆSALON and TINNUNCULUS, *i.e.*, the Falcons, Merlins and Kestrels.

Besides the above, there are in India, four other genera comprising in all 8 species which all have toothed mandibles, *viz* :—*Baza* (3 species) which are distinguished by having a sort of double tooth; *Erythropus* (1 species); *Microhierax* (3 species) and *Poliohierax* (1 species) but none of these are found in the Punjab so far as I am aware.

Now, though all the true Falcons, the Merlins, and the Kestrels can be placed in their proper Type by a single glance at the beak and nostril, the separation of the different species from each other, in *Falco*, is by no means so simple. Variations in plumage from the young to the adult stage are considerable, and differences in size of specimens, of the same species, are by no means negligible.

Like most of the Raptores previously dealt with, the Falcons, Merlins and Kestrels are easily distinguished by their flight, not only as such, but can usually be correctly placed in their proper species, by anyone who has studied their flight, but it will not be an easy matter to put the subtle differences in black and white and still make them intelligible to my readers.

The 3 genera and 11 species of this Type are as under :—

Genus.	SPECIES.	
<i>Falco</i>	<i>F. peregrinus</i>	The Peregrine Falcon
"	<i>F. peregrinator</i>	The Shahin "
"	<i>F. barbarus</i>	The Barbary "
"	<i>F. jugger</i>	The Laggar "
"	<i>F. cherrug</i>	The Saker or Cherrug Falcon
"	<i>F. milvipes</i>	The Shanghai Falcon
"	<i>F. subbuteo</i>	The Hobby
"	<i>F. severus</i>	The Indian Hobby
<i>Æsalon</i>	<i>Æ. regulus</i>	The Merlin
"	<i>Æ. chiquera</i>	The Turunti or Red-headed Mer- lin.
<i>Tinnunculus</i>	<i>T. alaudarius</i>	The Kestrel

KEY TO THE GENERA.

- Falco*. Size medium to small; toes long, middle toe without claw as long, if not longer than, the tarsus; tail rounded, *not* graduated; 2nd quill longest, 1st much longer than fourth.
- Æsalon*. Size small; 2nd and 3rd primaries longest and subequal, first primary much shorter and approximately equal to the fourth; first two quills always notched on the inner web. Other characteristics as in *Falco*.
- Tinnunculus*. Size small; foot much smaller and weaker than in the Falcons, mid-toe without claw being from two thirds to three fourths the length of the tarsus; Tail graduated, outer rectrices being 1 to 1½ inches shorter than the middle pair. Upper parts tinged with rufous throughout, with black bands in the females and young.

KEY TO THE SPECIES.

- F. peregrinus*. Size medium, wing in male about 12·5 and in female about 14·5; 1st primary *longer* than the third; cheek-stripe broader than the eye; no nuchal collar; crown dark grey (sometimes, though rarely, black); breast very slightly rufous.
- F. peregrinator*. Size medium, wing in male about 11·5 and in female about 13"; 1st primary *longer* than the third; cheek stripe broader than the eye; crown black or blackish; under parts rufous.
- F. barbarus*. Size, a little smaller than the above, wing 11 in males to 12·5 in females; 1st primary *longer* than the third; cheek-stripe narrow, a buff nuchal collar; *head ashy grey or rufous*.
- F. jugger*. Wing in male about 12·5 and in female about 1" 1st primary *subequal to 3rd or shorter*; a distinct narrow cheek-stripe; middle tail feathers entirely brown in adults.
- F. cherrug*. Wing in male about 14·5 and in female about 15·5"; 1st primary *subequal to 3rd or shorter*; no cheek-stripe; middle tail feathers, usually brown with white spots on each web, adults not banded above.
- F. milvipes*. Wing in male 14 and in the female about 16"; adults banded with rufous on back, wings, and tail.
- F. subbuteo*. Size small, wing of male 10½ and of female about 11"; Breast white or buff with brown streaks.
- F. severus*. Very similar to *F. buteo* except that this species has a deep rufous breast, unspotted in adults.

N.B.—Both the Hobbies (*F. subbuteo* and *severus*) resemble the Peregrine group in having the first primary longer than the third.

The size, as indicated by the length of wing, is somewhat misleading when the Shaheen or Barbary Falcons are compared with the Hobbies. Half an inch or an inch would appear to make very little difference, but the former are *altogether heavier and robuster* birds with *much* longer toes and *more* powerful claws generally. Whereas the mid-toe without claw in the Hobbies would not exceed 1½" in length, in the remaining six species it will be found to be 1¾" or over.

Æ. regulus.

Size small, wing about 8 to 9"; 2nd and 3rd primaries longest and subequal, first much shorter and approximately equal to the 4th; crown grey or brown, dark-shafted.

Æ. chiquera.

Size small, wing in females about 9"; 2nd and 3rd primaries longest and subequal first much shorter and approximately equal to the fourth; crown chestnut.

T. alaudarius.

As for genus.

TYPE H.

FAMILY FALCONIDÆ.

SUBFAMILY FALCONINÆ.

Genus FALCO.

No. 1254. *Falco peregrinus.* The Peregrine Falcon.

Characteristics.

Size medium, length of male about 15" and of a female about 18"; 1st primary longer than the 3rd; cheek-stripe broader than the eye; no nuchal collar, crown dark grey, sometimes almost black; breast very slightly tinged with rufous.

Colouration.

In adults. Slate-grey above, darker on the head and neck and gradually shading down to a pale grey on the rump, most of the feathers dark-shafted and except on the head and nape with dark cross-bands. Cheek-stripe black; Primaries blackish, with white bars on the inner webs, except near the end; Secondaries ashy grey with darker cross-bands; tail dark grey or blackish with numerous ashy-grey cross bars, closer together and paler towards the base, extreme tip and borders near tip, whitish; lower parts white with a rufous tinge, a few brown or black spots on the lower breast and middle of the abdomen, and narrow dark bars on the flanks, lower wing-coverts, thigh coverts, and under tail-coverts.

Young birds are very dark brown above, the feathers edged with rufous, the buff bases of the feathers showing about the nape; the tail feathers with about six transversely oval rufous spots on each web, forming imperfect cross-bars; primaries as in adults; cheek-stripe narrower; lower parts white, buff, or rufescent, spotted, except on the throat, with broad brown elongate median stripes, becoming broad spots on the flanks (Blanford).

The transition from the young to the old plumage is gradual but considerable and, I do not think there can be much doubt, that variations of a marked degree exist in individuals of the same age.

The bird with an almost jet black head and dark-brown back and under parts of a rich cream colour with deep brown markings, is an entirely different looking bird to the one with the slaty grey back and pure white under parts, sparsely speckled with black, and transverse bars on the flanks.

A few years ago I caught a tiercel with a head and nape almost jet black and resembling that of the next species, much more than that of the Peregrine.

"Bill bluish, dark at tip; cere yellow; irides brown; legs and feet yellow." (Blanford).

Measurements.

"Length of a female about 19; tail 7.5; wing 14.5; tarsus 2.1; mid-toe without claw 2.25; bill from gape 1.3; Males are considerably smaller: length about 16; wing 12.5." (Blanford).

Mr. Hume records an Indian female measuring, 20.25 in length; expanse 39; wing 13.25; tail 6.75; tarsus 2.25; mit-toe 2.06.

Habits, etc.

The Peregrine Falcon is a winter visitor to the Punjab, though it is possible that some few stragglers may even breed in the Himalayas, and Hume records having seen a trained Peregrine which the owner informed him had been taken from a nest on the Indus River. Personally I have never, to my certain knowledge, seen this bird in the Himalayas during the summer.

The *Bhyri*, by which name this species is known to the Indian falconer, is essentially a bird of the river and jheel. It arrives in Northern India just after the ducks make their appearance and disappears when they go. It is an early hunter and may be seen on the wing just after dawn, flying low over the extensive plains bordering any of our Punjab rivers. When hunting, the Peregrine flies low and fast, the wings usually slightly bent back from the first joint, and with fast powerful beats.

On viewing ducks on a pool or a flock of doves in the fields, the falcon drops to within a few feet of the ground, the beat of the wings become even faster than before and the wings bend closer into the body and it fairly hurls itself through the air and into the middle of the flock, which will probably rise "en masse" when the falcon is still a few yards distant. Having selected one particular bird, the chase begins, unless by good fortune for the falcon, it ends before it really begins in an easy capture. Usually the dove succeeds in evading those dread talons in the first instance and neatly doubles back. Up rises the falcon almost vertically to her "pitch", turns, and shoots down like an arrow in the wake of its quarry following every turn and twist of the latter.

Another miss and up she goes again to repeat the performance, determined to secure its breakfast before the dove can reach the shelter of the trees surrounding a village, not far distant. The dove reaches the fringe of trees closely followed by the falcon and dashes right into the branches of the nearest tree. The falcon once more rises high into the air, circles round once or twice in the hope of its quarry, or another bird leaving the security of the trees for the open ground beyond, gives up the chase and flies straight away, rising steadily as it goes, to make an attack elsewhere.

During the day the Peregrine betakes itself to some big tree overlooking a river or a jheel, and shelters from the heat of the sun. It usually perches on one of the thicker branches about half way up and seldom on the topmost branches, like so many of the other falcons do.

Another favourite haunt of the Peregrine is the sandy bed of the river itself. A mound of sand, a half buried log, or a stump or stake in the ground, from which it can view the country for miles round, have attractions for a hungry falcon.

Whereas duck probably form its staple diet, a crow colony is almost a certain find for a hungry Peregrine late in the evening. One that has failed to secure a tit-bit in the shape of a duck or a dove, earlier in the afternoon, will wend its way to a crow colony sooner or later, whence it need never go hungry, even though the quality of the meal is not all that can be desired.

I have already stated that the flight of the birds in this type (H) is by no means easy to describe. The flight of the falcons generally is not only distinctive but is capable of a more or less intelligent description but to give such a description as will enable a novice to differentiate between the different members of this type, is quite another matter.

Indeed the trained eye has to depend on factors other than shape of wings, the way they are held, length of tail, etc., to separate one falcon from another on the wing, and even where the flight itself is distinctive the difference is subtle enough to defy description though noticeable to the trained eye. Size and colour of certain portions of the body or wings must be taken into account and even then it is not always possible to make absolutely certain of your bird.

The sharp pointed (swallow like) wings, the shorter tail, proclaim the falcons at a glance.

The wings are held level, *i.e.*, on the same plane as the body and even when soaring will frequently be found to be slightly bent, though this is by no means always the case.

If seen at close quarters, the white or light coloured breast (in the adult plumage) will help to differentiate the Peregrine from the Shaheen, which has a rufous breast and under parts. The latter's black head and very dark upper parts are also a guide to its species.

The Barbary resembles the Shaheen except for its light coloured head.

The Laggar, in adult plumage, has a very white breast, often shows a slight white patch on the under-part of the wing, and the marking of the wing is also "patchy". Moreover they usually hunt in couples.

The Cherrug or Saker Falcon is very much bigger and is seldom to be found in the haunts of the Peregrine or the Shaheen. It affects dry sandy tracts.

The Merlins and Hobbies are all very much smaller.

Genus FALCO.

No. 1255. *Falco peregrinator*. The Shaheen Falcon.

Characteristics.

Length of male about 15", of a female about 18"; 1st primary longer than the 3rd; cheek-stripe broader than the eye (sometimes, in very old birds, the cheek-stripe is fused into the back of the head and nape and indistinguishable in itself), no nuchal collar, crown blackish; lower parts deep rufous. Wing 11.5 to 13".

Colouration.

"This falcon is distinguished from the Peregrine at all ages by its darker and almost black head and nape, and by the deeper rufous of the lower surface, especially on the breast, abdomen and lower wing-coverts. The colour of the lower parts varies, however, greatly; in some birds, especially those from Southern India, it is deep ferruginous or chestnut, whilst in many Himalayan birds it is scarcely darker than in some (exceptional) Peregrines. Except in very old birds there is almost always in the present species some rufous sprinkled over the nape, owing to there being a rufous band on the feathers between the black ends and the white bases. In old birds of *F. peregrinator* all markings disappear on the breast and abdomen very narrow bars remaining on the flanks alone, and bars almost disappear on the pale ashy feathers of the back, rump, and scapulars.

In young birds of the year the whole upper surface is almost black, the feathers at first having rufous edges which soon disappear by wear; there is some rufous on the nape; and the tail is marked with transverse, oval, rufous spots as in the Peregrine but they are more numerous; the chin and throat are pale rufous and unspotted, the breast and abdomen marked with longitudinal drops, but the lower abdomen is sometimes unspotted." (Blanford).

"Bill slaty blue, dark at the tip; cere, orbits and legs yellow; irides intense brown."

Measurements.

"Length of a female about 18"; tail 6.5; wing 13"; tarsus 2; mid-toe without claw 2.1; bill from gape 1.25; of a male, length 15; wing 11.5. (Blanford).

Habits, etc.

This beautiful falcon is a dweller of the hills and breeds freely all over the lower hills in the Punjab, up to an elevation of about 7,000 ft.

Pigeons, doves, parrots, mynahs and thrushes come in for the attentions of this falcon and to watch one hunting, particularly in the hills, is an education. Like the Peregrine it is a very early hunter and begins its day if anything earlier than does the latter, and certainly continues to a later hour in the evening.

I have had the good luck on several occasions to have my camp near a Shaheen's pet hunting grounds, and it is extraordinary how faithful they are to certain localities, even to the extent of the same branch of a particular tree in that locality.

In Dharmisala there are cliffs just above my house. Above and all down one side, these cliffs are surrounded by a heavy oak forest. Immediately below is fairly

open ground, below which is a small lake and below that again the Cantonments. Further away to the left is a village with a wide extent of cultivation, and down below there is an unrestricted view of the low-lying hills of Kangra and the plains.

On a much lopped oak tree, at one corner of the cliffs, the Shaheen is to be found any afternoon, between the months of March and the middle of May.

Thereafter she vanishes to re-appear again in September. Her pet tree commands a magnificent view and no pigeon can fly anywhere in the Cantonments, nor dove alight in the village fields, which escapes her all seeing eyes.

Periodically she leaves her perch and makes a circuit of the hill, as if bored with nothing to do, returning within ten minutes or quarter of an hour, to her own perch.

From this coign of vantage it is a treat to see her give chase. If you watch her on her perch for a few minutes you will see her head bob up and down as though focussing the eyes on some distant object.

Suddenly, with a spasmodic movement her wings half open and she gets lower on her perch, as though preparing for a spring. Thus she sits for a few seconds with her wings still half open, being blown about in the breeze, her eyes fixed straight ahead of her and downwards and the head shoots up and down as though on springs. As suddenly she changes her mind, draws up her wings and sits bolt upright, but only for an instant. Again her wings half open and her mind is made up and off she goes. With fast beating wings she rises steadily, but in a different direction to that in which she had previously been looking. Up and up she goes then suddenly turns and shoots down like an arrow at incredible speed. The stoop is, however, not that of the trained falcon, with wings tightly glued to the body, but a succession of such stoops intercepted by moments of wildly vibrating wings hurling and pushing her through the air at ever increasing speed. Down, down she comes missing the top of a rhododendron bush by inches and with a great swish a streak passes within a few feet and rises straight up into the blue sky, for two or three hundred feet without a check, then the wings open wide and the falcon circles two or three times and then flies off to her old perch.

The Merlin is the only other falcon that follows its quarry in this way, and somewhat resembles the ordinary flight of a wagtail or sparrow, except that it is not so undulating but much more direct.

The Shaheen arrives at her hunting grounds at about four o'clock and if not successful in procuring her dinner earlier, will be seen hunting bats, as a last resort, well after sunset.

It is by no means uncommon even on the plains and I have seen it as high up as 9,000 ft. in the Himalayas.

They build in cliffs, a nest composed of sticks and lay brownish yellow eggs, speckled and blotched with reddish brown measuring 2 by 1.63. Mr. Dodsworth records a nest he found in the vicinity of Simla on the 30th March 1913 containing two eggs. He says:—"In the present case there was no nest of any kind, and the eggs were reposing on the bare ground. The colouration of the two eggs is entirely different. One—a magnificent specimen is a rich uniform deep brick-red, the other has a ground colour of brownish yellow, and is heavily blotched with reddish brown. In shape they are broad ovals, a good deal pointed towards the small end. They measure (1) 1.92" \times 1.53", (2) 1.88" \times 1.52".

TYPE H.

Genus FALCO.

No. 1256. *Falco barbarus*. The Barbary Falcon.

Characteristics.

Length of male about 15 and of a female about 17; first primary longer than the 3rd; cheek-stripe narrow; a buff nuchal collar; head ashy grey or rufous.

Colouration.

"Head more or less ashy grey or brown, with a white or buff frontal band, and varying to rufous or a chestnut brown towards the nape, the feathers being dark shafted." Sides of neck buff; broad nuchal collar rufous, often mixed with brown (occasionally nearly the whole crown and nape are light chestnut); upper parts ashy grey with dark or blackish cross-bars, the bars broad and predominating on the upper back and wing-coverts, less broad on the scapulars, narrow, and in old birds faint, on the rump and upper tail-coverts; primaries dark brown, closely banded with pale rufous on the inner webs except near the tips; secondaries ashy grey with dark cross-bands; tail with alternating bars of ashy grey and blackish grey, the former broader near the root, the latter near the end, tip whitish; chin and throat white, or rufescent, rest of lower parts pale rufous, depth of tint varying; the breast in some with a few narrow dark shaft lines and the abdomen with small spots; the flanks and under-wing coverts with dark bars, but in old birds all markings on the breast and abdomen disappear, and only arrow-head shaped marks remain on the flanks.

Young birds are dark brown above the feathers with broad rufous edges, which wear off after a time, scapulars with rufous spots; upper tail-coverts barred with rufous; forehead, middle of crown and sometimes superciliary streaks, with the nuchal collar, buff or rufous, the collar mixed with brown; quills brown, barred as in adult; tail brown with equal rufous bars at regular intervals; lower parts more or less rufous

pale and whitish on the throat, marked with elongate spots on the breast and abdomen, and broader spots on the flanks." (Blanford).

"Bill bluish, black at the tip; cere legs and feet yellow; irides dark brown."

Measurements.

"Length of a female about 17"; tail 6.5; wing 12.5; tarsus 1.9; midtoe without claw 2; bill from gape 1.1; length of males 15; tail 5.75; wing 11" (Blanford), expanse about 3½ feet.

Habits, etc.

Mr. Hume records a nest of this species having been taken at Murree by Major Delme Radcliffe and the Gumal Pass, near Dera Ismail Khan is another locality where the nest has been taken. I believe the young of this species are frequently brought in by Pathans from the Samana Range near Kohat and I do not think that there is much doubt that the Barbary Falcon breeds in the hills bordering the North West Frontier Province, but I know of no instance of the nest having been found in the Punjab, apart from the one above mentioned.

I have seen and caught the bird in Bhadarwa, in the Kashmir State, in the autumn and have seen it in various parts of the Punjab Plains, but the only one I ever tamed and trained, was not nearly so good as the Shaheen.

Hume says:—"I believe, we may say that the Red-cap Falcon occurs throughout Northern India, during the cold weather, as far south as Gwalior, being rare east of the Jumna, less rare between the Sutledge and Jumna, and decidedly common west of the Sutledge specially in the Peshawar valley, and the tract west of the Indus, and that it breeds in Cabool and Cashmere and throughout the southern ranges in the Himalayas, west at any rate of Dalhousie, at heights of from four to seven thousand feet; but further information with regard to this species is much required."

The Barbary Falcon is said to breed in cliffs, and the eggs, three to four in number, resemble those of a Peregrine but are somewhat smaller.

TYPE H.

Genus FALCO.

No. 1257. *Falco jugger*. The Laggar Falcon.

Characteristics.

Length of male about 16; and of a female about 18; First primary sub-equal to 3rd or shorter; wing in male 12.5, in female 14; a distinct narrow cheek stripe; middle tail feathers entirely brown in adults.

Colouration.

"*Adult.* Forehead, lores, and supercilia white, with dark streaks; crown and nape brown, with broad rufous edges to the feathers; a streak running back above the ear-coverts, and a moustachial band from the gape sometimes continued to the eye, with some feathers round the orbit dark brown; rest of sides

of head white, with a few dark shafts beneath the eye; upper plumage from the nape brown with an ashy tinge; quills the same; inner webs of primaries, except near the end, with broad white bars, tail brown, middle feathers unbarred and pale tipped, outer feathers with whitish bars on the inner webs and white tips; lower parts white, a few dark streaks, wanting in very old birds, on the breast, and spots on the abdomen; flanks and outer thigh-coverts chiefly brown. (Blanford).

“Young birds are almost brown throughout, the chin and throat white, and some white on the forehead, sides of head, breast and lower tail-coverts, buff instead of white on quills and inner webs of tail feathers. There is a gradual disappearance of the brown on the lower parts with successive moults.” (Blanford).

“Bill greyish blue, the tip blackish; cere yellow in adults, greenish grey in young birds; irides dark brown; legs and feet yellow, pale plumbeous to dull greenish grey in the young (Hume)” (Blanford).

Measurements.

Length of female about 18 inches; tail 8; wing 14; tarsus 2; mid-toe without claw 1·8; bill from gape 1·25; of a male, length 16; tail 7·5; wing 12·5. (Blanford).

Habits, etc.

The Laggar Falcon is widely distributed throughout India and is generally to be found in open plains, over scrub and thin jungle and the vicinity of cultivation and villages. It ascends the lower hills to an altitude of about 3,000 ft. but is seldom seen near heavy forests. It preys on a variety of small birds, from partridges downwards and may often be seen hunting bats in the evening. Laggars usually hunt in pairs and are past masters in following sportsmen near a snipe jheel, or when after quail. I witnessed a beautiful chase one day after a snipe, in the Kangra valley, but the snipe got away in the end.

Mr. Hume describes how a pair of these birds followed him every time he went out quail shooting near their haunts and used to stoop at the quails his party put up. “This did not happen once or twice” says Mr. Hume, “or even during one or two seasons, it was regularly the case for the four or five successive years, that I remember the birds returning to their favourite tree.”

I have noticed this *trait* more than once, in places which are often shot over.

In the air the Laggar can usually be recognised by his very white breast and dark and white pattern on the under surface of the wing, and of course by the fact that two are generally seen together. The Turumti or Red-headed Merlin is the only other of the pointed long-winged birds which hunt in couples, and this species also has a white breast, but there is a vast difference in the size and the Laggar looks $1\frac{1}{2}$ times bigger.

The Laggar builds, on trees, in cliffs [or on ruined buildings, from January to March and lays usually four eggs, reddish or brownish, speckled or spotted all over with a darker and richer shade of the same, and measure about 2.01 by 1.57.

N.B.—Whatever the age or the plumage of any individual, and there is a great difference between the young and the adult, the central tail feathers in the Laggar Falcon are always plain brown, unbarred or unspotted, and this factor is worthy of careful consideration when in doubt.

Genus FALCO.

No. 1258. *Falco cherrug*. The Saker or Cherrug Falcon.

Characteristics.

Size medium, length of a female about 22" and of a male about 20. 1st primary subequal to 3rd or shorter, no cheek stripe, middle tail feathers usually brown with white spots on each web; adults *not* banded above.

Colouration.

"*Adult.* Crown and nape white (the crown sometimes pale rufous) with black shaft-stripes, which are broader on the nape; lores and sides of head white, with scattered dark streaks; no cheek stripe from the eye, but sometimes a broken moustachial stripe from the gape; ear-coverts brown, streaked darker; upper parts brown throughout, the feathers with rufous or tawny margins, and frequently a few rufous spots forming imperfect bars on the scapulars and larger wing-coverts; quills brown, paler beneath; primaries broadly barred with white on the inner webs, the bars widening and generally coalescing towards the inner border; secondaries with smaller white markings or with white spots, or uniformly coloured brown; tail feathers brown, with a whitish tip, generally with round or oval white spots on both webs, but occasionally the middle feathers are unspotted (as in *F. jugger*) and sometimes the spots become on the outer rectrices imperfect bands, interrupted at the shafts; lower parts white, with large elongate brown spots on the breast and abdomen and larger spots on the flanks and thigh coverts; with age the spots grow smaller, rounder, and more scattered, especially on the breast

"Young birds do not differ greatly from old except that the brown spots on the lower plumage are much more developed, and cover the greater part of the breast and abdomen; the head, too, is sometimes brown, and a moustachial stripe is usually well marked; the middle tail feathers are often unspotted at first.

"Bill pearly white, tipped black; cere, legs and feet dull yellow in old birds, greyish green in the young; irides dark brown, or brownish yellow or yellow." (Blanford).

N.B.—I have examined very many birds but cannot remember ever having seen one with eyes approaching yellow.

Measurements.

"Length of a female about 22"; tail 9; wing 15.5; tarsus 2.2; mid-toe without claw 2; bill from gap, 1.45; length of male 19.5; tail 8; wing 14.5" (Blanford).

Habits, etc.

This fine falcon is a winter visitor to the plains of India and though by no means a common bird even in mid winter in most parts of the Punjab a good many are caught and brought into the Amritsar market for sale from the western Punjab and Bikaner. This is a desert species and seldom to be seen near jungle or cultivation, though I caught one in Wazirabad many years ago, right in the very heart of miles of cultivation.

The food of this species for the most part is said to be the Spiny-tailed lizard (*Uromastix hardwickii*) but rats and mice do not come amiss and the one above mentioned had recently caught a frog and came down to a mynah a few minutes later.

The Saker is much prized for falconry and trained to gazelle, kite, houbara, grass owl, etc., and it would be difficult to say which quarry furnishes the least sport.

More than once I have lost sight of both falcon and quarry when the latter was the grass owl, as the pair ringed and circled almost directly overhead, and on one occasion the falcon was not found till the following evening. The first Saker I ever flew at a Kite gave the most extraordinary exhibition I have ever seen and the kite, perhaps, was the most surprised object on earth or in the sky, that day. The falcon flew straight at the kite as soon as she was slipped, made a half hearted attack and then turned half right and went straight away, much to the amusement of a couple of friends who had come to see the fun. "If that is a sample of falconry I can't say much for it" and similar remarks were not lacking, as we watched the falcon getting smaller in the dim distance.

I told the falconer to call her back, but the old fellow was quite indignant at the idea, and merely remarked "You just wait and see Sahib, she is a tiger and is not going to disappoint us like that" or words to that effect.

We watched and the falcon disappeared from view altogether and even the old falconer began to have qualms that he had seen the last of the bird.

The kite, in the meantime had risen to a considerable height and had not been in the least alarmed by the falcon's half-hearted attack, and still circled round in the company of some half a dozen vultures.

The old falconer was the first to spot the falcon again and in a very ecstasy of delight shouted out, "Look Sahib, look, didn't I tell you she was a tiger, and now you will see." High up, a tiny speck against the sky, came the falcon from the direction whither she had gone and having reached well over the vultures and kite she simply shut her wings and

came down like a bullet, striking the kite fair and square, though the latter turned over to meet the blow with its upturned claws. The kite staggered as the falcon passed on her downward swoop, to rise almost vertically to her pitch, and down she came again "raking" the kite badly as the latter zigzagged downwards to avoid the falcon's talons, and this time a handful of feathers floated in the breeze behind. The kite appeared to be in a bad way and had somehow injured one wing. It did not attempt to rise but flew straight ahead and distinctly lop-sided. The falcon after her stoop, rose again only to about the level of her quarry, turned and went straight for it, the two birds flying at each other, and "bound" with out the least hesitation and the two came down in spirals with wings extended. As they came to earth we found that the falcon had got the kite with one claw by the neck and the other was firmly imbedded in the shoulder of the kite, whereas both claws of the kite were round the tarsi of the falcon.

Nothing is known of the nidification of this species in India.

TYPE H.

Genus FALCO.

No. 1259. *Falco milvipes*. The Shanghar Falcon.

Characteristics.

Size medium, wing in male about 14" and in female about 16"; 1st primary subequal to 3rd or shorter. Adults banded with rufous on back wings and tail.

Colouration.

"Crown brown, the feathers with broad rufous margins, still broader and mixed with buff on the nape; cheek-stripe black, ill defined; lores and forehead whitish. Upper plumage and tail brown, with rufous cross-bars throughout (somewhat as in a female Kestrel); inner webs of primaries mostly covered by confluent white bars, except near the tips of the feathers; lower parts buff or white with spots on the breast abdomen, and flanks, those on the breast and middle of the abdomen disappearing in old birds."

"In young birds the rufous bars are irregular and ill-marked, and those on the tail more or less imperfect. In this stage *F. milvipes* is very like *F. cherrug*, but may generally be distinguished by some of the bars going quite across the tail feathers. A nestling from Tibet in the Hume collection, attributed to this species, has, however, the tail absolutely unbarred."

"Bill bluish, black at the tip; cere, legs and feet yellow." (Blanford).

Measurements.

Length of female about 23"; tail 9"; wing 16"; tarsus 2.2; mid-toe without claw 2; bill from gape 1.35; length of male about 20; tail 7½; wing 14. (Blanford).

Habits, etc.

This is a rare winter visitor to the plains of India and little is known about it.

I cannot remember ever having seen it on the plains or in captivity, though on two occasions I have seen a bird which, I think, must have been this species high up in the Himalayas, once late in the autumn and on the other occasion early in the spring.

On both occasions the bird I saw appeared to have a very white and glistening breast and under parts, though I saw them at fairly close quarters I could not be sure of their identity.

Of its distribution Blanford says—"Tibet and Mongolia. A few birds have been obtained in the Punjab at times, and one by Sir O. St. John at Quetta."

Nothing appears to be known of its nidification."

Genus FALCO.

No. 1260. *Falco subbuteo*. The Hobby.

Characteristics.

Size small, wing about 11"; tarsus about $1\frac{1}{2}$ " or less; mid-toe without claw about $1\frac{1}{4}$ "; "Breast white or buff with brown streaks".

Colouration.

Head, cheek stripe and the side of the head, beneath and behind the eye, blackish; the supercilium and forehead whitish and a partial collar of buff on the hind-neck. Rest of upper plumage dark slaty grey, the tail feathers barred with dull rufous on the inner webs. Quills blackish with rufous bars.

Under surface white, or whitish tinged with buff and each feather with a deep brown streak; the thigh coverts, abdomen and under tail coverts rufous or deep ferruginous.

Young birds are usually blackish above with buff or fulvous edges to the feathers. Cheek and throat fulvous or pale rufous, as also the under parts generally the latter with dark brown streaks to the feathers.

"Bill bluish, with a black tip; lower base of bill, cere, and orbital skin greenish yellow; irides intense brown; legs orange (Cripps)"—(Blanford).

Measurements.

"Length of female about 13"; tail 6; wing 11; tarsus 1.4; mid-toe without claw 1.25; bill from gape 8: of a male wing 10.25; tail 5.5". (Blanford).

Habits, etc.

This beautiful little falcon is by no means rare in the Himalayas and its wonderful evolutions in the air cannot help attracting attention. Its long pointed wings make it appear bigger than it really is, and one often has to look twice to make sure that it is not a Shaheen one sees. If watched for a few seconds it will be seen to constantly change direction and turn and twist in the air in a most amazing way in pursuit of insects, on which it mostly preys. The Hobby does not usually make its appearance till late in the afternoon and may be seen circling, stooping, rising vertically, and playing extraordinary tricks in the air, sometime after all diurnal birds have gone to rest.

In spite of its extreme rapidity of flight, from a falconer's point of view the Hobbies are disappointing as they lack the dash and daring of the Merlin. They

are very easily tamed and can be taught to "wait on" at great heights and have been used in the pursuit of larks, etc., a good deal.

This species breeds in the Himalayas and the finding of the nest has been recorded (in the Journal of the B. N. H. Soc.) from various places. Lt.-Col. Rattray found a nest on Miranjani in the Murree Hills and Mr. A. E. Jones records nests from Simla (Vol. XXIV, page 359).

I have seen the bird in Kulu and in the hills behind Dharmasala in mid-summer, so presumably it breeds there though I have not, so far, found the nest.

The nest is built in trees but the Hobby does not appear to be averse to appropriating an old crow's nest as this is what Mr. Jones had to say with regard to his find—"The nest was on the outskirts of a deodar forest placed 65 feet up a deodar (*Cedrus deodarus*) at an elevation of 6,000 ft. The nest was undoubtedly built by crows (*C. macrohynchus*) but the hobbies had added a 'fence' of thorny twigs round the brim. The lining was fine rootlets, hair, grass and small pieces of twine. A few of the hobbies' feathers adhered to the nest. The eggs were slightly incubated. Two eggs are of a dull salmon-pink ground, evenly and finely speckled with liver red and some blotches of the same shade sparsely distributed over the surface. The third egg is a uniform bright brick red with a few indistinct blotches of a deeper shade collected at the larger end. The gizzard of the bird contained portions of a bird."

Genus FALCO.

No. 1261. *Falco severus*. The Indian Hobby.

Characteristics.

Size small, wing about $11\frac{1}{4}$; tarsus under $1\frac{1}{2}$; mid-toe without claw about $1\cdot35$; "breast deep rufous, unspotted in adults."

Colouration.

Very similar to the preceding species; the top and sides of head and the back of the neck black, shading to a dark slaty grey on the back. The tail dark grey with a blackish subterminal band, blackish, in the young with grey cross-bands.

"Chin, throat, and sides of neck white tinged with rufous; rest of lower parts, including the under wing-coverts, deep ferruginous red." (Blanford).

"Young birds are brownish black above, with light rufous edges, broadest on the secondaries, upper tail-coverts and tail; a few rufous feathers scattered over the nape; breast, abdomen, and under wing-coverts, deep rufous with black spots." (Blanford).

"Bill plumbeous; irides deep brown", cere, gape and orbital skin lemon yellow; legs and feet deep yellow (Cripps). (Blanford).

Measurements.

“Length of a female about 11.5; tail 4.75; wing 9.8; tarsus 1.35; mid-toe without claw 1.35; bill from gape .9: length of a male 10.5; wing 9. (Blanford).”

Habits, etc.

Very similar to the preceding species and as Hume says, *F. severus* bears the same relationship to *F. subbuteo* that *F. peregrinator* bears to *F. peregrinus*, being a more subtropical species with a comparatively limited range of distribution.

This species is common throughout the Himalayas, but I think they affect somewhat lower altitudes than does *F. subbuteo* at any rate after the young ones have left the nest. Whereas high up on the Alpine pastures *F. subbuteo* is very common in the early autumn, *F. severus* is more restricted to the glades and slopes in the vicinity of deodars and pines, at about 6 to 8,000 ft. elevation.

Anything from a single pair to almost a dozen may be seen hawking insects in the afternoons and till late in the evening.

I have tried both the Hobbies with birds for baits but never succeeded in catching one, except with a siccada. On more occasions than one, I have had one start from its perch, for a quail or a sparrow, but never has one got to within several yards of my net.

I have found the nest of this species in Tehri Gurhwal and again in Bhadarwa (Kashmir), but though this is the Indian Hobby with a much more restricted range, its nest has not been so often found as that of the preceding species, which is supposed only to be a winter visitor.

The chief point of difference between the two birds is the colouring of the under parts which, in the case of *F. subbuteo* is, at most, tinged with rusty brown while in *F. severus*, all, except the chin and upper breast is a deep ferruginous red, easily distinguished even when the bird flashes past at some distance.

In Vol. XVI, p. 518 of the Journal of the B. N. Soc. Mr. Macdonald records the finding of a nest in a cliff in Burmah.

Genus *ÆSALON*.

No. 1263. *Æsalon regulus*. The Merlin.

Characteristics.

Size small, wing about 8 to 9"; 2nd and 3rd primaries longest and subequal, first much shorter and approximately equal to fourth; crown grey or brown dark-shafted; First two quills notched.

Colouration.

In the adult male, practically the whole of the upper parts are bluish grey, varying in individuals from a pale to a dark tint, with dark brown or black shaft-stripes to each feather. The sides of the head, the forehead and the lores are whitish and the cheeks and supercilia rusty brown, as well as the nuchal collar but the crown of the head, like the back is a clear blue

grey, with dark shafts to the feathers. Primaries are blackish, the inner webs barred with whitish towards the base, and outer webs tinged with blue grey. Tail bluish grey tinged with whitish and sometimes with a faint rufescent wash, and a broad band of black immediately before the terminal white tip.

Throat white and the rest of lower plumage whitish with a rufous tinge, and dark brown shaft-stripes.

The female differs from the male in having the head brown or brownish, with dark shafts to the feathers and the upper parts generally brownish with a grey tinge and reddish margins to the feathers.

"The tail barred throughout, and the quills with rufous cross-bands; the nuchal collar and lower parts less rufous than in the male and the breast and upper abdomen with much broader brown shaft-stripes these frequently occupying more space than the white borders.

"Young birds of both sexes resemble the female, but are browner with broader rufous edges to the feathers of the upper parts, with the crown rufous (dark-shafted), and with the tail alternately banded brown and white; the quills too are barred almost across" (Blanford).

"Bill dark slaty grey, greenish at base of lower mandible; cere legs and feet yellow; irides brown" (Hume).

"Length of a female about 12"; tail 5·5; wing 8·75; tarsus 1·5; mid-toe 1·3; bill from gape ·8; Length of a male 11; wing 8". (Blanford).

Habits, etc.

The Merlin is another of our winter visitants, arriving in the autumn and leaving again in the spring. It is much esteemed for falconry and for its size is second to none in point of speed and courage, and few facons can show a more pleasing spectacle than the little Merlin in pursuit of a hoopoe or a lark. They are very easily tamed and trained but are delicate and require careful handling.

This species is much given to sitting on the ground, or on low bushes, whence it can keep a sharp look out for birds passing overhead. When in full chase the flight of this bird is not unlike that of the Shaheen but more undulating, something like that of a flock of starlings. A "bund" between two dry paddy fields or the open plains adjoining a stream or river, are favourite haunts of the Merlin and, if watched, it will be noticed that its little head is hardly still for a second. It appears to be on springs, bobbing this way and that, ever on the look out for some luckless quarry. Having sighted something worthy of its attentions, it will rise hurriedly and go off with fast vibrating wings, inclining steadily upwards. If you have the good fortune to see the object of its attentions, possibly a flock of sparrows or wagtails, you will notice that the moment they realize their danger, they will begin to mount higher and higher, but the Merlin is mounting

too and coming up with them fast. Suddenly two or three of the little birds in front leave the rest and begin to twist and swerve, as if uncertain what to do next, and suddenly decide to dive for the bushes far below. The little Merlin shows no indecision but fairly cleaves the air in a succession of regular bounds and is up to the birds it has selected for its own in a couple of seconds, and then begins as pretty a bout of aerial gyrations as one could wish to behold. Stoop after stoop, twists and turns, with a rapidity which the eye can only just follow. A drop of a hundred feet with closed wings, a sudden flick, and hawk and quarry are yards apart, and then a rise for the open sky followed by a zigzag course, as the Merlin again catches up and follows every turn and twist in the train of its quarry, only inches dividing the two. A sudden vertical rise upwards, a double back, as the Merlin shoots forward, and a headlong drop for the friendly bushes below, which the fraction of a second's start has made possible, but the little falcon turns, shuts its wings and with a couple of quick beats to give impetus, hurls herself through space and just as those friendly bushes, and safety therein, seem so very near, the little bird finds those relentless claws even nearer, and once more has to swerve, rise and twist and just as it makes one final dive for liberty it feels a sudden sharp prick, as the Merlin bears off its prize to the seclusion of a tussock of grass away from prying eyes.

The Merlin builds on the ground but the nest has never been found in India.

Genus *ÆSALON*.

No. 1264. *Æsalon chiquera*. The Turumti or Red-headed Merlin.

Characteristics.

Size small, wings in females about 9"; 2nd and 3rd primaries longest and subequal, first much shorter and approximately equal to the fourth; crown chestnut.

Colouration.

Very similar to the adult male in the preceding species but can always, and at any age be differentiated, by this species having a chestnut crown and nape. Generally the plumage of the upper parts is a pale bluish grey with dark shaft-stripes and a few dark bars on the scapulars and wing coverts which fade with age.

The under parts are pure, white especially the chin and breast with very faint thin black lines, which become wider and more distinct lower down, and bars on the flanks and abdomen.

The tail is grey with narrow dark bars and a broad marginal black band the extreme tip being white. The crown of the head sides and nape are bright chestnut and the forehead and lores white.

In the young bird the barring of the feathers of the upper parts is more distinct and there are more dark bars generally. There is a slight rufescent tinge on the lower parts and at the bend of the wing and the head is more rufous than chestnut with dark shaft-stripes.

"Bill bluish black greenish yellow at the base; cere orbital skin and legs yellow; irides rather light brown" (Hume).

Measurements.

Length of female about 14; tail 6; wing 9; tarsus 1.6; mid-toe 1.5; bill from gape .9." (Blanford). The male is smaller.

Habits, etc.

The Turunti is well distributed throughout this country in suitable localities. It affects groves and gardens or open plains bordered by trees and is not to be found at high altitudes.

They usually hunt in pairs and for the most part prey on small birds. The flight of this species is very different to that of the Merlin when in pursuit of game being very straight and with regular beats of the wings and not in jerks and "jumps". This is a plucky little falcon and can be trained to take the Roller and the Hoopoe and occasionally partridges. In its wild state I have seen them frequently pull down a dove and on one occasion a Blue-rock Pigeon and have caught them in a net with a mynah as a bait. I cannot remember ever having seen one soaring.

A pair I had used throughout one winter and which had afforded me much sport I kept on through the summer as pets and both became firm friends of a couple of young mynahs which I had at the same time, all four birds perching together on a towel horse in a spare bathroom.

The falcons were placed there earlier in the afternoon and the mynahs would make their way thither of their own accord and sit alongside their erstwhile enemies, in the most friendly and confiding manner.

The Turunti breeds in the early spring laying 4 eggs in a neat little nest high up in the fork of some tree. The eggs are brownish red mottled and blotched with darker red."

Genus TINNUNCULUS.

No. 1265. *Tinnunculus alaudarius*. The Kestrel.

Characteristics.

Size small length about 14"; foot much smaller and weaker than in falcons, mid-toe without claw being from two thirds to three fourths the length of the tarsus; tail comparatively long and graduated the outer rectrices being 1 to 1½ inches shorter than the middle pair; upper parts tinged with rufous throughout with black bands in the females and young.

Colouration.

The top of the head, the sides and the nape ashy grey with dark shaft-stripes to the feathers; ear-coverts and cheeks greyish or white and the forehead

and lores white tinged with yellow; tail, rump and upper tail coverts, like the head, ashy grey. A black subterminal band to the tail and narrow white tips. The remainder of the upper plumage is a deep brick-red with black triangular spots on back and scapulars which vary in intensity and numbers with different individuals. Quills dark brown towards the tips and nearly white at the base, with whitish bars. The under parts generally buff or pale rufous with long lines and streaks on the breast which pass into spots on the lower breast and flanks, except the lower abdomen which is unspotted; the under side of the tail is whitish, as also the wing lining, with dark spots.

Females are more dingy above, being some shade of rufous, throughout; the head feathers are streaked with dark brown shaft-stripes and the rest of the upper parts with black or blackish bars. The under parts are paler than the back and spotted with black as in the males.

The young are somewhat similar to the females, but the tail may assume its grey tinge before the head in the young male.

"Bill bluish black; gape, cere and eyelids yellow; irides brown; legs orange yellow, claws black." (Blandford).

N.B.—*T. cenchris* the Lesser Kestrel, has whitish or pale horny claws, but specimens of *T. alaudarius* also occasionally are met with, with light coloured claws.

Measurements.

Length about 14"; expanse $21\frac{1}{2}$ "; tail $6\frac{1}{2}$ to 7"; wing $9\frac{1}{2}$ "; tarsus $1\frac{1}{2}$ "; mid-toe 1; bill from gape .85. Not much difference between the sexes.

Habits, etc.

The Kestrel, or Windhover, is a familiar feature of the landscape from the grassy slopes of the Himalayas to the plains of India, though locally migratory with the seasons. It is not often found in dense forests, though one may occasionally be seen hovering over a glade in the midst of a dense jungle.

This beautiful little hawk is very often most confident and will permit one to sit down within a few paces of its perch and watch it searching for its prey. Like the Merlin, the head is always bobbing up and down, as it focusses its eyes on to some tiny tuft of grass or on some movement. Silently and slowly it will leave its perch and fly down with half bent wings until within a couple of feet of the object of its attack, when it will suddenly put on a spurt and fairly dash on to the ground. Its movements depend on the nature of its quarry. Sometimes a Kestrel will be seen dropping from the skies at a terrific pace with no attempt to check its stoop until it apparently actually hits the ground, whereas a few minutes later the same bird will be seen to come down very gently, with extended wings and alight with the utmost caution. A grass hopper crawling up a blade of grass, or along the

ground, calls for no haste, whereas a mole cricket, or a lizard, may find a hole to disappear into any moment, and requires speedy attention.

It is by watching the "hoverers" (the Osprey, The Short-Toed Eagle, the Black-winged Kite and the Kestrel) that one begins to realise what marvellous eyesight the birds of prey are gifted with. When one sees a Kestrel hovering some 500 ft. above the earth and sees it drop to rise again with nothing visible in its talons, and as it flies slowly up one notices the head bend down and the claws come forward to meet the head and a couple of tiny, semi-transparent wings flutter to earth, one knows that the object which attracted the attention of those wonderful eyes, from such a height, was not much bigger than one's thumb nail, it leaves one wondering and marvelling.

The Kestrel makes a delightful little pet, and has been trained to catch sparrows and other small birds. It will come readily to a quail behind a net, but its food consists almost entirely of insects, lizards and mice, and in its wild state it very seldom attacks birds. That birds pay little or no attention to one hovering in their immediate vicinity is proof that they do not consider it an enemy.

It builds in cliffs, in the Himalayas, very often in deep holes and lays 4 or 5 eggs "brick to blood red, mottled and blotched with a deeper colour, and measuring about 1·57 by 1·21" (Blanford).

(To be concluded in the next number.)

SUMMARY OF THE RESULTS FROM THE INDIAN
MAMMAL SURVEY

OF THE
BOMBAY NATURAL HISTORY SOCIETY.

By R. C. WROUGHTON, F.Z.S.

PART VII.

(Continued from page 85 of this Volume.)

Family II.—CERVIDÆ.

Two subfamilies are recognised which may be distinguished as follows:—

Key to the subfamilies of the CERVIDÆ.

- A.—Antlers, face, glands, and foot glands
(at least in hind limbs) present; no
caudal gland I. CERVINÆ.
B.—Antlers, face-glands, and foot-glands
absent; a caudal gland in male ... II. MOSCHINÆ.

Subfamily I.—CERVINÆ.

Lydekker recognises only two genera, one of which however he subdivides, into six subgenera. Thomas supports me in holding that all these subgenera should be treated as full genera. One of them is not represented in our region, but the remaining six may be arranged in a key as follows:—

Key to the genera of the CERVINÆ.

- I.—Upper canines tusk-like in males;
horns short; pedicels as long as
horns, or longer, and continued down-
wards as prominent converging
frontal ridges; no phalanges to
lateral digits I. MONTIACUS.
II.—Upper canines (when present) not
tusk-like; long horns on short pedi-
cels, which are not produced down-
wards on the face; bony phalanges
present in lateral digits.
A.—A specialised gland forming a mo-
derately deep cleft on front of
hind pasterns; antlers three-tined;
tail long.

- a. Size larger; gland cleft on hind pasterns without long hairs; coat spotted at all seasons ... II. AXIS.
- b. Size smaller; gland cleft on hind pasterns, lined with long hairs; coat spotted, at most, in summer ... III. HYELAPHUS.
- B.—No specialised gland, or deep cleft, on front of hind pasterns; upper canines usually present.
- a. Muffle extending some distance below the nostrils; antlers normally three-tined; tail relatively long and bushy, coat unicolorous ... IV. RUSA.
- b. Muffle scarcely extending below nostrils; tail short.
- a¹. Antlers typically dichotomously forked, with at least four tines; no light rump-patch ... V. RUCERVUS.
- b¹. Antlers usually five-tined; a light rump-patch or area on back of hams ... VI. CERVUS.

Gen. I.—MUNTIACUS.

This name was given by Rafinesque in 1815, a year earlier than Blainville's CERVULUS.

No. 362, *muntjac*, Zimm. I re-examined this group recently, No. 363, *feæ*, Thos. & Dor. (J. B. N. H. S. xxiv, p. 42, 1915), and decided to recognize four species excluding *feæ*. These five species may be arranged in a key as follows:—

Key to the species of MUNTIACUS.

- A.—Upper surface of tail rufous or fulvous.
- a. Grizzling not extending backwards beyond the shoulders.
- a¹. General colour tawny ochraceous. 1. *grandicornis*, Lyd.
- b¹. General colour bright chestnut. 2. *vaginalis*, Bodd.
- b. Grizzling extending backwards over back.
- a¹. General colour ochraceous buff. 3. *aureus*, H. Sm.
- b¹. General colour hazel ... 4. *malabaricus*, Wr.
- B.—Upper surface of tail black ... 5. *feæ*, Thos. & Dor.

DISTRIBUTION :—

1. *M. grandicornis*, Lydekker. *Type locality* :—Amherst District Burma. (Allen).
Other localities :—Lower Chindwin; Shan States (B. M.); Chin Hills; Chindwin; Mt. Popa; Shan States; Tenasserim (M. S. I.).
Type :—B. M. No. 4.9.23.1.
2. *M. vaginalis*, Boddéert. *Type locality* :—Bengal.
Other localities :—Kumaon; Nepal; Sikkim; Garo Hills (B. M.); Sikkim; Bhutan Duars; Chindwin (M. S. I.).
Type :—Unknown. (Co-types of *ratwa*, Hodgson, B. M. No. 43.1.12.123 and 43.1.26.13.; Lectotype B. M. No. 43.1.12.123.)
3. *M. aureus*, Hamilton Smith. *Type locality* :—Unknown.
Other localities :—Dekhan (Sykes); (B. M.); Central Provinces; Berars; Kumaon (M. S. I.).
Type :—Unknown. (Type of *tamulicus*, Gray, B. M. No. 701. b., skull only).
4. *M. malabaricus*, Wroughton. *Type locality* :—Nagarhol, Coorg. (B. N. H. S.—Shortridge).
Other localities :—Kanara; Coorg; Ceylon (M. S. I.).
Type :—B. M. No. 13.8.22.103.
5. *M. feæ*, Thomas & Doria. *Type locality* :—Mt. Muleyit, Burma. (Fea).
Other localities :—S. W. Siam (B. M.).
Type :—Genoa Museum.

Gen. II.—AXIS.

No. 368. *axis*, Erxl. Lydekker admits a subspecies for Ceylon, which may be distinguished from the peninsular form as follows:—

Key to the subspecies of AXIS AXIS.

- A.—Antlers stouter; spots larger; forehead usually with a dark chevron and a few white spots 1. *a. axis*, Erxl.
- B.—Antlers lighter; spots smaller; forehead uniformly brown 2. *a. ceylonensis*, Fitz.

DISTRIBUTION :—

1. *A. axis axis*, Erxleben. *Type locality* :—Peninsular India.
Other localities :—Berars; Central Provinces; Kanara; Oudh; Rohilkund; Kumaon; Bengal; Nepal; Sikkim (B. M.); Central Provinces; Kanara; Coorg (M. S. I.).
Type :—Unknown. (Type of *nudi-palpibra*, Ogilby, B. M. No. 693. i.)
2. *A. axis ceylonensis*, Fitzinger. *Type locality* :—Ceylon.
Other localities :—Ceylon (B. M.); Ceylon (M. S. I.).
Type :—Unknown (Type of *zeylanicus*, Lydekker, B. M. No. 5.5.18.1.)

Gen. III.—HYELAPHUS.

- No. 369. *porcinus*, Zimm. The only form in our area.

DISTRIBUTION :—

- H. porcinus*, Zimmermann. *Type locality* :—Indo-Gangetic Plain.
Other localities :—Kumaon; Rohilkund; Nepal; Sikkim; Bengal; Garo Hills; Burma (B. M.).
Type :—Unknown.

Gen. IV.—RUSA.

- No. 367. *unicolor*, Kerr. Lydekker accepts a number of subspecies, of which however only one actually belongs to our area. A second is recorded from Sze Chuen, and may later be found in N. E. Burma so I have included it here. Lydekker distinguishes the two as follows :—

Key to the forms of RUSA.

- A.—Size rather larger; face longer;
shanks dark 1. *u. unicolor*, Kerr.
- B.—Size slightly smaller; face shorter;
shanks light... .. 2. *u. dejeani*, Pous.

DISTRIBUTION :—

1. *R. unicolor unicolor*, Kerr. *Type locality* :—Ceylon.
Other localities :—Mhow; Godavery Valley; Kumaon; Oudh; Nepal; Sikkim (B. M.); Western Ghats Dharwar; Coorg; Ceylon; Kumaon Bhutan Duars (M. S. I.).
Type :—Unknown.

2. *R. unicolor dejeani*, Type locality:—Sze Chuen.
 Pousargues. Other localities:—No specimen in
 B. M.
 Type:—Paris Museum.

Gen. V. RUCERVUS.

No. 365. *duvaucelli*, Cuv. Lydekker accepts two subspecies of
 No. 366. *eldi*, McCl. *eldi* for our region, viz., *eldi*, and
frontalis, from S. Burma and Manipur
 respectively. Thomas has more recently studied this group (J. B.
 N. H. S. xxv, p. 364, 1918). He shows that the original of *eldi*
 came from Manipur and not from Pegu, and that consequently
 that name must be used for the form now called *frontalis*. The
 true Thamin of Pegu being thus without a name, he proposes for it
 that of *thamin*, at the same time raising it to specific rank alongside
 of *eldi*; finally he establishes a subspecies of *thamin*, viz., *brucei*,
 for the animal from the Ruby Mines, Burma. The four forms of
 RUCERVUS (including *duvaucelli*) may be arranged in a key as
 follows:—

Key to the species of RUCERVUS.

- A.—Brow tine differentiated from the
 beam, leaving it at an appreciable
 distance above the burr 1. *duvaucelli*, Cuv.
 B.—Brow tine continuous with the beam,
i.e., leaving it immediately above the
 burr.
 a. Under surface of hind pasterns
 horny 2. *eldi*, McClelland.
 b. Under surface of hind pasterns
 hairy.
 a'. Antlers spreading widely outwards
 almost from the burr 3. *t. thamin*, Thos.
 b'. Antlers rising parallel for an ap-
 preciable distance, and then only
 spreading feebly outwards ... 4. *t. brucei*, Thos.

DISTRIBUTION:—

1. *R. duvaucelli*, Cuvier. Type locality:—Plains of India.
 Other localities:—Central Provinces;
 Kheri, Oudh; Kumaon; Nepal;
 Brahmaputra Valley; Gauhati, Assam
 (B. M.).
 Type:—Unknown. (Type of *ela-*
phoides, Hodgson, B. M. Nos. 45.1.8,
 128-131.; Type of *dimorphe*, Hodgson,

- B. M. No. 45.1.8.271; Type of *lyratus*, Schinz, Ind. Mus. Calc. No. f.).
2. *R. eldi*, McClelland. Type locality:—Manipur. (Eld).
Other localities:—Manipur (B.M.).
Type:—Not traced. (Co-types of *frontalis*, McClelland, B. M. No. 79. 11.21.36. and Ind. Mus. Calc. Nos. b. and c.; Type of *cornipes*, Lydekker, B. M. No. 1.17.13.1).
3. *R. thamin thamin*, Thomas. Type locality:—Pegu. (Evans).
Other localities:—Lower Chindwin; Pegu; Thatone, Tenasserim (B. M.).
Type:—B. M. No. 0.7.23.1.
4. *R. thamin brucei*, Thomas. Type locality:—Ruby Mines, Burma. (Bruce).
Other localities:—Ruby Mines.
Type:—B. M. No. 17.7.8.17.

Gen. VI.—CERVUS.

No. 364. *cashmirianus*, Falc. Lydekker adds two more forms which occur either within our region; or on its immediate border. These three may be arranged in a key as follows:—

Key to the species of CERVUS.

- A.—Muzzle mainly dark, lower lips and chin fawn or brown; ears long and pointed, with sinuous upper margins.
- a. A white rump patch; antlers five-tined, sharply angulated and bent forward at the third tine, so that the tips of the fifth are bent inwards. 1. *affinis*, Hodgs.
- b. White area restricted to back of hams; a brownish patch on croup, in front of tail; antlers wapiti like. 2. *macneilli*, Lyd.
- B.—Muzzle pale fawn, lower lip and chin white; ears bluntly pointed, with straight upper margins ... 3. *hanglu*, Wagn.

DISTRIBUTION:—

1. *C. affinis*, Hodgson. Type locality:—Chambi Valley; Sikkim (Hodgson).
Other localities:—Chambi Valley; Bhutan (B. M.).
Type:—B. M. No. 45. 1. 8. 94.

2. *C. macneilli*, Lydekker. *Type locality*:—Sze Chuen. (Macneill).
Other localities:—None.
Type:—B. M. No. 9. 5. 31. 1.
3. *C. hanglu*, Wagner. *Type locality*:—Kashmir.
Other localities:—Kashmir (B. M.).
Type:—Unknown. (Type of *cashmeerianus*, Falconer, B. M. No. 46.8. 24.2.).

Subfamily II.—MOSCHINÆ.

Gen.—MOSCHUS.

- No. 370. *moschiferus*, L. The only Indian genus.
 The only species.

DISTRIBUTION:—

- M. moschiferus*, Linnaeus. *Type locality*:—"Tataria *versu* ; Chinam."
Other localities:—Kashmir; Garwhal, Nepal; Sikkim; Cachar (B. M.); Sikkim (M. S. I.).
Type:—Unknown. (Type of *chrysogaster*, Hodgson, B. M. No. 43.1.12. 93.; Type of *leucogaster*, Hodgson, B. M. No. 43.1.12.95; Type of *cachariensis*, Hodgson, B. M. No. 43. 1.12.97; Type of *saturatus*, Hodgson B. M. No. 43.1.12.98).

Section II.—TRAGULINA.

There is only one Family.

Family.—TRAGULIDÆ.

Thomas has recently (A. M. N. H. (8) xviii, p. 72, 1916) restricted the name TRAGULUS to the unspotted forms of Malaya, and revived Hodgson's MOSCHIOLA for the spotted peninsular form. These two genera may be distinguished as follows:—

Key to the genera of the TRAGULIDÆ.

- A.—Body spotted; chin and throat hairy. . . I. MOSCHIOLA.
 B.—Body not spotted; skin between rami
 of mandibles naked II. TRAGULUS.

Gen. I.—MOSCHIOLA.

- No. 371. *meminna*, Erxl. The only species.

DISTRIBUTION :—

- M. meminna*, Erxleben. *Type locality* :—India.
 Other localities :—Dekhan ; Kanara ;
 Mysore ; Coorg ; Travancore ; Ceylon
 (B. M.) ; Kanara ; Coorg ; Ceylon (M.
 S. I.).
 Type :—Unknown. (Type of *malac-*
censis, Gray, B. M. No. 42.5.26.19).

Gen. II.—TRAGULUS.

- No. 372. *javanicus*, Gmel. Two forms are found in Burma, a
 No. 373. *napu*, Raff. large and a small, for which Blanford
 borrows names from Java and Suma-
 tra, but more recently Miller has provided the names *ravus* and
canescens, (Proc. Biol. Soc. Wash. xiii, p. 185, 1900, and xv, p. 173,
 1902). They may be distinguished as follows :—

Key to the species of TRAGULUS.

- A.—Size smaller, head and body about
 18-19 inches, hind foot 4.5-5 inches ... 1. *ravus*, Mill.
 B.—Size larger, head and body about 25-
 30 inches ; hind foot 5.5-6 inches ... 2. *canescens*, Mill.

DISTRIBUTION :—

1. *T. ravus*, Miller. *Type locality* :—Trong, S. W.
 Siam (Abbott).
 Other localities :—Tenasserim (B.
 M.) ; Tenasserim (M. S. I.) ;
 Type :—U. S. Nat. Mus. No. 83506.
 2. *T. canescens*, Miller. *Type locality* :—Trong, S. W. Siam
 (Abbott).
 Other localities :—Tenasserim (B.
 M.) ; Tenasserim (M. S. I.).
 Type :—U. S. Nat. Mus. No. 83509.

Section III.—SUINA.

Only one Family is represented.

Family—SUIDÆ.

Two genera are represented which may be distinguished as follows :—

Key to the genera of the SUIDÆ.

- A.—Size large, height 20-40 inches at the
 shoulder ; tail fairly long ; mammæ 12. I. SUS.
 B.—Size small, height 10 inches at
 shoulder ; tail short ; mammæ 6. .. II. POCULA.

Gen. I.—Sus.

No. 374. *cristatus*, Wagn. Miller has founded the name
 No. 375. *andamanensis*, Bl. *jubatus* for the Tenasserim pig, and
nicobaricus for the form from the
 Nicobars. These may be arranged in a key as follows:—

Key to the forms of Sus.

- A.—Size larger; 30-40 inches at shoulder;
 face not banded; last molar complex.
 a. Larger; ears long and haired ... 1. *c. cristatus*, Wagn.
 b. Size smaller, ears shorter; nearly
 naked 2. *c. jubatus*, Mill.
 B.—Size smaller, about 20 inches at
 shoulder; face banded; last molar
 simple.
 a. Upper tooth row 83mm. 3. *andamanensis*, Bl.
 b. Upper tooth row 95mm. 4. *nicobaricus*, Mill.

DISTRIBUTION:—

1. *S. cristatus cristatus*,
 Wagner. *Type locality*:—Malabar.
Other localities:—Central Provinces;
 Nilgiri Hills; Malabar; Nepal; Sik-
 kim (B. M.); Kathiawar; Western
 Ghats; Dharwar; Bellary; Coorg;
 Ceylon; Bhutan Duars; Chindwin
 (M. S. I.).
Type:—Unknown. (Type of *affinis*,
 Gray, B. M. No. 38.3.13.48; Type
 of *zeylonensis*, Blyth, Ind. Mus. Calc.,
 No. p.)
 2. *S. cristatus jubatus*,
 Miller. *Type locality*:—Trong, S. W. Siam
 (Abbott).
Other localities:—None.
Type:—U. S. Nat. Mus. No. 83518.
 3. *S. andamanensis*, Blyth. *Type locality*:—Port Blair, Andaman-
 is.
Other localities:—Andaman (B.M.).
Type:—Not traced.
 4. *S. nicobaricus*, Miller. *Type locality*:—Great Nicobar
 Island. (Abbott.)
Other localities:—No specimens in
 B. M.
Type:—U. S. N. Mus. No. 111, 794.

Gen. II.—PORCULA.

No. 376. *salvanus*, Hodgs. The only species.

Subgen. I.—RHINOCEROS.

No. 334. *unicornis*, L. These two species may be distinguished as follows:—
 No. 335. *sondaicus*, Desm.

Key to the species of RHINOCEROS (RHINOCEROS).

- A.—Fold in front of the shoulder not continued over the back of neck; skin of sides bearing tubercles... 1. *unicornis*, L.
 B.—Fold in front of shoulder continued over back of neck; skin of sides divided into small polygonal scales. 2. *sondaicus*, Desm.

DISTRIBUTION:—

1. *R. (R.) unicornis*, Linnaeus. *Type locality*:—Assam.
Other localities:—Assam; Nepal (B. M.).
Type:—Unknown. (Type of *stenocephalus*, Gray, B. M. No. 722. e.).
 2. *R. (R.) sondaicus*, Desmarest. *Type locality*:—Sumatra. (Diard and Duvaucal).
Other localities:—Cochin China; Malay Peninsula; Sumatra; Java; Borneo (B. M.).
Type:—Unknown. (Type of *nasalis*, Gray, B. M. No. 59. 8. 16. 1.).

Subgen. II.—DICERORHINUS.

In 1901 Thomas grudgingly accepted *lasiotis*, Sclater, as a subspecies of *sumatrensis* (P. Z. S. ii, p. 154), solely on its larger size. Lydekker also keeps the two forms separate, and Sclater in his Catalogue of the Indian Museum, Calcutta, distinguishes them as follows:—

Key to the forms of RHINOCEROS (DICERORHINUS).

- A.—Skull narrow; tooth-row short ... 1. *s. sumatrensis*, Cuv.
 B.—Skull broader; tooth-row longer ... 2. *s. lasiotis*, Scl.

DISTRIBUTION:—

1. *R. (D.) sumatrensis sumatrensis*, Cuvier. *Type locality*:—Sumatra.
Other localities:—Pegu; Malay Peninsula; Borneo (B. M.).
Type:—Unknown. (Type of *niger*, Gray, B. M. No. 72.12.31.1.).
 2. *R. (D.) sumatrensis lasiotis*, Sclater. *Type locality*:—Chittagong.
Other localities:—None.
Type:—B. M. No. 1. 1. 22. 1.

Family III.—TAPIRIDÆ.

There is only one genus recognised but Lydekker, accepts ACROCODIA (Goldman), as a subgenus to contain the Indian forms.

Gen.—TAPIRUS.

Sub-genus.—ACROCODIA.

No. 337. *indicus*, Cuv. The only species.

DISTRIBUTION :—

T. (A). indicus, Cuvier. *Type locality* :—Malay Peninsula.
Other localities :—Malay Peninsula ;
 Sumatra (B. M.).
Type :—Unknown.

Suborder III.—PROBOSCIDEA.

Gen.—ELEPHAS.

The only genus.

No. 332. *maximus*, L. Thomas (P. Z. S. p. 101, 1911.), points out that Linnæus himself gives the type locality of *maximus* as Ceylon. Lydekker however asserts that there are two races of elephants in Ceylon, an indigenous and an imported, and holds that it was on one of the latter that the name was based. He thus recognises two forms which he distinguishes as follows:—

Key to the forms of ELEPHAS.

A.—Tusks large	1. <i>m. maximus</i> , L.
B.—Tusks insignificant	2. <i>m. zeylanicus</i> , Blainv

DISTRIBUTION :—

1. *maximus maximus*, Lin- *Type locality* :—Doubtful, pro-
 næus. bably S. India.
Other localities :—No specimens.
Type :—Unknown.
2. *E. maximus zeylanicus*, *Type locality* :—Ceylon.
 Blainville. *Other localities* :—No specimens.
Type :—Unknown.

Order VIII.—EDENTATA.

The only Suborder (of several recognised) represented in India is the SQUAMATA.

Suborder.—SQUAMATA.

Only one of several Families is found in our area.

Family.—MANIDÆ.

There is only one genus.

Gen.—MANIS.

Blanford was mistaken in placing the name *pentadactyla*, as representing the common Pangolin, for that name is an older synonym of *aurita*, consequently *crassicaudata*, Geoff., must be substituted for it, while it takes the

place assigned by him to *aurita*. With these changes of names Blanford's key stands as follows:—

Key to the species of MANIS.

- A.—Fore-claws about twice the length of hind-claws.
 a. 11 to 13 rows of scales round the body ... 1. *crassicaudata*, Geoff.
 b. 15 to 19 rows of scales round body... 2. *pentadactyla*, L.
 B.—Fore-claws but little longer than hind-claws ... 3. *javanica*, Desm.

DISTRIBUTION —

1. *M. crassicaudata*, Geoffroy. *Type locality*:—India.
Other localities:—Shevaroy Hills; Madras; Kandy; Ceylon; Bengal (B. M.); Cutch; Kanara; Bellary; Mysore; Coorg; Ceylon; Bengal (M. S. I.).
Type:—Unknown.
2. *M. pentadactyla*, Linnaeus. *Type locality*:—Formosa.
Other localities:—Nepal; Sikkim (B. M.); Mt. Popa; Pegu (M. S. I.).
Type:—Unknown. (Type of *aurita*, Hodgs. B. M. No. 43.1.12.85).
3. *M. javanica*, Desmarest. *Type locality*:—Java.
Other localities:—Bankasun; Tenasserim (B. M.).
Type:—Perhaps in Paris Museum.

Order IX.—CETACEA.

Order X.—SIRENIA.

I have found no record of recent work, on Indian material, in these two groups, and have omitted them entirely from this Summary.

(To be continued.)

BOMBAY NATURAL HISTORY SOCIETY'S
MAMMAL SURVEY OF INDIA, BURMA, AND CEYLON.

REPORT No. 32, BALUCHISTAN.

By R. C. WROUGHTON, F.Z.S.

COLLECTION	...	...	No. 32.
LOCALITY	...	...	Baluchistan.
DATE	...	...	January 1916 to July 1918.
COLLECTED BY	...	...	Col. J. E. B. Hotson.
EARLIER REPORTS :—	..	..	For previous reports, see, Vol. XXVI., p. 1025, 1920.

This fine Collection was made by Col. J. E. B. Hotson (assisted to some extent by the Society's Taxidermist, N. A. Baptista) in British Baluchistan.

This area is not strictly part of "India" proper either geographically or zoologically but as the collection completes the linking up of the Indian with the West Asian (Persian, Arabian, &c.) fauna, already foreshadowed in the Sind Collection (No. 24) it deserves a place in the Survey.

Broadly the eastern half of British Baluchistan, made up to a great extent, of part of the Khalat State and the Las Beyla State. Its principal feature is the Central Brahui and Pab Ranges, running North and South, and forming a central ridge. The western half may be again subdivided into a northern and southern half, the latter the Mekran, from the sea to the Siahan Mountain Range, with several lesser parallel ranges between. The country north of the Siahan Range is understood to be for the most part uninhabited desert and is not represented in this Collection.

Four of the eight forms of bat obtained are Sind species but have not so far been taken further south in India. Among the Insectivora, both species of Hedgehog and the *Crocidura* belong to the frontier. The panther is of course found throughout India, and so is the Wolf (*C. pallipes*). The Mongoose is identical with the Sind form, as also probably is the Jackal. The Mottled Polecat (*V. peregusna*) is a local form of the frontier, and so is the Hoary Fox (*V. cana*); while the common fox of the country (*V. persica*) though distinct from *leucopus* is very closely allied to it.

Among the Rodents the Banyan Squirrels *Funambulus* and Gerbils *Tatera sherrini* are identical with north Indian forms. But the rest for the most part are specifically and in many cases generically distinct from any forms found in India proper. The House-mouse *Mus bactrianus* appears to be distributed all over Baluchistan, and to differ specifically from the Punjab or Sind

form, but, so far as can be gathered from this very full collection, the House-rat is entirely absent from the country, being only found, evidently introduced by shipping, at or close to marine ports.

In the Collection are represented 44 forms included in 34 genera and as might be expected on the border-land of transition from one Fauna to another it has been found necessary to give quite a number of new names to intermediate forms, but from the point of view of novelty by far the most interesting, are the two forms of the Vesper Mouse *Calomyscus* (*hotsoni* and *baluchi*), a genus intimately related to the New World *Peromyscus* by the form of its teeth. A single specimen of another species (*bailwardi*) of the genus was taken at Mali-i-Mir, 70 miles N. E. of Ahwas, Persia, by Col. Bailward and Mr. R. B. Woosnam, and these three species form a small group without any intermediate forms either structurally or geographically between them and the American *Peromyscus*.

The following list shows the new species and subspecies found in this collection :—

- (1) *Myotis lanaceus*.
- (2) *Paraechinus amir*.
- (3) *Crocidura portali*.
- (4) *Allactaga hotsoni*.
- (5) *Cheliones hurriancæ collinus*.
- (6) *Meriones persicus*.
- (7) *Calomyscus baluchi*.
- (8) *Calomyscus hotsoni*.
- (9) *Ochotona rufescens vulturina*.

(1) ROUSETTUS ARABICUS, And. & deWint.

The Arabian Rousset.

1871. *Cynonycteris amplexicaudata* (nec GEOFF) Dobson. Cat. Chir Ind. Mus. p. 2.
 1891. *Xantharpyia amplexicaudata*, Blanford. Mamm. No. 137.
 1892. *Rousettus arabicus*, And. & deWint. Zool. Egypt p. 86 & seq.
 Panjgur, ♂ 12, ♀ 11.

(2) ASELLIA TRIDENS MURRAIANA, K. And.

The Sind Trident Leaf-nose.

1813. *Rhinolophus tridens*, Geoffroy. Descr. d' Egypte, II, p. 130.
 ? *Phyllorhina tridens murraiana*, Anderson. Car. p. 113.
 1891. *Hipposiderus tridens*, Blanford. Mamm. No. 158.
 Panjgur, ♀ 21, ♂ 1.

(3) HIPPOSIDEROS FULVUS PALLIDUS, K. And.

The Sind Leaf-nose.

1891. *Hipposiderus bicolor*, Blanford. Mamm. No. 166.
 1918. *Hipposideros fulvus pallidus*, K. Anderson. A. M. N. H. 9, II, p. 831.
 Panjgur, ♂ 1.

(4) EPTESICUS NASUTUS, Dobs.

*The Sind Serotine.*1877. *Vesperugo nasutus*, Dobson. J. A. S. B. XLVI., pt. 2, p. 311.1891. *Vesperugo nasutus*, Blanford. Mamm. No. 175.

Rajbar, ♀ 1.

This species was described from Sind, but is as yet unrepresented in the British Museum.

The present specimen has had its skull broken, so that its relationship is not certain, but it is probably *E. nasutus*, and would also seem to be nearly allied to the Western Persian bat, *Eptesicus pellucens*. Thos. originally described as a subspecies of *E. matschiei* of Aden, from its Persian ally however it may be distinguished by its more uniformly coloured membranes without the prominent white edging and peculiar transparency found in *pellucens*. These details were kindly furnished by Mr. Thomas.

(5) PIPISTRELLUS KUHLI LEPIDUS, Blyth.

The Kandahar Pipistrel.

(Synonymy in No. 24).

Panjgur, ♂ 5; Nag, ♂ 2, ♀ 1; Kalgal Jaur, ♂ 1.

(6) MYOTIS LANACEUS, Thos.

*The Woolly Mouse-ear.*1919. *Myotis lanaceus*, Thomas. J. B. N. H. S. XXVI, p. 933.

Shastun nr. Dizak, Persian Baluchistan, ♀ 1.

The publishing of the name as *lanaceus* was obviously a misprint.

(7) RHINOPOMA MICROPHYLLUM, Geoff.

*The Egyptian Mouse-tail.*1812. *Rhinopoma microphyllum*, Geoffroy. Decsr. d' Egypte, II., p. 123.

Las Beyla, ♀ 2.

(8) RHINOPOMA PUSILLUM, Thos.

*The Slender Mouse-tail.*1920. *Rhinopoma pusillum*, Thomas. J. B. N. H. S. XXVII., p. 25.

Sib., ♀ 1 (in al).

(9) RHINOPOMA, sp.

Ispid Lamin, Persian Baluchistan, ♂ 1. (juv).

The specimen is too young for certain identification, all the more so that there are at least three species which may be represented in this locality.

(10) HEMIECHINUS MEGALOTIS, Blyth.

*The Large-eared Hedge-hog.*1845. *Erinaceus megalotis*, Blyth. J. A. S. B. XIV., p. 353.1891. *Erinaceus megalotis*, Blanford. Mamm. No. 105.

Mastung, ♂ 2, ♀ 3; Sorab, ♂ 1, ♀ 1; Shahdadgi, ♂ 1;

Khojdar, ♂ 1; Mazaryib, ♀ 2.

An interesting series of a species hitherto very insufficiently represented. Type locality, Kandahar.

(11) *PARAECINUS AMIR*, Thos.

The Afghan Hedge-hog.

19. *Paraechinus amir*, Thomas. A. M. N. H. (8) 1., 1918. p. 230.

Sib, ♂ 1, ♀ 1; Chahabar, ♀ 1; Chib, ♂ 1; Panjgur, ♀ 2.

This species is no doubt very closely allied to *P. macracanthus*, Blanf., but besides the skull differences mentioned in Thomas's description—some of which prove to be rather variable—this series shows that *amir* may be distinguished from *macracanthus* by its blackish belly and chest.

(12) *CROCIDURA PORTALI*, Thos.

Portal's Shrew.

19. *Crocidura portali*, Thomas. A. M. N. H. (9) V., 1920. p. 119.

Kelat, ♀ 1; Turbat Kech, ♂ 1, ♀ 1; Panjgur, ♂ 1.

These shrews vary very considerably in colour, though they agree in being much lighter than most other members of the genus.

On the whole they seem best referable to the little *C. portali* recently described from Palestine, but as this involves their occurrence right across Persia and Syria, the reference should for the present be looked upon as provisional.

They are also related to, but paler than, the central Asian *C. ilensis*, Miller.

(13) *FELIS PARDUS*, L.

The Panther.

(Synonymy in No. 5.)

Perso-Baluch Border? 1.

(14) *HERPESTES EDWARDSI FERRUGINEUS*, Blanf.

Blanford's Indian Mongoose.

(Synonymy in No. 24.)

Mand, ♂ 1; Jumajgi, ♀ 1; Panjgur, ♂ 1, ♀ 2; Gebri, ♂ 1;

Quarquarsdan, ♀ 1; Geh, ♂ 1.

Some of the specimens look rather grey but one at least from Quarquarsdan is as highly coloured as any from Sind.

(15) *VORMELA PEREGUSNA*, Gueld.

The Mottled Polecat.

1770. *Mustela peregusna*. Gueldenstaedt. Nov. Comm. Acad. Sci. Imp. Petrop., XIV., p. 441.

1891. *Putorius sarmaticus*, Blanford. Mamm. No. 80.

Kanak, 1 cured flat skin, no skull.

(16) *CANIS AUREUS*, Linn.

The Jackal.

(Synonymy in No. 1.)

Mastung, ♀ 1; Khojdar, ♂ 1; Panjgur, ♂ 4, ♀ 1.

When working out the Indian Jackals I purposely left out the northern form until we knew more of true *aureus* from the Persian Gulf. These must similarly wait, and for the present go under the name *aureus*.

(17) CANIS PALLIPES, Sykes.

The Indian Wolf.

(Synonymy in No. 3.)

Khojdar, ♂ 1. (juv.)

(18) VULPES PERSICA, Blanf.

*The Persian Fox.*1875. *Vulpes persicus*, Blanford. A. M. N. H. ser. XLV., p. 310.*Vulpes persicus*, Blanford. Eastern Persia., II., p. 39.

Mand, ♂ 1, ♀ 1; Shirwan, ♀ 1; Bamgour, ♀ 1, ♀ 1.

Chaharbar, ♂ 1; Gwarpuski, ♀ 1; Panjgur, ♂ 1, ♀ 3;

Sor Kilkaju, ♀ 1; Kojdar, ♀ 1; Wakir, ♀ 1; Wadh, ♂ 1;

Nasirabad, ♀ 1.

(19) VULPES CANA, Blanf.

*The Hoary Fox.*1877. *Vulpes canus*, Blanford. J. A. S. B. XLV., pt. 2., p. 321.1888. *Vulpes cana*, Blanford. Mamm. No. 73.

Turbat Kech, ♂ 1.

(20) FUNAMBULUS PENNANTI ARGENTESCENS, Wrought.

The Sind Banyan Squirrel.

(Synonymy in No. 24.)

Gajar, ♂ 1, ♀ 1; Kelat, ♀ 1; Geh, ♂ 1; Turbat Kech, ♂ 3, ♀ 3;
Panjgur, ♀ 2; Turbat, ♂ 3, ♀ 1; Mand, ♂ 4; Noding, ♂ 1.

We have recently seen so much of seasonal variation in this genus that I hesitate to add a new name, but as almost might have been expected these specimens are much more coldly coloured than any from further south.

(21) ALLACTAGA INDICA, Gray.

*The Afghan Jerboa.*1842. *Allactaga indica*, Gray. A. M. N. H. X., p. 262.1863. *Alactaga bactriana*, Blyth. Cat. Mamm., p. 110.1891. *Alactaga indica*, Blanford. Mamm. No. 262.

Sourab, ♀ 2.

Cuvier in 1836 spelt the generic name as above, following Pallas who had already used it specifically. He dropped an "l" in 1838 and was followed by all later authors up to about the end of the century.

(22) ALLACTAGA HOTSONI, Thomas.

*Hotson's Jerboa.*1919. *Allactaga hotsoni*, Thomas, J. B. N. H. S. XXVI., p. 936.

Kantt, 20 ms., S. W. of Sib, Persian Baluchistan, 3,950 ♀ 1.

(23) TATERA SHERRINI, Wrought.

*The Sind Gerbil.*1917. *Tatera sherrini*, Wroughton. J. B. N. H. S. XXV., p. 43.

Las Beyla ♂ 1, ♀ 1.

In the Sind Report No. 24, the Gerbil was listed as *indica* later in Results (XXV., p. 43). I distinguished it as *sherrini*. The present specimens appear to be the same species.

(24) *TATERA PERSICA*, Wrought.*The Seistan Gerbil.*1906. *Tatera persica*, Wroughton. A. M. N. H. 7, XVII., p. 496.

Panjgur, ♂ 44, ♀ 39; Hoshab, ♂ 1; Turbat, ♂ 3, ♀ 1; Mand, ♂ 2, ♀ 2; Isiphan, ♀ 1; Daga, ♂ 1; Tuphon Gishai, ♂ 1; Bazdat, ♂ 1; Rekin, ♂ 3, ♀ 4; Manguli, ♀ 1; Seahendamb ♀ 1; Nag, ♂ 1, ♀ 6; Shirejan Palk, ♀ 2; Sitana, ♂ 1; Turbat K'ech, ♂ 5, ♀ 7; Nasirabad, ♀ 1; Sami, ♂ 5, ♀ 1; Tejeban, ♂ 1; Harboi, ♂ 1; Gazar, ♀ 1; Khojdar, ♂ 2, ♀ 2; Chahabar, ♂ 5, ♀ 8.

(25) *CHELIONES HURRIANÆ COLLINUS*, Thos.*The Western Desert Gerbil.*19. *Cheliones hurrianæ collinus*, Thomas, J. B. N. H. S. XXVI., p. 726.

Kelat, ♂ 2; Hazarganji, ♀ 1; Nal, ♂ 1, ♀ 2; Wadh, ♂ 5, ♀ 4; Chahabar, ♀ 4; Chambar, ♂ 2, ♀ 1.

These specimens by their size and the marked slaty bases of the hairs of the belly fall into Thomas's subsp. *collinus*. It is possible that later it may be found that the more western (Chahabar, &c.) individuals (at present the most westerly representatives of the genus) may prove, with Persian specimens, to require a separate name.

(26) *MERIONES PERSICUS BAPTISTÆ*, Thos.*The Persian Jird.*19. *Meriones persicus baptistæ*, Thomas, J. B. N. H. S. XXVI., p. 934.

Charboi, ♀ 1; Kelat, ♂ 4, ♀ 4; Gwambauk, ♂ 1; Koldars, ♂ 1; Pasht Kuh, ♂ 1; Panjgur, ♂ 2; Kulochak, ♂ 1.

I have adopted the English name, based on the local vernacular, given to this genus when its first individual was found in the very early 18th century.

(27) *MERIONES ERYTHROURUS*, Gray.*The Afghan Gerbil.*1842. *Gerbillus erythroura*, Gray. A. M. N. H. X., p. 266.1891. *Gerbillus erythroura*, Blanford. Mamm. No. 267.

Kelat, Baluchistan, ♂ 2; Sourab, ♂ 2.

(28) *DIPODILLUS NANUS*, Blanf.*The Baluch Dipodil.*1875. *Gerbillus nanus*, Blanford. A. M. N. H. 4, XVI., p. 312.1891. *Gerbillus nanus*, Blanford. Mamm. No. 267.

Pasni, ♂ 4, ♀ 2; Gwambauk, ♂ 1, ♀ 1; Har (Kalva), ♂ 1; Rekchak, ♀ 1; Harboi, ♀ 1; Chahabar, ♂ 1; Hoshab, ♂ 2; Shaharak, ♂ 1.

Specimens under this name are recorded in the reports from Kathiawar, Palanpur and Sind. Thomas however after examining the present specimens has arrived at the conclusion that these represent true *D. nanus*, and that the form found in Sind, &c., is distinct, and has published his conclusions elsewhere in this Journal. I have abandoned Blanford's English name which ceases to be descriptive.

(29) MUS MUSCULUS, Linn.

The House Mouse.

(Synonymy in No. 1.)

Chahabar, ♂ 1, ♀ 1; Pasni, ♂ 1.

Both localities are on the coast and these specimens no doubt represent imported stock. They are not quite the same as European House-mice but until the many shades of change from the Indian frontier westward have been studied as a whole it is most undesirable to multiply named subspecies.

(30) MUS BACTRIANUS, Blyth.

The Kandahar House Mouse.

(Synonymy in No. 24.)

Panjgur, ♂ 79, ♀ 56; Ispihan, ♂ 2, ♀ 1; Sib, ♀ 2; Mand, ♂ 2, ♀ 1; Chib, ♂ 3, ♀ 1; Turbat, ♂ 3, ♀ 1; Chahabar, ♂ 8, ♀ 7; Johran Kahur, ♂ 1; Khojdar, ♂ 1, ♀ 1; Manguli, ♂ 1, ♀ 4; Sourab, ♂ 4, ♀ 4; Mastung, ♂ 6, ♀ 5; Kalatak, ♂ 1, ♀ 1; Shakarak, ♀ 1.

The most northerly specimens (from Mastung) have been compared with the type of *bactrianus*, Blyth, the type locality of which is Kandahar and I can discover nothing to consistently differentiate these Mastung specimens from the rest. The name has already been used in these reports for specimens from Sind but these are clearly separable on size. Blyth has described a species *gerbillinus* from Pind Dadan Khan which might very well be the Sind species. Unfortunately the Museum has no representative specimens from the Jhelum Valley, or indeed from the Punjab. I propose therefore to use the name *gerbillinus* for the Sind specimens (in substitution for *bactrianus*) until something is known of the Punjab forms.

(31) ACOMYS DIMIDIATUS, Rupp.

*The Sinai Spiny Mouse.*1826. *Mus dimidiatus*, Ruppell. Atlas. p. 37.

Chahabar, ♂ 4, ♀ 1; Karochi Durk, ♀ 1.

These specimens differ from the solitary specimen taken by Waston at Laki near Sohwal. They seem to resemble the Sinai form but it is a difficult group and more material especially of our Sind form is required to make a reliable identification possible. I have temporarily ranked it as *dimidiatus*.

(32) CALOMYSCUS BALUCHI, Thos.

*The Baluch Vesper Mouse.*19. *Calomyscus baluchi*, Thomas. J. B. N. H. S. XXVI., p. 939.

Harboi, ♂ 2, ♀ 5; Kelat, ♂ 5, ♀ 2.

(33) CALOMYSCUS HOTSONI, Thos.

*Hotson's Vesper Mouse.*19. *Calomyscus hotsoni*, Thomas. J. B. N. H. S. XXVI., p. 939.

Gwambauk, ♂ 4, ♀ 3.

The isolated appearance of this genus so closely related to the American genus *Peromyscus*, is most startling. At Mr. Thomas's suggestion I have adopted for it the name *Vesper-Mouse* which is that used for its representative in the U. S. A.

(34) CRICETULUS MIGRATORIUS, Pall.

The Little Grey Hamster.

- 1794 *Mus migratorius*, Pallas. Reis, II., p. 703.
 1891. *Cricetus phœus*, Blanford. Mamm., No. 309.
 Kelat, ♂ 1.

Thomas has in his paper on this Genus (A. M. N. H. 8, XIX p. 452, 1917) adopted the name *migratorius* as the oldest applying to this species.

(35) ELLOBIUS FUSCOCAPILLUS, Blyth.

The Quetta Vole.

1841. *Georychus fuscocapillus*, Blyth. J. A. S. B. X., p. 262.
 1891. *Ellobius fuscicapillus*, Blanford. Mamm. No. 308.
 Much Baluch, ♂ 2 (juv. I).

(36) RATTUS RATTUS ALEXANDRINUS, Geoff.

The Egyptian Rat.

(Synonymy in No. 24.)

Chahabar, ♂ 3, ♀ 5; Pasni, ♂ 4, ♀ 6; Talas Sunt, ♀ 1.

These undoubtedly are either imported or from imported stock, elsewhere in Baluchistan, *Rattus* seems to be unrepresented. Four of the above specimens have pure white undersides and possibly represent the *frugivorus* of Rafinesque.

(37) NESOKIA GRIFFITHI, Hardw.

The Hazara Nesokia.

(Synonymy in No. 15.)

Khojdar, ♂ 1, ♀ 1.

The English name earlier in these Reports does not differentiate the present Genus from *Gunomys*, with the result that some of the other species would require too long a name. I propose to adopt the Latin name *Nesokia* for the Genus.

(38) NESOKIA INDICA, Hardw.

The Rajputana Nesokia.

(Synonymy in No. 24.)

Panjgur, ♂ 19, ♀ 27.

(39) ACANTHION LEUCURUS, Sykes.

The Indian Porcupine.

(Synonymy in No. 1.)

Bajukan, ♂ 1; Khojdar, ♂ 1, ♀ 1.

(40) LEPUS CRASPEDOTIS, Blanf.

The Afghan Hare.

1875. *Lepus craspedotis*, Blanford. Eastern Persia, II., p. 80, pl. VIII.
 Pishmant, ♂ 1; Sorab, ♀ 1; Panjgur, ♂ 1, ♀ 1; Sor, ♂ 1;
 Harboi, ♂ 1, ♀ 1; Shah-i-arab, ♀ 1; Hazar Gange, ? 1.

(41) OCHOTONA RUFESCENS VULTURNA, Thos.

The Baluch Pika.

19. *Ochotona rufescens vulturna*, Thomas. J. B. N. H. S. XXVI., p. 937.
Harboi, ♂ 2.

As Thomas pointed out in describing this form elsewhere in this Journal the present, for which I propose the name *Baluch Pika*, is a southern form of *O. r. rufescens*, the *Afghan Pika*; there are two corresponding western forms, viz., *O. r. regina* and *O. r. oizier*, completing so far as we know the distribution of the species *rufescens*.

(42) OVIS VIGNEI CYCLOCEROS, Hutton.

The Afghan Urial.

1840. *Ovis vignei*, Blyth. P. Z. S., p. 70.
1842. *Ovis cycloceros*, Hutton. Calc. Journ. Nat. Hist., p. 88.
1913. *Ovis vignei cycloceros*, Lydekker. Cat. U. M. I., p. 88.
Lashkarankan, ♀ 1; Saplah, ♂ 1; Nali-jingian, ♂ 1; Gwatbuk, ♂ 1; Hoshab, ♀ 1; Gwambuk Kane, ♂ 1; Hodal Pass, ♂ 1; Dab-Koh, ♂ 1; Porigent, ♂ 1.

(43) CAPRA ÆGAGRUS BLYTHI, Lyd.

The Sind Wild Goat.

1874. *Capra ægagrus blythi*, Hume. Hume P. A. S. B., p. 240. (nomen nudum).
1898. *Capra ægagrus blythi*, Lydekker. Wild Oxen Sheep and Goats, p. 264 Pasni, ♂ 1; Lob, ♂ 1, ♀ 1; Kilikaur, ♂ 1; Gajar, ♂ 1; Khojdar, ♂ 1 (juv.).

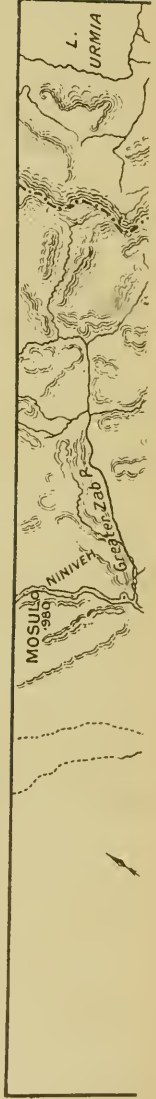
(44) GAZELLA BENNETTII, Sykes.

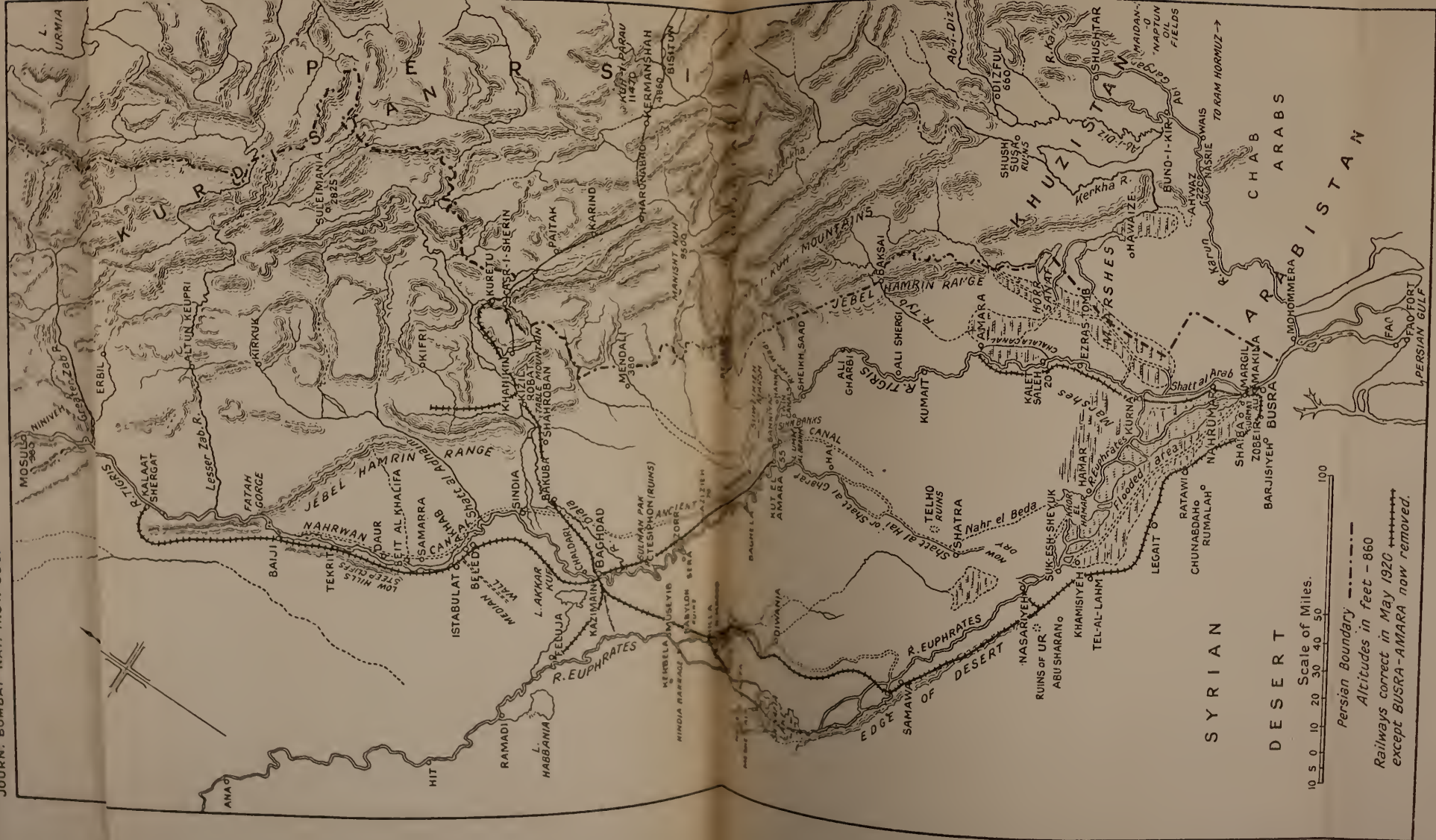
The Indian Gazelle.

(Synonymy in No. 1.)

- Pasni, ♀ 1; Mand, ♂ 1, ♀ 1; Gumasgi, ♂ 1; Hoshab, ♂ 2; Gajar, ♀ 1; Nasirabad, ♂ 1; Meherab, ♀ 2.

JOURN. BOMBAY NAT. HIST. SOC.





MAP OF MESOPOTAMIA and Surrounding Country to illustrate reports on Zoological Collections made by Members of THE MESOPOTAMIAN EXPEDITIONARY FORCE.

REPORT ON THE MAMMALS OF MESOPOTAMIA

COLLECTED BY MEMBERS OF THE MESOPOTAMIAN
EXPEDITIONARY FORCE, 1915 TO 1919.

BY

MAJOR R. E. CHEESMAN, M.B.O.U., F.R.G.S.

Mr. Oldfield Thomas conferred a privilege when he invited me to write this paper. Both he and Mr. R. C. Wroughton have combined in making the task a light and pleasant one. It has been necessary for me to ply them with a continual hail of questions throughout and to their patient guidance must be attributed any merit the paper may possess. To the rest of the staff in the mammal room of the British Museum Natural History I also acknowledge a debt of gratitude for valuable assistance.

The collection comprises 259 specimens of 36 different species and sub-species. Nine have already proved new to science. Several more are awaiting further material, and are only provisionally placed under the name of their nearest ally.

It may be said, that 'awaiting further material' often recurs in the notes. A lot of confusion is caused by the hasty naming of species and sub-species, on slight differences of colour or proportions, which afterwards prove to be mere individual variation and are not constant. It seems preferable to err on the side of caution.

The collection consists entirely of mammals contributed by members of the Mesopotamian Expeditionary Force. It has therefore an historic interest as well as a scientific value.

Many of the specimens were collected very close to the enemy's lines and some must have been skinned within range of his guns. The acquisition of such a good series under the difficulties attending service conditions is largely due to the encouragement given to all Officers interested in birds, beasts and fishes, by the officials of the Bombay Natural History Society, who in spite of the many calls on their time during the War, always managed to acknowledge and identify the specimens sent.

Again a factor that played no small part, is the able pamphlet, "Notes on the Animals of Mesopotamia", written by Capt. N. B. Kieneer in 1916 and circulated at an opportune moment.

To all interested in Natural History, that is the large majority of Officers and men in Mesopotamia, this has been a treasured book of reference. To those who were collecting it has proved invaluable. I have taken it throughout the writing of this paper as the framework to which the present notes on the specimens obtained must be considered as a supplement.

To Major-Gen. Sir P. Z. Cox, and Lieut.-Col. A. T. Wilson, I was personally indebted while on service for much timely assistance, for the loan of a gun and for facilities of transport of specimens down river and on to India. Without this many of my skins would either never have been collected or have been spoilt or even lost *en route*.

All my specimens have been united under the name of the Cox-Cheesman collection. For the help given me by all my senior officers in Mesopotamia I would like to express my appreciation. They have always been ready to smooth the way for collecting when possible and to read "King's Regulations" in their widest interpretation to that end.

Capt. P. A. Buxton has kindly allowed me to make use of his collection which was sent direct to the British Museum for inclusion in this paper.

The Indian Museum sent a few specimens to the British Museum for identification. These have also been added.

A list of the officers who collected and sent specimens to the Bombay Natural History Society is given below.

Care has been taken to avoid errors, but in the event of omissions or mistakes in the spelling of names it is hoped that they will be excused, as the writing on labels is often difficult to read and is sometimes obliterated.

Major E. Arthur.	Capt. F. Ludlow.
Major R. Bagnall.	Capt. H. L. Mackenzie, I.M.S.
Lieut.-Col. F. M. Bailey, C.I.E.	Brig.-Gen. H. J. A. Mackey, C.M.G., M.V.O., D.S.O.
Major R. E. Cheesman.	Lieut.-Col. H. A. F. Magrath.
Major C. Christy.	H. J. May, Esq.
F. Collins, Esq.	Capt. Napier, I.M.S.
Lt.-Col. F. P. Connor, D.S.O., I.M.S.	Patiala Lancers. A Squadron.
Maj-Gen. Sir P. Z. Cox, G.C.I.B., K.C.S.I.	Capt. C. R. S. Pitman, D.S.O., M.C.
J. M. S. Culbertson, Esq.	The late Major G. A. Perreau.
Deputy Civil Commissioner.	Major G. B. Scott.
Lt.-Col. Evans.	Capt. G. C. Shortridge.
Major F. C. Fraser, I.M.S.	The late Capt. W. H. Shakespeare.
Capt. Graham, R.A.M.C.	Capt. W. H. O. Short.
Capt. R. W. G. Hingston, I.M.S.	Lt.-Col. F. Wall, C.M.G., I.M.S.
Capt. C. M. Ingoldby, R.A.M.C.	Lt. D. Webster, R.N.
J. Jenkins, Esq.	H. Whitehead, Esq.
Kilminster, Esq.	Lt.-Col. Sir A. T. Wilson, C.S.I., C.M.G., C.I.E., D.S.O.
Capt. T. R. Livesey.	

Although many men are now conversant with the topography of the area covered by this paper, a short sketch will not be out of place, for those who are not. Mesopotamia, for which the Turkish name of Iraq is preferable, is a large flat alluvial plain of comparatively recent origin. It is 450 miles in length and about 150 miles in breadth. The foothills of the Kurdistan and Persian Mountains form a Northern and North-Eastern boundary, while to the South and West lies the margin of the Arabian and Syrian desert.

The land of the lower reaches of the Karun River, although in Persia has been included in this paper, as fantastically it is in the great Mesopotamian plain.

Through the plain the three main rivers—Tigris, Euphrates and Karun—wind a serpentine course towards the sea at Fao on the Persian Gulf. The Tigris and Euphrates unite at Kurna and also at Gurmat Ali to form the Shatt-al-Arab, a river of considerable width. This is in turn joined by the Karun at Mohommerah. All three rivers bring down a large amount of silt, and it is of this the Mesopotamian soil is composed, without any admixture of stones or gravel. The Karun enters the Iraq plain at Ahwaz where it crosses a low spur of the Jebel Hamrin range of hills, in a series of rock-strewn rapids. The Tigris crosses the same range several hundred miles to the North-West through the beautiful Fatah Gorge. It however does not finally leave the land of rocks behind until Samarra is passed, where there are cliffs of conglomerate. This region of undulating hills and rocky ranges extends from Samarra north-west to Mosul as well as along the North and North-East boundary previously mentioned. So far very little collecting has been undertaken there. It is the home of the porcupine and the gazelle grazes on the higher plateau. The latter is also well

distributed along the Mesopotamian plains to the sea. In the immediate neighbourhood of Mosul I have seen the mounds and tunnels of a species of mole or rodent mole which does not occur lower down.

The capture of a 'badger' with young was reported at the Ali Gherbi Military Grass Farm during a flood. From the description there seems little doubt it was the new species of ratel, which has been obtained by Col. A. T. Wilson in the foothills near the Tyb river less than 30 miles distant and is mentioned by Kinnear.

Of real forest land there is none, although the broad belt of date palms that fringe the banks of the Shatt-al-Arab gives that impression from the river, until glimpses of the desert appear a mile or so in the background. These plantations are the haunt of the jackal and the Persian mungoose.

I am inclined to treat the stories of ancient Mesopotamian forests as a myth. If the Kings of Egypt came there to hunt elephants it is probable they also hunted their owners who had imported them. The building of the huge canals at least four thousand years ago points to the land being desert then and not a region capable of sustaining natural forest. Two vast permanent reed covered marshes have been formed above Karna by the overflow of the Tigris, Euphrates and Kerkha, a Persian river. These are the Hammar Lake and Hawaiza marsh. These and smaller marsh districts have so far produced no mammal peculiar to those areas unless we may include the otter. Judging by the number of these skins exposed for sale in the bazaars, they must be plentiful.

Patches of thick jungle occur locally in the large U bends of the rivers and grow a tangle of dwarf tamarisk and Euphrates poplar. They seldom exceed a mile or two in width, but harbour small herds of wild pig. It is unfortunate that no skins or skulls have been sent so we do not yet know the species. We can be sure however that the boars seen are too large to be the Indian pig and I am of opinion that the hair is too brown for the typical European wild boar and lack the hoary grey tinge of the bristles of this species several of which I have examined recently in the London Zoological Gardens. It is also certain from the many mascots seen about the Mesopotamian camps that the young are striped.

Low cover is afforded by scrub growing in the vicinity of banks of rivers and canals. This chiefly consists of a dwarf acacia, *Prosopis stephania*, the "Shok" of the Arabs and the wild liquorice plant, *Glycyrrhiza glabra*; also *Lycium europaeum*, a thorny plant with bright red berries, and *Sueda monoica*, of which the lower leaves are succulent and which appears to thrive also on the salt lands, where no other plants can live.

Here are the wild cat, hares, jackal, mole rats, several of the gerbils (*Tatera*, *Dipodillus* and *Meriones*) and the hedge hogs. The foxes are found in the bare desert country behind, seeming to prefer it to the cover.

The country on the right bank of the Euphrates has distinct features. It is the only real desert region and is in fact the edge of the Syrian desert. Gravel is found as far down as Shaiba within a few miles of the sea. The hyæna, and Loftus' jerboa were obtained in this and no other locality. add to this a very pale fox, jackal and hare and a new hedge-hog and gerbil and we have evidence that this portion of the country contains a fauna of exceptional interest:—

Although the contributors to this collection are to be congratulated on the results, it must not be considered that the work is finished. It has just begun. The satisfaction of the thirst of science can be but temporary. A few notes of the particulars required are given for the assistance of those who find themselves in a position to continue the collection.

The following measurements, if possible in millimeters, should be taken before skinning and recorded on the label:—

1. H. & B. Head and body, that is from the tip of nose to the joint of tail and spine.
2. TL. Tail without end hairs.
3. HF. Hind foot without claws, *i.e.*, from the tip of the longest toe to the hinder side of the heel.
4. Ear. Ear from notch at base to tip. This would be the longest inside measurement of the ear.

In addition it is important to record on the label the date, sex, locality, altitude above sea and your name.

The locality of small villages should be identified with towns or districts well known or marked on maps.

Other field notes such as nature of the soil, food, immature, etc., are also of great assistance when working out a collection.

Have the skin removed as carefully as possible. Correctly made up skins are stuffed and dried, leaving the animal in a squatting position—the front legs pointing forwards, and the hind legs backwards—the bone is pulled out of the tail and a straight wire with wool wound round it takes its place but a roughly made skin is better than no skin at all.

The skull of small mammals at least should be dried with the meat on and sent separately. The bones and teeth travel better when treated thus. Both skin and skull should be labelled with the same number to ensure subsequent identification. The value of a series of skins and skulls of the same species cannot be over-estimated. Accurate identification or separation of closely allied forms, is only made possible by the comparison of a large number of specimens.

Do not hesitate to send everything you can get. It is often the apparently common place which proves to be an important link in the chain.

1. RHINOLOPHUS HIPPOSIDEROS MIDAS, K. And.

1905. *Rhinolophus midas*, K. Andersen, P. Z. S. ii, p. 138.

1918. *Rhinolophus hipposideros midas*, K. Andersen, A. M. N. H. 9, ii, p. 378.

Midas Horse Shoe Bat. Arabic "Kushaf-el-leyl" or "SAHAT".

N.B.—These names apply to all bats in Arabic.

2♂	1♀	Baghdad,	Buxton 23-9-17 to 11-10-17.
1♂	1	,,	Ingoldby, Nov. 1917.

A small bat with long pale grey fur, with purplish tinge towards the end of the hairs. The ears are large with curved and pointed tips.

Buxton remarks from Baghdad—Apparently common.

The distribution given is Gilgit to Cyprus. Andersen.

The type locality is Jask, Persian Gulf.

2. ASELLIA TRIDENS, E. Geoff.

1812. *Rhinolophus tridens*, E. Geoffroy, Desc. Egypt. ii., p. 130.

Trident Leaf-nosed Bat.

1. Feluja, Euphrates. Mackenzie. No. date. in al.

2. Lake Akkar Kuf, Baghdad. Pitman, 24-3-17 and 16-8-17 ,,

This bat is slightly larger than the last, though the description of the fur would be much the same. The very large ears are its chief distinction in the field.

This was compared with the series of *A. tridens* from Egypt and appears inseparable.

Andersen and De Winton give the distribution as Senegal, Algeria, Tunisia, S. Syria and Zanzibar, with a sub-species *A. tridens murraiana* from Karachi and Bushire.

3. PIPISTRELLUS KUHLI, Kuhl.

1819. *Vespertilio kuhlii*, Kuhl. Ann. Wett. Ges. Nat. IV., p. 199.

White bordered Pipistrel Bat.

1 ♂	16 ♀	1	Amara	Buxton	29-1-18—7-6-18.
2 ♂			Baghdad	"	8-10-17.
1			Shushter, S. Persia	Bailey.	21-1-18, alt. 500 ft.
2			Busra	Cox-Cheesman	June, 1916.
2			Sheikh Saad	Ingoldby	20-7-16 & 21-7-16.
2			Busra	Christy	June, 1918, in al.

The commonest bat of the lower Tigris.

Although several almost black forms appear in the series, this is usually a small dark brown bat, with short hair and ears and a pale border to the wing filament. Buxton remarks, plentiful in Amara and the only bat that appears in winter on warm nights, and all females were pregnant in March.

Ingoldby saw them chasing insects round the lights of river steamers near Sheikhs Saad, and I found it in numbers in the Busra houses.

Miller gives the distribution as Mediterranean region eastward into Asia. It has been recorded by the B. N. H. S. Mammal Survey from Sind.

4. PIPISTRELLUS COXI, Thos.

1919. *Pipistrellus coxi*, Thomas, J. B. N. H. S., Vol. XXVI, No. 3, p. 747.

Cox's Pipistrel Bat.

1.	Type.	Beit Mahommad, Amara,	Cox-Cheesman.	20-3-18.
1.	Makina,	Busra.	Christy	20-3-18.

A small bat with light grey back, white belly and black ears and muzzle. The type was caught in the house of Sheikh Mahommad, in the vicinity of marshes on the Chahala canal. The Makina specimen in the Mess of No. 33 B. G. Hospital.

It has been named by Mr. Oldfield Thomas after Major-Gen. Sir P. Z. Cox.

5. EPTESICUS, Species.

Serotine Bat, spec.

1.	Amara.	Cox-Cheesman,	16-3-18.
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A single specimen of a bat was collected in Amara, much resembling *P. kuhlii* in size, but the forearm is longer, colour paler and white border is missing. In the absence of the skull definite determination is not possible until more specimens are forthcoming. It is probably nearly allied to *Eptesicus matschiei pellucens*—several of which were obtained by Woosnam in Ahwaz.

6. EPTESICUS HINGSTONI, Thos.

1919. *Eptesicus hingstoni*, Thomas. J. B. N. H. S., Vol. XXVI, No. 3, p. 745.

Hingston's Serotine Bat.

1.	Type.	Baghdad.	Hingston,	1-5-17.
1.		Busra.	Cox-Cheesman,	6-8-18.
1.	Khazimain,	Baghdad.	"	8-11-18.
1 ♂.		Busra.	Wall.,	15-1-17. M. 16 in al.

Of the two Busra specimens only the skulls have been examined

A bat about twice the size of *P. kuhlii*, fur on the back, mouse coloured, underparts paler, ears brown. It has been named by Mr. Oldfield Thomas after Capt. R. W. G. Hingston.

7. *EPTESICUS WALLI*, Thos.

1919. *Eptesicus walli*, Thomas, J. B. N. H. S., Vol. XXVI, No. 3, p. 746.
Wall's Serotine Bat.

1 ♀. Type. Busra. Wall, 27-5-16.

The type of this species has a smaller forearm than that of *E. hingstoni*. This bat has been named by Mr. Oldfield Thomas after Lt.-Col. F. Wall.

8. *TAPHOZOUS KACHHENSIS MAGNUS*, Wettst.

1914. *Taphozous magnus*, Wettstein, Ann. Vienna, Nat. History Museum, Vol. 27, page 465.

Babylonian Sheath-tailed Bat.

1 ♂	Amara.	Ingoldby,	29-7-16.
2 ♂	Amara.	Buxton,	27-10-17.
1 ♀	Shaiba	Cox-Cheesman,	1-10-16.
1 ♂	1 ♀	Ctesiphon Arch	„ „ 4-10-18.
1	Busra	Connor,	29-6-18. M. 13.

A sub-species of the Kutch Sheath-tailed Bat.

This is a large bat with tail protruding through the centre of the inter-femoral membrane. The fur is confined to the head and central portion of the body, giving a very naked appearance to the limbs and inter-femoral membrane. The ears are large.

They are plentiful in Shaiba and Amara, and after sunset large numbers can be seen emerging from the houses, winging their way with steady flight to the desert. They are also very quarrelsome and noisy in the houses.

The same bat was described under the name of *Taphozous kuchhensis babylonicus* in 1916 by Thomas, who, owing to the war, had no means of knowing that it had been previously described by Wettstein.

9. *PACHYURA*, Species.

Musk rat.

1 ♀	Busra	Cox-Cheesman,	6-8-18.
1 ♀	Busra	Whitehead,	1-6-18.
1 ♂	Kurna	Buxton,	26-3-18.
1	No locality	Connor, Nov. 1918	M. 6 in al.
1	„ „	Wall „ „	M. 5 in al.
1	„ „	Wall, no date	M. 4 in al.
1	Busra	Wall, no date	M. 3 in al.
1	„	Christy, June 1918	in al.

There are seven specimens in all of the larger *Pachyura* or musk rats, which seem to represent two forms.

I feel inclined to place together the three made skins and one from Connor in alcohol. This is a gray form and might be indigenous. The other three in alcohol—one from Busra and two without locality are in bad condition—and evidently belong to a larger form. One of these marked M. 3 has the small premolar characteristic of *Pachyura* missing, but whether it has never developed or has fallen out, cannot be positively postulated.

This larger form may well have been imported by shipping, as suggested by Kinnear. The fact that so far all specimens have been obtained on the Shatt-al-Arab, in the area of ports of call of the Indian cargo boats, should not be lost sight of.

It has not been possible to carry the identification further the whole group of these shrews or musk rats, being at present in a state of profound confusion.

Pachyura is an oriental genus—but there is one species—a dwarf found in Europe and a few species in East Africa. They have four premolars—one of which is minute. This small tooth is missing entirely in *Crocidura*.

Crocidura is an African genus with one or two species in Europe and a few in Asia.

10. PACHYURA ETRUSCA, Savi.

1822. *Sorex etrusca*, Savi Nuovo Giorn de Lett Pisa i, p. 60.

Pigmy Shrew.

1 ♀	Trenches near Kut.	Magrath, 30-8-16.
1	Busra	Cox-Cheesman.
1	Busra	Fraser, no date.
1 ♂	Amara	Buxton, 5-8-18.

In the present state of our knowledge of these little known animals there seems to be no alternative but to accept provisionally Savi's name *etrusca*.

Kinnear suggests it may prove to be *Sorex pusillus*, whose length he gives as 2.4 inches. Gmelin's original description gives the length as 3.6 inches (German) which is double the size of our largest specimen.

It may be as well to note that our pigmy shrew bears a strong resemblance to some specimens that have recently been sent in from Palestine by Shortridge.

The known range of *P. etrusca* is Spain eastwards to Aden and is now extended to the present locality.

11. HEMIECHINUS AURITUS, Pall.

1778. *Erinaceus auritus*, Pallas. Nov. Comm. Acad. Petrop XIV, p. 593.
Long-eared Hedge-hog. Arabic "gunfudh."

4 ♂ 2 ♀	Amara.	Buxton, 19-10-17, etc.
2 ♂	Busra.	Shortridge, 25-3-16 and 27-3-16.
1 ♀	Busra.	Wall, 17-8-16.
1 ♀	Busra.	Wall, 23-1-17 M. 8 in al.
1	Busra.	Cox-Cheesman, 19-6-16.
	a foot.	Culbertson, 22-1-17.
1 ♀	Amara.	Connor, 9-10-16.
1 ♂	Busra.	Short, 6-5-18.
1 ♀	Busra.	Christy, June 1918—Pregnant. in al.

This is the common hedge-hog of the lower Tigris; specimens are still required from Baghdad and above, also from the Euphrates.

Buxton says, "very common in Amara, hibernates 3 months." He obtained 1 young in July. The writer found it plentiful in Sheikh Saad. This hedge-hog might be described as having hair of whitish brown, almost white in places, with light coloured quills and long ears, the feet and forehead are sandy brown.

The genus *Erinaceus* has now been restricted to the European hedge-hog. The genera *Hemiechinus* and *Paraechinus* being accepted for the more Eastern forms. The difference in the two lines in the front line of quills. In *Hemiechinus* the quills and hair meet in a clear cut line across the

forehead, in *Paraechinus* a groove without quills runs from the centre of the forehead towards the crown. A key and description can be found in Summary of the Indian Mammal Survey. Wroughton, pt. ii., J. B. N. H. S., 1918, Vol. XXVI, p. 31.

Trouessart gives the distribution of *H. auritus* as S. E. Europe, Caspian and S. Siberia.

12. PARAECHINUS LUDLOWI, THOS.

1919. *Paraechinus ludlowi*, Thomas, J. B. N. H. S., Vol. XXVI., No. 3. p. 748.

Ludlow's Hedge-hog.

1♂ Type Hit. Euphrates.

Ludlow, 8-8-18.

The type is the only specimen seen. Ludlow remarks that it was on stony desert soil at 400 ft. altitude. He also says that he found this within 20 yards of the Euphrates and that the preceding genus *H. auritus* was plentiful at Hit.

Besides the generic difference, this hedge-hog can be distinguished from *H. auritus* by the colour of the quills which are almost white on the sides of the animal, with a broad row of brown quills running down the centre of the back. Most of the hair is white—the tail, feet and nose being brown—with brown streaks running up the forehead. It also appears to attain a larger size.

Mr. Oldfield Thomas has named this after Capt. F. Ludlow.

13. FELIS CHAUS, GULD.

1776. *Felis chaus*, Guldénstädt, Nov. Com. Ac. Petrop XX, p. 483. Jungle Cat. Arabic "Bizzoon."

1♀ Amara Buxton, 2-12-17.

1♀ Qualet Saleh Webster, Jan. 1911.

1♀ " " Buxton, 23-2-18.

1 Mesopotamia Perrian, Jan. 1917.

1♂ Madij Ludlow, 15-2-18.

1 Shahroban Mackie, July 1917.

1♀ Shahroban Indian Museum (Connor), Dec. 1918.

This is the cat frequently met with on the Tigris among the scrub-jungles by the river. It grows to such a size that it is easy to mistake it for the jackal at a short distance. Its black ear tufts, yellow tinge of colouring and short tail have led in many instances to the reports of caracals and even lynxes being seen or shot on the Tigris and Euphrates during the war.

So far the only authentic record of the caracal in this neighbourhood, is the specimen obtained by Loftus at Dizful, which I have examined.

The uniform brick-red colour and absence of black or brown markings would distinguish this caracal at a long distance from *F. chaus*.

These specimens vary considerably. Buxton's from Amara has the under-parts white and is a brightly coloured cat, while his and Webster's from Qualet Saleh, although from much the same locality, are less highly coloured, with buff belly. De Winton dealt with the sub-species of this cat in 1898 (A. M. N. H. 7 ii, p. 291) but I have been unable to determine to which sub-species these belong. Buxton's Amara specimen, skin and skull, can be duplicated from the series of *Felis c. affinis* from India, collected by the Indian Mammal Survey, while the Qualet Saleh skins approximate to the British Museum series of *F. chaus nilotica* from Egypt and are also very similar to some among the *F. c. affinis* series. Major St. John

compared a specimen obtained near Bushire with a living member of *Felis chaus* in the London Zoological Gardens. He came to the conclusion that they were identical (Blanf. Eastern Persia, ii, p. 36.)

I do not consider the separation of the present series of the Mesopotamian cat from *F. chaus* would be justified as yet.

F. chaus is found throughout India, W. Asia and N. Africa. The type locality is the Caspian.

14. FELIS OCREATA IRAKI, Subsp. nov.

Pale Eastern Wild Cat.

Type 1, Koweit, Arabia, Shakespeare, May 1913.

1 ♂, Sheik Saad, Tigris, Cox-Cheesman, 8-12-16.

Felis ocreata is, according to Temminck, the origin of the domestic cat and is the Abyssinian representative of a group to which these two specimens belong.

It has been known in literature as *Felis caligata*, *Felis maniculata*, and *Felis lybica*. Schwann in 1904 pointed out that the first description of this cat was given by Gmelin, as *Felis ocreata* in 1791.

Besides being widely distributed in Africa, specimens have been obtained near Aden by Col. Yerbury in 1895, at Lahej, S. W. Arabia, by Messrs. Percival and Dodson in 1900, and at Moab, Palestine, by Tristram in 1893. All these Asiatic skins are very similar to the African in shade of colour and markings. The two from Koweit and Sheikh Saad although very similar to each other in these respects, are unlike any of the other specimens in the British Museum and obviously represent a paler race. It has been considered advisable to give them subspecific rank.

FELIS OCREATA IRAKI, Subsp. nov.

Size similar to Aden and Palestine specimens, with slightly heavier dentition.

General colour dove grey, with tendency to salmon buff shading. Forehead silvery, caused by a subterminal brown ring on the hairs showing past the silvery tip, base of hairs salmon buff. White patch in front of eye. A few buff stripes on the face. Ears uniform reddish buff, a few long reddish hairs at the tips, but no tufts. Back without distinct pattern, colour as on the forehead, darker towards the centre, paler towards the flanks. The buff bases to the hairs showing through on the flanks, form almost invisible spots which lower down become more distinct. Tail long, extending some inches beyond the outstretched hind legs, tip brown black, with two or three brown black rings above separated by greyish white intervals. Belly white, grading to pale buff at the sides and with obscure reddish spots. Legs on the upper side pale creamy white to the toes, thighs and upper fore legs slightly darker with cross bars of pale brown. Underside of the feet brown black.

Dimensions of the type.—Head and body, 630 mm; tail, 372; hindfoot, 134; ear, 47. Skull:—Greatest length, 94; condylo basal length, 83; zygomatic breadth, 64.5; palatal length, 34.5; least interorbital breadth, 17; breadth of braincase (broken), 45; upper tooth row behind canine 22.5; length of carnassial, 11.5; greatest length of bullæ, 22.

Hab.—N. E. Arabia and Mesopotamia. The type from Koweit, Arabia. Another specimen from Sheikh Saad, R. Tigris.

Type.—Apparently a male. B. M. No. 20.1.19.2. Collected May 1913, by the late Capt. W. H. Shakespeare. Presented to the British Museum by the Bombay Natural History Society.

The Sheikh Saad specimen is shorter in the tail than that from Koweit. It was shot in low scrub on the River bank below Sheikh Saad. As this cat appears as a rare straggler within the range of the preceding species, *F. chaus*, with which it might in the field be confused, the chief differences may be emphasized as follows. The tail in typical *F. chaus* reaches little more than half the length of the outstretched hindlegs, in all the *F. ocreata* group the tail extends two to five inches beyond them. The ear of *F. chaus* is deep reddish with a darker patch in the centre and a tuft of long hairs at the tip, in *F. ocreata* the ear is paler, self-coloured, and without the tuft. The hair on the body of *F. ocreata* is distinctly softer. The most marked difference however lies in the skull, which in *F. chaus* is almost twice the size of that of the *F. ocreata* group, with far larger carnassial teeth.

The European wild-cat, *Felis sylvestris*, extends to Asia Minor and will probably be represented in N. Persia, but is not likely to be found on the Mesopotamian plains.

15. HERPESTES PERSICUS, Gray.

1864. *Herpestes persicus*, Gray, P. Z. S., p. 554.

Persian Mongoose. Arabic Jeraydee ma'l Nakhala, or 'Abu al arrais'

1 ♀	Amara	Connor,	25-8-16.
2 ♂	"	Buxton,	21-12-17 & 1-12-17.
1	"	"	25-2-18 1918.
1 ♀	Busra	Shortridge,	12-1-17.
1	Baghdad	Ingoldby	Dec. 17.
1	Busra	Connor,	no date M 22 in al.
1	Busra	Wall	" " M 23
1	"	Christy	June 1918 in al.

This is the common mongoose of the Tigris, at least from Fao to Baghdad. The Arab children tame them easily and sell them as pets for a few annas. Connor remarks that his female from Amara had full grown young following her in August. The first Arabic name, literally, rat of the palm-tree, is misleading, and some men have seriously informed me that they live on dates. But the Arab is not accurate in his observations and seeing a mongoose in a palm tree probably led to this belief.

The type locality is Mohammerah and its range is given from there to Kuzistan. No specimen of a larger mongoose has been so far obtained, but in May 28, 1917, I chased but failed to secure, a large mongoose beyond the oil fields at Maidan-i-Naptun. This might have been an Indian species or even the Egyptian, *M. ichneumon*, which Kinnear points out may reach the country west of the Tigris.

16. HYÆNA HYÆNA, L.

1766. *Canis hyæna*, Linnæus, Syst. Nat. 1., p. 58.

The Striped Hyæna. Arabic Dhab'a.

1 Ur of the Chaldees.

Patiala Lancers.

Lt.-Col. Cox, 1/4 Som. L.I., told me he had seen a hyæna in the desert outside Makina near Busra in 1916, and chased it for some distance on a horse. Ludlow tells me that 4 miles N. of Feluja on the left bank of the Euphrates he rode and chased a hyæna to ground. The earth was in the side of a mound, self dug, with more than one entrance. Outside there was a large larder of Camel and donkey bones.

These, the only records I have of the hyæna are from the Euphrates.

It is probably met with on the Tigris as well, but will nowhere be plentiful. The desert tribes north-west of Baghdad seemed very vague as to its whereabouts or existence there. Sheikh Feisul ibn Saoud from Central Arabia was well acquainted with them and recognised them at once in the London Zoological Gardens.

The specimen from Ur has been compared with a recent series of *Hyæna hyæna* from India, and appears identical with the exception of being slightly paler. The type locality of the species is Bunder Abbas.

The range is Palestine, Persia, Trans-Caspia and India. Also North Africa.

17. CANIS PALLIPES, Sykes.

1831. *Canis pallipes*, Sykes, P. Z. S., p. 101.

Indian Wolf. Arabic 'Dhib.'

1	Shaiba	Livesey, June 1917.
1 ♂	Tanooma, Busra.	Christy, May 1918.

In addition to the skins sent, wolves have occasionally been seen and killed on the Tigris, their appearance is however rare and I have not heard of their being seen otherwise than singly or in pairs. The wolf sent by Christy was collected by Major R. W. Cooper, who shot it. He states it measured 26 inches and a bit to the shoulder. It had killed sheep from a wire pen several nights in succession at Tanooma.

On comparison with the series of *Canis lupus* and *Canis pallipes*, there is no doubt that the Mesopotamian wolf belongs to the latter species.

A skin and skull of *C. pallipes* was collected near Aden by Percival and Dodson in 1899 and in 1894 Col. Jayakar obtained a skin of *C. pallipes* from near Bunder Abbas, both are now in the British Museum.

Distribution.—Sind and throughout India. The type locality is Dekkan. The occurrence of this wolf in Mesopotamia is a link with those found in Arabia mentioned by Kinnear.

18. CANIS AUREUS, L.

1758. *Canis aureus*, Linnæus, Syst. Nat. 1, 10th ed., p. 40.

Jackal. Arabic Wow-wi.

1 ♂	Kut	Pitman, 13-1-17.
1 ♂	Shaiba	Livesey, Feb 1917.
1 ♂	Legait	" 5-4-17.
1	Mesopotamia	" 16-10-16.
4	Baghdad	Ingoldby, 18-1-18.
1 ♂	Shahroban	Connor, Jan. 1919.
1	"	Indian Museum (Connor), 5-5-19.
2 ♀	Amara	Buxton, 4-11-17 and 17-1-18.
1	Persian Gulf	Evans, 14-2-18.

The skins of Mesopotamian jackals are separable into two groups. Some agree with a series selected from the National collection from the direction of Bunder Abbas, the type locality from which Linnæus described *C. aureus*. Unfortunately the type itself is unknown. The skins in this series were from Bunder Abbas. Rae. 1911. Shush, near Dizful, Woosnam 1905—S. Arabia, Bury, 1902. Fao, Cumming, 1893, and Seistan, Kennion, 1910. These with the present collection from the lower Tigris and Euphrates may be described as bearing a ground colour of pale sandy to pale buff. The larger hairs are brown tipped with a few black tipped. The skin sent from Shaiba by Livesey is an exceptionally pale example, but the coat is old and the variation would be caused by the

fading effect of the Shaiba desert sun on an already pale specimen of *C. aureus*. These would therefore all be referable to *C. aureus aureus*. One of Ingoldby's specimens from Baghdad has no duplicates among any of these. The ground colour here is bright fox-red with black tips to the longer hairs in sufficient numbers over the loins to create the appearance of a black patch. This bright colouring is identical with several specimens from Khotz near Trebizond, and one from Greece. Here we have strong evidence of a dark race coming to Mesopotamia from Armenia and meeting the paler *C. aureus* from the Persian Gulf. At Sheikh Saad Garden in 1917 considerable raids were being made by jackals on the fields of melon and vegetable marrow grown for the troops. When the order was given for their destruction the men killed over sixty jackals in a few weeks.

Buxton remarks "abundant everywhere. Destroys broad beans by rolling in them in spring, trampling patches quite flat. Eats cucumbers. Litters of cubs, seen under bushes as soon as they can walk."

19. VULPES PERSICA, Blanf.

1875. *Vulpes persica*, Blanford, A. M. N. H., XVI., p. 310.
Persian Desert Fox. Arabic Huseinee.

- | | |
|-----------------------|----------------------|
| 1. Legait | Livesey, 20-4-17. |
| 4. Purchased at Busra | Shortridge, 26-2-16. |
| 1. Ahwaz | Ludlow, 4-7-17. |
| 1. Shatt-al-Adhaim | Pitman, Nov. 1917. |

These small foxes are grey on the sides merging into fox-red towards the centre of the back and on the legs and forehead. The throat and underparts contain portions of mauve grey.

Livesey's specimen from Legait is a very pale example with the forehead, flanks and brush almost silvery white, touched here and there with chestnut. The tips of the ears and centre of the neck and back are chestnut brown. This would seem to be a case of partial albinism, as there are cases of similar colouring among a series of *V. leucopus* from Sind.

The long brush becomes white tipped with age.

They are plentiful in the desert mounds formed by the ruins of the irrigation canals of the ancients. In these their earthen burrows are found, but they more often lie in the open. Their footmarks can be seen round the holes of Jerboas and Gerbills on which they largely prey. I once approached to within a few feet of one—intent on digging out these small rodents. The Arabs course them with greyhounds and sell the skins in the markets. These skins are often called 'bizzoon el chowl' which might be misleading as literally it means 'cat of the desert.'

This fox would appear from the specimens to hand to belong to the *leucopus* group, and there is little doubt it is Blanford's *V. persica*.

V. leucopus is found along the Sind, Punjab frontier, while Blanford gives the habitat of *V. persica* as Persia around Isfahan.

20. MARTES FOINA, Erxl.

1777. *Martes (Mustela) foina*, Erxleben, Syst. Regn. Anim. I, p. 458,
Beech Marten.

1. Push-ti-koh. Napier, July 1917.

The Beech Marten keeps to considerable elevations in the mountains and is not likely to be met with in the plains of Mesopotamia, but it contributes to the interest of the paper to include specimens obtained just over the Persian border. Unfortunately there is no skull and the skin has the appearance of a bazaar purchase which would account for the exact locality not being given.

There seems to be little known regarding the Martens in this region although they occur in the highlands of Asia Minor. Major St. John remarks "I am told that Marten skins are commonly sold at Ispahan, said to come from the Westward. But whether this means Asia or the forests of the Zagros I cannot say" (Blanford's Eastern Persia, II, p. 44). The Zagros is an old name for the Push-ti-koh. He assumes that these skins were *Martes abietum*, a synonym of *Martes martes*, the Pine Marten, a species which has a larger amount of white on the throat patch, but reliable identification rests on skull differences.

Martes foina has a range from central and southern continental Europe to Western Asia, also Afghanistan and the Himalayas.

21. MELLIVORA WILSONI, sp. nov.

Wilson's Ratel.

I ♀ Baksai, Tyb River, Iraq—Persian Frontier. Wilson, May 1914.

The material representing *Mellivora indica* in the British Museum is most meagre. On comparing the present specimen with what is available and with the series from Africa, I find that it shows a number of differences from both, which, though not great in themselves, are so constant that the erection for it of a new species seems justified.

For comparison below I have used a specimen obtained by the Mammal Survey of India from Bengal. The dimensions given in brackets are those of this specimen which unfortunately is a ♀.

MELLIVORA WILSONI, sp. nov.

A *Mellivora* having the mantle extending almost to the tip of the tail, as in *indica*, but the mantle showing a marked white border along the shoulders and flanks as in so many of the African forms.

Size rather smaller than *indica* (even allowing for the difference in sex of the two specimens compared) with a rather longer tail proportionately.

General colour black with a greyish-white mantle commencing from between the eyes (commencing rather behind the line of the eyes in *indica*) and extending over the entire back and upper side of the tail almost to its tip; bordered by a white band, about 20mm. wide, from the ears along the flanks. The individual hairs of the mantle are pure white to their bases, rather sparse and about 30—35mm. long. Everywhere these overlie a finer, shorter coat of brown hairs (except in the marginal border where they are absent) and these seen through the white hairs give the effect of grey colour to the mantle. On the marginal border the white hairs are closer set, and longer (40—45mm. on flanks), which with the absence of the underfur accounts for the contrast between the margin and the rest of the mantle. The claws are black.

Dimensions of the type.—Head and body, 595 mm. (705); tail, 175, (175); hindfoot, 100, (120); ear 19, (19 from dry skin). *Skull*.—Condylobasal length, 122, (133); palatilar length, 56, (55); interorbital breadth, 32, (28); breadth of brain case 58, (62); upper tooth row behind the canine, 27, (28); length of carnassial, 11.5, (13).

Hab.—S. W. Persia, the type from Ram Hormuz, alt. 500.

Type.—Adult ♀ B. M. No. 5,10-4-21. Original number 24. Collected 4th April 1905, by Mr. R. B. Woosnam and presented to the National Museum by Col. Bailward.

The specimen taken by Col. A. T. Wilson near Baksai, some distance further N. W. and sent for identification to the British Museum by the Bombay Natural History Society corresponds closely, in all essential characters with the description of *M. wilsoni* so far as the absence of the skull

allows me to judge. The pattern is quite the same. The general black body colour has rusted to a deep brown, except in the centre of the belly, while the pure white hairs on the mantle of the type are altered in this specimen to a creamy white. The claws are cream coloured. Dimensions of the Baksai specimen :—Head and body, 741mm ; tail, 191 ; hindfoot, 102. *Mellivora* from Aden have the mantle darker grey than *M. wilsoni* and the grey of the mantle extending only a short way down the upper surface of the tail, this is more characteristic of the African forms.

The Baksia specimen was caught in open desert, while that from Ram Hormuz was trapped at a hole in a bank among corn lands.

I have named this species in honour of Lieut.-Col. Sir A. T. Wilson. Owing to the absence of the skull it was found necessary to take Col. Bailward's specimen as type of the species.

22. LUTRA LUTRA, L.

The Common Otter.

1. Amara. Christy, June 1918. Obtained from an Arab.
Arabic "Keleb-al-mi"

This proves to be the common otter, *Lutra lutra*, as predicted by Kinneer.

Buxton says :—The marsh Arabs spear them by moonlight with a trident. So far otters have been most in evidence in the marshes in the lower reaches, but there is little doubt that they are found throughout the length of the larger rivers.

Distribution :—Miller gives the range of *Lutra lutra* as N. Africa, eastward into Asia, and westward in Europe to Ireland and north to the Arctic Coast.

23. JACULUS LOFTUSI, Blanf.

1875. *Dipus loftusi*, Blanford, A.M.N.H., XVI., p. 312.
Loftus Jerboa. Arabic Jerboor.

1 ♂	Busra, Cox-Cheesman,	12-10-18.
	"	21-10-18 skeleton and skull in al. M. 19.
1	"	28-10-18 in al. M. 1.

These are the size of a half grown rat.

The kangaroo like legs and thick fur below the feet, of three toes, are the chief characteristics noticed here. Colour of back isabelline, darker towards the tail and white below. The tail is isabelline with a tuft of dark hair ending in a white tip.

These two specimens were kindly given to me alive by Capt. Turner in June 1917 and lived sometime in the collection at Bombay. He obtained them from the line of the Busra-Nasariyeh Railway. During the heat of the day these animals would frequently fight in their cage, make an angry spitting noise like a rabbit when fighting and suddenly fall into a trance like sleep, from which they required a considerable shaking to awaken. They drank frequently, taking small sips in their forepaws. This is remarkable as their earths are often placed where both dew and water would be to all appearances unobtainable.

They usually remove the sand in front of their burrows by pushing it in front of them with their fore feet. For the excavation they adopt the more usual method, *i.e.*, backwards.

The Jerboas are considered eatable by Mahommedan law, the other small rodents are 'haraam' or forbidden.

Blanford gives a plate of this animal in his 'Eastern Persia,' ii., p. 75. In his description in 1875 he mentions that it is distinguished from its allies by its colour and proportion.

Distribution.—Persia and Mesopotamia. According to Trouessart Loftus obtained the type at Mohommerah.

24. *TATERA BAILWARDI*, Wroughton.

1906. *Tatera bailwardi*, Wroughton, A. M. N. H., Ser. 7, XVII., p. 498. Bailward's Gerbil. (Bundi Kir, Karun River)

6 ♂	Amara	Buxton, 22-11-17 to 12-10-18.
♂	Sinn Abtar Kut	Shortridge, 6-7-16.
1	Mesopotamia	Bagnall, 12-2-17.
1	Baghdad	Ingoldby, 18-12-17.
3 ♂	Akka Kuf	
	Baghdad ✓	Pitman, 27-7-17.
imm.	"	" 14-8-17.
3 ♂ 1 ♀	Sheikh Saad ✓	Cox-Cheesman, 24-2-17 to 5-3-17.
1 imm.	"	" 14-3-17.
1	Shahroban. ✓	Indian Museum (Connor), Jan. 1919.

In the Gerbil family the hind foot is long, but the hind legs are considerably shorter than in the Jerboas. This is the most numerous of the Gerbils so far met with on the Tigris at Baghdad and below. It is the size of a rat with large black eyes, soft sandy brown hair with rufous tinge and speckled with black-brown. Underparts white. The long tail is dark brown above and below and pale at the sides and well covered with hair. This tail marking distinguishes *Tatera* from all other Gerbils.

Buxton remarks that his specimens were taken with cheese and were common among lucerne patches.

Mine were flooded out of burrows made below freshly sown garden peas, on which they were probably feeding.

Distribution.—Lower Tigris, Euphrates and Karun rivers.

25. *TATERA PITMANI*, sp. nov.

Pitman's Gerbil.

1 ♀ Type. Baiji near Fatah Gorge, Tigris, Cox-Cheesman, 18-4-19.
1 ♂ " " " " " " " " " " " "

A larger species than *T. bailwardi* with less "rufous" on the back and flanks.

The chief distinction is the difference in proportions. The skull of *T. pitmani* being considerably the larger, while the feet of both are about the same size.

Upper surface of back sandy brown, well speckled towards the centre with black brown caused by the brown tips of the hairs. Base of hairs dark grey. A light area around the eye clearly defined, some of the hairs being white to their bases. Under surface white, the lateral line of demarcation not specially sharply defined.

Ears similar to back but darker. Hands and feet white, tail dark brown above and below, pale buff at the sides of the basal half of the tail, terminating in a dark brown tip with elongated hair.

Dimensions of the type.—Head and body 194 mm.; tail 184 mm.; hind foot 41 mm.; ear 29 mm.

Skull.—Greatest length 49.0 mm.; condylo incisive 45.0; zygomatic breadth 26; nasals 22; interorbital breadth 8; palatine foramina 9.8; upper molar series 7.2.

Hab.—The rocky soils and foothills of the Jebel Hamrin range on the N. Eastern boundary of the Iraq plain.

Type.—Adult female B. M. No. 19-12-24. 1. Original number 390. Collected by R. E. Cheesman at Baiji, Tigris, April 18, 1919. Another specimen from the same place.

The measurements of the male are:—head and body 203 mm, tail 194; hind foot 41; ear 26. The skull is also larger than that of the type, but was unfortunately incomplete.

The skull measurements are larger than those of the type of *Tatera persica* which is in turn as large or even larger than either *T. toeniura* or *T. indica*, according to Wroughton.

This Gerbil will be found to be akin to *Meriones toeniurus* described by Wagner in 1843. The measurements were those of a stuffed specimen, without skull, the type locality being given as Syria.

Wroughton when writing on the genus *Tatera* in 1906 (A. and N. M. H. ser. 7 XVII, p. 495) deduced that Wagner's description was too vague to indicate more than a large *Tatera*. Unfortunately there are no specimens from Syria in the National collection.

Of the specimens of *Tatera* obtained by Col. Bailward at Bundi Kir, Karun River, Wroughton identified two of the larger with *T. toeniura*. The average measurement in mm. was head and body 187; tail 197; hind foot 42; ear 29. Skull greatest length 47; length of upper molar series 7.

Three smaller specimens from the same collection and one from Loftus; from the same locality and one presented by the Euphrates Expedition, he describes under the name of *T. bailwardi*. The type, a male, measured head and back, 166 m.m.; tail 182; hind foot 41; ear 28; skull greatest length 44; upper molar series 6.5. Since the arrival of the present series of *Tatera* in the Mesopotamian collection we are able to form the opinion that *Tatera toeniura* does not extend across the desert from Syria to the North-Eastern boundary of Mesopotamia as we now have evidence that in the intervening country on the Lower Tigris and Euphrates the resident species is *T. bailwardi*, to which all *Tatera* obtained at Baghdad and below on the Tigris are referable. It appears safe to assume that the two specimens from Baiji belong to a hitherto undescribed species with a range on the rocky soils above the alluvial Iraq plain.

They inhabit burrows in patches of sandy soil in the vicinity of river banks. I have named this species in honour of Capt. C. R. S. Pitman.

26. GERBILLUS CHEESMANI, Thos.

1919. *Gerbillus cheesmani*, Thomas, J. B. N. H. S., Vol. XXVI, No. 3, p. 748.

Cheesman's Gerbil.

1♂. Type Lower Euphrates. Cox-Cheesman, 21-8-17.

This Gerbil was captured on the Busra-Nasariyeh Railway by Capt. Turner, who generously presented it to me. It was taken alive to Bombay. In general colour and size it resembles a brightly coloured dormouse. The edge of the pale chestnut of the back and the white of the underparts meeting in a clearly marked line along the side. The chestnut continues between the ears to a point towards the nose. The hair round the eyes being much lighter.

Mr. Oldfield Thomas has kindly named this after the writer.

27. DIPODILLUS DASYURUS, Wagn.

1842. *Dipodillus dasyurus*, Wagner, Arch. Naturg. i., p. 20.
Dasyurus Naked-soled Gerbil.

1♂	1♀	Baghdad	Buxton, 11 & 12-9-17.
3♂	1♀	Amara	„ 15-9-18 and 7-11-18.

These are small Gerbils about the size of dormice. The two from Baghdad are pale chestnut on the flanks, shaded to brown towards the centre of the back with underparts white. The tail is darker above than on the side or below. In the four from Amara the general colour of the back is browner than in those from Baghdad.

Buxton remarks from Baghdad "trapped on bare mud banks of the Tigris with bait of flour paste" and from Amara he says "apparently common in bare salt desert with a few bushes of *Sueda*." *Sueda monoica* is the common salt loving shrub. He also says "I kept a lot in captivity and they fed almost exclusively on the succulent leaves of this plant.

The burrows are not complicated having 3 or 4 entrances, all within 3 or 4 feet of each other.

The holes descend very steeply to about 12 to 18 inches below ground level.

When you attempt to dig out these animals they scratch their way out of the burrows, into the surrounding earth and definitely block the track they have excavated. If you follow the main burrow you dig past the occupants, which are lying up a few inches away in the soil."

In the present state of our knowledge of this genus it is not safe to go further than provisionally to place these under *D. dasyurus*.

Trouessart gives the distribution of *D. dasyurus* as Arabia, Red Sea and Oman.

28. MERIONES CHARON, Thos.

1919. *Meriones charon*, Thomas, A. M. N. H. Ser. 9, Vol. III, p. 269.

Karun Desert Gerbil.

1♂	2♀	Kazimain, Baghdad.	Cox-Cheesman, 18-1-19.
1	imm.	Beled, Tigris.	" " 21-10-18.

Another of the Gerbil family: slightly larger than the last.

These were living in earthen on the dry banks of irrigation channels among cornland and were trapped with a bait of cocoanut. I have extracted a few sentences from Thomas' description of *M. charon*. "Small, with terminally crested tail, general colour above finely speckled sandy buff, under surface white, tail dull buffy with an upper crest of black hairs."

These have been compared with a series of *Meriones erythrourus* from Shiraz and Kandahar, the reddish colour at the base of the tail is a character of *M. erythrourus* and missing in the Mesopotamian specimens, which also appear to belong to a smaller species.

To *Meriones charon* the resemblance is much closer. This species was found by Loftus on the mounds of Susa, and Woosman obtained the type at Ahwaz, Karun river. As none of the skulls of the Tigris specimens show adult formation, it has been considered advisable for the present to place them provisionally under *M. charon*.

29. RATTUS RATTUS, L.

1758. *Mus rattus*, Linnæus, Syst. Nat., 10th ed., p. 61.

Black Rat. Arabic 'jeraydee.'

N.B.—This name applies to all rats and most small rodents.

2♀		Kazimain, Baghdad.	Cox-Cheesman, 30-3-19.
1♀		Busra	Kilminster, 17-5-18.
1♂		"	Whitehead, 12-5-18.
1♂	1♀	Amara	Buxton, 6-11-17 & 27-11-17.
1♀		Busra	May, 22-5-18.
1♂		Amara	Indian Museum (Connor), Sep. 1916.

The long tail and small size should distinguish this species from the next. This rat is a tree loving species and is frequently seen passing from date tree to date tree by the fronds.

Buxton found it common in houses at Amara.

Hinton has dealt with the *Rattus* group recently in the Journal of the B. N. H. S. of Dec. 20, 1918, No. XVIII. Although many species and sub-species of the house rats have been separated under different names from time to time, in many cases he has been unable to distinguish them specifically.

As instances occur of the black rat being brown and the brown rat being black, I have asked Hinton to identify the *rattus* specimens from Mesopotamia and he has placed them in the two species given—that is *Rattus rattus* and *Rattus norvegicus*.

This rat originally came from India and spread westwards. In Mesopotamia it should be more or less in its original form. It was first taken to England by the Crusaders and also scattered about the world by shipping. Considerable changes of colour and habits have since taken place.

30. RATTUS NORVEGICUS, Berkenhout.

1769. *Mus norvegicus*, J. Berkenhout, Outlines Nat. Hist. Gt. Britain and Ireland. 1, p. 5.

Brown Rat.

2 ♂	2 ♀	Busra	May, 8-5-18 to 26-5-18.
	1 ♀	"	Whitehead, 4-5-18.
	1 ♂	"	Jenkins, 26-5-18.
	1 ♀	"	No name, 5-5-18.
	1 ♀	"	Collins, 13-5-18.

The large rat with tail shorter than length of head and body.

This rat originated from S. Russia in the region between the Caspian and Lake Baikal. It has spread like *Rattus rattus* by means of shipping, to all parts of the world and likewise dark and light forms have been evolved by change of environment.

It is interesting to note that no specimens were obtained higher than Busra.

31. NESOKIA BUXTONI, Thos.

1919. *Nesokia buxtoni*, Thomas, J. B. N.H.S., Vol. XXVI, No. 2, p. 422. Buxton's Mole Rat.

1 ♂		Amara	Buxton, 24-4-18.
4 ♂		"	" 31-3-18 to 30-9-18.
3 ♂		Kurna	" 17-5-18 to 17-7-18.
3 ♂		Lake Akkar, Kuf, Baghdad	Pitman, 27-7-17 to 18-8-17.
1		Sheikh Saad,	Ingoldby, 18-3-17.
2 ♂	1 ♀	"	Cox-Cheesman, 26-2-17 to 19-3-17.
	1 ♀	Nasariyeh	Indian Museum (Hodgart) January 1918.

The four skins from Sheikh Saad differ from the rest in the quality of the fur which lacks the inter-mixture of black stiff hairs and the coats are therefore softer in texture.

These mole rats somewhat resemble the English water vole in general appearance.

They may be recognised by the rather short tail, almost hairless, and the enormous length of the rodent teeth. Their hair is soft, golden brown on the back with long black hairs of coarser texture inter-mingled. The under parts are grey white.

Buxton remarks from Amara, they are common but very difficult to trap. He trapped one with cheese, but the rest of his specimens were shot at the mouth of the burrow. He adds: "during the spring floods, they excavate hard even by day light and come to the surface to throw out earth". I also found them difficult to trap and my specimens from Sheikh Saad garden were dug out of their holes by a gang from a Santali Labour Corps, who proved experts at catching them alive in their hands and were sorely disappointed that they were not allowed to eat them.

They live in colonies in holes in dry banks of canals. Their holes are always stopped at the entrance with loose earth. So anxious are they that the holes shall be closed, that I used to remove the loose earth. Very shortly a head would appear and the damage be immediately repaired.

The nearest ally in colour to *N. buxtoni* is *N. huttoni* from Kandahar, an illustration of which appears in Blanf. Eastern Persia ii, p. 61, a neighbouring species.

Nesokia bailwardi from S. Caspian is a dark wood brown.

Mr. Oldfield Thomas has named the Mesopotamian species after Capt. P. A. Buxton.

32. *MUS MUSCULUS GENTILIS*, Brants.

1827. *Mus gentilis*, Brants, Muizen, p. 126.

House Mouse. Arabic 'Fars.'

8 ♂	5 ♀	Amara	Buxton, 27-11-17 to 8-9-18.
1 ♂		Sinn Abtar, Kut	Shortridge, 5-7-16.
1		Busra	Cox-Cheesman, May 1916.
1 ♂		Twin Canals	" 15-11-16.
1 ♂	1 ♀	Sheikh Saad	Cox-Cheesman, 26-2-17 & 4-3-17.
	1 ♀	Busra	Kilminster, 22-5-18.
1 ♂	1 ♀	"	Whitehead, 15-5-18 & 20-5-18.
2 ♂	1 ♀	"	May, 27-5-18 & 28-5-18.
1		Amara	Wall, M. 10 in al.
1		"	Connor, M. 11 in al.
3		Busra	Christy, June 1918 in al.

These mice are found in the fields as well as in houses, and often turned up in tents in the most distant desert camps. Among the specimens received were several tending to a chestnut brown coloration on the back. The majority were brown.

Blanford obtained a specimen of *Mus bactrianus*, the Kandahar house mouse, from Shiraz and mentions that he expects that this will be the house mouse of S. Persia.

Mus musculus musculus of Linnæus, the common house mouse of Europe, although originating from Central Asia, has now been carried all over the world. Typical forms of this have recently been taken at Menjil, N. W. Persia, by Buxton.

Mus musculus gentilis, an Eastern form of the common house mouse is found in Egypt. A rough guide to these three forms is belly dark, with slate coloured bases, to hairs, *Mus. m. musculus*. Belly whitish, but with slate bases to hairs, *Mus. m. gentilis*. Belly white, with white bases to hairs, *Mus. bactrianus*. The tails of the Mesopotamian specimens from measurements in the flesh, average 76.5 m.m. which is eleven m.m shorter than a series recently collected by Hotson in Shiraz. Several Mesopotamian specimens have the pure white underparts of *M. bactrianus*.

33. ACANTHION, Species.

Porcupine. Arabic Necce or Da'alej.

1 ♂ 1 ♀. Bait-al, Khalifa, Samarra, Pitman, 1-2-18.

Pitman's two specimens are browner than either *Hystrix cristata* from Europe or *Acanthion leucura*, the common Indian porcupine. One of the Samarra skins had both hind feet white.

The porcupine is sparingly distributed among the rocky undulations and hills, but there is no record of its appearance on the plains. I have seen porcupine quills in the caves of the hills between Samarra and Tekrit on the right bank of the Tigris. On the mounds of Susa near the Kerkha river there was a well used earth of this animal with beaten tracks leading to it.

Blanford originally placed the Persian porcupine with *H. cristata*, but subsequently identified it with *H. leucura*.

The porcupines formerly called *Hystrix* are now divided into two genera. *Acanthion* which includes those from India, and *Hystrix*, comprising the African, as well as the porcupine found locally in the Mediterranean region of Europe.

Muller has lately published a paper S. B. Ges. Nat. Fr., Berlin, 1911, p. 110, describing six new sub-species of the Asiatic porcupines. It is not at present known how many of these will prove valid. As his paper covers the present area I have perforce to leave the species open.

34. LEPUS CONNORI, Robinson.

1918. *Lepus dayanus connori*, Robinson, Rec. Ind. Mus. XV, pt. 11, No. 6. Connor's Hare. Arabic "arneb".

7.		Hindiyeh Barrage, Euphrates	Pitman, 2-7-17 to 13-7-17
1 ♂	1 ♀	Kut	" 13-1-17
1		Shat-al-Adhaim	" 30-9-17
	1 ♀	Jilam plain, N. Samarra	" 4-2-18
	2	Frontier of Arabistan	Wilson
1 ♂		Feluja, Euphrates	Ludlow, 7-1-18
1 ♂		Hit	" 14-4-18
1		No locality	Arthur, 1919.
1 ♂	2 ♀	Amara	Buxton, 27-1-18 & 11-2-18.
2 ♂		Kumait, Tigris	" 28-2-18.
	1 ♀	Shahroban	Connor, Jan. 1919.
1		Twin canals	Graham, 28-11-16.

The Iraq hare is inseparable from specimens obtained by Woosnam on the Karun river at Bundi Kir.

Robinson in 1918, described a hare obtained between Ahwaz and Mahammerah by Connor. To this it would seem the present species should be referred.

There are two distinct phases of colour in the present series ranging from a ground colour of grey to that of rufus. Even the grey individuals show a tinge of rufus on the flanks, throat and nape of the neck.

I have not been able to discover any constant difference in the skulls, nor do the dates give an explanation that the two phases are due to seasonal change of coat. It must therefore be assumed that these are merely colour variations.

Ludlow's specimen from Hit has features distinct from the rest. It is small with a golden buff ground colour. The tips of the hairs are silvery buff. Black tips and centres to the hairs do not enter into the colour composition of the back as it does in all the rest.

The size may be due to its being a leveret, but there is no skull to decide this.

The arrival of more specimens of this little golden hare from Hit will be awaited with interest.

The examples obtained on the Tigris have been compared with Palestine and Arabian species. All and the Samarra specimen in particular, bear a strong resemblance to a series from the Dead Sea. A series of six *L. craspedotis*, the Beluch hare lately arrived from Hotson in Persian Beluchistan was compared with five Tigris hares from Buxton.

The average head and back measurements taken in m.m. in the flesh were *L. connori* 472 m.m. against *L. craspedotis* 411 mm. Ear measurement *L. connori* 105 m.m. against *L. craspedotis* 123.3 m.m. The Tigris hare is therefore a large bodied, slightly rufus hare with small ears; while *L. craspedotis* is a small bodied grey hare with very long ears.

Lepus connori differs from *L. dayanus*, a Sind species in three distinct features. The hair of *L. connori* is long and soft, the upper part of the tail is black and the nape of the neck fox red. *L. dayanus* has short hair of coarser texture. The upper part of the tail is sandy brown and the nape of the neck grey. The comparison of a series of both brings conviction that the Iraq hare is worthy of specific rank and should not be associated with *L. dayanus*. From this it is also geographically separated by a very distinct hare *L. craspedotis* as we have seen.

The range of *L. connori* is at present the lands of the Lower Karun, Tigris and Euphrates rivers.

35. GAZELLA MARICA, Thos.

1897. *Gazella marica*, Thomas, A.M.N.H. Ser. 6, Vol. XIX, p. 162.

The Marica Gazelle. Arabic 'gazaal' and 'Dhabi.'

1 ♂	2 ♀	Busra	Dep. Civil Commissioner, 28-3-18 to 16-12-18. Died in Victoria Garden, Bombay.
1		Nasariyeh	Livesey, 4-7-17 skin without mask or skull.
1 ♂	1 ♀	Shushtar	Bailey, skulls.
1 ♂		Ahwaz	Ludlow, 3-7-17, skull.
1 imm.		Amara	Buxton, spring, 1918. Skin.

The gazelles have taken more time than any other group of animals in the collection. Partly because the whole position of the Gazelle family, especially in this area, is in need of expert revision. Little reliance can be placed on previous works on the subject as the series on which they are based are small.

Perhaps it will be more helpful in this paper to note briefly the chief features of the geographically neighbouring species with which the Mesopotamian skins have been compared, and the conclusions arrived at.

Any of the species mentioned may occur in Mesopotamia.

The species compared were:—*G. arabica*, *G. subgutturosa* and *G. marica*.

The Arabian gazelle, *G. arabica*. This is a small race, the forehead and nose are bright chestnut. Females horned. Inhabits the deserts of Oman N. of Aden and Western Arabia.

The lower Mesopotamian gazelle lacks the chestnut on the head and has indistinct brown face streaks with a tendency to whiteness increasing with age. It is also larger.

The Persian gazelle, *G. subgutturosa*. These were long coated, with distinctly brown coloration. The forehead was brown, in some specimens white hairs were intermixed.

An extract from a description of *G. subgutturosa* by Lyddeker and Blaine is, males with a goitre like swelling in the throat during the rutting season, color dark sandy faun in summer. In winter much paler. An indistinct dark flank band. Face markings indistinct, the median dark stripe fading into white with age. Females without horns.

It has a range in Persia and Afghanistan, at elevations of 3,000 to 7,000 ft.

The specimens under review differ from these, being shorter in the coat. The color of the Busra skins is sandy with a tendency to pinkish, the legs are almost white, while those of the Persian gazelle are reddish brown and we have a horned female from Major Bailey at Shushter and also from the Deputy Civil Commissioner, Busra.

The description of *G. marica* by the same authors is a pale coloured desert form with white forehead, fawn face streaks nearly obsolete, ears, long-whitish fawn on backs, pale flank bands nearly obsolete. Females with horns.

Range—desert tract from Nejd to W. Oman.

The specimens from lower Mesopotamia include a complete skin, skull and mask of a beautiful adult male from the Deputy Civil Commissioner at Busra. The skin in all particulars, especially in the white nose and forehead, closely resembles the type of *G. marica* in the National collection. The horns of this type are those of a younger animal and are in consequence much smaller. The male skull and horns from Shushter resemble the Busra head. The female from the same locality is that of an adult and is horned. The young male from Ahwaz has horns identical with those of the type of *G. marica*.

The skin from Nasariyeh is much paler than the Busra colouring, but may be young.

These particulars in addition to the resemblance of the Busra skin to this type, have led me to place the lower Mesopotamian gazelle with *G. marica* for the present.

36. GAZELLA, Spec.

4 ♂	2 ♀	Samarra	Pitman, skulls
2 ♂	2 ♀	"	" 13-1-18 masks.
6		Mesopotamia	" 13-3-18 masks.

The heads obtained in Samarra are those of a smaller gazelle than those from lower Mesopotamia. The horns are lyrate in form and of a lighter build. Unfortunately no skins accompanied them. There are two skulls with perfect horns of old males. Two are those of adult females and are without even rudiments of horns. The four masks from Samarra have brown face streaks with a tendency to grizzled white. The six masks marked Mesopotamia, are nearly all white. The whiteness of the heads of gazelles seem on the plains around Tekrit and Samarra and of masks obtained in this neighbourhood and examined by the writer in Mesopotamia has always appeared remarkable. In addition to the neighbouring species previously mentioned under *G. marica* I have compared these with *G. dorcas*, *G. muscatensis*, *G. benneitii* and *G. gazella*.

The Dorcas gazelle, *G. dorcas*, has bright chestnut on forehead and nose, general colour dark-red fawn extending down the legs with a pronounced dark flank band. Female horned. Habitat given in "The Book of the Antelopes." Sclater and Thomas as Tripoli, Morocco through Egypt and Syria.

The Muscat gazelle, *G. muscatensis*, is much the same in size and colouring. Female horned, A resident of Oman Eastern Arabia.

The Indian gazelle, *G. bennetti*—the Chinkara—the horns are short and not lyrate. Female horned. *Habitat*.—From India through Baluchistan and to the shores of the Persian Gulf.

Palestine gazelle. *G. gazella*—bright chestnut on forehead and nose. *Habitat* Syria.

In all these the bright chestnut on the nose and forehead is quite distinct from the facial colouring of the Samarra masks.

The horns of the Samarra gazelle are more delicate than any now in the National collection and I am of opinion that it will prove a new species of which the Females are hornless. In this Mr. Oldfield Thomas agrees. As it will probably be allied to *G. subgutturosa*, the goitre like swelling on the throat of the males during the rutting season, should be looked for and noted. It would also be of value to know if the hornless females from Samarra and the horned females from lower Mesopotamia are constant features.

37. OVIS LARISTANICA, Nas.

1909. *Ovis laristanica*, Nasanov, Bull. Ac. Sci. St. Petersb. p. 1179,

Laristan Red Sheep.

1 ♂ imm. Baktyari, W. Persia. Scott, June 29, 1911.

1 ♂ imm. no locality. . Arthur. Reed, Bombay, 31-3-19

This material is insufficient for any but provisional conclusions.

The nearest described species of wild sheep are *Ovis orientalis isphahanica*, Nasanov, type locality Ispahan, and *Ovis laristanica*, Nasanov, type locality Laristan, S. Persia.

There are no specimens of either in the National collection. Lydekker in his "Catalogue of Ungulate Mammals," Vol. 1, p. 83, 1913, provisionally allows the Laristan sheep specific rank.

I have had the advantage of seeing an excellent series recently collected by Hotson in Baluchistan and Shiraz, which has been sent to the British Museum for identification, by the Bombay Natural History Society. This, in my opinion, links the Red Sheep of the Push-ti-koh with that of Afghanistan, the type locality of the Afghan Urial, *Ovis vignei cycloceros*, with which the specimens from Baluchistan and Shiraz agree.

The difference between the two groups, *Ovis orientalis* and *Ovis vignei*, are well marked in typical adult specimens. *O. orientalis*, Red Sheep, has hornless females and the curve of the horn of the male if continued from the end points over the shoulder. In *O. vignei*, the Urial, the females have small horns and the horn of the male curves forward, the point being in front of the eye. The subspecies of both are separated chiefly on size, and geographically.

The *Ovis orientalis* group, type locality Cyprus, extends through Asia Minor and Transcaucasia to Persia. A subspecies on the Elburz Mountains has been named *O. o. erskinei*.

The *Ovis vignei* group, type locality Astor near Gilgit, extends through the Salt Range, Punjab, to Afghanistan, where we have the subspecies *O. v. cycloceros* to which the specimen from Baluchistan and Shiraz are at present referred, as they have the typical horn of the *vignei* group and the females are horned.

It seems unlikely that in face of the facts revealed by Hotson's specimens that a subspecies of the group with hornless females should crop up at Ispahan, therefore Nasanov's *Ovis orientalis isphahanica* should be accepted with caution until a confirmatory series of specimens is forthcoming from that locality.

Blanford, in "Eastern Persia", quotes Major St. John:—"I believe, myself, that it will be found that *O. gmelini* is confined to the Elburz and that *O. cycloceros* extends from Baluchistan to Mesopotamia". As *O. gmelini* belongs to the *orientalis* group and *O. cycloceros* to the *vignei* group this quotation seems about to be proved prophetic.

Specimens from Budjnurd near the Persian-Turkestan Frontier are of the larger forms of the *vignei* group, and are referred to *O. v. arkar*, a subspecies from the Ust-Urt plateau, Transcaspia.

38. CAPRA AEGAGRUS BLYTHI, Lyd.

1898. *Capra aegagrus blythi*, Lydekker. Wild Oxen, Sheep, and Goats, p. 264. Sind Wild Goat.
♀ 1. Shushtar. . W. Persia. . Bailey, Reed, Bombay, 23-2-18 (skin without skull).

As the only specimen is a female without skull, I have been obliged to assume the probability of the Push-ti-koh wild goats being the same as those recently sent by Hotson from Shiraz, in order to give even an approximate classification.

Capra aegagrus blythi is a smaller subspecies than that found in the Caucasus and Asia Minor, viz., *Capra egagrus egagrus*, and has a slighter development or even absence of the knobs on the front edge of the horns and this latter is also sharper in *C. æ. blythi*.

The type locality of *Capra egagrus blythi* is Sind and since the arrival of Hotson's specimens its known range can be extended to Baluchistan and Shiraz.

A LIST OF SNAKES FROM MESOPOTAMIA.

COLLECTED BY MEMBERS OF THE MESOPOTAMIAN EXPEDITIONARY
FORCE, 1915 TO 1919.

BY

G. A. BOULENGER, LL.D., D.Sc., F.R.S.

WITH FIELD NOTES BY CAPT. C. M. INGOLDBY.

TYPHLOPIDÆ.

1. *Typhlops braminus*, Daud.

Basra (Lieut.-Col. F. Wall).

Habitat: Southern Asia; Islands of the Indian Ocean; South Africa; Mexico (probably transported by human agency).

GLAUCONIIDÆ.

2. *Glauconia macrorhynchus*, Jan.

Faleya, Euphrates (Capt. H. T. Mackenzie).

Habitat: Algerian Sahara, Nubia, Mesopotamia, Persia.

BOIDÆ.

3. *Eryx jaculus*, L.

Basra and Sheik Saad (Lt.-Col. F. Wall); Amara (Capt. P. A. Buxton); Shaiba (Lt. T. Livesey); Basra (Capt. C. R. Pitman); Bagdad (Capt. C. M. Ingoldby); Mesopotamia (Maj. Fitzgerald).

Habitat: North Africa, S. W. Asia, S. E. Europe.

Very common along the Tigris within a mile or so of the river especially near villages. Excepting *Trop. tessellatus*, the most commonly killed snake owing to his frequent appearance above ground in daylight and his sluggish movements. The largest I have measured was 2 feet 5¼ ins. in length.—C.M.I.

COLUBRIDÆ.

4. *Tropidonotus tessellatus*, Laur.

Basra (Lt.-Col. F. Wall, Lt.-Col. F. P. Connor); Quelat Saleh below Amara, Sheik Saad, Haquicole on Euphrates near Hamar Lake (Capt. C. M. Ingoldby); Faleya (Capt. Mackenzie); Zobeya (Capt. Pitman); Basra (Maj. C. Christy).

Numerous specimens, nearly all with a single upper labial shield (the fourth) entering the eye.

Habitat: Europe and Asia as far East as the extreme West of China and the extreme North-West of India, Asia Minor, Transcaucasia, Persia, Mesopotamia, Syria and neighbouring parts of Sinai and Egypt.

Abundant wherever there is water. Major F. E. W. Venning who collected the specimens from the Hamar Lake, on the Euphrates, has told me that on warm days the shallow water edging the lake appears to be writhing with them.—C.M.I.

5. *Zamenis gemonensis*, Laur, var. *asianus*, Boettg.

Basra, Amara, Bagdad, Haquicole (Lt.-Col. F. Wall); Faleya (Capt. Mackenzie); Basra (Maj. C. Christy).

Habitat: This form is known from Asia Minor, Rhodes, Cyprus, Syria and Persia.

This exceedingly handsome snake is found almost exclusively in the palm groves edging the rivers. It does not appear to acquire its pure black coloration until over 4 feet in length.

It is a swiftly moving creature, climbing palm trees with ease and biting with accuracy and animus when handled.

I have found lizard remains in the stomach of one; the usual diet however is certainly snakes. Near Bagdad, the only place where I had the opportunity of observing them in any numbers, the victim in the great majority of cases was *Tarbophis iberus*. One specimen kept in captivity for several weeks ate voraciously any small snake offered (usually *Zam. dahlia* or *Zam. ventrimaculatus*) eventually dying as a result of attempting to swallow too large a specimen of the latter. They are thirsty creatures drinking often and copiously from a saucer, occasionally immersing the whole mouth in the process—C. M. I.

6. *Zamenis dahlia*, Fitz.

Bagdad (Capt. Ingoldby).

Habitat: S. E. Europe, Asia Minor, Transcaucasia, N.-W. Persia Cyprus, Syria.

This most slender and beautiful snake is common in the palm groves, frequenting the young thorny palm bushes where it can feed in reasonable safety. Its food seems to be chiefly insects, occasionally small lizards.

Active in day-time only. All specimens refused food in captivity—C.M.I.

7. *Zamenis ventrimaculatus*, Gray.

Basra, Twin Canals at Sheik Saada, Esra's Tomb between Quarrah and Amara (Lt.-Col. Wall); Shaiba (Lt. Livesey); Faleya (Capt. Mackenzie); Zobeya (Capt. Pitman); Bagdad (Capt. Ingoldby); Samash (Maj. Lane); Baquba, N.-E. of Bagdad (E. W. E. Wouterz); Sheik Saad (Sir P. Z. Cox), Basra (Maj. C. Christy).

Habitat: From the Euphrates to Kashmir and N.-W. India.

An active snake, most frequently met with on the desert at considerable distances from water. The colour harmonises perfectly with the baked earth of its surroundings—C.M.I.

8. *Zamenis diadema*, Schlg.

Basra, Bagdad, Twin Canals at Sheik Saad (Lt.-Col. Wall); Shaiba (Lt. Livesey); Faleya (Capt. Mackenzie); Zobeya (Capt. Pitman); Nasiryah (Lt. Livesey); Baquba (E. W. E. Wouterz); Daur (Capt. W. M. Logan Home).

Habitat: From the Sahara and Arabia to Kashmir and N. W. India.

Very common throughout at any rate lower Mesopotamia. The markings of the young persist in adult life—C.M.I.

9. *Lytorhynchus diadema*, D. and B.

Shaiba (Lt. Livesey); Faleya (Capt. Mackenzie); Awaz (Capt. E. S. Hearn).

Habitat: From the Algerian Sahara to Arabia, Syria and Persia.

10. *Contia collaris*, Mén.

Bagdad (Lt.-Col. Wall).

Habitat: Caucasus, Mesopotamia, Persia. A specimen from Muscat is preserved in the Collection of the Bombay Natural History Society. I now regard *C. modesta*, Mart. with the scales in 17 rows, as a distinct species.

11. *Contia coronella*, Schlg.

Shaiba, Zobeya (Lt. Livesey); Faleya (Capt. Mackenzie).

Habitat: Was known from Syria and S. W. Persia.

12. *Tarbophis iberus*, Eichw.

Bagdad (Capt. Ingoldby): Mesopotamia (Capt. Mackenzie).

The 6 specimens in the collection have the scales in 21 rows, as in Wall's *T. tessellatus* (J. Bomb. N. H. Soc. XVIII, 1908, p. 802) from S. W. Persia, of which I have examined the type and which I cannot separate from *T. iberus**

Habitat: Caucasus, Mesopotamia, S. W. Persia.

Moves chiefly by night. Usually extremely sluggish and placid, allowing itself to be picked up and handled without protest. One which I had kept in a small box for two days before transfer to a cage was on removal exceedingly aggressive, hissing and biting vigorously. The largest I found was coiled in a bunch of dates, at midday, on the top of a tall palm.—C.M.I.

13. *Cælopetis monspessulana*, Herm.

Bagdad (Lt.-Col. Wall, Capt. Ingoldby).

Habitat: Borders of the Mediterranean, eastwards to the Caucasus and Persia.

Fairly common near Bagdad whenever vegetation is fairly dense.

Lives in holes, usually at the roots of bushes or palms. Most active at night, but not infrequently seen moving in the shade by day, during the great heat. Markings pretty constant, ground colour varying from bluish gray to dark olive brown in specimens of equal size—C.M.I.

14. *Cælope litis moilensis*, Reuss.

Sodom, Sheik Saad (Capt. Ingoldby); Shaiba (Lt. Livesey).

Habitat: Northern Sahara, from Algeria to Egypt and Nubia, Arabia, Western Persia.

One specimen sent me by Capt. Cheesman from Sodom near Sheikh Saad. The skin between the dorsal scales is orange or bright brick-red colour. On being disturbed the creature dilates its neck somewhat, producing a striking appearance of a vivid flush as if the neck were aglow—C.M.I.

15. *Psammophis schokari*, Forsk.

Basra (Lt.-Col. Wall); Shaiba (Lt. Livesey).

Habitat: Borders of the Sahara, Arabia, Syria, Persia, Baluchistan, Afghanistan, Sind.

16. *Naia morgani*, Mocquard.

Shaiba (Lt. Livesey); Mesopotamia (Capt. Mackenzie).

Habitat: Previously known from Persia.

When Wall's description of *Atractaspis wilsoni* appeared in this Journal (XVIII, 1908, p. 804, fig.). I concluded that his snake was identical with Mocquard's *Naia morgani* (Bull. Mus. Paris, 1905, p. 78), and I entered it in my notes as a synonym of that species, a conclusion fully confirmed by a comparison with Wall's type specimen kindly entrusted to me by Mr. Kinnear. *Naia morgani* is well characterized by its larger rostral, the internasals separated from the præfrontals, the parietals bordered on the outer side by 3 or 4 temporals, and the entire anal. The Mesopotamian specimens have 23 scales across the neck and 21 across the body. Uniform blackish brown, a little paler beneath.

Wall's *Melanoseps macphersoni* (Journ. Bomb. N. H. Soc. XVII, 1906, p. 27, fig.), from the Aden Hinterland, is a synonym of my *Atractaspis andersonii* (Ann. and Mag. N. H. XVI, 1905, p. 180).

* *Typhlops wilsoni*, described as new in the same paper, is, in my opinion, a synonym of *T. vermicularis*, Merr.

VIPERIDÆ.

17. *Vipera lebetina*, L.

Bagdad (Lt.-Col. Wall); Aushuru (Lt.-Col. H. D. Piele).

Habitat: Morocco, Algeria, Tunisia, Cyclades, Cyprus, and South Western Asia from Syria and Asia Minor to Baluchistan, Afghanistan and Kashmir.

18. *Cerastes cornutus*, L.

Basra (Lt.-Col. Wall); Shaiba (Lt. Livesey).

All the specimens, six in number, lack the horn-like scale above the eye whence the species derives its name and which is more frequently present than absent in North African individuals.

Habitat: Borders of the Sahara, Arabia and Palestine. Had not been previously recorded from Mesopotamia.

A LIST OF LIZARDS FROM MESOPOTAMIA.

COLLECTED BY MEMBERS OF THE MESOPOTAMIAN EXPEDITIONARY
FORCE, 1915 TO 1919.

BY

G. A. BOULENGER, LL.D., D.SC., F.R.S.

The following is an enumeration of the Lizards sent to the Bombay Natural History Society's Museum during the Mesopotamia Expedition which Mr. Kinnear has entrusted to me for identification. I have also referred to the specimens presented to the British Museum by Capt. P. A. Buxton, Major C. Christy, and Capt. C. L. Boulenger:—

GECKONIDÆ.

1. *Ceramodactylus doricæ*, Blanf.
Zobeya, Lower Mesopotamia (Capt. F. C. Fraser).
Habitat: Arabia, Mesopotamia, Persia.
2. *Gymnodactylus scaber*, Rüpp.
Amara (Capt. P. A. Buxton), Basra (Lt.-Col. F. Wall).
Habitat: Egypt, Arabia, Mesopotamia, Persia, Afghanistan, Sind.
3. *Hemidactylus flaviridis*, Rüpp. (*coctæi*, D. and B.)
Basra (Lt.-Col. F. Wall, Lt.-Col. F. P. Connor).
Habitat: Coasts of the Red Sea and of the Persian Gulf, Socotra, Mekran Coast, India, Burma.

EUBLEPHARIDÆ.

4. *Eublepharis macularius*, Blyth.
Mesopotamia (Capt. H. T. Mackenzie).
Habitat: Mesopotamia, Persia, Transcaucasia, Baluchistan, Punjab, Sind.

AGAMIDÆ.

5. *Agama persica*, Blanf.
Euphrates Barrage (Capt. C. R. Pitman), Faleya, Euphrates (Capt. F. W. Mackenzie), Bagdad (Capt. R. W. Hingston), Amara (Lt.-Col. F. P. Connor), Zobeya (Capt. F. C. Fraser).
Habitat: Mesopotamia, Persia.
6. *Agama ruderata*, Oliv.
Faleya (Capt. H. L. Mackenzie), Amara (Lt.-Col. F. P. Connor), Zobeya (Capt. F. C. Fraser, Lt. T. R. Livesey), Basra (Lt.-Col. F. P. Dickinson, Maj. E. H. Martin).
Habitat: Asia Minor, Syria, Arabia, Mesopotamia, Persia, Sind. Also Egypt and Nubia. *A. pallida*, Reuss, should be regarded as a variety of this species, as some of the specimens from Mesopotamia tend to show.
7. *Agama nupta*, De Fil.
Mesopotamia (Capt. H. T. Mackenzie).
Habitat: Mesopotamia, Persia, Baluchistan.
8. *Phryncephalus maculatus*, Anders.
Zobeya (Capt. F. C. Fraser).
Habitat: Mesopotamia, Persia, Baluchistan, Afghanistan.
9. *Uromastix microlepis*, Blanf.
Zobeya (Lt. T. R. Livesey), Mesopotamia (Lt.-Col. F. P. Connor).
Habitat: Head of the Persian Gulf.

VARANIDÆ.

10. *Varanus griseus*, Daud.

Nasariyeh (Capt. C. R. Pitman) Mesopotamia (Lt.-Col. F. P. Connor).

Habitat : North Africa, South-Western Asia from Arabia and the Caspian Sea to North-Western India.

AMPHISBÆNIDÆ.

21. *Pachycalamus zarudnyi*, Nik.

Shaiba Lezait (Lt. T. R. Livesey).

Originally described from Western Persia, under the name of *Diplometopon zarudnyi*, Nikolsky, Ann. Mus. Zool. St. Petersb. X. 1906, p. 68. A specimen from the Island of Manama, Persian Gulf, was presented to the British Museum by Dr. G. K. Monami in 1910.

LACERTIDÆ.

12. *Acanthodactylus boskianus*, Daud.Var. *asper*, Aud.

Basra (Maj. C. Christy).

Var. *euphraticus*, Blgr.

Ramadieh, Euphrates (Capt. C. L. Boulenger).

An interesting new form, described by me in the Annals and Magazine, Nat. Hist. (9) iii. 1919, p. 549.

Habitat : North Africa, Arabia, Syria. Had not been recorded from Mesopotamia before.13. *Acanthodactylus scutellatus*, Aud.

Basra (Maj. C. Christy).

Habitat : North Africa, Senegambia, Arabia, Syria. First record for Mesopotamia.14. *Acanthodactylus fraseri*, Blgr.

A new species, discovered by Capt. F. C. Fraser at Zobeya and described in this Journal, XXV. 1918, p. 373.

15. *Eremias brevirostris*, Bland.

Faleya (Capt. F. W. Mackenzie), Zobeya (Lt. T. R. Livesey), Ramadieh and Desert of Tel Jebarrah (Capt. C. L. Boulenger).

The types of this species are from Karabagh in the Punjab and Tum Island in the Persian Gulf. The lizard has since been found in Persia near Bushire and in Syria (*E. bernoullii*, Schenkel), and I refer to the same species one of the specimens from Dasht in Baluchistan included by Blandford under his *Mesalina pardalis*.16. *Ophiops elegans*, Men.Var. *ehrenbergii*, Wieg.

Ramadieh, Euphrates, (Capt. C. L. Boulenger).

Var. *persicus*, Blgr.

Sharoban, N.-E. of Bagdad (Capt. C. L. Boulenger).

Var. *mizolepis*, Stol.

Euphrates at Suk esh Shuyak and on road from Felujah to Ramadieh (Capt. C. L. Boulenger).

Amara (Capt. P. A. Buxton), Basra (Lt.-Col. F. Wall).

The range of this lizard extends from Constantinople and Tripoli to N.-W. India. The var. *mizolepis* was originally described from the low country S.-W. of Karabagh, on the Indus, and was found at Basra by Blandford; specimens from Haifa in Palestine also appear to be referable to it.

SCINCIDÆ.

17. *Mabuia vittata*, Oliv.

Amara (Capt. P. A. Buxton), Mesopotamia (Capt. C. R. Pitman).

Habitat: Algeria, Tunisia, Lower Egypt, Syria, Cyprus, Asia Minor, Mesopotamia.

18. *Mubuia septemcœniata*, Reuss.

Amara (Lt.-Col. Connor, Capt. P. A. Buxton), Basra (Lt.-Col. F. Wall, Lt.-Col. F. P. Connor), Ramadieh, Euphrates (Capt. C. L. Boulengere).

Habitat: Erytrea, Arabia, Syria, Asia Minor, Transcaspia, Mesopotamia, Persia, Sind.

19. *Ablepharus brandti*, Strauch.

Amara (Capt. P. A. Buxton), Basra and Suks-esh-Shuyek, Euphrates (Capt. Boulenger).

Habitat: Bokhara, Samarkand, Mesopotamia, Persia, Baluchistan, Punjab, Sind.

20. *Eumeces schneideri*, Daud.

Mesopotamia (Capt. H. T. Mackenzie).

Habitat: Tunisia, Egypt, Syria, Cyprus, Asia Minor, Transcaspia, Mesopotamia, Persia, Baluchistan.

A NOTE ON THE SPECIES OF THE GENUS *MYCALESIS*
(*LEPIDOPTERA*), OCCURRING WITHIN INDIAN LIMITS.

(With four Plates.)

BY

LT.-COLONEL W. H. EVANS, R.E.

1. Having found it impossible to classify satisfactorily the species of the *Calysisme* and *Samanta* groups of the genus *Mycalesis*, I asked my friends to try and assemble some material for me. Led by the late Messrs. Hannynghton from Coorg and Ellis from Burma, by General Tytler from Manipur, Mr. Mackwood from Ceylon and followed by several others, my appeal met with a generous response and before the war I had accumulated a very considerable amount of material for investigation. I dissected the genitalia of about 400 males and had prepared the accompanying plates showing venation, primary and secondary sexual characters. Unfortunately the war broke off my investigations and it has been a little difficult to pick up the threads again after an interval of 5½ years.

2. Up to the present the so-called genus *Mycalesis* contains the following "genera" or "sub-genera" and species described from Indian limits; the first named species is the "type" in each case.

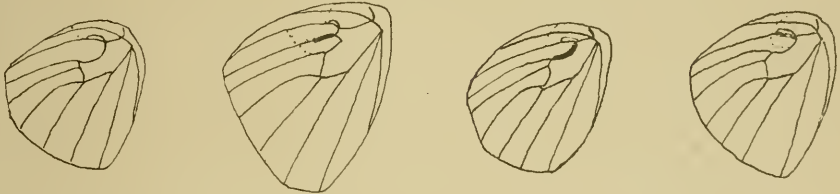
- (1) *Virapa*; *anaxias*; *adamsoni*.
- (2) *Samundra*; *anaxioides*.
- (3) *Gareris*; *sanatana*.
- (4) *Sadarga*; *gotama*.
- (5) *Suralaya*; *orseis*.
- (6) *Mydosama*; *fuscum*.
- (7) *Calysisme*; *mineus*; *perseus*; *perseoïdes*; *subdita*; *visala*; *rama*; *evansii*.
- (8) *Myrtilus*; *mystes*.
- (9) *Telinga*; *adolphei*; *oculus*.
- (10) *Culapa*; *mnasicles*.
- (11) *Pachama*; *mestra*; *suavolens*.
- (12) *Samanta*; *malsara*; *watsoni*; *nicotia*; *misenus*; *heri*.
- (13) *Kabanda*; *malsarida*.
- (14) *Nissanga*; *patnia*.
- (15) *Loesa*; *oroatis*.

Except that the 3 last named species under *Samanta* appertain rather to *Pachama*, the above groups, which are based on the venation and the secondary sexual characters, form a very natural arrangement. I think, however, that the employment of subgenera is now generally considered undesirable. For the purpose of classifying the species in the genus, the first step needed is a careful analysis of all the features at all stages; the next step is the arrangement of the species in as natural an order as is possible; the final step is the production of a key, whereby the species fall into certain groups, which can be designated by letters, numbers or Latin or English names. We all realise that any linear arrangement is bound to be unsatisfactory, as it is opposed to the whole system of evolution, but it is the only thing to be done. I consider that all the species mentioned above should be included under one genus, which may be called *Mycalesis* for the present, though eventually this name will have to be restricted to the African species with naked eyes and *culapa* used for the hairy-eyed Asiatic species. The genus *Orsotriena* has sometimes been included under *Mycalesis*, but its smooth eyes, venation, primary and secondary sexual characters, as well as its facies, entitled it to full generic rank, which Bingham very rightly accorded it.

3. The results of my investigations are embodied in the key at the end, where the outstanding features of each species and race are summarised. Most of these



(Vivipa) anaxias, ♂. (Samundra) anaxoides, ♂. (Sadurga) charaka ♂. (Garevis) sanātana, ♂.



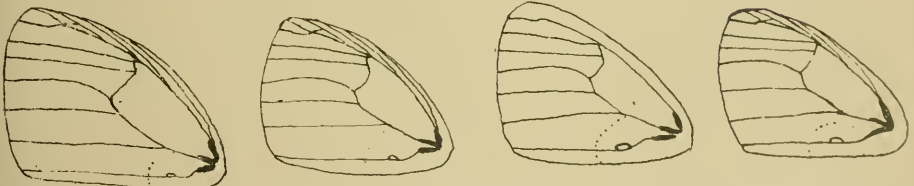
anaxias ♀

charaka ♀

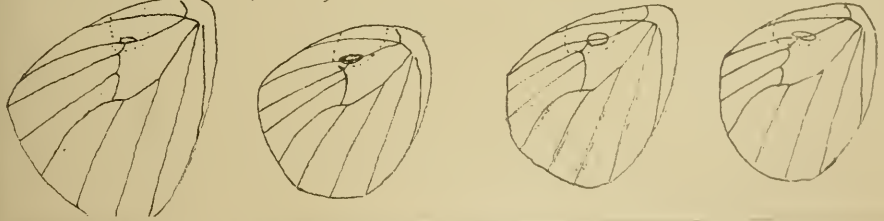
sanātana ♀



(Suralaya) orseis, ♂. (Calysime) khasia, ♂. (Telinga) oculus, ♂.



(Pachama) mesura, ♂. (Pachama) suvolens, ♂. (Samanta) nicatia, ♂. (Samanta) misenus, ♂.



features have been dealt with by other authors and the only point that I wish to draw attention to is the correlation between certain of the secondary sexual characters.

A—Forewing below a nacreous patch of variable size above the dorsum, usually containing an oval cavity lying along vein 1 filled with androconia; this feature is correlated with an almost exactly similar one on the upperside of the hindwing, situated above vein 7 at its origin; over the androconial patch on the hindwing there is an erectile tuft of fine, long, hairs springing from within the cell. The actual androconial patches or brands may be missing in certain species, but the nacreous areas on both wings and the hair pencil on the hindwing are present in all species of the genus.

B—Forewing above an elongated cavity along the middle of vein 1 filled with androconia and covered by a hair pencil springing from nearer the base; this pencil is moveable in the plane of the wing, but is not erectile; it is usually tucked into a narrow slit along the centre of the androconial patch; on the underside of the forewing the patch appears as a raised lump. Correlated with this feature are certain distortions and swellings of the veins of the hindwing. This character is present in a greater or less extent in Moore's genera *Virapa*, *Samundra*, *Gareris*, *Sadarga* and *Suralaya*.

C—A few species have developed additional features, which are referred to in the key.

4. The *Calysime* group is dealt with in the next paragraph; the following notes deal with the remaining groups:—

(a) *anaxias* was described by Hewitson from South India. Fruhstorfer gives *amate* as the race from Burma, stating that it differs from the Sikkim form in being larger, having the outer margins broadly paler and in that the pre-apical band is yellow rather than white; I have only one male of *anaxias* from Burma (Tavoy), which has the band slightly yellower and wider, but a more extensive material might perhaps justify the name *amate*. South Indian specimens differ, however, constantly from specimens from N. E. India in that the brand on the upperside of the hindwing is black instead of white; above the white band is broader in the male, while below this band is sharply defined outwardly by an apical brown area and not diffused into a pale yellow apical area, as is the case with the Northern dry season form. I therefore propose the name *miranda* for the *anaxias* race flying from Sikkim to Manipur. I have no specimens of an *anaxias* form from the Nicobars, but I would like to point out that the descriptions given by Doherty and Bingham of *manii* differ so greatly that they hardly seem to refer to the same insect.

(b) *sanatana* is considered by Fruhstorfer to be a race of the Chinese *francisca*. Specimens from S. Burma have the hindwing prolonged and are paler; they are probably what Fruhstorfer calls *gomia*, but his description and locality for this race are very obscure. I consider Tytler's *albofasciata* to be a high elevation race of *sanatana*; it is closely allied to Leech's *magna* from S. China.

(c) *nudgara* is given by Fruhstorfer as the Tenasserim race of *nicotia*; I have no specimens to enable me to confirm the differences he mentions.

(d) The *malsara* group has been cleared up by General Tytler in B. N. H. S. XXIII, 226, but I think that my *watsoni* should be sunk to Cramer's *mamerta*, if Fruhstorfer's figure in the Macro-Lepidoptera is correct. In Tenasserim, as seems to occur with other species of this genus, the forewing is prolonged at the apex and the hindwing at the tornus, while the outer margin is scalloped; the shape agrees with what Fruhstorfer calls *annamitica* but the secondary sexual characters are not so highly developed; it might stand as *annamitica* for the present.

(e) *perna*, *surkha* and *nautius* are considered to be the Indian races of the Malayan *mnasicles*, *oroatis* and *orsei*; *charaka* is a race of the Chinese *gotama*.

5. In the *Calysisme* group *rama* and *evansii* are easily separated, but the remainder afford one of the most difficult problems in the study of butterflies; males may be dealt with more or less satisfactorily, but the females in some cases are almost impossible to separate. An additional complication is that in S. India several species fly in 3 forms—normal dry season, normal wet season, and an intermediate form, with complete, but reduced ocelli. I started off by dissecting the genitalia of nearly 300 males and then, taking into account the various features and localities, arranged them over labels bearing the names given in the key.

(a) *perseus* occurs throughout the area and I have no difficulty in separating this species in either sex. The Southern form differs as detailed in the key.

(b) *mineus* also occurs throughout the area and the Southern race always runs smaller; the intermediate form occurs in this species in North India as well as in South India. The diffused ring of the ocellus seems to separate this species fairly satisfactorily from everything except *igilia*, but here the angulation of the discal band on the forewing below serves to distinguish the latter species.

(c) *igilia* is what Bingham described as a variety of *perseoides* from Kathlekan, Mysore, and on the strength of this description Fruhstorfer gave it the name *igilia*, placing it as a race of *perseoides*. I have a long series from Coorg and a specimen from Travancore. It has nothing to do with the Burmese *perseoides* and is a very well defined species with a very restricted locality. It flies with *orcha* but not apparently with *subdita*.

(d) *mercea* is an isolated species flying in Pachmarhi with *visala*, from which it is easily separated by its smaller size and the tessellated border of the hindwing. I found it common in October 1910, just when the dry season brood was out in full swing and a few individuals of the wet season form were still about; curiously enough all the fresh males were of the intermediate form and all the females normal dry season.

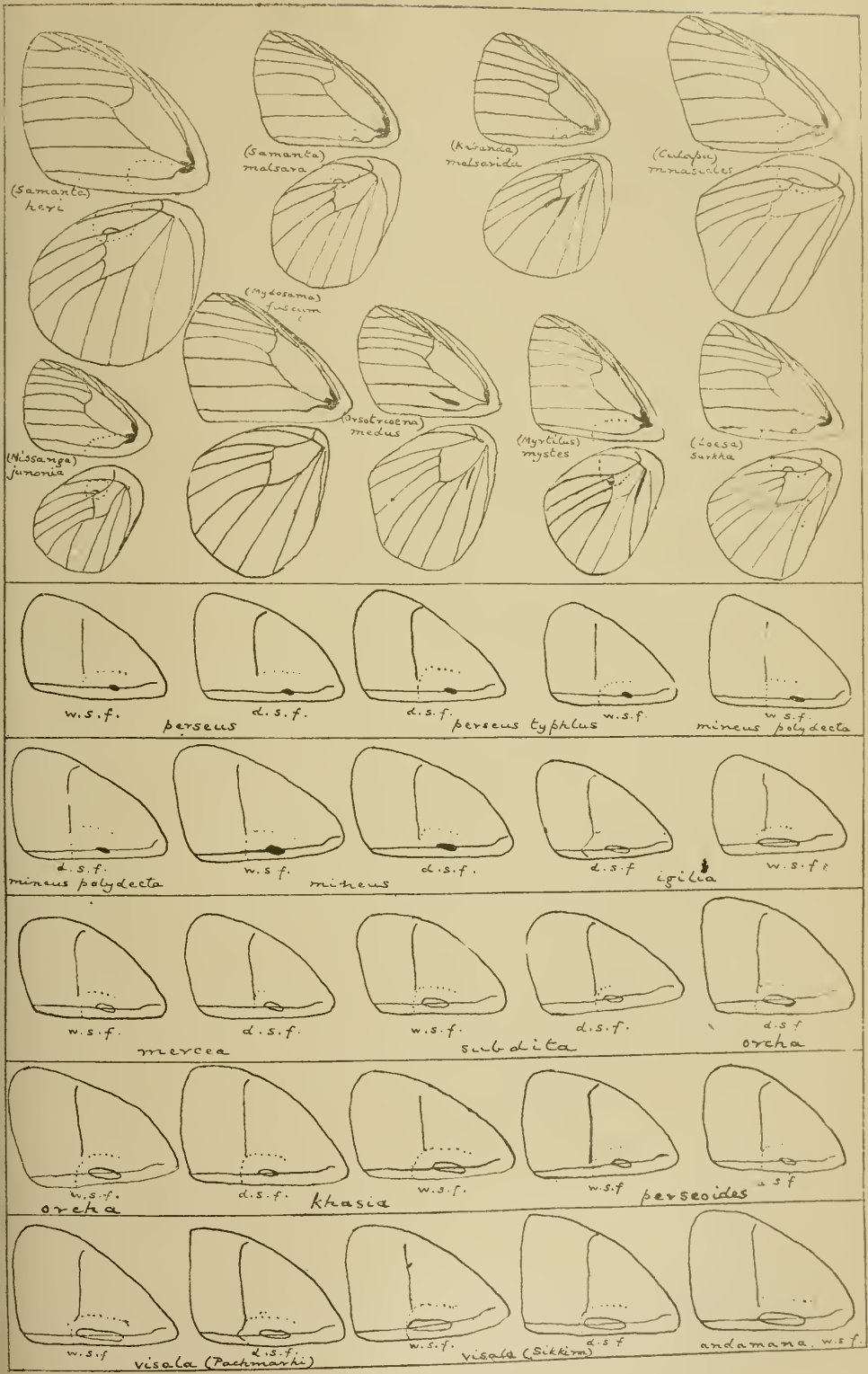
(e) *perseoides* is an isolated species from Burma and is common in the neighbourhood of Rangoon. It is easily recognised in the male, while the peculiar, dull ochreous tint on the underside of the dry season form is very characteristic, being found also in *mystes*.

(f) *visala*—I have from Pachmarhi, Sikkim to Burma and the Andamans. It is a well defined species as regards the secondary sexual characters of the male and the pointed forewing of the dry season female; wet season females are very difficult to separate from *khasia*. I do not think that it occurs south of Pachmarhi, specimens recorded from South India being either *subdita* or *orcha*. Fruhstorfer makes a point of the venation of *visala* differing from that of its allies, but I cannot find any appreciable constant difference, though individuals differ to a certain extent. The Pachmarhi dry season form differs from N. Indian forms in having the band on the underside of the forewing a good deal shorter, while the discal line on the forewing above is very prominent. It is rare east of Sikkim, where its place appears to be taken by *khasia*. From Burma I have very few specimens, but Fruhstorfer's name *neovisala* seems justifiable.

(g) *subdita*—I have from Ceylon, where it is the only form of this group and from a few localities in South India, where it seems very rare. The differences between it and *orcha* are given in the key; they are not very considerable and, but for the differences in the male genitalia, I should not have separated them; had *subdita* been confined to Ceylon, I would have treated it as a race of *orcha*.

(h) *khasia* and *orcha* are very alike and, but for the fact that *orcha* occurs in an intermediate form, I would not have separated them as races.

6. Several authors have hinted that the various species of *Mycalesis* interbreed. I do not agree; races no doubt do, where they meet, but to me the essential definition of a species is that it does not interbreed with another species. It



Wing Characters of Indian Myalesis.

is probably impossible to evolve any theory to account for the development of the very closely allied species of the *Calysisme* group, but something on the following lines may have taken place. *perseus* and *mineus* I take to be the oldest, the former having remained pretty constant and not developed into other species. *mineus* is an insect of the plains and in the dim distant past it developed into 2 races (a) and (b) whose areas became cut off but again became re-united after sufficient time had elapsed to establish the races as species. *mineus* (a) preferred the plains, while *mineus* (b) preferred the hills, where, as these elevations became elevated and separated from one another, it developed into a number of local races, say b^1 to b^6 . Eventually changes in the earth's crust, temperature, etc., permitted these races to extend into one another's area; some no doubt re-united, while others led a separate existence, entitling them to be ranked as species *mineus* b^1 =*subdita* developed in Ceylon, whence it has spread to the continent, where it refuses to interbreed with its cousins, but finds it difficult to maintain its existence in face of the competition prevailing. *mineus* b^2 =*igilia*, b^3 =*mercea* and b^4 =*perseoides* have not spread into other areas, but refuse to interbreed with their invading relations. *mineus* b^5 =*visala* developed in Sikkim and has successively invaded the Central Provinces, but its penetration eastwards has not met with the same success. *mineus* b^6 =*khasia* developed perhaps in Assam, whence it has very successfully invaded S. India and Burma. It is the most abundant species as far as my experience goes.

7. Regarding the plates: they have been drawn by myself and are, I am afraid, very crude. The intention of the plates showing venation is only to illustrate the features mentioned in the key; no other conclusions should be drawn from them. A study of the plates depicting the genitalia will, I think, be worthwhile; they bear out to a certain extent Moore's subgenera and the arrangement adopted in my key. Where more than one example for a species has been taken, it must not always be assumed that the genitalia differ with the locality, as may seem to be indicated by the drawings; I have tried to represent, as far as possible, the variations that occur in the species; in some instances, however, there is no doubt that the locality does affect the genitalia very considerably. In some species, e.g., *nicotia*, the clasps vary very considerably with individuals, but the tegumen and the hooks are pretty constant. The difference in the hooks between the closely allied *malsara* and *lepcha* is very noticeable. *bethami* and *davisonii* have clasps more related to *memerta* than to *lepcha*, whose genitalia differ greatly with the locality, but their facies lead me to regard them as races of *lepcha*. The teeth at the upper edge of the clasp are much finer in *malsara* than in *lepcha*. The clasp of *mnasicles* and the hooks of *patnia* are very extraordinary. It will be seen that the *Calysisme* group is a very definite one and, as one might imagine from their facies, the clasps resemble one another very closely, except that *evansii* is very distinct. *igilia* and *mineus* are allied to one another and well distinguished from the rest. *subdita* from its clasp is easily distinguished from the otherwise almost inseparable *orcha*. The clasp of *perseoides* is variable and approaches that of *visala*, it is curious how very different the clasp of *mystes* is to any member of the *Calysisme* group though females are quite difficult to separate.

8. The following abbreviations have been used in the key:—

A, B, C refer to the secondary sexual characters, see para 3.

V refers to the venation. v^1 =vein No. 1.

f=forewing and h=hindwing.

upf, unf, uph, unh,=upper and underside of the forewing and hindwing respectively.

DSF & WSF=dry and wet season forms.

dcv=discocellular vein.

The figures given after the localities represent the average expanse in inches and decimals of an inch of males and females respectively.

Key to the Indian Mycalesis.

1. (10). B—present. V—origin 10 f at or near end cell.
2. (3.6.9). F—above unmarked, dark brown; below outer area paler, lilacine in WSE, lilacine and yellow in DSF. A—f no brand; h brand white, tuft pale yellow. B—f brand black, prominent both sides; tuft black, bases dark brown, from either side of v^1 ; h origin v^1 pushed back to before middle of cell, rendering upper dcv very long and concave. C—absent. V—h 3 & 4 from end cell; 6 & 7 well separated in ♀.
 - adamsoni*, Wat. Manipur—N. Burma. 1.8—2.0.
3. (2.6.9). F—above pre-apical white band.
4. (5). C—absent. V—as 2.
 - a. F—inner edge apical band midway between apex and end cell.
 - a^1 . F—above no prominent ocelli; below as 2. A—f brand small, black; h tuft pale yellow. B—as 2.
 - a^2 . A—h brand black.
 - anaxias anaxias*, Hew., S. India. 1.9—2.1.
 - b^2 . A—h brand pale yellow.
 - a^3 . see b^3 .
 - anaxias miranda*, nov. Sikkim—Assam. 1.8—2.0.
 - b^3 . F—above paler outwardly, apical band yellowish.
 - anaxias æmate*, Fr. Burma. 1.8—2.0.
 - b^1 . F—upf prominent ocellus in 2, sometimes also in 5 and in 2 uph. Below uniform brown; h discal band obscure in ♂, irregular and white in ♀. A—as 2. B—f brand and tuft very obscure; h venation as 2.
 - anaxias radza*, M. Andamans, 1.8—2.0.
 - b^1 . F—apical band broader, inner edge extends nearly to cell.
 - anaxias manil*, Doh. Nicobars.
5. (4). C—f obscure pale patch between bases 3 & 4; h prominent black atch between bases 5 & 7; costa h very arched. A—as 4a¹. B—f brand and tuft brown and only above v^1 ; h v^6 pushed back as well as 7 and basal half of 6 swollen. V—h³ & 4 from end cell; 6 & 7 from a point in the ♀. F—upf ocellus in 2 more or less apparent; below as 2.
 - anaxioides*, Mar. S. Burma. 2.2—2.5.
6. (2.3.9). F—above brown, pupilled ocellus in 2 f at least; upf never an ocellus in 3. A—f brand small, brown; h brand and tuft brown. C—absent.
7. (8). V—h v^3 from end cell. B—as 2.
 - a. F—below discal band lilac; upf usually ocellus in 5, none uph.
 - a^1 . See b^1 .
 - francisca sanatana*, M. Kili—N. Burma (below 6,000 ft.). 2.0—2.2.
 - b^1 . F—paler, h prolonged.
 - francisca gomia*, Fr. S. Burma. 2.0—2.2.
 - b. F—below discal band white; upf prominent ocellus in 5, and sometimes in 2 & 3 uph.
 - francisca albofasciata*, Tyt. Manipur (above 6,000 ft.). 2.1—2.2.
8. (7). V—h 3 from before end cell. B—f no brand, tuft very obscure; h upper dcv as in 2, but swollen. F—pale brown; upf ocellus in 2 large and prominent, also one in 5; uph no ocelli; below pale brown, inwardly darker in DSF, discal band white.
 - gotama charaka*, M. Assam—Burma. 1.8—2.0.
9. (2.3.6). F—♂ above purple glossed, no pupilled ocelli; ♀ pale brown, all ocelli show through and are pupilled obscurely; below pale ochreous, discal lines dark brown. A—f brand brown, medium size; h brand long, brown; tuft dark brown. B—f tuft brown, obscure and no brand; h origin v^7 pushed back, but dcv is straighter. C—f dorsum very convex; h large black patch between bases 2—4.
 - orseis navillus*, But., Naga Hills—Burma. 1.9—2.1.

10. (1). B—absent.
11. (52). V—origin 10 at or near end cell, f.
12. (33.51). V—origin 3 h at or just beyond end cell.
13. (14). V—f dev between 4 & 5 nearly straight. F—♂ above dark brown, ocelli show through unpupilled; ♀ pale brown, all ocelli show through complete with pupils and rings. Below ochreous, with 2 prominent fulvous bands. A—f no brand; h no brand, only a cavity; tuft white. C—h v^1 swollen at the base.
fuscum, Fd., S. Burma. 1.7—2.0.
14. (13). V—f dev between 4 and 5 concave and angled.
15. (30). F—above normally only an ocellus in 2f (except 18.a) very rarely an ocellus in 5 f or 2 h (usually so in 28), but never more than one ocellus h.
16. (29). V—h 6 and 7 well separated at the base; lower dev at an angle to v^3 . C—absent. A—tuft pale yellow.
17. (20.27.28). A—f small brand placed centrally under the origin of v^2 .
18. (19). A—h brand black; f black; very small. F—ocellus upf never ringed; unh ocellus in 3 shifted prominently out of line towards termen; unf WSF curved series of ocelli in 2, 3, 4 and 5; DSF termen f straight or slightly concave.
a. F—above usually unmarked in WSF. Smaller.
perseus typhlus, Fr., Ceylon—Himalayas and Bengal. 1.6—1.9.
b. F—above always with a pupilled ocellus in 2 f. Larger.
perseus perseus, F., Kangra—Burma. 1.7—2.0.
19. (18). A—h brand salmon pink or brown; f small, dark (or rarely pale) brown. F—ocellus upf situated in a more or less pale area, outwardly and inwardly defined by a narrow dark line; the ocellus ring diffuses into this area and is never narrow, of uniform width or sharply defined.
a. F—WSF often very dark below and with small ocelli. DSF pale area often very extensive.
mineus polydecta, Cr., Ceylon—Bengal. 1.7—2.0.
b. F—larger.
mineus mineus, L., Kulu—Burma. 1.8—2.1.
c. F—darker; ocelli below larger.
mineus nicobarica, M., Nicobars. 1.8—2.1.
20. (17.27.28). A—f brand extends from under origin v^2 to at least under origin v^3 and often much further.
21. (24). A—f brand in WSF extends to beyond outer edge of the discal band; in DSF to under origin of v^3 or v^1 , but if not through the discal band, the latter is bent outwards between v^1 and v^2 and sharply angled at v^1 .
22. (23). A—h brand brown or pale yellow; f brand pale yellow or brown in DSF; in WSF inner half brown and outer half pale yellow. F—resembles 19. a as regards the pale area upf in the DSF but unf discal band always angled at v^1 in DSF and always up to v^1 in WSF, being outwardly curved before reaching it.
igilia, Fr., Travancore, Coorg, Mysore. 1.6—1.9.
23. (22). A—h brand pale brown; f usually pale brown, sometimes brown especially in DSF from the C. P. and Burma.
a. F—DSF apex sharp pointed and termen straight; WSF more rounded; WSF ocellus above large and well defined.
visala visala, M., Central Prov., Kumaon—Assam. 1.9—2.3.
b. F—apex more rounded; ♀ not distinguishable from 26c.
visala neovisala, Fr., Burma. 1.9—2.2.
c. F—apex rounded; much darker.
visala andamana, M., Andamans. 1.8—2.2.
24. (21). A—f brand never to beyond discal band, though often up to it; discal band never angled at v^1 .

25. (26). A—h brand black. F—WSF ocellus above with rather broad and prominent yellow ring; unf discal band reaches costa; apex f very rounded. DSF always more or less ocellated and with a wavy post-discal line beyond the ocelli more or less apparent.

perseoides, M., S. Burma. 1.8—2.0.

26. (25). A—h brand pale yellow.

a. F—above sub-terminal pale line is followed by 2 dark lines separated by a pale line and followed by the cilia, the inner half of which are pale and the outer half dark. In 19 this feature occurs more or less, but at any rate on the forewing of the ♀ the pale line is preceded by a prominent dark line bordering the ground colour. Above the ocellus has a narrow well defined ring, though often obscure; unf nearly always an ocellus in 1. WSF black below.

subdita, M., Ceylon, Nilgiris, Madras, Orissa. 1.8—2.0.

b. F—f apex very rounded; h termen very scalloped and almost caudate at v^1 . ♀ termen f chequered. ♂ DSF always ocellated; ♀ very variegated.

mercea, nov. Pachmarhi (C. P.). 1.7—1.9.

c. Occurs in 3 forms, wet, intermediate and dry.

khasia orcha, Evans. Palnis, Coorg, Nilgiris. 1.8—2.0.

d. Occurs in 2 forms only, wet and dry.

khasia khasia, Evans. Assam—Burma. 1.9—2.1.

27. (17.20.28). A—f and h brand silvery white, hard to see on the nacreous ground. F—above dark ferruginous; ocelli ringed fulvous; usually ocelli in 5 f and 2 h above; below ochraceous with broad yellow discal band.

rama, M., Ceylon. 1.9—2.2.

28. (17.20.27). A—f no brand; h brand dark brown, tuft reduced. F—below pale brown, discal band broad, pale yellow. Wings very rounded.

evansii, Tyt., Manipur. Assam. 1.8—2.0.

29. (16). V—h bases of 6 and 7 approximate, lower dev in line with v^3 F—DSF dull ochreous below, always more or less ocellated. A—f no brand and h no brand, tuft white. C—h white brand below origin v^3 , covered by recumbent tuft black hairs rising beyond middle of cell; v^1 swollen and covered by recumbent tuft of black hairs.

mystes, D \acute{e} N., Manipur—N. Burma. 1.8—2.0.

30. (15). F—normally 3 ocelli uph (may be 2 or 4). Above very dark ferruginous brown. A—h brand black, tuft brown. V—5 and 6 well separated at base.

31. (32). F—above large ocellus in 2 f and ocelli h ringed fulvous; unringed ocellus in 2 f. A—no brand f, tuft h very inconspicuous.

adolphei, Guer., Nilgiris, Coorg. 1.9—2.2.

32. (31). F—large ocellus in 2 f on a wide fulvous area; ocellus in 5 f minute or absent; h ocelli ringed fulvous or on a fulvous area. Termen h caudate at v^1 . A—f brand small, black.

oculus, Mar., Palnis, Travancore. 2.0—2.4.

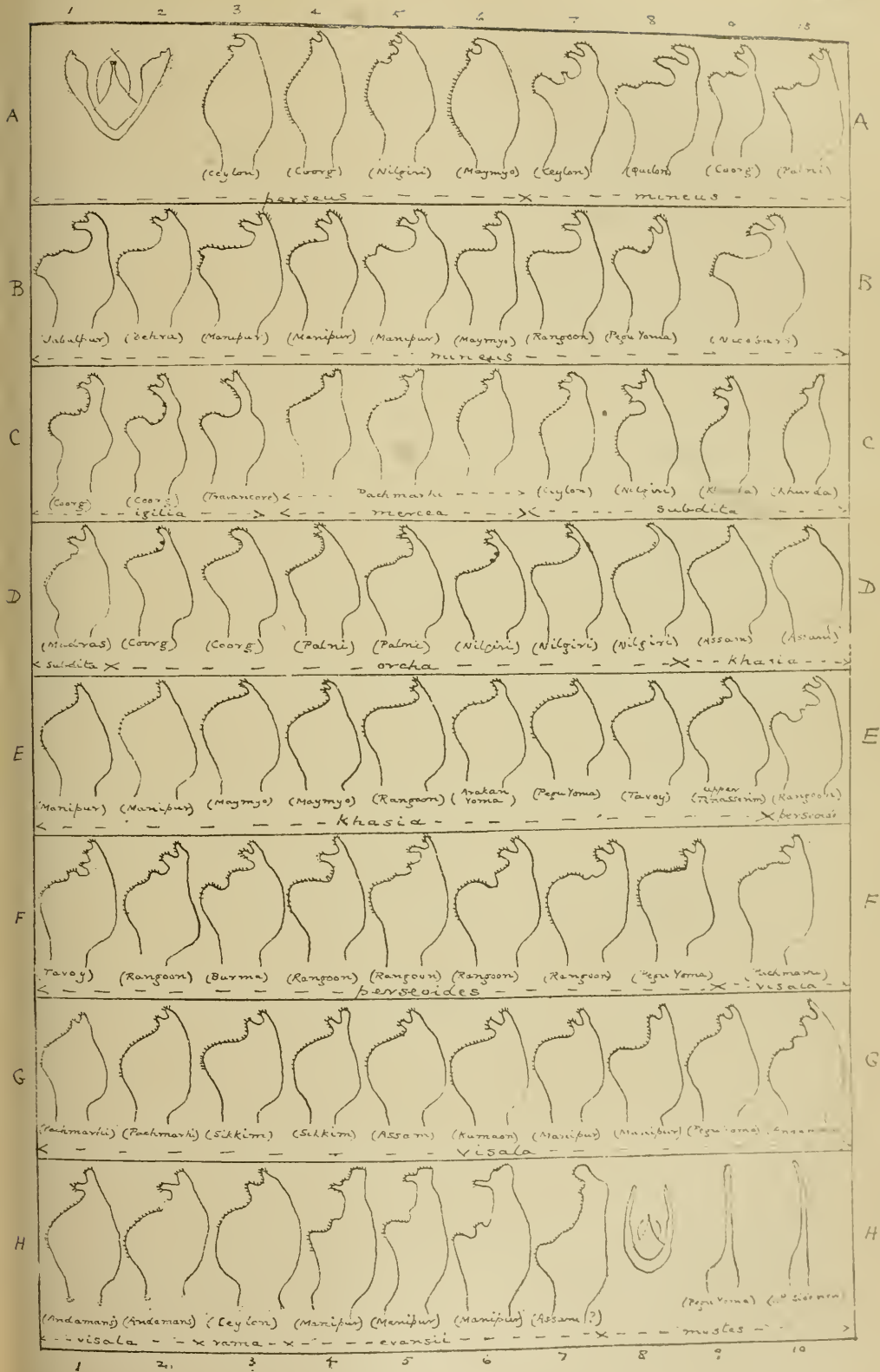
33. (12.51). V—origin v^3 before end of cell.

34. (45.50). F—above pupilled ocelli present in 2 and 5 f and 2 h (5 f sometimes absent in 39).

35. (36). F—below dark discal line. Apex f produced. Above ochreous brown; ocellus in 2 f very large, with broad yellow ring; minute ocelli 5 f and 2 h. Below pale. A—f no brand but prominent square white patch in the usual nacreous area; h brand golden brown, tuft bright yellow. C—absent.

mnasicles perna, Fr., S. Burma. 2.3—2.7.

36. (35). F—below pale yellowish discal band.



Genitalia of Indian *Mycalesis*.

37. (38). F—below uniform, unmottled. Cilia white. Above prominent ocellus in 2 and 5 f and 2 h; 5 f slightly larger than 2 h and slightly smaller than 2 f. A—f brand small, pale yellow; h brand pale yellow, tuft pale brown. C—long erect dense brown hairs along basal portion v¹ h.

suavolens, Wm., Sikkim—N. Burma. 2.3—2.7.

38. (37). F—below basal portion mottled. C—absent.

39. (40). F—cilia white. Above ocelli small; 2 f and 2 h equal, 5 f minute or absent. Below f in addition to ocellus in 2 only 2 obliquely placed apical ocelli; h ocellus in 3 absent. A—f brand minute, black; h brand small, black; tuft brown.

a. F—upf white discal band obscure.

mestra vetus, Fr., Sikkim, Bhutan. 2.5—2.7.

b. F—upf white discal band prominent.

mestra mestra, Hew., Assam. 2.5—2.7.

40. (39). F—cilia pale brown. Above ocelli larger; 5 f and 2 h equal, 2 f much larger. Below ocelli complete and f all in line.

41. (42). F—uph in addition to ocellus in 2, always one in 3 and usually in 4, rarely also in 1. upf ocellus in 2 very large. A—f no brand; h brand black, tuft brown.

heri, M., Kumaon—Bhutan. 2.5—2.8.

42. (41). F—uph rarely more than the ocellus in 2, if more very small.

43. (44). F—below outer basal area before discal band nearly black, mottling confined to the base. A—f brand small salmon; h salmon tuft yellow brown.

misenus, D³N., Sikkim—Assam. 2.3—2.5.

44. (43). F—below brown all over and mottled up to discal band; ocellus in 2 upf much larger than the rest. A—brands f and h and tuft black.

a. See b.

nicotia nicotia, Hew., Mussoorie—Burma. 2.1—2.3.

b. Above ocelli larger; below band wider.

nicotia nudgara, Fr., Tenasserim. 2.2—2.4.

45. (34.50). F—above ocelli blind. Below mottled; pale yellow or white discal band. A—f and h brands black, tuft brown. C—absent.

46. (47). F—above white discal band clearly defined.

malsara, M., Sikkim—Burma. 1.9—2.1.

47. (46). F—above white band not visible.

48. (49). F—upf nearly always sub-equal ocelli in 3 and 5 as well as the normal one in 2; rarely an ocellus in 1. uph always an ocellus in 2 and 3 even when the ocelli upf are reduced to a single one in 2. Cila brown.

a. see b.

mamerta mamerta, Cr., Assam—Burma. 1.8—2.0.

b. wings more elongated; termen h very scalloped.

mamerta annamitica, Fr., Tenasserim. 1.9—2.1.

49. (48). F—upf normally no ocellus in 3, if present smaller than the ocellus in 5; uph there may be ocelli in 2 and 3 but always absent if the ocellus in 5 f is absent.

a. Cilia white, prominently chequered at ends of veins.

lepcha davisonii, M., Palnis, Animalai hills. 1.8—2.0.

b. Cilia brown. Band below wide, outwardly ill-defined.

lepcha bethami, M., Central Prov. Orissa. 1.8—2.0.

c. Cilia brown. Band below narrow, thread like or obsolete towards costa f.

lepcha lepcha, M., Kulu—Kumaon. 1.8—2.0.

d. Cilia white, not chequered. Very dark above and below.

lepcha kohimensis, Tyt., Assam—Burma. 1.8—2.0.

50. (34.45). F—above unmarked, prominent double ante-terminal line; below uniform, discal band lilacine; ocelli in 2 and 3 h larger than the rest.

Wings very rounded. A—f brand absent or minute, dark; h brand black; tuft brown, inconspicuous. C—h bases 2, 3 and 4 slightly swollen and covered with scattered erect hairs.

malsarida, But., Assam. 1·8—2·0.

51. (12.33). V—origin v^3 far beyond end cell h. A—f no brand; h brand black; tuft pale brown. C—absent. F—above dark brown, ocellus in 2 f set obliquely at lower, outer, edge of a pale area; minute ocellus in 5 f (often absent); these ocelli pupilled; no ocellus h. Below not mottled.

a. F—pale area above fulvous and a broad fulvous patch in cell f. Below fulvous.

patnia patnia, M., Ceylon. 1·5—1·7.

b. F—pale area above white and not in cell. Below rather pale brown.

patnia junonia, But., South India. 1·6—1·9.

52. (11). V—f origin v^{10} well beyond end cell. A—f small dark brand h brand pale yellow; tuft pale yellow. C—h small dark brand above origin v^6 ; v^1 distorted towards v^2 resulting in a fold of the wing, over which there is a recumbent tuft of brown hairs. F—above brick red, blind ocellus in 2; below very dark, not mottled.

orotis surkha, Mar., Tenasserim. 2·0—2·2.

SOME NOTES ON THE GENUS *CAPRIMULGUS*
(*NIGHTJARS*) IN THE PUNJAB.

BY

HUGH WHISTLER, F.Z.S., M.B.O.U.

WITH A NOTE ON THE NIGHTJARS OF SIND BY DR. C. B. TICEHURST.

It has for some time past been apparent to me that our knowledge of the Nightjars or Goatsuckers which appear in the Punjab is most incomplete. The reasons for this are not far to seek. In the first place the genus is a very difficult one to study from the nocturnal habits of its members, and the fact that so far as my experience goes it is almost impossible to distinguish the various species in the field unless the call notes are heard and recognised. Secondly, even after an individual has been shot, specific identification is not by any means easy unless the observer has previous acquaintance with the different kinds, or has specimens available for comparison; as the various characteristics do not readily lend themselves to written description.

Thirdly in addition to the above special reasons there is the general fact that, until late years, the Punjab has been neglected Ornithologically as much as any provincial area of India.

Accordingly I recently collected all the records that were within my reach so far as they concerned the Punjab (in the political sense including certain mountain areas), or other contiguous areas, which might be expected to throw light on the status of the birds in the Punjab. The result was to show very clearly that in none of the six species concerned was our knowledge in any way complete; indeed as regards several it is most incomplete. It then occurred to me that it might be of interest to publish the result of my survey in the hope and belief that a clear view of these woeful gaps might encourage the placing on record of individual records or other particulars of interest, which must be within the knowledge of many of our members. The size of the country, the sparseness of the European population, the fact that such population is mainly official and very busy, and the entire absence of scientific proclivities amongst the Indian population, are such that there is no possibility of the general and exhaustive knowledge of the avifauna which exists in the British Isles. It is therefore all the more incumbent on those of us who are interested in the subject to place in print such facts that come to our notice in order that they may be available for the next observer in the area. In England the Ornithologist everywhere is the heir to an exhaustive literature and an oral tradition, and generally a personal introduction to the study of his science. In India each observer in each district starts afresh, or after a considerable gap of some twenty to forty years, and has to assist him but a scanty literature. Under these circumstances there cannot be too strongly impressed on every one the value and importance of recording observations however disconnected or fragmentary.

In these notes I have not touched at all on questions of plumage or oology, but on these points too, more information is badly required. Writing, far away from Museums and Libraries, with only a portion of my own books and specimens available I have doubtless overlooked some records, and should be grateful to any one who would bring them to my notice. As I have tried to emphasise above, this article is intended to emphasise not our knowledge, but our lack of it, in the hope that some of the gaps may be quickly filled.

The Key given below may perhaps be a useful supplement to that given in the "Fauna of India Birds", (Blanford and Oates) on which individual specimens do not always work out correctly.

Finally I would urge all members interested to endeavour to obtain and submit for competent identification any Nightjars about which they are doubtful, especially all Nightjars which are caught at sea on board ship on the voyage between India and England. Nightjars frequently come aboard and often can be caught.

KEY TO PUNJAB MEMBERS OF THE GENUS *CAPRIMULGUS*.

(Note: White includes buff.)

	{	2 outer pairs of tail feathers with large white terminal spots	2	
1	{	4 outer pairs of tail feathers with white sub-terminal spots	<i>indicus</i> ♂	
	{	Outer tail feather without white spots	5	
	{	2 outer pairs of tail feathers entirely white except at the tip	<i>monticola</i> ♂	
2	{	Wing under 160 mm.	<i>asiaticus</i> ♂ ♀	
	{	Wing over 160 mm.	3	
3	{	Large white spots on 1st four primaries	4	
	{	Large white spots on 1st three primaries	<i>macrurus</i> ♂	
4	{	General tint above sandy grey. Black spots on crown transverse	<i>mahrattensis</i> ♂ ♀	
	{	General tint above silvery grey. Black spots on crown lanceolate	<i>unwini</i> ♂	
5	{	Large white spots on 1st three primaries	<i>unwini</i> ♀	
	{	Large white spots on 1st four primaries	6	
6	{	General colour above dark brown with black markings	<i>indicus</i> ♀	
	{	General colour above dark brownish grey with rufous markings	<i>monticola</i> ♀	

THE JUNGLE NIGHTJAR, *CAPRIMULGUS INDICUS INDICUS*. Lath.

The Jungle Nightjar has been divided into three races, the typical form *C. indicus indicus* (wing in ♂ 197-203 mm.) found in India, replaced in Ceylon by the smallest race, *C. indicus kelaarti*, with a wing in the male of 173-183mm. The third form is *C. indicus jotaka* of S. E. Siberia, China, Japan and other eastern localities which is larger, with a wing in the male of 212-224mm.

There has been a certain amount of confusion regarding these Nightjars as the various races intergrade with one another both in size and colour and it is impossible to be sure of the correct identification of individuals. Under the circumstances therefore so far as the Punjab is concerned (lying in the extreme N. W. corner of the entire range of the species) I propose to treat all records of the Jungle Nightjar as referring to *C. indicus indicus*, irrespective of the name under which the record was made. Since, from the geographical position of our area, it is extremely unlikely, whatever may be the case in other parts, that the status of the sub-species may be confused by migration from the areas of the other two races.

I find the following records:—

Ratray took a clutch of eggs at Fort Munro, Baluchistan border, on 28th July 1904, which is figured in the Journal B. N. H. S. Vol. xvi, p. 660. The bird is apparently not uncommon about Hazara and the Galis. Hume

mentioned it at Abbottabad (S. F. vi 56-57); it is included with the remark "breeds in Galis" in Buchanan's list of Hazara birds in the gazetteer of that district. Rattray took 2 very hard set eggs near Dunga Gali on 7th June 1904 (Jour. B. N. H. S. xvi, 660) but Magrath reports it as rare at Thandiani (Jour. B. N. H. S. xviii, 284); according to a marginal note by Andrew Anderson in my copy of Jerdon it "lays in Murree."

About Simla it is common according to G. F. L. Marshall (Journal Simla N. H. S. 1886, p. 7) and A. E. Jones (Jour. B. N. H. S. xxvi, 614), the latter adds the information that it prefers the barer hill side contiguous to jungle and ascends to 6,000 ft.

The information regarding the Punjab plains is very meagre. Hume implies that it occurs (S. F. vi, 56-57) and a female from the Hume collection obtained at Sirsa (no date) is catalogued by the British Museum.

Mr. A. H. Marshall, Indian Police, informs me that he shot a specimen at Kasinda, Rohtak district, in December 1910.

I have never obtained the Jungle Nightjar personally. The call is variously described as "tew-yo-yo frequently repeated" (Jerdon), a plaintive "choo-yo-yo" (G. F. L. Marshall), a rapidly repeated "Chuck-Chug-Chuck" (Magrath), and a continuously uttered "tchouk, tchouk, tchouk" (Dresser.).

UNWIN'S NIGHTJAR, *CAPRIMULGUS EUROPÆUS UNWINI*, Hume.

This Nightjar is the Eastern race of the Common European Nightjar *C. europæus europæus*, Linn; and was first described by Hume from Hazara, in the Ibis. 1871, p. 406. The original description will be found reproduced in Stray Feathers Vol. III, 407. It differs from *C. europæus* in that the general tint is slightly greyer and paler. The white spot on the inner web of the first primary in the male always extends to the shaft and touches it as a rule for a space of 10 to 15 mm. The white spot on the second primary is not confined to the inner web but is always continued to the outer web in the form of a white band. The under tail coverts are usually but very faintly barred and frequently are quite unmarked.

In size this race is smaller with a shorter wing on the average. Wing of adult as a rule 180-186 mm. (as against 190-202 mm. in *C. europæus europæus*) but extremes of 174 and 194 mm. have been recorded.

The restricted distribution of this Eastern form is thus given by Hartert (Vog. Pal. Fauna ii, 849):—

"The breeding bird in parts of Turkistan (Ferghana) Transcaspia, Persia (at all events in E. and S. W. Persia), Afghanistan, Baluchistan, the Pamirs, Kashmir and Gilgit: a winter visitor to Sindh, the Punjab, and occasionally to the N.-W. Provinces (Etawah). A specimen was caught on a ship off Cape Gardafin on 6th November; occasionally also in South Africa (Natal)."

In endeavouring to amplify the above distribution I have discovered the following records with regard to Unwin's Nightjar.

At Quetta, Delme-Redcliffe, Marshall, and Meinertzhagen have found it to be a fairly common summer visitor and breeding (Jour. B. N. H. S. xv., 351; xxiii, 363; xxiv, 158). At Chaman just over the border in Southern Afghanistan, Barnes recorded it long ago as not uncommon and breeding in May, before which month he apparently did not observe it (S. F. ix. 215 et 453).

Then at Thall, Rattray and Whitehead both found it to be common in summer, and the former took 10 nests (Jour. B. N. H. S. xii, 343; Ibis 1909, 253).

In Gilgit, Biddulph and Scully reported it to be a common summer visitor arriving early in May and breeding about 5,000 ft. in the valleys (S. F. ix., 313; x, 101, et 261).

Hume obtained specimens from the Hazara and Agrore Valley including a female from Murree (10th May). (S. F. iv, 501, Cat. Brit. Mus). Cocks and Marshall took three nests about 5,000 feet near Murree in May (S. F. i., 350). In the same region Rattray considered the species not common and only recorded it near Dunga Gali where he took two nests (Jour. B. N. H. S. Vol. xvi, 660.). I have no breeding record east of Murree.

To sum the above up, it is clear that Unwin's Nightjar is a summer visitor and breeding species from May onwards in the lower hills and valleys of the chains of mountains which run up and down the north westerly and north-easterly frontiers of the Punjab. It is also extremely probable that a small number breed in the Salt Range as I obtained a male with the testes greatly enlarged near Choa Saidan Shah on 26th May 1913 (Ibis. 1916, 84) and similar stragglers may be expected in the contiguous low ranges such as the Kala-Chittar, and the broken country about Rawalpindi.

The question next arises as to what becomes of these Nightjars in the winter; Hartert says that the bird is a winter visitor to Sindh, the Punjab, and N. W. Provinces, *i.e.*, the United Provinces, but I cannot find the evidence on which this is based.

Whitehead says that it passes through Kohat in spring and autumn (Ibis. 1909, 253) and Doig has recorded that it is a passage migrant for a short time in September to the Eastern Narra, Sind (S. F. viii, 372.) The only other record that I have traced for the Punjab and Sindh is a female in the Hume Collection, obtained near Sirsa, but the date is not given in the B. M. Catalogue, (see also S. F. iv, 501).

My own records are scanty; an adult female was shot on the Canal bank at Gujranwala on 1st August 1915 and two other Nightjars seen about the same time (6th July and 5th August) were probably of the same species; these would all be on the autumn migration.

In Jhang district I have obtained three specimens only, one at Kot Lakhana (on the Lyallpur border) on 27th September 1918, a female at Jhang on 3rd May 1919, and one at Chund on 20th August 1919. These birds were all doubtless on passage. I have a few records of Nightjars seen but not identified in various districts and some of these may refer to this species, but the number of such records is not great and there is no use in quoting them in the absence of identification.

The above data would point to the fact that Unwin's Nightjar is only a spring and autumn passage migrant in the Punjab and it would be interesting to know what are its true winter quarters. It does not appear to me that they are fully known as yet and any authentic records bearing on its distribution in time and place are therefore to be welcomed.

The call note of this sub-species does not appear to have been described.

SYKE'S NIGHTJAR, *CAPRIMULGUS MAHRATTENSIS*, Sykes.

This Nightjar inhabits Baluchistan, Afghanistan and the plains of North-Western India extending South to Belgaum and eastwards to Upper Bengal. It appears to be closely related to *Caprimulgus nubicus*.

To examine its distribution more closely, I find the following records. In Seistan, according to Cumming (Jour. B. H. S. xvi, 690), it is very numerous in summer from April to September, breeding all over the gravel-strewn "dasht" in May and June; he does not specifically note that it migrates in winter but his words appear to point to that conclusion, which is probably correct, as Rattray records that at Thall the species is

a fairly numerous summer visitor arriving about the middle of May and breeding in June and July. Here it frequents the more open hill sides and nullahs and is not found in jungle. (Jour. B. N. H. S. xii. 343).

A pencil note by Andrew Anderson, the well known naturalist of the seventies, in my copy, of 'Jerdon's Birds of India' is my authority for stating that Sykes' Nightjar breeds in the Murree hills. At Bannu, Magrath procured several in September probably on migration (Ibis 1909, 253). In the Eastern Narra, Sindh, Doig recorded the bird as a permanent resident and it is said to breed there from February to July (S. F. viii, 372). Hume procured a single male on the extreme northern border of Sindh, where the Indus river leaves the Punjab, on the 13th December.

The above records suggest that Sykes' Nightjar is a resident in the plains, and a summer visitor to the hill areas of its range, the latter presumably wintering in the plains with the resident birds. If this deduction is correct I presume that it is a permanent resident in the Punjab; it is in any case not common. The only records which I can trace are those of the British Museum Catalogue and a single bird obtained at the end of October near Lahore by Currie (Jour. B. N. H. S. xxiv, 570). The Catalogue includes ♀ ♂ Delhi (no date), ♀ Bahawalpur (Feb. 14), ♀ ♂ Ambala (Feb.), four males and a female from Sirsa (February, July), all from the Hume Collection.

I have only met with this species on three occasions, all in the bed of the River Sutlej, one at Phillour on 10th May 1910, and a pair shot near Jellalabad (Ferozepur) on 25th February 1912.

These various dates for the Punjab support the assumption that the bird is a permanent resident. The call is described by Cumming as like that of a frog.

THE COMMON INDIAN NIGHTJAR, *CAPRIMULGUS ASIATICUS ASIATICUS*, Latih.

The distribution of the Common Indian Nightjar is given in the Fauna of British India series, "Birds", Vol. iii., 187; as from Sind and the Punjab through India and Ceylon, and in Burma as far south as Moulmein. But since that account was written the birds inhabiting Ceylon have been separated under the name of *C. asiaticus minor*, Parrot (Orn. Monatsbr. 1907, p. 170) and it is probable that when sufficient material is available the birds of the remaining areas may require some division into sub-species. In the meantime our Punjab birds must remain as *C. asiaticus asiaticus*.

The species has lately been recorded from Southern Tibet, Mipi, Dibang Valley, 4,800 ft. 13th May 1913, by Capt. Bailey (Jour. B. N. H. S., xxiv. 76).

As regards the Punjab there is but little on record. In Hume's 'Nests and Eggs' (2nd edition, Vol. iii, 48) Cock records a nest found at Dharmsala and says "The bird does not remain with us during the winter, but comes up about April and departs about August," and implies that it is common.

In the Catalogue of the British Museum I find the following specimens from the Hume collection, namely two males and a female from Gurgaon (December and February) and a female from Sirsa (Dec. 14) which is referred to also in Stray Feathers. (vii. 169).

Mr. A. H. Marshall, Indian Police, informs me that he shot a specimen at Silanah jheel, Rohtak District, in September 1910.

I have personally met with the species on two occasions. The first of these was on the 20th November 1914 when I shot one from a party of 2 or 3 which were resting in short grass amongst Uck plants in a small grove of Kikur trees near the Otu jheel, Sirsa. I heard the characteristic call near Chandigarh in Ambala District on the nights of the 25th and 26th March 1916.

It is not clear from the above whether this Nightjar is a permanent resident or merely a winter visitor to the plains and its range in the Himalayan foot hills should surely be extended.

The call is well described as the sound made by a stone skidding over ice and is syllabised by Colonel G. F. L. Marshall as "*Chak-Chak Char-r-rk*" and by Jerdon as *tyook-tyook-tyook*. The latter adds that the bird when flushed rises with a low chuckle.

FRANKLIN'S NIGHTJAR, *CAPRIMULGUS MONTICOLA*, Franklin.

Franklin's Nightjar is found throughout a large portion of the plains of India, throughout the Lower Himalayas, in portions of Burma and in the south of China.

As regards our area the information is very deficient. At Thall, Rattray states that it is common and a permanent resident, and that he found it breeding plentifully (Jour. B. N. H. S. xii, 343).

A note by A. E. Jones (Jour. B. N. H. S. Vol. xxvi. 614) warrants the assumption that it breeds near Simla.

The British Museum Catalogue includes the following specimens from the Hume collection; two females and one immature bird from Delhi, male and female from Gurgaon district, three females and one male from Sirsa (all the above without dates), a female from Simla (March) and a male from Simla (April 15). Certain records by Currie (Jour. B. N. H. S. Vol. xxiv, 604) I omit as the birds were not fully identified.

Franklin's Nightjar, as it so happens, is the member of the genus with which I am best acquainted in the Punjab.

So far as I have observed the bird, and confirmed my identifications with specimens, the bird is a regular autumn passage migrant in some numbers, arriving and leaving suddenly, and being very local in its appearance. On these occasions it is confined to patches of ground where grow large clumps of the familiar 'Sirkana' or Pampas grass, whether such patches are growing on open sandy plain, around the edge of some jheel or tank or amongst the embankments of one of the larger railway bridges over our larger rivers. One such locality may be found full of the birds while similar ones around are empty. The only one of these patches of which I have been able to ascertain particulars for more than one year is visited annually, so it is possible that the birds follow definite lines of flight.

It is perhaps worth while giving details of my observations in case other observers in the same localities can supplement them.

I have omitted a number of records of single birds, which although they were probably of this species, were not definitely identified as such.

Ferozepore District, 1912.

Aug. 6th.—R. Sutlej bridge. 4 flushed and ♀ shot in a patch of thick grass jungle by pools of water at one portion of the embankments.

10th—Another female shot from the same patch.

25th—Some still about in the same place.

Hissar District, 1914.

July 24th.—Many reported to me at Hissar.

26th.—Great numbers found in a patch of bush jungle in the Government Bir near some flood water from the canal; there were none in other patches of similar ground. None were found in this place when I went again on 1st August.

Aug. —An unusual number of Nightjars noted singly during the month, but none definitely identified.

Sept. 1st.—Many in the grass and bush jungle partly flooded in an old famine relief work called Rajpura. Three birds were shot for identification.

13th.—Still common in the same patch of ground and two shot. I may note that this tank is surrounded by much similar ground yet the Nightjar appeared confined to the tank.

Note.—Mr. R. Branford, I.C.S., V.D., Supdt. of Government Cattle Farm, informed me that Nightjars had become similarly abundant in July and August 1915 and in August 1916.

Ludhiana District, 1917.

July 31st.—A flight of 9 or 10 observed in one portion of a sandy plain behind Civil Lines, covered with straggling patches of Sirkana grass. Specimens were shot and found to be heavy in moult.

Aug. 9th.—Two, apparently of this species, flushed in grass jungle near the Budhan nala.

10th.—Some on the embankment of the railway bridge at Ladhowal, one shot.

Sept. 15th.—Two flushed in the same place.

Jhang District, 1919.

Aug. 20th.—A solitary female shot from a borrow-pit at the side of the railway line near Chund bridge.

The call of this Nightjar is said to be very similar to that of *C. asiaticus siaticus*, but I have never heard it. When flushed in the day time individuals utter a low sort of chuckle not easily described.

HORSFIELD'S NIGHTJAR, *CAPRIMULGUS MACRURUS*
NIPALENSIS. Hartert.

My only definite record of Horsfield's Nightjar for our area is that in the British Museum Catalogue of a male from Simla (March 5) in the Tweeddale Collection. It is there attributed to *C. macrurus albonotatus* but since that date the Nepalese and West Himalayan form has been separated under the name of *C. nipalensis*. Hume however describes a clutch of eggs taken at Dharmsala by Captain Cock (N. and E. 2nd Ed. III, 44).

G. F. L. Marshall (Jour., Simla N. H. S., 1886, 70) remarks in his description of Simla birds that it "ought to be heard in the valleys near" but does not say anything more definite.

The call is described by Jerdon (in addition to a low chirp, sometimes emitted on the wing) as the sound of striking a hammer on a plank, but Marshall (loc. Cit.) says that that gives little idea of the richness and volume of the sound "*Chouuk Chouuk*," repeated at intervals.

With reference to the above article on the Nightjars of the Punjab, appended is a brief summary by Dr. C. B. Ticehurst on the Nightjars of Sind and Baluchistan so far as there is any information.

SIND.

Caprimulgus mahrattensis.—Hume (S. F. Vol. I) says Nightjars are very rare in Sind and he met with this species on the Upper Sind Frontier, but that he was told Nightjars of sorts were common round Larkhana,

Mehur and the Munchar. Barnes says this species is very common round Hyderabad breeding in April and May and nests have been found as early as February. Doig considered it resident on the Narra, nesting on "Kuller" ground (bare, salt impregnated ground) and he found nests in May and July. I personally have met with species on several occasions in Lower Sind and I consider it to be resident and the Nightjar of Sind. I found it extremely common on the Narra and Jamrao canals in December, inhabiting jungle. In other places I have met with it in quite open desert.

Caprimulgus europæus unwini.—Butler recorded this species as an autumn passage migrant at Hyderabad during September and October arriving in August. This species appears to be a regular passage migrant in Lower Sind, and doubtless in Upper Sind also, on both spring and autumn passages. It does not so far as I know breed in Sind.

Caprimulgus asiaticus.—Murray records this species at Schwan on November 27th and Butler says it is not uncommon round Schwan in January. Beyond this I have no knowledge of this species in Sind and I have not met with it myself, even round Schwan. Why it should be so local and what its true status is I have no idea.

BALUCHISTAN.

Caprimulgus mahrattensis.—This species appears to be resident in Baluchistan in suitable places, but does not appear to occur in the higher mountainous regions, viz., Kelat-Quetta-Ziarat ranges. Cumming found it common in Seistan from April to September breeding April-June. It certainly breeds in the Paff Hills and probably in all the lower hills of Baluchistan. It extends westward as far at all events as Bahu Kelat on the border of Persian Baluchistan.

Caprimulgus europæus unwini.—This is the Nightjar of the higher mountains of Baluchistan to which it is a summer visitor. It breeds round Chaman in May (Barnes) and certainly must breed in the hills round Quetta, Ziart, Mastung, etc., as also in the higher hills round Panjgur in Central Baluchistan. To the lower hills and coast line as at Ormarsa it is a spring and autumn passage migrant as in Sind.

Caprimulgus ægyptius.—Does not come further east than Bampur in Persian Baluchistan.

REPORT OF THE COMMITTEE OF THE BOMBAY NATURAL HISTORY SOCIETY.

The Committee of the Bombay Natural History Society have the honour to submit herewith their report on the operations and progress of the Society covering a period from the signing of the Armistice in November 1918 to the 1st August 1920.

The Society was founded on the 15th November 1883 by certain Residents of Bombay "for the purpose of exchanging notes and observations on Zoology and Botany and exhibiting interesting specimens of animal life." In the month of May 1885, the Society divided its activities into separate sections to insure the more scientific treatment of zoological phenomena, and in January 1886 issued, under the editorship of Messrs. R. A. Sterndale and E. H. Aitken, the first number of its now well-known and popular Journal. This publication has now completed its 26th Volume.

The administration of the institution is directed by a Committee consisting of a President, three Vice-Presidents, an Honorary Secretary, Honorary Treasurer, and twelve members. The Museum and Library are in the charge of a Curator. The Editorship of the Journal is in the hands of the Honorary Secretary who is assisted by joint Editors.

The following is the Personnel of the management for the current year:—

President.—

H. E. The Right Hon'ble Sir George Lloyd, G.C.I.E., D.S.O.

Vice-Presidents.—

Mr. J. D. Inverarity, B.A., LL.B.

The Hon'ble Sir Norman MacLeod, Kt., Chief Justice of Bombay.

H. H. The Maharao of Cutch, G.C.S.I., G.C.I.E.

Honorary Secretary.—

Mr. R. A. Spence.

Honorary Treasurer.—

Mr. H. F. Lodge, M.C.

Honorary Editors.—

Mr. W. S. Millard, Mr. R. A. Spence, and Mr. S. H. Prater.

Curator—

Mr. B. C. Ellison; Mr. S. H. Prater (Acting).

Managing Committee.—

Mr. T. Bainbridge Fletcher, F.E.S.; Mr. T. R. Bell, C.I.E., I.F.S. (retd.); Rev. E. Blatter, S.J., F.L.S., Mr. E. Comber, F.Z.S.; Col. G. H. Evans, C.I.E., F.L.S.; Lt.-Col. W. H. Evans, R.E.; Lt.-Col. J. E. B. Hotson, I.A.R.O., C.B.E. (I.C.S.); Mr. C. M. Inglis, M.B.O.U.; Prof. V. N. Hate; Major F. C. Fraser, M.D., I.M.S.; Lt.-Col. W. Glen Liston, C.I.E., I.M.S.; Mr. F. Ludlow, I.E.S.; Mr. F. M. Macwood: The Hon'ble Mr. P. J. Mead, C.I.E., I.C.S.; Mr. H. P. Maenaghten, B.A.; Mr W. S. Millard, F.Z.S.; Mr. P. M. D. Sanderson; Lt.-Col. F. Wall, I.M.S., C.M.G., C.M.Z.S.; Lt.-Col. H. J. Walton, I.M.S., C.M.Z.S. and Mr. John Wallace, C.E.

At the outbreak of War the number of members on the roll was 1,600. At the date of the Armistice the number was 1,775. On the 1st July 1920 the nominal roll stood at 1,841 but of these 499 had not paid their annual subscription for 1920. Included in the list of members are 102 life members who have compounded in one lump sum.

The Society takes its title from its origin and establishment in the City of Bombay, but its membership is spread throughout India, Burma and Ceylon. The roll of members includes also a number of learned Societies and individuals resident in Europe, America, Africa and Australia.

Subscription and Entrance Fee. The entrance fee is Rs. 10 and the annual subscription is Rs. 15 for which members receive the Society's Journals, post free, and the assistance of the Society on questions dealing with Natural History, and the identification of specimens and advice in the making of private collections. Suggestions of remedial measures in connection with House and Garden pests and supervision and advice in connection with the setting up and mounting of game trophies are among the advantages enjoyed by its members.

MUSEUM AND LIBRARY.

Collections. The Society's Museum contains 4,330 specimens of Mammals, 6,000 Birds, 3,200 Birds' Eggs, 3,700 Reptiles and Fishes, and 27,000 other Invertebrates in addition to Botanical specimens. The average monthly additions total about 80. The majority of the specimens are classified and arranged. The Society possesses a valuable reference Library containing over 1,000 Volumes mainly devoted however to the Natural History of the Oriental Region. The Museum is open to members and their friends from 10 A.M. to 6 P.M. on week days and 10 a.m. to 3 p.m. on Sundays and holidays.

FINANCE.

Grant from Government. The Society is almost entirely supported by the annual subscriptions of its members. It receives in addition an annual grant of Rs. 5,000, from the Government of Bombay. The Museum unfortunately suffers greatly from the Society's limited income.

Treasurer's Report for year 1919. The Honorary Treasurer's report for the year ending December 1919 is appended :—

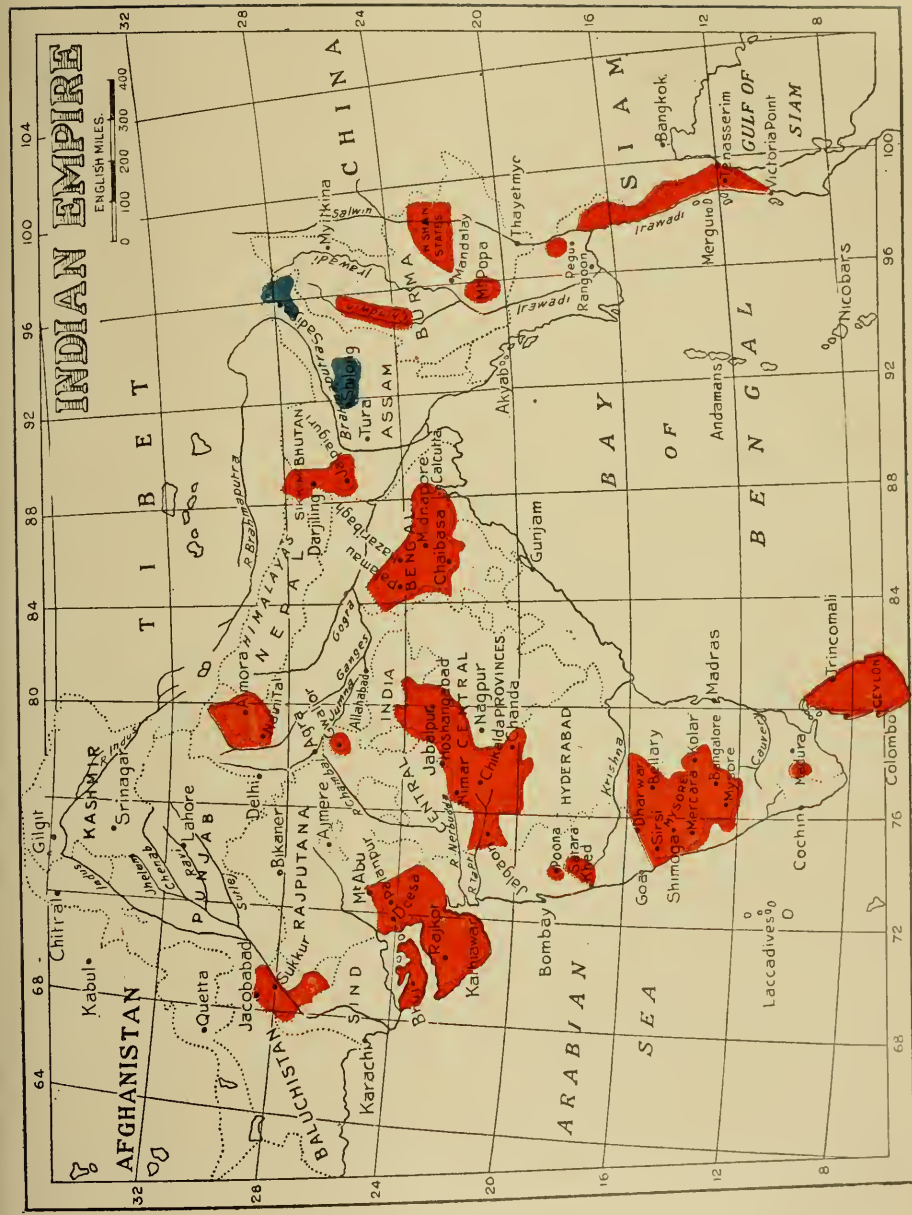
“ Mr. H. F. Lodge, the Honorary Treasurer, in presenting the accounts for the year ended 31st December 1919, said that a copy of the audited balance sheet was on the table for inspection of members and this would as usual be published in the Society's Journal. The following however were the main features of the accounts for the past year. On the 1st January 1919 the Society opened with a credit balance of Rs. 14,727-5-8 and during the year this figure decreased to Rs. 14,297-11-8, the cash balance shown on the 31st December 1919. The receipts during the year under review amounted to Rs. 33,767-4-8 which shows a decrease of Rs. 2,203, when compared with the corresponding figures of the previous year. The expenditure during the year 1919 amounted to Rs. 34,196-14-8 and this figure shows an increase of Rs. 9,719-10-11 over the corresponding figures for 1918.

The increase in expenditure was easily understood as the Society in common with every other institution had lately had to pay considerably more for every thing required to carry on its work. In spite of this the Society had not increased the annual subscription which remains at Rs. 15 and it was hoped to avoid having to do so. Indications for 1920 pointed to the fact that expenditure generally would be still further increased and to counteract the rise in prices every effort ought to be made to increase the revenue of the Society and this can best be done by the enrolment of new members. It is therefore hoped that members would do their best to interest their friends who were not already members in the work of the Society with a view to their being enrolled as members.

As regards the Mammal Fund the balance at the commencement of the year was Rs. 8,684-7-2 and the closing balance Rs. 12,389-2-5.”

EXPLORATION AND RESEARCH.

Mammal Survey. The most important work taken up in this connection has been the Mammal Survey of India, Burma and Ceylon. The Survey was instituted in the year



Portion coloured Red shows Districts which have already been worked by the Mammal Survey.
Portion coloured Blue shows Districts now being worked.

1912 with the object of making as complete a study as possible of the occurrence and distribution of mammals found in India, Burma and Ceylon and with the further object of supplementing the collection of Indian Mammals at the Society's Museum and the British Museum as well as the collections of other Museums and scientific establishments in India.

The funds necessary for the promotion of this work were obtained principally through individual subscription and through grants provided by various Governments. The European War put an end to this Mammal Survey so far as work done by collectors in the employment of the Society was concerned, as the four collectors employed—Messrs. Shortridge, Mayor, Crump and Macmillan—joined the Military forces of the Empire at the earliest opportunity, Capt. Macmillan laying down his life at Ypres and Mr. Crump, who obtained the M. C., being severely wounded.

The interest of the Society in a systematic collection of the smaller mammals was not however overlooked by the members of the Society. From the nature of the War many members who were active contributors were collecting outside or on the very borders of the territory selected for the scope of the Mammal Survey, and good collections were received from Lt.-Col. J. E. B. Hotson, I.C.S., I.A.R.O., in Mekran and Persia, Capt. Ingoldby, R.A.M.C., in Waziristan, Mr. J. P. Mills, I.C.S., in Assam, and from many members in Mesopotamia—especially Sir Percy Cox, K.C.S.I., Major R. E. Cheesman and Lt.-Col. F. P. Connor.

The demobilisation of men after the signing of peace enabled the Society to resume the work of the Mammal Survey so far as that was done by collectors definitely engaged for the purpose. None of the old collectors still alive has so far been able to return but in the autumn of 1919, Mr. H. W. Wells commenced work in Assam on the borders between India and China.

Though the difficulties of collecting are greater in Assam perhaps than anywhere else in India, and are particularly difficult to a newcomer, this part of the country was selected as the scientific results to be obtained from a systematic survey are likely to be greater here than anywhere else in India. Difficulties would moreover be lessened through the help to be obtained from members of the Society resident in Assam and particular thanks are due in this respect to the Hon'ble Sir Nicholas Beatson Bell, K.C.I.E., C.S.I., Mr. J. P. Mills, I.C.S., Mrs. Jackson, Mr. L. Bishop, Capt. W. J. H. Ballantine, Mr. H. O. Allen, Mr. A. Lockett, Mr. A. M. Primrose and Mr. A. J. W. Milroy.

The Government of Assam kindly made a grant of Rs. 1,000 towards the expenses of the Survey, and Government officials have at all times given all the help and assistance possible to our collector.

The results of the Mammal Survey so far as the discovery of new Genera and Species, and sub-species are concerned are referred to under the heading "Publications" at the end of this report.

The work of the Mammal Survey has now been carried on in Upper Sind Frontier (Mr. S. H. Prater), Cutch and Kathiawar and Gujarat (Mr. C. A. Crump), Satara and Ratnagiri Districts (Mr. S. H. Prater), S. Kanara and Mysore (Mr. G. C. Shortridge), Madura (Mr. S. H. Prater), Almora (Mr. C. A. Crump), Gwalior (Major E. W. Mayor), East Khandesh, Berars and part of the Central Provinces (Mr. C. A. Crump), Bihar and Orissa and the Midnapore District of Bengal (Mr. C. A. Crump), Sikkim and Darjeeling and the Bengal Terai (Mr. C. A. Crump), the Chindwin River, South Shan States, Dry Zone, Burma, Mergui and Tenasserim (Mr. G. C. Shortridge and Capt. Macmillan) the Pegu District, Burma (Mr. J. M. D. Mackenzie), Ceylon (Major E. W. Mayor).

For easy reference a map showing the districts already collected in is appended hereto. The area worked up to the Armistice is coloured in red. The

parts now being worked are coloured in blue. Assistants are being trained for the work and it is hoped that this year the Society will be in a position to take advantage of the offer of H. H. The Maharaja Scindia of Gwalior to give facilities to our Collector to work in and round Sipri where the red and black soils meet, and also of the very valuable offer by Dr. Anandale, the Director of the Zoological Survey of India, to give assistance to a collector working round the shores of the Chilka Lake in Orissa where Dr. Anandale has a bungalow and has himself already obtained very valuable scientific results from collections of fresh water fauna.

For purposes of scientific classification, all material collected by the Society's Mammal collectors is sent to England to the British Museum where it is arranged and classified by those who have made a life-long study of Mammals from all parts of the world. After satisfying the requirements of the National Museum the collections will be returned to the Society who will distribute the surplus named specimens amongst various Museums in India and elsewhere.

The Results of the Survey in the shape of "Scientific Results" and "Reports" are written at the British Museum by Mr. Oldfield Thomas, F.R.S., and Mr. R. C. Wroughton, formerly Inspector General of Forests in India, and are published in the Society's Journal. Mr. Wroughton has also published a 'Summary of the Results of the Mammal Survey' which brings the work on 'Mammalia' in the "Fauna of British India Series" more or less up to date so far as small mammals are concerned. The Volume published in the above series having been issued so long ago as 1891 had for many years become obsolete. In this respect the Survey has already proved its great usefulness.

The Indian
Desert.

Besides our work on Mammals, the Society was able to publish most exhaustive reports on the Flora of the Indian Desert, including observations on the Geology and Meteorology of what is described as the least known of the Indian Plains. The thanks of the Society are due to Rev. E. Blatter, S.J., and Prof. F. Hallberg for their exertions in this connection. Father Blatter and Prof. Hallberg, accompanied by Mr. S. H. Prater of this Society, had moreover in 1915 made a trip through the High Wavy Mountains in the Madura District, Southern India, from which good Botanical and Zoological results were obtained.

Persia and
Baluchistan.

Through the Agency of Col. J. E. B. Hotson, C.B.E., I.C.S., I.A.R.O., very valuable and interesting collections of mammals, birds, reptiles and plants have been made in the above countries. The advancement in our knowledge of the fauna and flora of these regions, due to the systematic collecting of Col. Hotson, is shown to some extent in the number of new genera and species discovered by him, and the information gained as to the geographical distribution and range of species in these little known tracts.

Mesopotamia.

During the War a large number of contributions were received from members serving with the forces in Mesopotamia. The contributions include valuable collections of Mammals, Birds, Reptiles and Insects. These collections are now being worked out by experts in England, and the results of their researches will be published in the forthcoming issues of the Journal. At the request of the Civil Commissioner, Bagdad, it has been decided to collect the various papers at the close of the series and issue them as a separate publication. As such it will constitute a valuable work on the Fauna of the country.

Indian Avi-
fauna.

We have to record the exceedingly valuable work done by Mr. E. C. Stuart Baker in the preparation of a "Hand List of the Birds of British India" to be issued by the Society in a similar form to the "Hand List of British Birds" published by the British Ornithologists' Union. Oates and Blanford published their books on Birds in the Fauna of British India series between 1888 and 1898. The considerable amount of research work done since that period, together with the introduction of the trinomial system, has altered a number

of the names and rendered Oates and Blanford, until amended in this respect, of little value to the Ornithologist. Mr. Stuart Baker's work goes far towards making good this defect.

Further, with a view to showing the distribution of birds in India, the following lists have been published during the period under review:—

The Birds of Prey of the Punjab. By C. H. Donald, F.Z.S.

Birds of the Ludhiana District, Punjab. By H. Whistler, M.B.O.U., F.Z.S.

A List of Birds found in the Simla Hills. By A. E. Jones.

A Tentative List of the Vertebrates of the Jalpaiguri District, Bengal (With Plates) By C. M. Inglis and others.

PUBLICATIONS.

The Society's Journal published during the period under review contained the following contributions to Scientific Biology:—

THE SCIENTIFIC RESULTS OF THE MAMMAL SURVEY NO. 18, BY MARTIN C. HINTON AND NOS. 19, 20 AND 21, BY OLDFIELD THOMAS, F.R.S., R.C. General Bio-logy.

WROUGHTON AND WINIFRED M. DAVIDSON.

Martin Hinton's paper comprises a report on House Rats of India. It is based on the enormous amount of material collected by the Survey and is a valuable monograph on the distribution and races of the genus *Rattus* in India.

Mr. Oldfield Thomas' papers form a synopsis of the groups of True Mice found within the Indian Empire and deal with new species of Mammals found in Baluchistan and N. W. India.

The 21 papers on the Mammal Survey hitherto published comprise descriptions of 6 New Genera, 68 New Species and 83 New Sub-species.

SUMMARY OF THE RESULTS FROM THE INDIAN MAMMAL SURVEY OF THE BOMBAY NATURAL HISTORY SOCIETY, PARTS, 2, 3, 4 AND 5. BY R. C. WROUGHTON, F.Z.S., M.B.O.U.

Mr. Wroughton's papers are a revision of the present day genera, species and geographical distribution of Indian Mammalia in special reference to Blanford's Volume on Mammalia in the Fauna of British India series.

A NEW SPECIES OF NESOKIA FROM MESOPOTAMIA, BY OLDFIELD THOMAS, F.R.S.

SOME NEW MAMMALS FROM MESOPOTAMIA, BY OLDFIELD THOMAS, F.R.S.

These papers deal with descriptions of new mammals obtained by the Society's members in Mesopotamia and are published by permission of the Trustees of the British Museum.

ASIATIC STARLINGS BY CAPT. C. B. TICEHURST, R.A.M.C.

The paper deals with the classification and geographical races of the Genus *Sturnus* found in Asia.

A MESOPOTAMIAN BULBUL, BY CAPT., C. B. TICEHURST, R.A.M.C.

On a new sub-species of Bulbul obtained by the author at Basra.

SUPPLEMENTARY NOTES ON INDIAN BIRDS BY B. B. OSMASTON C.I.E., I F.S.

The article is written on special reference to certain errors and omissions in the Volumes on Birds in the Fauna of British India series.

DESCRIPTION OF A NEW SNAKE OF THE GENUS *CONTIA* (B. AND G.) FROM PERSIA BY G. A. BOULENGER, F.R.S.

ON A COLLECTION OF SNAKES MADE IN THE NILGIRI HILLS AND THE ADJACENT WYNAAD. PART 1 AND 2. BY COL. F. WALL, I.M.S., C.M.G.

Col. Wall's paper is based on a collection of 1699 snakes comprising 43 different species, one of which is new to science.

NOTES ON INDIAN BUTTERFLIES, BY LT.-COL. W. H. EVANS, R.E., F.E.S.

These articles are written with a view to bringing up to date our information on Indian Butterflies and are continued from the previous Volume.

INDIAN DRAGONFLIES—PARTS III, IV, V AND VI. BY MAJOR F.C. FRASER, I.M.S.

The papers are intended primarily to give a brief outline of the Anatomy and Biology of Indian Dragonflies and subsequently a description of the various families, genera and forms found within Indian limits.

THE CYPERACEAE OF THE BOMBAY PRESIDENCY—PART II. BY L. J. SEDGWICK, I.C.S.

The papers provide a more up to date flora of this family (Rushes) adding 20 new species to the number given by T. Cooke in his work on the Flora of the Bombay Presidency.

A REVISION OF THE INDIAN SPECIES OF ROTALA AND AMMANNIA. BY E. BLATTER AND PROF. HALLBERG—PART II.

The articles are published with a view to correcting the many mistakes as to identification, description and synonymy which have crept into the more recent works on Indian Botany and amplify the number and description of species as contained in the papers by Clarke on Indian *Lytharacea* in Hooker's Flora of British India (Vol. II, 1879).

SOME SOUTH INDIAN COCCIDS OF ECONOMIC IMPORTANCE, BY T. V. RAMAKRISHNA AYAR, B.A., F.E.S., F.Z.S. GOVERNMENT ENTOMOLOGIST, MADRAS.

Describes 33 species of Coccids inhabiting S. India, with special reference to these as Garden and Orchard pests.

EXPECTED PLAGUE OF FIELD RATS IN 1920 BY L. J. SEDGWICK, I.C.S., WITH A NOTE BY MR. N. B. KINNEAR.

Written in special reference to the recrudescence of plague of Field Rats in years immediately following periods of famine with a note by Mr. N. B. Kinnear containing suggestions and recommendations in regard to the above.

Economic
Biology.

Articles of popular interest have been contributed by Mr. E.C. Stuart Baker, in his serial on the Game Birds of India. Mr. T. R. Bell in his articles on the Common Butterflies of India, and Lt.-Col. F. Wall, whose work on Common Indian Snakes is concluded in the present Volume. In addition to the above a number of interesting articles and notes on the Indian Fauna and Flora are published. These articles are a contribution to the Society's principal object, which is the spread of knowledge and the awakening of popular interest in Nature study in this country.

Popular Art-
icles.

EDUCATIONAL.

The past eighteen months have been of considerable importance as marking a definite stage in the career of the Society. Hitherto the Society had existed for the benefit of members and the spread of knowledge in regard to the Natural History of India amongst those interested. During the period reported on, the Society has extended its scope of work so as to include that of interesting the unlearned in the Natural History of India and indicating means by which a knowledge of Natural History can be of practical value to every one in the vast Empire of India.

Chart for
identifica-
tion of poi-
sonous
Indian
Snakes.

Medical research has secured to us a sure remedy against death from the bite of a Cobra or a Russell's Viper. Statistics however tell us how often people in this country die from the bite of a non-poisonous snake through fright alone. The provision of easy, yet accurate, methods of identification between the poisonous and non-poisonous snakes of India has therefore for a long time been a great desideratum. The Society provided this so far as the medical profession and scientifically trained people were concerned when they published in 1907 Lt.-Col. Wall's "Treatise on Poisonous Terrestrial Snakes of the Indian Empire." New editions of this work were published in 1913 and 1917. In 1919 Lt. Hayes suggested that Col. Wall's book might be simplified so as to enable a key distinguishing between the poisonous and non-poisonous snakes of India to be published in Chart form. His idea was elaborated by Mr. S. H. Prater of the Society's Museum and approved by Col. Wall.

The chart is being printed in England and, by the means of simple diagrams and letterpress, enables individuals with no previous experience of the subject to recognise the poisonous snakes found in India. It has been adopted for the use of Hospitals, Dispensaries and Schools by the Bombay Government and most of the Provincial Governments in India. It is proposed to print the charts in the various vernaculars to meet the needs of the primary schools in the different provinces.

The introduction of charts descriptive of the indigenous Fauna and Flora which will help Indian students to obtain a more intimate knowledge of wild life in India would be a decided advantage. Nature study as hitherto taught in Schools in India deals for the most part with animals and plants not found in this country. This is partly due to the want of suitable literature on the subject, and to remedy this defect the Committee is considering the publication of a series of illustrated charts with short descriptions on:—

- Common Indian Birds.
- Common Indian Animals.
- Common Indian Butterflies.
- Common and Useful Indian Plants.

Further steps in this connection are the giving of lectures on Natural History subjects to various schools, these lectures to be illustrated where possible with lantern slides. The Committee of the Society is prepared to render all possible assistance in this connection and they are glad to report that one of their number, Col. Glen Liston, C.I.E., I.M.S., has already been giving lectures on popular and useful Natural History subjects to Teachers in High Schools in Bombay with a view to helping them when teaching nature study to their pupils.

With a view to still further co-operating with the Educational Departments connected with the Local and Provincial Governments in India the Society proposes to prepare educational charts for the use of schools, the Health Department of Municipalities and other Institutions as well as the general public. These charts will convey information on subjects which intimately concern the health and well-being of residents in India. With this object the Society is arranging descriptive charts on the following subjects:—

- The House Fly as a danger to health.
- Mosquitoes—in connection with Malaria.
- The Louse—and its relation to Disease.
- The Bed-bug and how to deal with it.
- House Rats as enemies of mankind.

These charts will contain diagrams and simple descriptions together with recommendations for the preventive measures to be adopted against these pests.

FORTHCOMING PUBLICATIONS BY THE SOCIETY.

INDIAN DUCKS AND THEIR ALLIES, BY E. C. STUART BAKER, F.Z.S., M.B.O.U. 2ND EDITION, REVISED AND ENLARGED, WITH 31 COLOURED PLATES, BEING VOL. 1 OF THE GAME BIRDS OF INDIA.

The first edition reprinted from the Journal of the Bombay Natural History Society and published in 1908 was sold out within a short period. To meet the widespread demand for a work which appeals both to the Sportsman and Naturalist, the Society have decided to bring out a second edition. The letterpress has been revised and brought up to date and an additional plate illustrating the various species of swans occurring in India is included in the present issue.

THE GAME BIRDS OF INDIA (SNIPE, BUSTARD, SANDGROUSE). VOL. II., BY E. C. STUART BAKER, F.Z.S., M.B.O.U.

Reprinted from the Bombay Natural History Society's Journal with 14 coloured Plates by H. Gronvold and other illustrations. The Series will be completed in four volumes. Vol. III containing the Pheasants and Vol. IV the Partridges.

Nature study in schools.

Lectures.

Educational charts.

PALMS OF BRITISH INDIA AND CEYLON. BY REV. E. BLATTER, S.J., F.L.S.

Reprinted from the Bombay Natural History Society's Journal and profusely illustrated with over a hundred photographs and a large number of text blocks. The Volume deals with the Palms of India, Burma and Ceylon, both indigenous and introduced and contains interesting accounts of History, Uses, and legends attached to this interesting order in a manner that would appeal both to the botanist and the general reader.

HAND LIST OF BIRDS OF THE INDIAN EMPIRE. By E. C. Stuart Baker, F.Z.S.

HAND LIST OF SNAKES OF THE INDIAN EMPIRE. By Col. F. Wall, C.M.G., I.M.S.

FAUNA OF MESOPOTAMIA. A series of articles on Mammals, Birds, Reptiles and fishes of Mesopotamia by various authors.

PAST PUBLICATIONS BY THE SOCIETY.

The following are still available :—

THE POISONOUS TERRESTRIAL SNAKES OF THE BRITISH INDIA. Price Rs. 2 to Members and Rs. 3 to non-members.

LIST OF INDIAN BUTTERFLIES. Price Rs. 2.

WOOD DESTROYING WHITE ANTS OF THE BOMBAY PRESIDENCY. Price Re. 1.

CATALOGUE OF THE SOCIETY'S LIBRARY. Price Rs. 2.

THE FLORA AND FAUNA OF MATHERAN AND MAHABLESHWAR. Price Re. 1.

THE SOCIETY'S JOURNAL from No. 1 published in 1886 to date. Back-numbers and occasionally complete sets are obtainable from the Secretary to whom application should be made.

THE SOCIETY'S JOURNAL.

Future numbers will contain the following :—

Papers on Game Birds of India, Burma & Ceylon. By E. C. Stuart Baker—(continued).

„ Common Butterflies of the Plains of India. By T. R. Bell.—(continued).

„ Flora of the India Desert. By Rev. E. Blatter, S. J., & Prof. Hallberg—(continued).

„ Indian Dragon Flies. By Major F. M. Fraser, M.D., I.M.S.—(continued).

WANT OF MUSEUM ACCOMMODATION.

The want of space in the Society's Rooms renders it difficult for the Society's Museum to take even to a limited extent the part so splendidly played in the cause of education by the National Museum at Home. The Committee would draw attention here to the proposals agreed to by the members of the Society and placed before the Trustees of the Prince of Wales' Museum of Western India whereby, without in any way sacrificing the individuality of the Society and its work in Scientific research, the collections of the Society would be housed in a public museum and arranged so that the full educational value of the collections would be available to the general public and to students in particular. It is greatly to be regretted that such slow progress is being made with the carrying out of the scheme.

CONCLUSION.

The Committee cannot close this report without expressing their deep sense of the obligation the Society owes to Mr. W. S. Millard who resigned this year his positions as Honorary Secretary and Editor. Mr. Millard had been connected with the Society since 1888 and to him and Mr. Phipson the enlargement of the scope of the Society's work is largely due. The Committee have also to report with great regret the resignation of Mr. N. B. Kinnear who had been in charge of the Society's collections since 1907 and one of the Editors of the Society's Journal and who also acted as Joint Honorary Secretary during Mr. Millard's absence.

R. A. SPENCE,
Honorary Secretary.

EDITORIAL.

IN the preceding pages of this number there appears a report of the work of this Society since the Armistice. The report was originally written with the idea that Government and other Natural History Societies and Institutions should know what this Society had been doing, was doing, and intended to do, but subsequently recognising that it was first and foremost necessary that the members of the Society should be kept thoroughly acquainted with the work of the Society, which they maintain through their subscriptions, the Committee decided to publish the report in the Journal. It will, we hope, prove of interest.

Before this Journal is issued members will all have been made aware of the proposals to transfer part of the Museum of this Society from its old quarters in Apollo Street to the premises of the Prince of Wales' Museum in Bombay. Until the original idea of building a Natural History wing to the existing Prince of Wales Museum building is carried into effect—and for want of money it is unlikely that this will be effected for several years—the offices and work of the Society will be carried on in the old premises. The change will not affect the interests of members in any way, nor the personal relation which has for so long existed between the upcountry members and the Committee in Bombay. What the change will bring about, it is hoped, is that the collections to which members have contributed in the past, and which we believe members will contribute to in the future, will be better looked after than it is now possible to look after them in our crowded quarters. With better Museum accommodation we should be able to be of more assistance to members who wish to work out their own collections, or have them worked out for them, and we shall be able to let others have some benefit from the interesting exhibits which have been received from our members during the course of nearly forty years. Naturalists are the least selfish of men and it must have been a source of regret to many that the valuable collections this Society possesses have, for reasons outside its own control, been inaccessible to the general public, and for the matter of that to the general run of members.

Before touching on the work of the Society's Mammal Survey during the past few months, the Editors have been asked by the Committee to express their thanks, and the thanks of all the members of the Society, to General His Excellency Maharaja Sir Chandra Shumshere Jung Bahadur Rana, G.C.B., G.C.S.I., G.C.M.G., etc., Prime Minister of Nepal, for his kindness in allowing one of our trained Indian collectors to work in Nepal. Owing to this permission we have been able to send a qualified skinner, who was trained in Natural History work by Mr. Kinnear, to work under Col. R. L. Kennion in Nepal. It is a piece of good fortune which we had long hoped for but had not dared to ask for until we were able to do so through the instrumentality of Col. Kennion, whose interest in Natural History is so well known. Since Brian Hodgson collected in Nepal from 1830 to 1845 the country has been practically unworked, para-types of his original type specimens are badly wanted by the British Museum and other Museums, and the results of His Highness' permission should be most valuable.

Mr. Wells is still carrying on the work of the Survey in Assam and we are very grateful to Mr. A. J. W. Milroy, one of our members, who has afforded Mr. Wells the opportunity of accompanying him on a journey into the Cachar Hills, where, with Mr. Milroy's assistance, it is hoped he will be able to do some very useful collecting in country which without the personal assistance of officials it would be practically impossible for him to travel in.

The statement has, we believe, been made that the work of the Society's Mammal Survey supplants and undertakes work which has so far been done

and would be done by amateurs as a relaxation from their ordinary duties. Far from doing this however the Society's Mammal Survey assists, and will assist, the amateur naturalist, and we think those who had the pleasure of meeting Capt. G. C. Shortridge in the course of his work for the Society will bear this out. At present Mr. Wells is learning and depends for help on our members, and our collectors must always depend for help on these, but the results of the Survey give members information of great value as to the animals found in various districts, and help by pointing out problems on which more information is wanted. The survey is intended to guide the amateur worker into channels where his co-operation will have the best effect.

The Society invites the assistance of its members, especially of those who have the opportunities at their disposal for studying and making collections of animal life in localities which are not readily accessible, to co-operate in making the Mammal Survey an outstanding success. In his introduction to the "Summary of the Results of the Mammal Survey," Mr. Wroughton points out the direction in which help can best be given, and he suggests that what are required are a series of skins from the fauna which surrounds the collector and that a series of skins of a single species of mammals, from a given locality, is very much more valuable than single specimens. The Society will always be ready to help members who are willing to assist in the work with advice on methods of collecting, etc. It would further be prepared to loan the services of a trained skinner in cases where members are in a position to make full use of his services. It is not only in the department of mammals that the assistance of members is sought, the same may be said of birds, fishes, reptiles and mollusca.

Science is greatly indebted to the work of amateurs, and their services in its cause are commented upon by Prof. T. A. D. Cockerell in his article on English Naturalists in 'Natural History' the Journal of the American Museum of Natural History. "Men who spent their leisure moments in the study of plants, insects, birds, or fossils, forming Societies and organizing excursions, everywhere worshipping at the shrine of Nature and gathering data for the advancement of knowledge." He avers that love for Nature was inculcated in these men by the excellent sources for information available to the youthful naturalist in England. "There were elementary 'Natural Histories' suited even for children, with good coloured illustrations. For those a little older, shilling books furnished guides to the butterflies, beetles, common objects of the country side, common objects of the sea shore. In addition to which the facilities afforded by local museums with the collections of the local fossils, insects and other objects made the would-be naturalist independent of formal instruction and enabled him to puzzle out things for himself."

A comparison of these conditions with the deplorable state of affairs prevailing in this country will in some measure account for the prevailing apathy among Indians in general for work of this nature. There are a few brilliant exceptions, but, alas, remarkably few.

The course of Nature Study prescribed in Indian Schools is retarded by the want of suitable literature describing the fauna and flora of the country in which the pupils live. As a general rule the books and explanatory charts at the service of the teacher deal with animal and plant life not met with in this country.

The report of the working of the Society for the past period makes reference to the future policy of the Society as regards its co-operation with the teaching body in this country by the publication of charts dealing with animals and plants commonly met with in India. Their introduction into Indian schools would tend to rouse the interest of the Indian pupil in the natural life which surrounds him and should develop in him a desire for further study and research.

There is a great dearth of readable books on Indian Natural History subjects, the standard works so far published are admirable in themselves but presuppose a knowledge of the subject on the part of the reader and as such are unsuited to the majority of the public.

In making a plea for Scientific Literature such as could be read and assimilated by the ordinary layman we would quote the words of the late President Roosevelt who was, among many other things, an ardent naturalist: "Very few scientists have written interestingly and these few have usually felt apologetic about it. Yet sooner or later the time will come when the mighty sweep of modern scientific discovery will be placed by scientific men with the gift of expression at the service of intelligent and cultivated laymen. Indeed I believe that already science has owed more than it suspects to the unconscious literary power of some of its representatives, for instance in regard to evolutionwhere their predecessors have created hardly a ripe Darwin and Huxley succeeded in effecting a complete revolution in the thought of the age. I believe that the chief explanation of the difference was very simple in that Darwin wrote what was interesting to read."

It is not too much to hope that Roosevelt's prophecy will be fulfilled and that the time will come when the scientist will write not alone for his brother scientist but also for the wider brotherhood of his fellowmen. This hope has already been fulfilled not only in this Journal but in others and in this connection we would invite attention to the very interesting article on Some Parasitic Flies written by Harold Russell in the July number of the Quarterly Review. We hope to induce Mr. Harold Russell to write on the subject of Indian Parasitic Flies in this Journal.

The Society receives from time to time not only the Journals of learned Societies, but also Government publications of various kinds and from various countries. From the supplement to THE FEDERATED MALAY STATE GOVERNMENT GAZETTE we extract the following:—

Zoological Expeditions. The expenditure on Museums during the year amounted to \$35,483. Expeditions for zoological purposes were made to Peninsular Siam, to the Endau and Rumpin Rivers in Pahang, to the "One Fathom Bank" off the Selangor coast, to Pulau Jarak in the Straits of Malacca, and to Sarawak. The expedition to Peninsular Siam was one of considerable importance, and produced large results, several new species being comprised in the collections, while the expedition to Sarawak resulted in the addition of some 1,600 specimens of vertebrates, many of which are of great rarity.

Botanical Work. A very extensive Botanical collection from lower Siam was forwarded during the year to the Royal Botanical Gardens at Kew, but little other work was done in this branch, partly owing to the pre-occupation of the staff with zoological work, and partly to the enormously increased cost of paper, of which large quantities are required for botanical work.

Public Health. The work done by the Malaria Bureau was severely handicapped by the sickness which is the unavoidable concomitant of such work, but much valuable information was collected. The great amount of field work done, in spite of sickness and shortage of staff, is indicated by the following figures:—

Breeding places found and examined	1,365
Larvæ identified microscopically	20,506
Adults bred out and identified	4,802

Much increased interest in the work of the Bureau has been shown by outside workers and others.

An interesting and somewhat disturbing question raised in the course of the field work during the last two years is as to whether there is not a danger of domesticating the Anopholine as a result of anti-malarial clearing and drainage work as at present carried on. During the whole of 1913 Anopholines were

only found eight times in artificial breeding places such as disused tins, broken jars, etc., and the surroundings in which the eight cases occurred suggested the idea that it was the destruction of neighbouring natural breeding grounds which had driven the insects to artificial breeding places commonly found close to human dwellings. Much more information must be collected before it can be decided whether this idea represents a real danger or is a mere chimera.

Turning from the publication of others to those of our own Society we are glad to record the completion of arrangements for the publication of the first volume of Game Birds, which is the second edition of Indian Ducks, and of the second volume of Game Birds which comprises the Snipe, Bustard and Sand Grouse, and also of the Snake Chart. Full particulars of these have been issued to all members and the subscription list opened to members has been well filled. Unfortunately owing to increased prices at home and the fall in exchange the estimated cost of production will be considerably exceeded. Difficulties at home have delayed publication but owing to Mr. Millard's energy these will be overcome. His labours have not been lightened by a continual stream of instructions from Bombay. One of the last of these was considered a very valuable one—so much so that it was sent by cable. It consisted of advice received from a medical member of the Society who had experienced much trouble from the destructive agency of rats and white ants and his advice was that the linen, varnish and roller of the Snake Chart should be preserved by poison against the voracious appetite of these pests. Despite Mr. Lefroy's help this has proved too much for the English publisher and the idea has had to be abandoned.

A good many enquiries have been received for vernacular editions of the Snake Chart and arrangements are being made for these to be printed and issued on the Society's behalf by the Oxford University Press. It is hoped that this Press will be able to collaborate with the Society in the issue of Nature Science Charts for schools in India.

The Committee have to record with great regret the death, the result of an accident, of Mr. E. L. Sale, I.C.S., who was Honorary Treasurer of the Society in 1912 and was always keenly interested in its welfare. He will be greatly missed by a wide circle of friends.

It is also with great regret that they have to report the death of Mr. F. M. Howlett of the Agricultural Research Institute, Pusa. Mr. Howlett had been a member of this Society since 1908.

Mr. F. Ludlow of the Indian Educational Service has been elected to the Committee to fill a previously existing vacancy.

MISCELLANEOUS NOTES.

No. I.—TIGERS IN TREES.

There is a considerable literature on the subject of tigers climbing trees to be found in old Sporting Magazines, although I can discover in our Journal only one reference to such an occurrence, recorded by Mr. Monteath in Volume XXVI, No. 3. Such being the case and the magazines in question being very difficult to obtain, it is perhaps worth collecting all that can be found on the subject.

In the *Bengal Sporting Magazine* for 1834 it is recorded that a tiger, struck on the back of the head by a bullet on the previous evening, was found quite dead on the lower branch of a pipal tree at least fifteen feet from the ground. The marks of his claws on the bark were so clear that there could be no difficulty in deciding that he had scrambled up cat-fashion. He then ran along the branch, at the extremity of which he lay down across it, his legs on either side being kept in balance by small twigs, there he died. This animal had not attained his full growth. An instance is given in the *Bengal Quarterly Sporting Review* for 1843 of a hunted tigress mounting to a bough twenty and a half feet from the ground to seize a man, the man was wounded and the tigress then lost her balance and fell.

In 1856 "Teutonium" recorded two such instances in the *India Sporting Review*. In the first case he had news of a tiger sitting in a tree where it was said to be blockaded by villagers. He rode to the place, which was within five hundred yards of a village, and there saw a large pipal tree round which people were picketed. A spearman was standing almost underneath it. When he approached within a hundred yards of the tree "there appeared, standing on a sturdy branch high aloft in the tree, the tiger, erect and calm and fearless with black, yellow and white colours in stripes, looking beautiful in high relief". The height of the animal above the ground was found to be twenty-five feet when subsequently measured. On receiving a shot he caught a lower branch with his two arms in falling, hung for a minute and then dropped dead. The villagers had found the animal in the morning asleep under a mango tree. On being roused he at first tried to hide himself in the drain of a tank, and eventually mounted the tree, which from its size and low stout branches was easy of ascent. They said that once during the day he tried to descend, but that he was driven higher up by their shouts. This was a young tiger about eight feet in length.

The second case, which was very similar, occurred on the 17th May 1856 near the village of Tucheza. A tiger attacked a buffalo near the village at about daybreak, but was driven off by the herdboy. The villagers then turned out and the tiger got up a pipal tree, where a dozen villagers remained to prevent it getting down. The sportsman approached to within forty yards, mounted on an elephant, and related that as he stood up in the howdah with his rifle levelled at the tiger's chest, it appeared to be a few feet higher than the rifle, and he calculated it to be about nineteen feet. The tiger, which was killed with three shots, proved to be a male measuring nine feet eleven inches. "How he got up the tree I could not well make out, as with the exception of an intervening branch, and many large notches, the trunk, measuring in circumference at least 38 feet, was at least fourteen feet high, and then branched out like a banyan tree, and there was plenty of room where he could stand and lie."

In Volume I, No. 5, of the *Oriental Sporting Magazine* for 1866, it is related that a herd of buffaloes drove a wounded tiger into a rhododendron tree, but no other particulars are given. In Volume IV, No. 41, of the same magazine

for 1871, an instance is given of a tigress charging a man in a tree, and springing up eleven feet six inches from the ground, as proved by the claw marks. It is also said that she began tearing the bark off the tree with her teeth at ten feet four inches from the ground.

Mrs. Colin Mackenzie in her book "Life in the Mission Camp and Zenana," says:—"Captain J. told me he never knew a tiger up a tree but once; that was at Hingoli. An unfortunate man who thought himself quite safe cried out 'here she comes'! The tigress heard him, went up the tree, pulled the man down, and bit him on the knee so severely that he died in hospital soon after. It was so remarkable an occurrence that the tree was cut down and brought into Hingoli as a curiosity."

But the most remarkable instance of tigers climbing trees was recorded in the *South of India Observer* in December 1870, as follows:—

"More tigers! Now that our monsoon is over, or greatly moderated, our sportsmen have been able to resume operations against the feline race. We learn that two gentlemen killed two tigresses last week, one on the 2nd instant, the other on the 5th. They may be called the Peermund and Aniculmund tigers. Both afforded considerable sport, and one carried on such games as possibly never were heard of before in tiger shikar. It appears that the one alluded to was found in a small sholah, about 200 yards long and 50 or 60 broad. The coolies and dogs had scarcely been put in at the top of the beat when a sudden screaming and skedaddling among our canine friends was heard, which showed that there was some animal of dangerous proclivities inside. This had hardly passed when a huge tigress bounced out at the foot of the sholah, immediately going heels over head in a hidden nullah which she had not seen. This was all so instantaneous that there was barely time for one of our sportsmen, who was seated calmly on the grass within 25 yards of where this happened, to blaze a shot at the tigress as she flashed back into the sholah. The men continued beating down and presently stripes again showed for a moment at almost the same place, and another hasty shot was fired. She then disappeared for some time, and next showed herself near the top of the sholah and tried to escape in another direction, but the coolies made such a din that they drove her down again. Now comes the curious part of the story. One of the shikaris, watching at the top, spied Mrs. Stripes suddenly appear on the top branches of one of the highest trees in the sholah. He immediately called out, "the tiger has gone up a tree."

This was good news, and one of the sportsmen ran up the side of the sholah and sure enough saw Mrs. Stripes laid out on a branch at least thirty feet from the ground. To knock her off this perch with a brace of bullets took but a moment of time, and down she came with a thundering crash, apparently lifeless. The beaters began to cheer, thinking their work was over; but they say a cat has nine lives and so it proved on this occasion. She presently began growling and snarling at the dogs that had got round her. The gentleman who had been busy with her, as she was nearest his side then crawled into the sholah and presently saw Mrs. Stripes get on her legs and move off; but the brushwood was so thick that it was impossible to see in what direction she was coming, so he skedaddled. He had hardly got out, when to his amazement he saw stripes shining up the same tree, just as any ordinary house-cat would. The tigress got back to almost the same part of the tree as before and stood on the fork of two branches upright, looking down and exposing her great chest. To tumble her off again was a momentary affair, and down she came with a tremendous crash. She required a ball through her brain to finish her off, even after this, as she lay on the ground pawing at the dogs. The sportsmen examined the tree after the battle was over, and it proved to be perpendicular for about 25 feet. There were the claw-marks, showing that she had gone up the same tree twice, once wounded, as seen by the blood. The

claw-marks were mere scratches, and how this great animal could climb a perpendicular tree is a perfect marvel. Everyone has seen a house-cat run up a post or tree, and this huge tigress did this with just as much ease. From this experience we might suppose that tigers drop on their prey from branches, and also reconnoitre their game from high trees. To show what a difficult tree this was to climb two young active coolies were offered a rupee each, if they would climb the tree, and they failed to do so."

In a letter to the *South of India Observer*, Lieutenant-Colonel Christie confirmed the story, and wrote that he shot the tiger in the way described. He added that the tree was perpendicular, about a foot in diameter, with no branches for about 25 feet. He wrote that "the tree in question will doubtless retain the double set of claw-marks for years to come, so any curious or dubious gentleman may go and look at it near Peermund. The length of the tigress was about 9 feet 6 inches."

The other sportsman present was Mr. J. W. Hadow of Southwich House, Ootacamund.

CHARLTON KINGS, ENGLAND,

June 1920.

R. G. BURTON, BRIG.-GENL.

No. II.—MAN-EATING TIGERS ON SAUGUR ISLAND IN
THE 18TH CENTURY.

It is not often that Europeans have fallen victims to man-eating tigers but I find recorded in the *Annual Register* two instances of such occurrences on Saugur Island. The following extract of a letter from a gentleman to his friend at Calcutta is printed in the *Register* for 1793 and dated the 23rd December 1792 on board the ship "Ardasier Shaw," off Saugur Island :—

"To describe the awful and lamentable accidents I have been an eyewitness of is impossible. Yesterday morning Mr. Downey, of the Company's troops, Lieut. Pyefinch, Mr. Monro (son of Sir Hector), and myself went on shore on Saugur Island to shoot deer. We saw innumerable tracks of tigers and deer but still we were induced to pursue our sport, and did the whole day. About half past three we sat down on the edge of a jungle to eat some cold meat sent us from the ship, and had just commenced our meal when Mr. Pyefinch and a black servant told us there was a fine deer within six yards of us. Mr. Downey and myself immediately jumped up to take our guns; mine was the nearest, and I had just laid hold of it when I heard a roar like thunder, and saw an immense royal tiger spring on the unfortunate Monro, who was sitting down. In a moment his head was in the beast's mouth, and he rushed into the jungle with him with as much ease as I could lift a kitten, tearing him through the thickest hedges and trees, everything yielding to his monstrous force. The agonies of horror, regret and fear rushed on me at once. The only effort I could make was to fire at him, though the poor youth was still in his mouth. I fired a musket, saw the tiger stagger and agitated, and cried out so immediately, Mr. Downey then fired two shots, and I one more; we retired from the jungle, and a few minutes after Mr. Monro came up to us all over blood, and fell. We took him on our backs to the boat, and got every medical assistance for him from the "Valentine" East Indiaman, which lay at anchor near the island but in vain. He lived twenty-four hours after, but in the extreme of torture; his head and skull were torn and broken to pieces, and he was wounded by the claws all over the neck and shoulders; but it was better to take him away, though irrecoverable, than to leave him to be devoured limb by limb. We have read the funeral service over him and committed him to the deep. He was an

amiable and promising youth. I must observe there was a large fire blazing close to us, composed of ten or a dozen whole trees; I made it myself on purpose to keep tigers off, as I had always heard it would. There were eight or ten of the natives about us, and many shots had been fired at the place and much noise and laughing at the time, but this ferocious animal disregarded all. The human mind cannot form an idea of the scene; it turned my very soul within me. The beast was about four and a half feet high and nine long. His head appeared as large as an ox's, his eyes darting fire, and his roar, when he first seized his prey, will never be out of my recollection. We had scarcely pushed our boats from the shore, when a tigress made her appearance, almost raging mad, and remained on the sand as long as the distance would allow me to see her."

The following is an extract from the *Annual Register* for 1787, Calcutta, October 12th :—The following melancholy accident shows that a tiger is not always deterred from approaching fire. A small vessel from Ganjam to this port, being longer on her passage than was expected, ran out of provisions and water. Being near the Saugur Island, the Europeans, six in number, went on shore in search of refreshments, there being some coconuts on the island, in search of which they strayed a considerable way inland. Night coming on and the vessel being at a distance, it was thought more safe to take up their night's lodging in the ruins of an old pagoda, than to return to the vessel. A large fire was lighted, and an agreement made that two of the number should keep watch by turns, to alarm the rest in case of danger, which they had reason to apprehend from the wild appearance of the place. It happened to fall to the lot of one Dawson, late a silversmith and engraver in this town, to be one of the watch. In the night a tiger darted over the fire upon this unfortunate young man, and in springing off with him, struck its head against the side of the pagoda, which made it and its prey rebound upon the fire, on which they rolled over one another once or twice before he was carried off. In the morning the thigh bones and legs of the unfortunate victim were found at some distance; the former stripped of its flesh and the latter shockingly mangled.

CHARLTON KINGS, ENGLAND,

June 1920.

R. G. BURTON, BRIG.-GENL.

No. III.—A SPORTING DIARY.

The Society is indebted to His Highness the Maharaja of Bikanir for permission to publish the following extracts from His Highness's Sporting Diary. The extracts deal with a sporting trip His Highness made in Nepaul between March and April 1920. On the 17th March the first camp was made at a village called Babia and on the 20th His Highness shot his first Wild Buffalo. Writing from Babia on the 17th he says :—

"Saw at Hathi Manda village, half an hour's journey from Babia, a tame male buffalo, which, while tied to a tree in the village, was set on and badly gored by a Wild Buffalo (Arna) who lives in the jungle close by and spends most of the night till fairly late in the mornings with the tame she-buffaloes of the village in the open patch close by the village."

On the following day an unsuccessful attempt was made to bring the beast to bay, in regard to which His Highness writes :—

"Unfortunately a mess was made owing to overkeenness. Bearing in mind the late Maharaja of Cooch Behar telling me how Wild Buffalo, living with village buffaloes, were sometimes easily shot off elephant, I thought same would result to-day. But the buff was on the other side of the plain from where we entered it—two howdah elephants only, self and Hiru. As

soon as he saw us he began to move away and entered the jungle, never letting us get nearer than some three hundred yards and I did not want to disturb him further with a long shot of which I could not make certain."

The buffalo returned to his nocturnal haunts the next evening but was left undisturbed. The following day, the 20th, His Highness describes as a red-letter day, his diary for the period runs as follows:—



At last I have shot my first buffalo. Khuber came of Buffalo at 7 a.m. Left camp about 7-30. Got to place about 8-45 a.m. A machan was tied up just a little inside the plain beyond the jungle on a small tree on which Hiru and I, with Asu Singh loading for me, got up. Staff put up on two machans to our right front and right rear in case of buffalo escaping wounded. Saw Arna buffalo a little to the north of where we saw him on the 18th. The only way to get a decent shot, as he wouldn't allow elephants near him, was to try some subterfuge. Hence machans and our attempting to get him to follow the tame buffalo herd past our tree. The plan succeeded and he followed some twenty yards behind the village buffaloes passing my machan about 70 yards off. Although the shooting itself was comparatively tame work, I confess I felt quite excited when the wild bull-buffalo began moving towards us! Would he come on, or, seeing us, move away without giving us a shot? But all went well and my rifle spoke out three times, the first bullet from my .465 Cordite going home well and true, crashing into his right shoulder, and the mighty beast came down on his knees and head. The second bullet again got him in the shoulder while he was plunging about on the same spot (though mortally wounded) and down he went. But as he was still moving about a little I finished him off with a third bullet in the top of the neck with the .450 Cordite. On cutting up his head we found that the old buff had a 12 bore bullet buried just below the skin in the neck, and we ascertained that a Nepaleso officer had tried to shoot it last year as it was giving much trouble to the villagers. This accounts for his not letting the elephants approach him.

He also had marks in neck and hindquarters of encounters with tigers, evidently before he was full grown. A great trophy though not with as long horns as I hoped for. Measurement of Buffalo as below :—

Total length from nose to tip of tail	13 ft. 00 in.
Body	9 ft. 10½ in.
Tail	3 ft. 1½ in.
Height	5 ft. 2¼ in.
Length of horn on outside curve	45 in.
Circumference	19½ in.
Tip to Tip	47 in.
Widest inside	46 in.
Widest outside	50½ in.
Across skull excluding horns	19½ in.
Both horns across skull round outside curve	8 ft. 4¼ in.

The record horn taking the length of horn on the outside curve is according to Rowland Ward (latest edition) 77¾".

The largest head in the Society's collection has horns measuring 54½" and 54" and is 125" on the outside sweep.

The association of Wild Bull Buffaloes with domestic herds has often been commented on by sportsmen.

On the same day the party moved off to Bankulwa where the following morning khuber of tiger was received from no less than 5 places. His Highness writes :—

"Two tigers ringed in but one got out before I got there. First sight I had was of a big tiger in mid air above grass jumping, I should say a good 9 feet from the ground, at the head of a huge tusker, Shamsher Prasad, which he scratched in forehead. Shortly on my moving our elephant round, he charged out straight at Hiru and me but my elephant moved backward some three yards and I had very unsteady and unsatisfactory first two shots. Hiru fired after I had wounded him and knocked him over temporarily, and the tiger went a little further riddled with my bullets and Hiru's shot, and died. Fine 10 ft. 1 in. tiger—the longest body tiger (7 ft.)—that I have shot or seen shot. Searched and made two rings for the second tiger but in vain. My elephant when making second ring nearly threw me out of howdah by kneeling and attempting to tusk a hogdeer breaking past him."

The 22nd brought no further addition to the Game record beyond 2 Muggers shot in a stream running by the Camp.

"The first one on being cut open had thirty-six eggs and a small tortoise inside it and the second one forty-five eggs and sixteen small round stones!"

On the 23rd His Highness had the good fortune to bag another 10 ft. 1 in. tiger. The animal had a huge head 3 ft. 1 in. and stood 3 ft. 5¼ inches in height. "The second biggest measurement in my Game log, my last tiger in Nepal shot on the 20th May 1918, standing 3 ft. 8 inches in height."

In describing the shooting of this tiger His Highness writes :—

"He looked an awfully fine sight galloping, head and tail raised, through the grass in the dusk."

On the 24th the shooting camp was shifted to a place called Hindalwa, where on Wednesday, the 31st March, the Maharaja shot what is described as the record tigress. His Highness describes the incident as follows :—

"Another red-letter day. Four tigers reported for some days right beyond the Kosi. They however before daylight went up a long low hill just above. So sent elephants out at night and put a line between the grass and the hill early this morning. Khuber brought here at 8 a.m. of one big tiger and two others seen, though a fourth was also expected to



His Highness the Maharaja of Bikanir's 9 ft. 7 in. Tigress.

be there. Left camp at 9-15 a.m. Motored in half an hour to Kosi bank on this side, crossed in a boat comfortably, went across a strip of jungle about half a mile wide, and again crossed in boat the other branch of Kosi on other side and got into howdahs at 11-15 a.m. We stood on bank of dry nullah bed some 100 yards wide, and sent two elephants across to first patch of grass, where big tiger was reported. It was lying there in rather low grass. A magnificent sight followed. A huge tiger, looking bigger even than it was owing to its standing out well above the low grass, immediately showed up and after going on the far side ahead of the farther elephant suddenly turned round and with tail up, charged out at elephant, then turned round and came through the grass straight at us. I attempted to down it with Mannlicher as it was leaving grass to cross nullah but elephant moved and my bullet failed to stop or drop it, the same happened with the second shot from the Mannlicher, and then I took up the .240 double barrel and my first shot hit it in the shoulder rather low. But except for a quiver she came on charging right across the nullah and, just when things looked exciting, suddenly fell dead at our feet, when almost up the bank. We all voted it to be a fine male tiger—the father of the family. Imagine our surprise on going up to it to find it was a huge tigress, of which the smallness of the head as it lay dead gave me my first doubts. On eyeing it closely it turned out to be the Record Tigress ever shot and the biggest recorded in India—9 ft. 7 inches long, with a body 6 ft. 5 inches, and a really superb prize to have secured. The record from Rowland Ward's book till now was 9 ft. 5½ inches, by Lord Villiers, though my 9 ft. 5 in. Lachhmania Tapu tigress shot in 1918 in Nepal had a 6 ft. 3 inches, against the body of Lord Villiers' tigress of only 6 ft. 2½ in."

"The following are the detailed measurements of the Record Tigress:—

Length of body	..	..	..	..	..	6 ft. 5 in.
Length of tail	..	..	..	..	..	3 ft. 2 in.
Total length	..	..	..	..	..	9 ft. 7 in.
Girth	..	..	..	..	..	3 ft. 6½ in.
Head	..	..	..	..	..	2 ft. 3¾ in.
Forearm	..	..	..	..	..	1 ft. 5½ in.
Height	..	..	..	..	..	3 ft. 1 in.

We then went on a bit and sent elephants round to beat up a long patch of low grass towards us where the two other tigers had been seen. Here again it was a very fine and jolly sight. Shortly after the elephants had begun beating up to us we saw a tiger coming towards us some 500 yards off. He was still going through the low grass slowly, some 100 yards from us towards our left, when I fired a Mannlicher bullet but, owing to the elephant moving slightly, missed. My second shot, however, hit it in the neck and dropped it in its tracks. Soon afterwards another tiger showed itself coming to our right front from the same direction and yet another to our left! The tiger on the right after a while crossed in front of us at a walk some 150 to 175 yards off and I dropped it with a bullet through the shoulder but it picked itself up again and charged the elephants to our left, scratching one and then lying up opposite them inside the line. The third then galloped across towards our right front and I downed it with a .240 bullet a little far back. I took my elephant up to it and finished it off and then we went up to the other wounded animal. Ranjit Singh said he could see it in the grass lying down opposite him, so I told him to fire. But in accordance with his usual practice he fired at his hind quarters and then a funny sight ensued: Jabbers missed the charging tiger with his second barrel and the next moment he and Bharat Singh were clinging on to the howdah for dear life while the elephant was down on his knees

with the tiger under it, trying to kill it with its tusks. It was for this reason that some days ago I changed from Ram Prasad to Vikram Prasad. Ram Prasad had however with his knees and weight practically done for the tiger but on getting a scratch on the trunk under the right eye he bolted a bit and after it stopped, Ranjit put a bullet into the tiger who, though alive, was really done for and could not get up. Thus ended another red-letter and ever memorable day. All four happened to be tigresses but the three daughters were all grown up ones measuring 8 ft. 3½ in., 8 ft. 3 in., 8 ft. 0½ in. We got back to camp about 3-30 p.m."

The following day, the 1st of April, His Highness obtained his 97th tiger. The 2nd and 3rd and 4th were blank days. The entry for the 5th reads as follows:—

"At last Nishan Tapu has yielded us a tiger but, compared with its reputation, and also the actual hunt, it was disappointing and the tigress led us a rare old dance to-day. Seen early in the morning by our scouts, line of elephants left early after breakfast and we at 1-15. On way heard tiger was ringed in after its having broken through first ring in quicksand patch on bank of Kosi. On our getting there tigress broke through the ring and back through the line in the next attempt before ring was completely made. We then beat it out past me in a small patch by force but the cunning old brute went through the only patch of grass instead of the open and I had a guess shot at her after she had galloped into the tall grass. In the next attempt of the same nature, she charged straight out at my elephant, my two shots getting her in the back just missing the spine and in the nose too far forward. Pools of blood. In the attempt following she got home and slightly wounded my elephant, Gorakh Prasad, in the trunk with claw scratches, who, considering everything, stood wonderfully staunch, though he was rather forced to do so as we were in somewhat quicksandy ground. Hiru's elephant, Sital Prasad, who was on my immediate right, seeing the tiger get home on my elephant knelt down anticipating a charge; and the unsteadiness and moving about of the elephants generally, contributed to bad shooting. Several other elephants were mauled—scratches mostly—during the long and tedious hunt. The last time we forced the tigress out of thick grass I managed to break her left leg, though rather low, and Jeoraj Singh and Nawal Singh opposite whom she was lying down close by, finished her off—a fine tigress 9 ft. 2 in. with two perfectly marked cubs—male and female—which would probably have been born within a week.

Had a somewhat perilous and uncomfortable journey back, as anticipating a pleasant river ride drifting down stream, as in 1908 on the Gandak, I foolishly agreed to Jabber's proposal and came back by boat. Whilst the elephants got back in one and quarter hours it took us two and half hours and we had considerable excitement also through boat striking submerged trees and stumps and bumping on shallow shoals in the dark."

On the 7th April His Highness' shoot was brought to a close.

The following is a Summary of the Nepal shoot:—

17th March to 7th April, 1920.

Tigers	...	..	..	(Self 15 and Hiru 2)	..	17
Arna Buffalo	..	..	..	(Self)	..	1
Mugger	..	..	..	(Hiru)	..	2
						<hr/>
Total	..	..	..		..	20
						<hr/>

MEASUREMENTS OF TIGERS.

Tigers.

1.	10 ft. 1 in. (7 ft. body)	..	..	..	Hindalwa, 21st March.
2.	10 ft. 1 in. (3 ft. 1 in. head)	..	..	..	„ 23rd March.
3.	9 ft. 6 in.	..	..	..	„ 26th March.
4.	9 ft. 5 in. (shot by Hiru)	..	..	..	Bankulwa, 18th March.
5.	9 ft. 3½ in.	..	..	..	Hindalwa, 1st April.
6.	8 ft. 5 in. (Old tiger)	..	..	..	Bankulwa, 23rd March.
7.	6 ft. 10½ in. (Three-quarter grown cub)	..	..	..	Sundar Gonar, 29th March.

Tigresses.

1.	9 ft. 7 in. Record Tigress (6 ft. 5 in. body)	..	..	..	Hindalwa, 31st March.
2.	9 ft. 2 in. (6 ft. 5 in. in body)	..	..	..	„ 5th April.
3.	9 ft. 2 in. (2 ft. 4¼ in. head)	..	..	..	Bankulwa, 20th March.
4.	8 ft. 8 in.	..	..	..	„ 24th March.
5.	8 ft. 6½ in.	..	..	..	Hindalwa, 27th March.
6.	8 ft. 5 in. (shot by Hiru)	..	..	..	Sundar Gonar, 29th March.
7.	8 ft. 3½ in.	..	..	..	Hindalwa, 31st March.
8.	8 ft. 3 in.	..	..	..	„ 31st March.
9.	8 ft. 0½ in.	..	..	..	„ 31st March.
10.	6 ft. 7½ in. (Three-quarter grown cub)	..	..	..	Sundar Gonar, 29th March.

LOCALITY OF BAG.

Hindalwa	..	..	..	..	..	10	Tigers.
Bankulwa	..	..	..	..	..	4	„
Sundar Gonar	..	..	..	..	..	3	„

Total .. 17 Tigers.

No. IV.—ON THE METHODS OF MEASURING TIGERS.

In No. 3, Volume XXVI of this Journal, H. H. the Maharaja of Dhar gave some notes on the length of tigers and panthers shot in his State. Recently in the Field—there appeared a photo of what was stated to be the record tigress which had been shot by H. H. the Maharaja of Bikaner—Reference to this tigress is made in the notes from His Highness' diary which by his courtesy are reproduced in this number together with a photo of the tigress.

In No. 1 of this Volume Brig.-Genl. R. G. Burton asked how the measurements of the Maharaja of Dhar's tigers and panthers were taken and stated that measurements round curves must always be unreliable as no two people are likely to take them alike. He considered that no measurements could be judged satisfactory unless taken in a straight line between pegs, the tail being measured separately.

The Editors wrote for information on this subject to both the Maharaja of Dhar and the Maharaja of Bikaner and were advised that the measurements had been taken round curves "this being the ordinary accepted way."

The controversy as to the correct way of measuring tigers is very ancient as will be seen from the following extracts from the *Asian* of December 23rd, 1879. The extracts are from a letter to the *Asian* dated Purneah, 1st November 1879, and signed "Joe" (J. L. Shillingford). Joe writes:—

"LENGTH OF TIGERS.

"In the columns of this Journal a good deal has been written on this subject, resulting evidently in no definite solution of the vexed question. "Naturalists, and even sportsmen, are still sceptical regarding the utmost

“length and size it is possible for a tiger to attain. I have ventured to record the result of my experience to assist towards settling this much controverted matter. During a career of over thirteen years, as a sportsman, chiefly in Northern Bengal, I have had the satisfaction of registering the death of about 170 tigers. The measurements of some of the largest, both male and female, are appended below, in a tabular form. The dates on which they were shot, and the initials of the party present are also mentioned. Invariably all were measured prior to being skinned, and in presence of the assembled group of sportsmen, generally on the very spot where they had been killed, before being ‘padded’ for removal to camp.

“The method of measuring is as follows:—

“Applying the tape to the tip of the nose, it is carried along the middle of it, to between the ears, then along the vertebrae to the root of the tail, which appendage being straightened out, the measurement is completed to the end of it.”

It will be seen that “Joe” measured in the same way as the Maharaja of Bikanir’s tigress was measured.

The length of the largest tiger, shot on the 3rd November 1868, is given as 11’-5”. Four tigers 11’ in length are recorded and detailed measurements of one of these shot at Purneah are given, namely:—

Tiger.—	Feet.	Inches.
Length	11	0
Girth round chest	4	6
Circumference round head	2	10
Tail	3	4
Round fore-arm	2	2
Height	3	7

“Joe” mentions 6 tigresses whose dimensions are larger than the one shot by H. H. the Maharaja of Bikanir. These six measured 10’-2” (shot 15th September 1867), 9’-8” (6th November 1868), 9’-11” (shot on 8th April 1870). Amongst the shikar party was Lord Mayo (the Governor General), 9’-8” (22nd August 1870), 9’-11” (28th August), 9’-7” (22nd April 1872).

“Joe” was firmly convinced that tigers in Central and Southern India never grew to the same length as those in Bengal, he compares the dimensions of the 11’ tiger shot in Purneah, and which are given above, with another shot in Southern India which measured:—

	Feet.	Inches.
Length	10	2
Girth round chest	6	1
Circumference round head	3	5
Tail	3	1
Round fore-arm	2	10
Height	3	9

He writes:—

“The tiger of Bengal is simply built, with a small head, long tail, small pug, and a smooth glossy skin, the black stripes are narrow and very dark, with perfectly white coloured hair under the stomach. The habits are much more retiring and sequestered, and its depredations confined chiefly to cattle and wild animals, very seldom attacking human beings, even though chance offers an easy victim. I lived for seven years in one of the most tiger infested portions of this district during which period I shot 63 tigers, and only heard of some ten or twelve natives being killed, most of whom were shikarees out on

“ shooting excursions. There were very few villages, and these far
 “ apart, with narrow footpaths, through heavy grass and underwood
 “ jungles, leading from one to the other and if the tigers were so inclin-
 “ ed they could kill bipeds daily without exposing themselves to view,
 “ still very few villagers were ever carried away.
 “ The tigers found in Southern India, judging from measurements
 “ and descriptions recorded, are more solidly built, have larger heads in
 “ proportion to the body, and very expanded pugs. They have short
 “ tails, and as far as I have been able to ascertain, the skin has more of a
 “ yellowish hue, than those of Bengal. They are more addicted to man
 “ killing, and fearlessly approach human habitations when pressed by hun-
 “ ger. I dare say the hilly nature of the country they have to live in, has
 “ good deal to do in their being more muscularly than those infesting
 “ the plains of Bengal.”

Commenting on the above in the *Asian* of 20th January 1880 “ Young
 Nimrod ” writes :—

“ I think it should be conceded that the tigers inhabiting Northern Benga
 “ and the Terai must be pronounced to be longer but not so well developed
 “ as those of Southern and Central India, and this I never doubted. The
 “ same may, I think, be said of the tigers of the Sundarbans, and I so
 “ described them in my article on the Royal Bengal tiger, which appeared
 “ in the *Oriental Sporting Magazine* for November 1872, p. 520. Your corres-
 “ pondent ‘Joe’ has furnished in a tabulated form much valuable information
 “ regarding the length of numerous tigers, four of which are stated to have
 “ reached exactly 11 feet, and only one to have attained beyond that length
 “ being five inches above it. Now I have always contended that a tiger over
 “ and not up to 11 feet is a desideratum, and I have therefore only to deal
 “ with the animal represented to be 11 feet 5 inches. Of course if the
 “ measurement had been accurately taken, there would be nothing further
 “ to say on the subject and I should be glad to admit that I had at last
 “ found a tiger exceeding 11 feet in length. But ‘Joe’ has favoured us with
 “ the method of measurement adopted by him, and this shows a radical
 “ defect, which proves that the measurements were not perfectly accurate.
 “ The mode of measurement practised appears to have been to pass the
 “ tape—was the measuring tape invariably used or a piece of string
 “ afterwards measured, and did the sportsman or the servants take the tape
 “ along the length of the tiger—from tip of the nose to the extremity of
 “ the tail following the undulations of the body in a line therewith? The
 “ part of the above sentence I have italicised shows that the measurement
 “ was inaccurate—inasmuch as it does not represent the exact length of the
 “ animal. I am quite sure that ‘Joe’ would never think of taking the
 “ height of a horse by measuring from the heel to the shoulder by following
 “ the curves of the body from one point to the other? Then why should
 “ the length of a tiger be measured in a different manner? In the former
 “ case any Steward of a Race Meeting would reject the measurement
 “ taken, and in the latter Naturalists have no option but to act in the same
 “ way. I observe that the length of the tiger shot on the 18th April
 “ 1870, when the G. G., the late lamented Lord Mayo, was out with the
 “ party, is stated by ‘Joe’ to have been 11 feet, while another of the
 “ same party, A. P., of Calcutta, I think the late J. H. G. told me,
 “ who furnished an account of that shooting excursion to the *O. S. M.*
 “ (see No. for July 1878, p. 1220), says it was ‘11 feet 1 inch.’ Who is
 “ right? I presume ‘Joe’ is; yet it shows how apt mistakes as to
 “ measurements are liable to occur, and how very careful it is neces-
 “ sary to be in such matters.”

“Joe” replies to Nimrod’s comment:—

“The manner of measuring tigers, scientifically speaking, is certainly open to objection; but it must be recollected universal custom warrants the style adopted by me. If from time immemorial the height of a horse had been mesasured by a tape instead of a rod, it would be the accepted method now; therefore, if I were to place a stake at the nose, and another at the tip of the tail, and then register the length of a tiger, instead of carrying the tape along the back, my way of measuring would decidedly be the exception and not the rule.”

“To further satisfy sceptics, I will now state that all the measurements recorded were taken by me personally or else by some member of the party there present; a tape carried out for the purpose was always used, and I may here add, the one I use is made of steel and has assisted in taking the dimensions of several scores of tigers.”

He adds that the skeleton of a tiger 11' long was handed over by him to the Indian Museum in 1871. A lengthened description of this tiger by “Bruiser” is given in the *Oriental Sporting Magazine* for July 1871.

The Society possesses the skull of a very large tiger shot by Mr. J. L. Shillingford in Purneah. Records of this tiger’s body measurements are not available but the skull is 14½” in length. The record skull according to Rowland Ward is 15¾” and was shot by the Maharaja of Cooch Behar.

We shall be glad to hear from members of the Society on the above subject—

EDITORS.

No. V.—NOTES ON PANTHERS.

In the *Journal* of our Society, Vol. XXVI, No. 3, page 841, is an interesting article by H. H. The Maharaja of Dhar on the big game of the Dhar State. I note that out of 106 panthers shot no less than 8 have taped eight feet in length.

The *Indian Field Shikar* book, third Edition, 1906, mentions only four panthers of 8 feet and over, *viz.*, one shot by Capt. A. G. Arbutnot (the longest on record) 8 feet 5½ inches. One shot by the Maharaja of Cooch Behar measuring 8 feet 4 inches. One of 8 feet 3 inches shot in Gurhwal; and one of 8 feet shot in Pauna.

I fear I am a sceptic in the matter of measurements. I speak from experience as I have been in at the death of well over a hundred panthers and not one of them approached 8 feet when measured between upright stakes. This experience covers India from Assam to Kathiawar.

Of this large number, the longest taped 7 feet 5½ inches immediately after death, he was a long lithe beast, built like a grey hound, old, and very light coloured. The story of his end is rather interesting:—I was walking through the Gir forest in the month of April 1913 examining the watershed of the hills with a view to finding a suitable passage for a Railway. After mid-day I sat down in a patch of long grass under a huge banyan tree for a rest and a frugal lunch, the latter was just finished when my attendant tapped me on the shoulder and pointed to a large panther walking through the grass about 30 yards away. I had a smack at him with my 300 H. V. but the bullet was deflected by the grass and struck him high up in the loins. Curiously, he did not answer the shot, and as there was no blood on the trail it looked like a miss. Half a dozen armed forest guards joined us, and we followed up the track; after going about 70 yards there was a huge splash of blood on a dry teak leaf, and of course every one rushed to examine it. Whilst we were bending down, there was a hoarse grunt and we looked up to see the panther almost on us. We all had a bang at him, and he rolled over at our feet simply riddled with buck-shot and bullets.

My companions were the famous Mekranis of the Gir, the staunchest shikaries I have met, but sad rogues and poachers in ordinary times.

The next longest panther was 7 feet 4 inches in length, a very heavy massive beast, also a Kathiawari; he was killed in May 1919 in the gardens to the North of Junagad town. It was in the height of the recent famine, the heat was very great, there was no water on the Girvad hills, the whole place was burnt, and all the trees had shed their leaves, under such circumstances life on the bare hill sides must have been very distressing, so this panther left the jungles and took up his abode under the dense shade of the mango trees in the State gardens. The men guarding the mangoes on going their rounds disturbed him, and one man was severely mauled; the panther moved to another part of the garden, was again disturbed, and mauled a second man; this continued until no less than six unfortunate men had been cruelly mangled. Curiously, all the victims were bitten and clawed in exactly the same part—the right shoulder and upper arm. *Khubber* was telephoned up to me in the late afternoon and about 5 o'clock I started out. On my way to the gardens I met several of the victims being carried to the hospital, and must confess I felt a certain amount of diffidence in meeting this ferocious brute.

It had been a dreadfully hot day—116° in the shade—with hot winds blowing which may have accounted for the panther's bad temper. We found him stretched at full length under a small Karunda bush beneath a large mango tree, he lay with his jaws agape, panting heavily, evidently much distressed with the abnormal heat. We crept up—under cover of a low aqueduct—to within 20 yards of him, and one shot in the chest from my .350 H. V. settled him. He was a massive beast, quite the heaviest I have seen.

The remaining males of the hundred odd mentioned above gave two or three measuring 7 feet 2 inches, the usual length was 7 feet or slightly under. All measurements were strictly honest, taken between stakes, and not along the curves, (this latter generally adds 2 or 3 inches to the length) and before the animal had stiffened.

The Kathiawar panther differs considerably in colour from the Bengal; the skin of the latter is more black and white, with large open rosettes, glossy and bright in appearance, eminently suitable to the heavy dark forests with bright chequers of sunlight shining through the trees. The Kathiawar skins are dull and rusty, with spots more crowded, the lighter colouring suits the open dust coloured Gir forests admirably. It is astonishing to see how perfectly the panther's colouring blends with the back ground, a moving panther is fairly well seen but directly he stops he seems to vanish, and his outline is picked out with difficulty. It is this fact that makes the following up of wounded panthers so exceedingly dangerous. I once followed up a small female, shortly before dusk in scrub jungle, I actually trod on her tail without seeing her, but fortunately for me she was stone dead, having made a dying rush of 50 yards or so with a ball well placed behind her shoulder. I will give another instance of the extraordinary invisibility of panthers and incidentally of the damage they can do when one would imagine they were "*hors de combat*." It was in a beat, a small female trotted past me. I fired with a .300 H. V. shattering both her forelegs above the elbow. She rushed into an isolated thicket of low shrubs and nothing would move her. Whilst we sat debating how best to finish her off a vainglorious villager seized a sword and dashed into the thicket after the wounded beast, shouting that we were all afraid and that he would show us how wounded panthers should be finished off. The foolish hero very nearly stepped on the panther which sprang up on its hind legs, bit the man in both shoulders and gave him a bad mauling generally; we threw all caution to the winds, dashed in to the rescue and my sporting cook brained the panther with an axe.

The village hero spent a month in hospital, and was lucky to escape with his life.

Caged panthers have been known to escape in Kathiawar, and at least one Chief has "put down" tame panthers to stock his jungles, this probably accounts for the variation in colouring, etc., occasionally met with as the purchased animals may be African, Malay or Bengal.

Two years ago one of these "bag" panthers came over our frontier and started man eating. After wandering about 100 miles across country, he finally settled down in open grass country, attacking the women working in the neighbouring fields and the children tending cattle in the grass. His attacks were always made in broad day-light and after a few deaths the country became panic-stricken. All field-work ceased, and moving outside the villages at any time became a night-mare.

I went out after him in mid-April and put Wali Mahomed (the finest tracker in the Gir) on to his trail. The first day he eluded the trackers, but the second day they found him asleep under a small bush. *Khubber* was brought to me about half past five in the evening, no time was to be lost as our quarry was 8 miles away over stony hills and we had to cross several big rivers with rocky beds full of boulders. Wali Mahomed carried a goat across his saddle and I carried a heavy rifle; a sharp gallop brought us to the spot just as the sun was dipping on the horizon. We tied up the unfortunate goat and sank behind a small bush. Within two minutes the panther appeared on a small hillock, and after satisfying himself that the coast was clear, rushed in and killed the goat. I killed the panther, and found him a full grown male of the Bengal type, 3 to 4 years old, 6 feet 10 inches in length, not heavily built, skull 9" by 6 $\frac{1}{4}$ ". The hair on his face and sides was rubbed off by the bars of his cage though he had been free for nearly a year. In this short time he had killed 14 poor villagers.

There is one man-eating panther in the Gir forest, I believe it is a female—probably with cubs. She kills spasmodically; for four successive years she has killed and eaten one child in each monsoon. The place is very difficult to reach in the rains and with the fever, mosquitoes and other biting flies the discomforts are too great to permit of camping in the forest at this season. I ventured out once, was eaten alive by mosquitoes, and had no luck, chiefly owing to too much *bundobast* made by an over-zealous police inspector.

The Rabaris or buffalo herdsmen of the Gir live in the most primitive shelters at all times, a ring of thorns with a few upright sticks covered with coarse grass form their only habitation, this structure is abandoned when the grazing near by is consumed, the graziers then seek pastures new and form a new hamlet.

The lions and panthers of the Gir move from their lairs shortly before sunset and make straight for the nearest Rabaris' hamlet, if they find no victim, they move on to the next settlement, if they fail to find a straggler from the byres they will sit patiently outside. As the cattle are driven out to pasture long before daybreak killing is then an easy matter. The four little girls mentioned above were carried off about dusk or dawn when visiting the edge of their camp, in each case the only trace left was a bare skull.

I have seen tiger, panther, and Indian lion approaching their kills dozens of times, and have watched many panthers kill goats tied up as bait. Some famous artists have painted pictures of these big cats on the prowl, with ears well laid back, head a few inches from the ground, body stretched to its greatest length and every muscle tense and strained. As far as my experience goes this is entirely wrong. They walk along quite naturally to within a few yards of their victim—stopping occasionally to look all round for the goat-herd—then settle themselves down *ventre-a-terre* with the hind legs well doubled up underneath, and then come with a terrific rush on the poor goat who has probably watched the whole performance. The attack is always made in silence, and is

so quick that details cannot be observed, but the goat is nearly always seized by the throat. Most panthers straddle the goat, some lie down at full length. In all cases the goat is held until life is extinct. On steep hill sides, or in places where there is little or no cover, the attacking rush may be from a considerable distance (100 yards or more).

In several instances I have seen a panther come trotting along a jungle path and go straight at the goat without increasing his pace.

Panthers are very cautious on approaching a kill, they walk along slowly and silently but neither stooping nor crawling, they stop at frequent intervals and look carefully around, when quite satisfied that there are no intruders they sit or lie down close to the kill; females appear to be much more cautious than males (I have noticed the same with tiger) and frequently stare long at the machan, if not quite satisfied they walk away and lie down at some distance until it is quite dark when they again approach the kill for a feed.

When a panther receives a wound, mortal or otherwise, he invariably makes a mad rush for the nearest heavy cover. It is astonishing how their instinct leads them to the most difficult and inaccessible cover in the vicinity.

In my experience panthers do not appear to possess a keen sense of smell, either this or they do not worry about the near presence of man, provided the latter keeps absolutely still. On many occasions I have sat in a thick thorn shelter, or a hole in the ground covered with a charpoy or a cart-wheel, with heap of thorns and green stuff piled on the top; the panthers have passed this without noticing the deceit. On one occasion in difficult ground I hollowed out a cactus bush and sat in this, closing the entrance with thorns and green branches, leaving a loop-hole facing the kill; the panther walked all round my shelter sniffing, and quite satisfied there was nothing wrong; when he came in front of the loop-hole I shot him through the head.

Their sense of sight and hearing is very acute, any movement however slight is instantly detected; the jungle may be disturbed by the noise of falling leaves or branches, squirrels or birds racing over dry leaves, etc., of these the panther will not take the slightest notice, but if the shikari touches a dry leaf or the machan creaks ever so slightly the beast is instantly on the alert and either stares straight at the source of the sound or bounds off at once. As with the hunting of all wild animals it is wise to have the setting sun at one's back if this is possible; this places the quarry at a disadvantage.

In tracking up spotted deer in the early morning I have frequently come across panther. Chital always bell when they see the great cats, it is a short sharp note, quite different from their usual musical call. When the panther's stalk is disturbed by man, the beast gives a few grunts and makes off. The Gir shikaries profess to be able to pick out the male panther by his deeper note.

Panthers possess one peculiar habit which is not found among lions and tigers. All three are much given to walking along roads and footpaths. (The Indian lion particularly, I have followed their tracks for many miles) the panther stops occasionally and leaves a long scratch on the side of the road, never in the middle; this mark is about two feet long and generally parallel to the track, but sometimes at right angles. I have never seen the fact quoted in shikar books, but it is well known to the jungle people who have frequently pointed it out to me in several parts of India. I shall be glad if some of the Members of the Society will confirm my statement.

TOKARVADI, POONA DISTRICT.

E. BROOK FOX, M. Inst. C.E.

7th May 1920.

No. VI.—THE HUNTING LEOPARD (*CYNELURUS JUBATUS*).

I have never had the fortune to see the Hunting Leopard in the feral state. I heard of one in the Buldana District of Berar in 1912. I beat up the animal's quarters, but found only tracks. It was said that its mate had been

captured by *pardis*. These animals appeared to be less uncommon in Berar than in many localities. I saw in 1890 the skins of three which had been shot in the Melghat Forest in the Satpura Hills North of Ellichpur by Mr. Ballantyne of the Forest Department. He told me that they all came out in one beat. Captain Winter of the Hyderabad Contingent Artillery shot one at Damangaon near Ellichpur in or about 1894. He saw two or three and shot one when sitting over a kill or a tethered goat. Another was shot in 1895 in the Wun District of North Berar by Captain Barnard, 4th Lancers, Hyderabad Contingent, the animal came down to drink at a pool of water close to him.

In an article in the *India Sporting Review* for February 1857, there is a reference to Chesney's "Journal of the Euphrates Expedition," in which this species is said to be more numerous in Asia Minor than in Persia and Mesopotamia: its occurrence is also noted in Arabia and in the vicinity of Aleppo. The writer of the article says that the chief supply of these animals in Upper India is from the Jeypur District. According to "Buchanan Hamilton," it is found in most of the hilly parts of India, but is nowhere very numerous except near Hyderabad, Deccan. It is stated by Mr. Ure, Surgeon at Hyderabad, that Hunting Leopards were numerous near that place, and live in holes among the rocks on the hills, or rocks that are near the plains which the antelope frequent.

Sir Samuel Baker, in his *Eight Years' Wanderings in Ceylon*, published in 1855, says this animal is common there and "frequently caught at Newera Ellia."

The late Sir Montagu Gerard told me he had ridden down and speared this species in Central India.

CHARLTON KINGS, ENGLAND,
June 1920.

R. G. BURTON, BRIG.-GENL.

NO. VII.—THE HUNTING LEOPARD (*CYNÆLURUS JUBATUS*) IN KATHIAWAR.

I notice in the last number of our Journal under an interesting note on the Hunting Leopard by G.O. Allen, I.C.S., that the Society is anxious to obtain all the information it can regarding this now somewhat rare animal, so am sending the following note on its occurrence in the Province of Kathiawar in the hope that it may be of some value.

According to Blandford's "Mammalia", the Hunting Leopard, does not occur in India, North of the Ganges or anywhere in the Eastern part of the Peninsular, or on the Malabar Coast. How far South it occurs, he is unable to state, but adds that its range is probably nearly the same as that of the Indian antelope.

As far as the Bombay Presidency is concerned I think I can safely say that the only district in which it occurs is in a limited area, situated about the centre of the Province of Kathiawar, and there only in very small numbers.

The antelope is met with in suitable localities, in most of the districts, ranging from Gujerat in the North down to the Southern *talukas* of the Dharwar districts bordering on the Mysore State, but during the many years I was engaged on Survey work, in the Bijapur, Belgaum and Dharwar districts, I have never once heard of a wild Hunting Leopard having been seen in those parts, although I made exhaustive enquiries amongst the natives, some of whom were acquainted with the animal from having seen tame ones, kept by Indian Princes for hunting purposes.

I am not so well acquainted with the more Northern districts of the Presidency but I think if a Hunting Leopard had either been seen or shot in any of them during my long service in Kathiawar I should most certainly have heard of it. As I have already stated they are exceedingly scarce in the latter Province. In the Kathiawar Volume of the Bombay Gazetteer, it is stated, on the

authority of the late Colonel J. W. Watson, who was a very keen observer and *shikari*, that in 1884, there were not more than twenty *Cheetahs* (the local name, the panther being known as the *dipdo* or spotted one). If any thing the number was overestimated by Colonel Watson, for during the succeeding 17 years, when I was serving in the Province and became intimately acquainted with a greater part of it, I only heard of nine, two of which were shot by natives, in the neighbourhood of Chotila, midway between Wadhwan and Rajkot: two by Mr. S. A. Strip of the Wadhwan Garassia School, within a few miles of the Civil Station, and the remaining five, including two which were speared respectively by Mr. Waddington of the Rajkumar College and myself, by two young officers. These five which consisted of a mother and four well grown cubs were obtained within a short distance of the Rajkot Civil Station during the rains of 1894. *Khabar* had been brought to the two officers by some Koli shikaris, that three panthers had been marked down by them. On reaching the spot with the men, they found the animals lying up under a small bush, in the open, and had no difficulty in shooting the lot as they showed no fight. It was only after the bodies had been brought into Rajkot and seen by others, that they discovered what the animals they had shot really were! The Kolis said they had seen two other larger animals, which it was presumed were the parents as the ones which had been shot were only three-quarters grown cubs, and it was arranged that the men should try and find them, and, that should they succeed in doing so, we should ride them down and spear them.

On the following morning, the news was brought into camp, that they had been found and surrounded, and not an hour later we found them in a patch of long grass between some low hills, and very restless as they were moving about with their tails cocked up and visible above the grass. They broke cover in two different directions at a great pace but we had no difficulty in eventually catching them up rough as the ground was, and spearing them. Like the others they did not show any fight and it seemed a pity that they should have been destroyed but we had no means of catching them alive, there being no professional snarers in the country and sooner or later they were bound to be shot by village *shikaris*. One of them turned out to be the mother and the other, another cub, showing that there had been four in the litter. The coats of all of them were in good condition, but otherwise they were very thin and the mother especially looked half starved. This was as far as I could ascertain the first time that hunting leopards had been seen anywhere near Rajkot and this family of them must have wandered there in search of food from the country round Vichia and Tardan where I was told they are occasionally met with. Their favourite haunt however is the large rugged tract of country, known as the Tanga, which includes the greater part of the districts of Chotila, Chobari, Anandpur, Than, etc. This appears to be their stronghold from which they occasionally wander away into the surrounding plains but never to any great distance. There are other localities further North especially in the directions of Dhrangdhra, Malia and Tankara under Morvi, where antelope are plentiful and other conditions apparently favourable for them but for some good reason or other they are never found very far away from the Tanga limits. The same remark applies to the Southern districts of Kathiawar, including the Gir Forest, the Girnar, the Barda, and Alache Hills, Sihor and the surrounding country. All these districts hold panther, but I have never heard of a hunting leopard having ever been met with in any of them.

It is many years since I left Kathiawar (nearly 20) and although there certainly were a few hunting leopards left in the Tanga country when I did stay there I am unable to state if there are any left there now.

MARSH HALL, SOUTH MOLTON,
N. DEVON., 15th May 1920.

L. L. FENTON, LT.-COLONEL.

No. VIII.—THE DESERT LARK (*ALÆMON DESERTORUM*).

During the past two months, I have had the opportunity afforded me of watching this bird. As nothing much appears to have been recorded about its habits, I venture to commit my observations to paper as it may interest others who are ornithologists.

This is an altogether peculiar bird and although classed among the larks, his habits are totally dissimilar. His habitat is the desert. He loves sand and is to be found in desolate places, where he runs about, at a considerable pace, over dunes and hummocks. He seldom takes to flight, preferring to footslog. In the non-breeding season, I believe he is silent. When the mating season comes round, he starts displaying. Before doing this, he runs up to the top of a hummock. On arriving, he utters two notes, very like a warning; he then utters three more, not quite so loudly; after this he runs forward three or four feet and then springs up into the air, sort of slantwise, and utters four or five more notes, which brings him to the top of his flight, when he descends to earth again, as though "side" slipping. He shows off his wings and opens his tail out, in fact makes as much display as he can of his beauty. The song is very pretty and the whole show delightful to watch. He does not rise more than 15 or 20 feet. On descending, he again mounts a hummock and continues the display at short intervals.

In order to find his nest, the best method to pursue is to get on to his haunts. On arrival one just stands and listens. If he is displaying, his voice will soon be heard. This must be followed till he is seen. If there is a nest about it is perfectly easy to find, for after each display, he returns to the same hummock, all that then remains to be done is to search round all the hummocks in the vicinity, where it is sure to be discovered. If there is no nest, he does not return to the same hummock to display, but runs along to another and so on.

In this manner I have discovered 5 nests this season and will endeavour to describe them.

On the 26th April, I came on a cock displaying. I stood and watched him. Almost at the same moment, to my delight, I saw the hen running along quite close by with building material. I hardly had time to realize it, when she flew a little distance to the foot of a hummock, on which was a low tamarisk bush and hopped on to it. I had found the nest. The nest was placed on the bush about a foot or so off the ground. First of all there was a regular platform on which the nest proper was built. This was a good solid affair, well finished off with a deep cup, bound with soft material. The whole must have been nearly 12 inches deep and a good 9 inches across. There was no effort to conceal the nest. It simply hit you in the face. Nothing could be less lark-like! On visiting the nest a week after I found it deserted, much to my disgust.

On the 9th May, pursuing the same method I found another. This was exactly similar to the other in structure but it was placed on the ground among some coarse grass on a hummock. There was no difficulty in finding it as it was so conspicuous. On the 11th I got three fresh eggs from it.

On the 25th May, I found two more nests being built. These were identical with that found on the 11th, *viz.*, placed on a hummock, on coarse grass and absolutely visible. On the 31st May, I got two eggs from one. I was afraid to leave them in case they might disappear. On visiting the other it was found to have been buried in the sand and was invisible. After the 25th May, heavy rain had fallen and apparently water had come down and gone over it, burying it. However, I was lucky enough to find that the birds

had only shifted a short distance away and had started another nest. This was situated in the fork of a small tamarisk about 12 inches off the ground and was solid and very well built. To-day I obtained 3 fresh eggs from it.

Although a lark it is very abnormal. To begin with, it likes the desert, then it prefers its legs to the air, it does not make a lark's nest, in that it does not use a hollow, but builds a massive affair, most conspicuously placed, and even takes to the fork of a small bush. Finally, its eggs are a china white covered with brown, grey and black specks. There is a small zone formed at the larger end, but not very conspicuous. The specks and spots do not obliterate the ground color. In fact, no egg could be less lark-like.

KARACHI,

R. M. BETHAM, BRIG.-GENL., M.B.O.U.

8th June 1920.

NO. IX.—ON THE OCCURRENCE OF THE LARGE BROWN THRUSH (*ZOOTHERA MONTICOLA*) IN SIMLA.

In the list of birds found in the Simla Hills (J.B.N.H.S., Vol. XXVI, No. 2, p. 609) it is stated that only a single specimen of the Large Brown Thrush (*Zoothera monticola*) has been seen and procured—on 21st April 1916—in ten years. It may perhaps be of some little interest to observe that I met with this bird on two occasions last year. I find from my notes that I first saw a specimen on 25th October. It was frequenting a small, narrow, damp ravine (elevation about 6,500 ft.) which broadened out at either end. I came across the bird suddenly round a bend and it flew off at once at a great pace some distance up the ravine. I endeavoured to follow it up and succeeded in approaching to within about 50 yards, but it was very suspicious and flew off again through the bushes and trees up the hillside. The steep nature of the sides of the nullah prevented me from following the bird and I left the spot for a time, returning again after an hour or so. I was pleased to find that the thrush had also come back, but, if anything, it was as shy as before, and darted up the hill through a clump of deodars and vanished. From the little that I saw of the bird I noticed that it was hunting for food in the bed of the nullah and on fairly large boulders, especially if these had any mud on them. I came across the bird (the same specimen presumably) again on 2nd November, but it gave me no more than a hasty glimpse as it disappeared over the side of the nullah. On the first occasion that I saw it I had no gun, and on the second occasion it was a difficult matter to shoot it! I have not seen the bird since although I have often visited the spot where I first saw it.

There is an exceedingly interesting note (Vol. XXVI, No. 2, pp. 668-669 of our journal) on this thrush by Mr. S. J. Martin who says that the bird is fairly common in his district (Kumaon).

Unfortunately, Mr. Martin has not found a nest and cannot, therefore, give us first hand information as to nidification. Is it possible that the bird remains in these parts (Simla) for the major portion of the year and breeds in about May or June?

Not long ago I secured a copy of a somewhat little-known book entitled "Birds of Darjeeling and India" by L. J. Mackintosh, and, on a perusal of this work I found a note on the habits and nidification of *Zoothera monticola*. I quote the following for what it may be worth:—" *Zoothera* prefers high altitudes. A few may be met with, at times, in Darjeeling, chiefly in the cold weather. It is evidently more at home on the Singalillas, in dense bamboo and rhododendron jungle and where more or less luxuriant forests exist, where the ground beneath is damp and moist. *Zoothera* has given not a little trouble to get it to betray its nest so as to learn a little of its nidification. This thrush seldom perches on trees. It is generally found on the ground, scraping away dead leaves which lie in thick layers in some dense shady retreat damp and forbidding,

tossing the leaves about with its ample-sized bill, as though it were in the General Post Office sorting letters. It is not the leaves, however, that it directs its attention to, but the tit-bits in the way of grubs that it is intent on. The nest of *Zoothera*, which I found by some lucky chance, is a biggish mound of damp green moss outside, neatly rounded off sides, broad at the base, and tapering a bit towards the top. Inside, the nest is a neat, cup-shaped hollow, with soft fibres, black hair-like moss roots, and fibrous shreds off a creeping plant. Eggs are *Temminckii* " (whatever this means !) Presumably the eggs resembled those of *Myiophonus temminckii* in which case they must have been of some shade of grey-green with brown (or pink) markings. There is some resemblance between this description of the nest and eggs and that of the nest and eggs shown to Mr. Martin by Mrs. Goban.

SIMLA,
7th May 1920.

S. BASIL-EDWARDES.

X.—RE-OCCURRENCE OF THE INDIAN PITTA (*PITTA BRACHYURA*) IN THE DARBHANGA DISTRICT, BEHAR.

On the 5th of this month I got a female of this species in some bamboos. The only other occasions on which this species was got here were on the 13th and 21st May 1904 as recorded in Vol. XVI, p. 72 of this Journal; so that this bird has put in an appearance after an absence of nearly 16 years.

CHAS. M. INGLIS, F.Z.S., M.B.O.U.

BAGHOWNIE FTY., LAHERIA SARAL,
16th May 1920.

No. XI—SOME BIRDS OBSERVED IN SOUTH WAZIRISTAN.

On the 24th May I was delayed by the effects of a severe hail storm at Piazza Raghza, a camp situated on a plateau 5,000 feet above sea level in the Tank Zam valley of South Waziristan. I noted the following birds there during the day and evening :—

All common.	}	Paradise Fly-Catcher.	<i>Terpsiphone paradisii.</i>
		Sooty Fly-Catcher.	<i>Hemichelidon sibirica.</i>
		Spotted Fly-Catcher.	<i>Muscicapa griseola.</i>
		Indian Golden Oriole.	<i>Oriolus kundoo.</i>
		Black-headed Jay.	<i>Garrulus sp.</i>
		Magpie.	<i>Pica rustica.</i>
		Bay-backed Shrike.	<i>Lanius vittatus.</i>
		Rufous-backed Shrike.	<i>L. erythronotus.</i>
		White-cheeked Bulbul.	<i>Molpastes leucogenys.</i>
		Jungle Crow.	<i>Corvus macrorhynchus.</i>
		White-breasted Kingfisher	<i>Holcyon smyrnensis.</i>
		Spotted Kingfisher.	<i>Alcedo sp.</i>
		Myna.	<i>Acridotheres tristis.</i>
		Blue Rock Pigeon.	<i>Columba intermedia.</i>
		Drongo.	<i>Dicrurus ater.</i>
		Grey Wagtail.	<i>Motacilla melanope.</i>
		Sparrow.	<i>Passer domesticus.</i>
		Little brown Dove.	<i>Turtur cambayensis.</i>
Scavenger Vulture.	<i>Neophron ginginianus.</i>		
Indian Vulture.	<i>Gyps sp.</i>		
Lammergeyer	<i>Gypaëtus barbatus.</i>		
Bonelli's Eagle.	<i>Hieraëtus fasciatus.</i>		
Wire tailed Swallow.	<i>Hirundo smithii.</i>		
Sand Martin	<i>Cotile sinensis.</i>		

One	}	Common Indian Nightjar.	<i>Caprimulgus asiaticus.</i>
only.		Cuckoo	<i>Cuculus canorus.</i>
A few.	}	Crested Lark.	<i>Galerita cristata.</i>
		Sky Lark.	<i>Alauda gulgula.</i>
		Dark-grey Bush-Chat.	<i>Oreicola ferrea.</i>
		Corn Bunting.	<i>Emberiza sp.</i>

The commonest or most noticeable were the Paradise and Sooty Fly-catchers, Golden Orioles and Magpies; and Himalayan Black-headed Jays.

The above list of birds extended up to Ladha (near Kaniguram) in the Baddar Toi, branch of the Tank Zam. The foliage was Holy-oak, Willow, Poplars, Mulberries, a certain number of fruit trees in small plateau orchards, and the elevation extended to 5,500 feet.

The numbers of birds of course would be very much greater than this list. This list merely indicates the birds which were immediately noticeable whilst moving up the valley.

CORRIE HUDSON, COL., I.M.S.

DERA ISMAIL KHAN,
31st May 1920.

No. XII.—ABNORMAL COLOURED EGG OF THE PHEASANT—
TAILED JACANA (*HYDROPHASIANUS CHIRURGUS.*)

As is well known this bird usually lays olive-brown coloured eggs varying in depth of tint. On the 28th of May this year I got a clutch of four; three were of the usual olive-brown colour, but one of those was spotted with brown; the fourth was of a beautiful pure pale greenish blue or sea green in colour. They were all of the usual peg top shape and quite fresh. Colonel Butler writing in "Hume's Nests and Eggs" says:—"One egg I possess, which I took out of a nest containing three other fresh eggs of the olive-brown type, is pale sea green all over. I have never seen another Jacana egg like it."

This is the first time I have ever seen a pale sea green egg of this species and I must have seen hundreds of eggs nor have I heard of one being got since Colonel Butler wrote the above. The 6th May is the earliest date on which I have found eggs of this species.

BAGHOWNIE FTY.,
DARBHANGA DISTRICT,
7th June 1920.

CHAS. M. INGLIS, F.Z.S., M.B.O.U.

No. XIII.—EVERSMAN'S REDSTART. (*PHŒNICURUS*
ERYTHRONOTA, EVERSM.)

The spell of cold weather in January 1903 having brought this beautiful Redstart prominently before my notice, I had occasion recently to look up various points connected with it, and finding the information in the Fauna of British India to be somewhat meagre and out of date, consider it may be of interest to set forth the results of my investigation.

In the Fauna it is stated that Eversman's Redstart is "a winter visitor to every portion of Cashmere, extending on the west to Hazara and Afghanistan, and on to Asia Minor. The most easterly locality from which I have seen a specimen of this bird is Kotokhai in the Himalayas. In summer this Redstart is found in Turkestan, and even in Mongolia and Siberia, if *R. alaschanica*. Prjev., should prove to be the same species as is probable." I may remark first of all that Hartert (Vog. Pal. Fauna. I. 728) has kept the latter bird as a separate species although the two forms are certainly very closely allied. Hartert gives

the range of one bird in greater detail, as in the breeding season from Turkestan to the Altai Mountains and Lake Baikal; on passage throughout Turkestan, Transcaspia, and East Persia; in winter the basin of R. Tarim (Turkestan), Southern Turkestan, Cashmere eastwards to Kotokhai, Afghanistan, and Bushire on the Persian Gulf. Recorded also in Asia Minor and the Ural Mountains.

I find however that Eversman's Redstart must come more regularly into British territory and the plains than may be understood from the above account.

From Quetta, Meinertzhagen writes (Ibis, 1920, p. 166.):—"A common winter visitor to the Quetta district from early November to the middle of March, a few old cocks assuming full breeding plumage before departure. It was noted that some females remained a few days after all the cocks had left, the last cock being seen on 13.iii and the last hen on 18.iii". Marshall had previously recorded it as common in winter at Quetta (Jour. B.N.H.S., xii, 603).

It must occur commonly all up the N. W. Frontier in winter judging from the following records. Whitehead writes, in the (Birds of Kohat and Kurram) (Ibis, 1909, p. 219), "Fairly common, especially in the Miranzai Valley, from December till March, and on the Samana from October till the end of March, chiefly frequenting scrub-jungle, olive groves, and avenues. The call is a peculiar croaking note sounding like *gre-er*. The male assumes nearly full breeding plumage before leaving. Not observed in the Kurram Valley." Hume long ago (Ibis., 1871, p. 403) recorded it as common at Murdan. Mr. A. E. Jones informs me that he has seen it at Risalpur, Nowshera, and Dera Ismail Khan.

Proceeding further north but more into the plains we find that Hume says this Redstart is a regular winter visitor to the Peshawar Valley, reaching at least as far as Attock (where it was very numerous during the cold weather of 1869-1870), and leaving early in April (Ibis., 1870, 530., Stray Feathers., iii 219). He also says elsewhere (S.F. ix, 327.) "very common throughout the winter months about Attock, in the Khyber, and generally about the bases of the hills N. W., W., and S. W. of the Peshawar Valley."

Mr. A. E. Jones found this bird during the winter of 1918-1919 about Cambellpore; he first saw a male on the 15th December, and in January it became fairly plentiful. He goes on to say *in epistola*: "The country round Cambellpore is anything but suitable to a bird of arboreal habits and it was surprising to see how the bird accommodated itself to its surroundings, *i.e.*, small hamlets round which are a few "sheeshum" and "neem" trees, leafless at this season, on what is otherwise a barren plain. In February when it started warming up, the birds' numbers rapidly decreased and during the past fortnight not one was observed."

In the neighbouring station of Rawalpindi, Eversman's Redstart was also apparently common the same winter; for a valued correspondent Mr. B. H. Bird, I.C.S., kindly informed me that he had seen some on various dates between 31st January and 24th March, and sent me specimens in verification of their identity.

On the Himalayan side of the Punjab I have not found many records. At Gilgit, Biddulph obtained two males in December and January (S. F. ix. 327), while Scully writes (S.F. x. 115) "This Redstart is a winter visitor to Gilgit and is common at an elevation of 5,000 feet from the middle of October to the first week in March."

Of the Chitral Valley, Biddulph writes: "It appeared to be common in the upper part of the Chitral Valley in November when I procured several specimens of both sexes" (S.F. ix., 327). This was amplified later by Perreau (Jour., B.N.H.S., xix) who says "very common down to 4,000 feet on the waste stretches in bushy parts in winter from November to February. Not seen after middle of March."

Kashgar "in winter" (S.F. iii., 219) and Cashmere "in spring" (Jour., B.N.H.S.) are further notes that I find. Mr. A. E. Jones in a letter, dated 3rd February 1920, informed me that he had just received a female in the flesh from Simla.

I am now able to record a considerable extension of the range of this species into the plains, in that I have met it in the district of Jhang (S.W. Punjab). A male was first obtained on 18th February 1918 near the town of Shah Jiwana, and a female was shot about 10 miles from the same place (at the Rivaz bridge over the Chenab river) on 12th January 1919. No other individuals were seen in those two winters, but the following winter a great number arrived in the district. The first two birds were seen on January 1st but no more were noticed until January 12th after which they were observed in abundance until the end of the month. Two only were seen in February, both on the 13th. From my notes it appears that I personally saw 50 individuals in all. All these birds were in the area which lies between Jhang and the Sharpur district boundary on both sides of the Chenab river. They were found for the most part either in the avenues of kikur trees which line the canal banks, or in groves of small kikurs often in most arid spots. The alarm note, which was excellently described by Whitehead as a croaking "gre-er," also be compared to the sound of a miniature watchman's rattle; the ordinary call is a softer slurred version of the same. The species is easily distinguished in the field from the common Indian Black Redstart. The colouring of the male of course prevents confusion, and the white shoulder patches are conspicuous in flight. The female may be distinguished by the larger size, the whitish markings on the wings, and above all by the habit (common to both sexes) of flirting the tail up and down above the level of the back, whereas in the common bird it is "shivered." The difference of the call notes is also distinctive.

A series of 12 males and seven females was observed all in the months of January and February; all were in typical winter plumage, and showed no traces of moult, except in the case of a single female (26th January) which was moulting a few feathers on the back.

This series yielded the following measurements in millimetres:—

		Bill from skull.	Wing.	Tail.	Tarsus.
Males	.. ..	.. 14—16.5	84—89	64—69.5	23—26
Females	.. ..	.. 15—16	81.5—86	(one 75.1)	22.5—27
				63.5—69.5	

The soft parts were as follows for both sexes; Iris dark brown: orbicular black: mouth yellowish (flesh colour in one bird): bill black: legs black.

HUGH WHISTLER, F.Z.S., M.B.O.U.,

INDIAN POLICE.

JHANG, PUNJAB.

No. XIV.—ON THE OOLOGY OF THE NILTAVAS.

A peculiarity noticed in several clutches of the eggs of these birds is that a single clutch frequently displays three distinct types of eggs. In most cases one egg is very heavily freckled, another faintly so, and the remaining one or two eggs are almost without traces of freckles. Exceptions sometimes occur and I have a clutch of *N. sundara* in which all three eggs are heavily marked. This peculiarity is, no doubt, favourable to cuckoos who frequently make use of these nests. I have taken the eggs of both *Hierococcyx nivicolor* and *Cuculus saturatus* from nests of *N. sundara* and if I mistake not that of *C. canorus* from the nest of *N. grandis*.

Oates in the Fauna of British India gives the dimensions of the eggs of *N. grandis* as $\cdot 9 \times \cdot 7$ and those of the eggs of *N. sundara* as $\cdot 93 \times \cdot 71$. The latter is certainly incorrect for it is not likely that the smaller bird would lay eggs larger than those of the larger bird. The average of eleven eggs of *N. sundara* measure $\cdot 82 \times \cdot 61$ and I have never taken more than three eggs in a clutch though four may be the complete number laid.

E. A. D'ABREU, F.Z.S.

CENTRAL MUSEUM, NAGPUR,

21st July 1920.

No. XV.—THE OCCURRENCE OF *TEINOPALPUS IMPERIALIS*
IN THE TOUNGOO HILLS, BURMA.

I write to enquire whether any specimens of *T. imperialis* have been recorded from the Toungoo Hills of Burma.

Bingham in Vol. 2 of his book only records *T. imperatrix* as having been obtained from there, but I have been given to understand that some specimens of *Teinopalpus* caught at Thandaung near Toungoo some years ago and sent for identification were all classed as *imperialis*.

Bingham's description of *T. imperatrix* shows that the chrome yellow discal fascia does not encroach on the discoidal cell. I have obtained about a dozen specimens of *Teinopalpus* from Thandaung in the Toungoo hills and seen a large number of other specimens obtained from the same place and about half the specimens had the discal fascia encroaching on the cell although the specimens appeared to be identical in all other respects. The encroachment on the cell being the same as shown in the illustration of *T. imperialis* at the end of the volume. The fascia starting from interspace 2 and not from interspace 3 as described for *T. imperialis*.

These butterflies are most common in April but are also to be had in Thandaung in October and I saw one specimen up in Thandaung in October last year, but could not get close enough to catch it as it settled on a large rock a few feet beyond the reach of my net. Bingham also only describes one specimen of female for each variety.

Last April I caught 7 specimens in one morning, one of which turned out to be a female and was identical in all respects with the males, except that it was very slightly larger. There was no doubt whatever about the sex as apart from the entire absence of anything resembling the anal valves of the male, she started laying eggs shortly after being caught and was so full of them that I had to clean the body out to preserve it.

The ordinary females do not appear to be at all common up at Thandaung as in 1918 none appeared to have been seen and last year only three were seen although there was generally someone out after these butterflies nearly every morning and quite a large number of males were caught.

Ragadia.

Bingham only records this from Tenasserim in Burma.

I caught two specimens in Thandaung in October 1919 and which appear to resemble *R. critolans*, but there are only 6 ocelli on the hind wing, there being only two of the median ocelli on the hind wing encircled by the same fulvous ring instead of three.

W. SPARKE.

c/o MESSRS. THOS. COOK & SON, RANGOON.

3rd April 1920.

No. XVI.—THE NAME OF A MESOPOTAMIAN EARWIG.

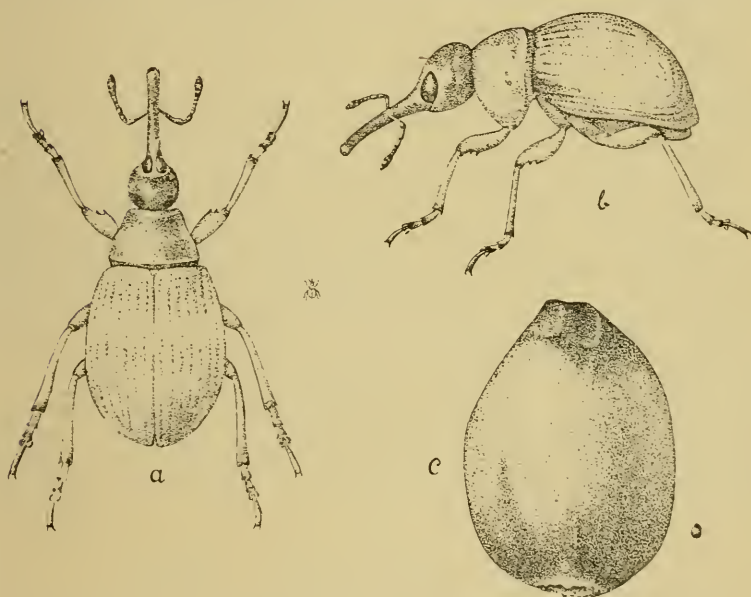
In a recent number Lt.-Col. F. P. Connor contributed a most interesting note in which he said that he had seen the ordinary large Earwig of Mesopotamia carry off a moth in its forceps. I am able to supply the name of the Earwig, *Labidura riparia*, a widely distributed species, which has occurred in Britain.

P. A. BUXTON.

TRINITY COLLEGE, CAMBRIDGE,

7th June 1920.

No. XVII.—“HOPPING” PUPA OF A CURCULIONID BEETLE.



A weevil back (a) and side, (b) view, (c) seed-like body from which it emerges.

The small figure alongside (a) and (c) shows the insect natural size.

Major Fleming, I.M.D., wrote to us from Lahore on the 28th June as follows:—“I am sending by parcel post a specimen of seed-like bodies, for your examination and kind favour of report. The history is as follows:—

Along the front of one of our barracks at the point where the brick work meets with the ground, from small holes 1 inch to 1½ inches in diameter, these little grains come literally hopping out into the open, their hop is about 2 inches high, or they would, so to say, hop along the ground. They leave their holes about six in the morning and generally hop back again when it

gets hot about 11 o'clock. Their first appearance was noticed about a fortnight ago, they have been growing less in number of late and less vigorous in action. To all intents and purposes when looked at on the ground they have the appearance of bird-seed moving and jumping about under some mystic influence! On keeping they generally die in 48 to 60 hours and if kept in a closed bottle, a small moth or some worm-like object leaves the shell. The specimen sent has been gathered at 8 o'clock this morning the 29th."

We sent the specimens to Mr. T. Bainbrigge Fletcher, F.E.S., the Imperial Entomologist, Agricultural College and Research Institute, Pusa, who kindly supplied us with the following information and drawings of the beetles:—

"I beg to say that I have carefully examined the seed-like bodies, which appear to be some grass-seeds. Each seed is inhabited by the pupa of a Curculionid beetle (weevil) in an early or an advanced stage of growth. From some of the seeds adult weevils are also emerging now in my Laboratory, and they are so unlike anything that we have in our named collection, that we shall have to forward specimens of this to a Specialist in England for exact determination."

Your observation regarding the "hopping" of these "seed-like bodies" is very interesting but I cannot understand how these come "literally hopping out in the open" from their "holes", and how they get back by hopping again. It seems probable that you have nests of a species of ant in the "holes" at the junction of "brick-work" with the ground? The ant may have stored these seeds in her nest little suspecting that these were infested with insect grubs. As is usual with the ants at this time of the year, this ant may also have brought out during the cool hours of the morning, all her stores, etc., for aeration and spread them out just outside the nest and took them in again at noon. With the advance of the day and consequent rise in the atmospheric temperature the grubs inside the seeds felt uncomfortable and in their efforts to escape from their captivity jumped about. This "hopping" phenomenon has been observed in the case of Bruchid grubs also which infest Peas, Grams, and other pulse-grains and also in the case of some moth larvæ living inside seeds.

The fact that they have been growing less in number of late and less vigorous in action can be easily explained. The larvæ must have changed to pupæ and in due course there is less of activity; and from pupæ adult beetles must have emerged and the empty shells that are left behind are not brought out of the nest.

EDITORS.

No. XVIII.—TROUT FISHING IN CEYLON.

The following extract from the Ceylon Manual for 1900 gives an authentic account of the introduction of trout into the Ceylon streams:—

"The first experiments in trout breeding were made in 1880 by the late Mr. Hugh L. Hubbard of St. Johns, Nda, Pusselawa, who was greatly interested in the subject; and to his efforts is due the knowledge that trout can be easily reared in Ceylon waters. He was assisted by Mr. C. J. R. Le Mesurier and Mr. Hearn, but no record apparently was kept of the number of Ova imported. In 1882 about twenty fish were turned into the Nuwara Eliya stream by Mr. Hubbard. In 1886 and 1888 the public subscribed liberally and an equal amount was contributed by the Local Board making a total of considerably over Rs. 3,000.

Ova were imported in 1886, 87, 88, 89 and 1890, but no record was kept of the results or of the localities where fry were turned out. From 1892 Ova have been regularly imported in considerable numbers and at present two or three importations of about 20,000 Ova on each occasion are made during the first four months of the year. Originally the Ova imported were those of the Brown Trout (*Salmo fario*), but in 1899 Ova of the Rainbow Trout (*S. irridens*) were imported for the first time and, as they stand heat better than the Brown Trout, they have proved very successful."

Subsequently, Mr. George Fowler, of the Ceylon Civil Service, while in office at Nuwara Eliya devoted much attention and care to the Hatchery importing 22,000 Ova at his own expense and it was owing to his zeal in the matter that the "Industry" was put on a sound working basis.

After that the supply was kept up by public subscription to the Trout Fund Committee, which gave place to the Ceylon Fishing Club, founded in 1896. The Club has a lease from Government of all streams above an altitude of 4,000' at a rent of Rs. 100 per annum and all sums collected by stamp duty on licenses, issued under Ordnance No. 8 of 1893, are refunded to the Club. Brown Trout were caught in the Horton Plains water in 1891 of 5 to 6 lbs., and in the Nuwara Eliya lake one of 14 lbs. and another 13½ lbs. were taken in 1904. But it soon became apparent that the Brown Trout did not breed although fish of both sexes had been taken which were in a condition to do so; and this failure is attributed to the fact that the temperature of the water in Ceylon rarely, if ever, falls below 50° Fahr.

With the Rainbow Trout, however, the reverse is the case, and the streams are well stocked with young fish.

Licenses to fish for trout can be obtained from the Secretary of the Club at the following rates for members and non-members:—

	Rs.	Rs.
Whole season	50	120
One month	30	75
One week	15	25
One day	5	12.50

A. H. DUNSMURE.

CEYLON,
10th May 1918.

No. XIX.—VEGETABLE DIET OF COMMON HOUSE LIZARD.

I did not know that the common house lizard was not averse to a vegetarian diet.

Our dog's food is generally put on the top of a book case to cool. Directly the dishes touch the wood, up starts a small lizard's head from behind the book-case, he crawls cautiously forward, and taking short darts as he would for a fly, eats about five grains of rice with much swallowing.

When the dishes are removed he remains near and stares into space; if they were left there perhaps he would make a larger meal, but the dogs are hungry, and he gets slower with every mouthful.

D. SWITHINBANK.

PROME,
11th April 1920.

The Fat-tailed Lizards (*E. macularius*) living in captivity in the Society's Museum sometimes feed on Biscuit crumbs. (Editors).

PROCEEDINGS

OF THE MEETING HELD ON 24TH JUNE 1920.

A meeting of members and their friends took place on Thursday, the 24th June 1920, Mr. John Wallace presided.

The election of the following 41 new members since the last meeting was announced :—Mr. M. Vinayak Rao, Calcutta ; Mr. H. B. Moore, Bombay ; Mr. E. C. Reid, Bombay ; Mr. K. J. Nicholson, Bombay ; Mr. W. H. K. Howard, O.B.E., Bombay ; Major W. B. Trevenen, Poona ; Lt.-Col. H. G. F. Stallard, R.A.M.C., Bombay ; Mr. H. R. Morrison, Assam ; Major L. Mason, M.C., I.F.S., Hoshangabad ; Major L. T. Raikes, D.S.O., R.F.A., Belgaum ; Capt. W. L. C. Brodriek, Bangalore ; Major W. S. Staffer, Nasik ; Mr. J. Riley O'Brien, Bombay ; Mr. E. H. N. Gill, Allahabad, U.P. ; Mr. G. S. Anderson, Ceylon ; Mrs. W. J. Segar, Dharwar ; Mr. T. Farley, Balipara ; Mr. C. R. Pawsey, I.C.S., Assam ; Mr. H. L. Birley, Assam ; Mr. F. A. C. Munns, Bihar ; Lt.-Col. D. Ogilvy, R.E., Bareilly ; The Mess President, Officers' Mess, Royal Artillery, Lucknow ; Capt. H. R. Irwin, Poona ; Major E. J. Ross, Bombay ; Lt. A. B. MacDonald, R.F.A., Belgaum ; Mr. C. H. Williams, Bangalore ; Wing Commander Charles Bruce, R.A.F., Simla ; Lt.-Col. J. C. Simpson, Lucknow ; H. R. H. Prince Carol, Crown Prince of Roumania, Bucharest ; Lt. A. M. Griffin, I.A.R.O., Bangalore ; Mr. J. B. Knight, Poona ; The Mess Secretary, 1st Kings Shropshire Light Infantry, Crater, Aden ; Mr. H. M. James, Assam ; Mr. Edwin Dean, Peshawar ; Mr. J. L. Henderson, Travancore ; Dr. D. L. Bare, D.D.S., Shillong ; Mr. J. K. Stanford, M.C., M.A., M.B.O.U., I.C.S., Sagaing, Upper Burma ; Mr. E. J. Dunkley, Rangoon ; Mr. R. M. Simmons, Ajmer ; Mrs. G. T. Mawson, Malad ; and Capt. D. G. Brown.

ADDITIONS TO THE SOCIETY'S MUSEUM.

Contribution.	Locality.	Donor.
MAMMALS.		
1 Rufous Mongoose (<i>M. m. ferrugineus</i>), 1 Desert Pipistrelle Bat (<i>P. mimus glaucillus</i>), 1 Shrew (<i>Crocidura sp.</i>), 16 Desert Gerbilles (<i>M. hurrianæ</i>), 8 Sind Gerbilles (<i>T. sherrini</i>), 5 Hairy-footed Gerbilles (<i>D. gleadovi</i>), 1 Small Indian Gerbille (<i>D. indus</i>), 1 Pale 5 striped Squirrel (<i>F. pennanti argentescens</i>), 2 Persian House Mice (<i>M. bactrianus</i>), 1 Hedge Hog (<i>Paraechinus blanfordi</i>).	S. Waziristan ..	Capt. C. M. Ingoldby.
2 Mottled Pole Cats (<i>Putorius sp.</i>), 1 Leopard (<i>F. pardus</i>), 1 Wolf (<i>C. lupus</i>), 1 Oorial skull (<i>O. vignei</i>), 2 Persian Wild-Goat Skulls (<i>C. ægagrus blythi</i>).	Kurdistan ..	Major E. J. Ross.

Contribution.	Locality.	Donor.
1 Ruddy Mongoose (<i>M. smithii</i>), 2 Robertson's squirrel (<i>F. robertsoni</i>).	Pachmari, C. P. . .	} A. E. Csmaston.
Skulls of the following :—3 Pan- thers (<i>F. pardus</i>), 6 Pine Mar- tens (<i>M. flavigula</i>), 1 Otter (<i>L. ellioti</i>), 2 Mountain Foxes (<i>Vul- pes montana</i>), 2 Foxes (<i>Vulpes bengalensis</i>), 6 Himalayan Tahr. (<i>H. jemlaicus</i>), 1 Musk Deer (<i>M. moschiferus</i>).	Garhwall . .	
1 Large Indian Civet (<i>V. zibetha</i>), 1 Black-backed Squirrel (<i>S. atrodorsalis</i>), 1 Grey-headed Squirrel (<i>S. caniceps</i>), 1 Tree Shrew (<i>Tupaia sp.</i>), 1 Berdmore's Squirrel (<i>M. bendmorei</i>).	Siam	
1 Pigmy Hog (<i>Sus. sylvanus</i>), 1 Skull of Pigmy Hog.	Kamrup	Major C. H. Stock- ley.
1 Tenasserim Giant Squirrel (<i>Ratu- fa phaeopepla</i>).	Tavoy	Mr. O. C. Ollenbach.
1 Flying Lemur (<i>G. volans</i>)	Tavoy	W. S. Wood.
1 Flying Squirrel (<i>Pet. taylori</i>), 1 Pigmy Flying Squirrel (<i>Pt. (H.) belone</i>).	Sandoway	F. C. Purkis.
1 Skull of Persian Gazelle (<i>G. sub- gutturosa</i>).	Banks of the Oxus.	Ljeut.-Col. F. M. Bailey.
1 Lion-tailed Monkey (<i>M. silenus</i>).	Palaga p and y, India.	A. M. Kinloch.
6 Black Buck (<i>A. cervicapra</i>)	Dhar	H. H. The Maharaja of Dhar.
1 Painted-Bat (<i>K. picta</i>)	Shillong	W. J. Ballantine.
1 Female Black Buck with horns (<i>A. cervicapra</i>).	Amraoti	C. J. Griparis.
1 Assam Giant Squirrel (<i>Ratufa gigantea</i>), 1 Pallas' Squirrel (<i>C. erythraeus</i>).	Garo Hills	R. T. Sangma.
2 Common Jungle Cats (<i>F. chaus</i>).	Bagobah	Major W. D. Ritchie
6 Grizzled Indian Squirrels (<i>R. dandolena</i>).	S. India	Mr. R. F. Stoney.
1 Common Jungle Cat (<i>F. chaus</i>)	Mesopotamia	Major E. J. Arthur.
BIRDS.		
2 White-winged Wood Ducks (<i>S. melanotus</i>), 1 Great White-bellied Heron (<i>A. insignis</i>).	Naga Hills	Mr. J. P. Mills.
2 Grey-headed Imperial Pigeon (<i>Ducula i. griseicapilla</i>), 1 Malay Bittern (<i>B. javanica</i>), 1 Green Shank (<i>T. glottis</i>).	Siam	Major C. H. Stock- ley.
2 Indian Coursers (<i>C. coromandelicus</i>).	Dharwar	Mr. L. J. Mountford.

Contribution.	Locality.	Donor.
1 Sheldrake (<i>T. cornuta</i>) ..	Fallujah, Euphrates.	Lt. A. Smith.
1 Stiff-tailed Duck (<i>E. leucocephala</i>).	Abu Jisra, Mesopotamia.	Major J. Chrystal.
12 Magpies (<i>Pica rustica</i>)	Shiraz, Persia	Lt.-Col. J. E. B. Hotson.
1 Great Slaty Woodpecker (<i>H. pulverulentus</i>).	Burma	F. Atlay.
BIRDS' EGGS.		
1 Sharp's Spotted Babbler (<i>P. minus</i>), 3 Black-breasted Ouzel (<i>M. protomomelena</i>), 3 Silver-eared Mesia (<i>Mesia argentauris</i>), 2 Burmese Button Quail (<i>T. blanfordi</i>).	Naga Hills	J. P. Mills.
REPTILES.		
<i>Lizards.</i>		
2 Desert Monitors (<i>V. griseus</i>) (alive), 1 Common Monitor (<i>V. bengalensis</i>) (alive), 5 Spiny-tailed Lizards (<i>U. hardwickii</i>) (alive), 1 <i>Gymnodactylus scaber</i> , 1 Persian Gecko (<i>H. persicus</i>), 1 <i>Agama rubrigularis</i> , 1 <i>Agama isolepis</i> , 1 <i>Acanthodactylus cantoris</i> , 1 <i>Eremias guttata</i> , 5 <i>Eumeces scutatus</i> .	S. Waziristan	Capt. C. M. Ingoldby.
1 <i>Calotes nigrilabris</i> , 1 <i>C. leolepis</i> ..	Ceylon	Lt.-Col. F. Wall.
<i>Snakes.</i>		
3 Jerdon's Blind Snake (<i>T. jerdoni</i>), 3 <i>Aspidura brachyorrhos</i> , 1 <i>Haplocercus ceylonensis</i> , 10 Drummond Haye's Shield-tails (<i>R. drumundhayei</i>), 1 Singalese Krait (<i>B. ceylonensis</i>), 3 <i>Aspidura trachyprocta</i> and 1 Shield-tail <i>Rhinophis</i> sp.	Ceylon	J. Erskine.
1 Schneider's Water Snake (<i>H. enyhydris</i>).	Gonda	F. Field.
1 Cobra (<i>N. tripudians</i>) without cuneate scale.	Shore, C. I.	Col. C. E. Luard.
INSECTS.		
<i>Lepidoptera.</i>		
2 Snow Butterflies (<i>D. apollinus</i>) ..	Mosul	Lt.-Col. C. W. Watney.
157 Butterflies	Kuban Valley, N. Chindwin.	Major E. J. Ross.
70 Butterflies	Coonor	Mr. J. Florence.



Contributions to the Museum as exhibited at a meeting held on the 24th June 1920.



The following contributions have been sent to the British Museum for identification and return :—

Contribution.	Locality.	Donor.
17 Mammal Skins and Skulls ..	Moko k e h u n g, Naga Hills.	J. P. Mills.
37 Birds	Kurdistan ..	Major E. J. Ross.
12 Magpies	Shiraz, Persia ..	Col. J. E. B. Hotson.

EXHIBITS.

Mr. S. H. Prater, acting Curator, exhibited an interesting number of contributions received since the last meeting. These included specimens received from a range of country extending from the banks of the Oxus to the deserts of Central Arabia.

Special attention was drawn to a number of animals obtained by Major E. J. Ross from Central and South Kurdistan; these include a leopard, a wolf, two mottled pole-cats and the heads of the Persian wild goat and Oorial. The two mottled pole-cats are a welcome addition to the Society's collection. They are nocturnal animals living in burrows and feeding on small animals, birds, insects and reptiles. Hutton gives an interesting account of one which he kept in captivity; he says that it killed in succession four wagtails and four rats. It had a special way of dealing with rats, these were always seized behind the ear and held until they stopped struggling and were then despatched with a couple of bites through the skull. The animal would never eat during the day but stored its victims away in the corner of the cage and finished them after night fall. The skin of an ostrich presented by Lt.-Col. A. T. Wilson attracted great attention. It was given to Col. Wilson by the Chief of the Anaizah tribe in Central Arabia. Outside African limits the ostrich is to-day confined to the deserts of Central Arabia and possibly the borders of Palestine. In former times this bird had a very much wider distribution. Evidence of its occurrence in Europe has been found through discovery of a petrified egg in the Cherson district of South Russia. And we read that a "Camel Bird" or ostrich was amongst the presents received by an Emperor of China from a Cham in Turkestan. That it once occurred in India is proved by the finding of a fossil specimen in the pliocene beds of the Siwalik range. This fossil specimen is named "*Struthio asiaticus*", it differs from the modern bird in having a stouter neck, but in other respects closely resembles it. Within recent times ostriches occurred in Mesopotamia and Persia and perhaps in Baluchistan and Sind though evidence as regards the last two countries is rather slender. Not long ago the common way of hunting ostriches in Arabia was to ride them down—an interesting account of this is given by Canon Tristram. At the present day, however, the more prevalent method is that briefly described by Col. G. Leachman, who in a letter just received writes :—

The ostriches are hunted by Sulaib (Sing. Solubbi) a type of nomad, thought to be of non-Arabian origin. They live alone in small camps far out in the

desert throughout the year and have far greater knowledge of water holes than the Bedouins themselves. Their hunters dress in Gazelle skins and can approach within touch of Gazelle and Ostriches before firing their rifles. Their rifles are for the most part of a very old type, the reason being that if they carried modern rifles, the Bedouin would certainly take them away from them. Otherwise the Bedouin do not molest them. Burton in his "Pilgrimage from El Medianah to Meccah" says that there is a belief prevalent throughout Arabia that Ostriches fling stones at their pursuers, he writes that this superstition may have arisen from the "pebbles being flung up by the birds' large feet or it may have been a foolery of fancy." A full account of the Arabian Ostrich will appear in the next number of the Journal.

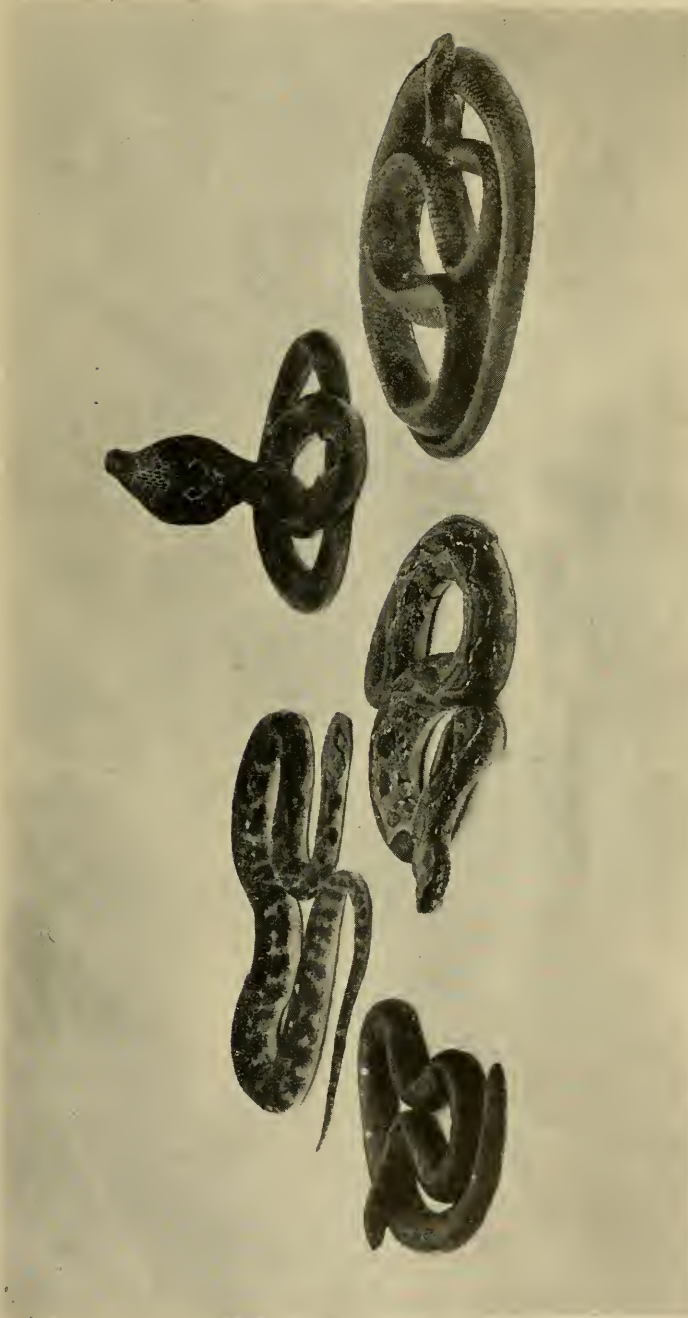
A number of skins were collected for the Society by Mr. J. P. Mills, I.C.S., from Mokokchung in the Naga Hills. The collection contained examples of the Red Serow, Gibbon, Himalayan Monkey, Chinese Scaly Ant-Eater, Porcupine and Bamboo Rats. Specimens of the three kinds of bamboo rats which occur within Indian limits were shown. These were a giant species, a medium sized one and a smaller animal. The bamboo rats are an interesting genus of rodents. They are found in India along the base of the Himalayas in Assam, Burma, Siam and China. They burrow under the roots of large trees using their large teeth and claws for the purpose, or live in the tall rank jungle grass. They are molelike in appearance with thickset bodies, very small eyes and ears and short limbs. Their principal food consists of roots. They are eaten by many of the Burmese and Assamese Hill tribes. The greater part of Mr. Mill's collection is in England where it is being worked out at the British Museum by Mr. Wroughton who has promised to write a report on it for the Journal.

A specimen of a Pigmy Hog was shown. The specimen was obtained by Mr. Chaston on the Bhutan Border. This animal is found at the foot of the Himalayas in Nepal, Bhutan and Sikkim, it measures about 26in. in length and stands 11in. in height. It lives chiefly in the high jungle grass in small herds of from five to twenty. Another remarkable animal shown was the Flying Lemur which was sent in by Mr. A. S. Wood from Tavoy. The Flying Lemur bears the same relation to the Tree Shrews as does the Flying Squirrel to the true squirrel. It has a curious expansion of skin along each side of its body which extends from the throat to the tip of the tail and is used as a kind of parachute in gliding from tree to tree. The animal is purely nocturnal and passes the day by hanging by its legs against the branch or trunk of a tree from which its mottled marking renders it scarcely distinguishable.

A collection of small Mammals and reptiles was obtained for the Society by Capt. C. M. Ingoldby, who had found time to interesting himself on the Society's behalf under the most disadvantageous conditions. Live specimens of the desert monitor and the spiny tailed lizard were presented by him and are shown in the Society's rooms.

A specimen of the beautiful Painted Bat (*K. picta*) was exhibited. Unfortunately these animals lose their wonderful colouring soon after death. But an illustration in the Society's Journal (Vol. XXI, page 1181) shows up remarkably the vivid colouring of this species. The wings are a bright orange and black and the body is buff coloured. This bat occurs all over India and when disturbed by day is often mistaken for a beautiful butterfly. Favourite roosting spots of this creature are the leaves of the plantain tree.

The head of a female black buck with horns was shown. The Society already possessed examples of a horned doe, and there were several records of similar heads in the Journal. The present example was presented by Mr. Griparis from Amraoti, Berar.



Painted Plaster Casts of Common Indian Snakes prepared in the Society's Museum

POISONOUS AND NON-POISONOUS SNAKES.

Considerable interest was evinced in the rough chart showing in a perfectly simple way how to distinguish between Indian poisonous and non-poisonous snakes. Beside the chart the Curator had arranged specimens of various snakes preserved in spirit which showed clearly how easily identifiable a snake was by means of this chart, which it is hoped to publish by the close of the year and which has already been adopted by the Educational Departments of most of the Provincial Governments and by the Military Medical authorities throughout India.

The disadvantage of preserving snakes in spirits for exhibition purposes was well shown in comparison with some beautiful plaster casts of snakes made in the School of Art and painted in their true colours by Mr. S. H. Prater, the Society's Curator. This method of exhibiting specimens will, as time and space permits, be extended to fish, the vivid colours of which are quite lost if any of the practical preservatives now known are used.

The meeting ended with a vote of thanks to the various contributors.

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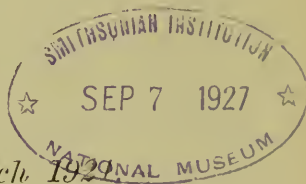
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EDITED BY

R. A. SPENCE, F.Z.S., B. C. ELLISON and S. H. PRATER.

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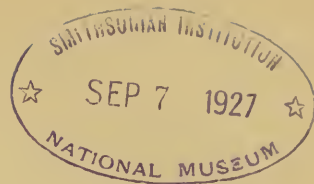
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MAR. 1921.

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No. 3.

THE GAME BIRDS OF INDIA, BURMA AND CEYLON,

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XXXI.

(Continued from page 210 of this Volume.)

Genus—*FRANCOLINUS* (continued.)

FRANCOLINUS PICTUS PALLIDUS.

The Northern Painted Partridge.

Perdix hepburni var. *pallida*.—Gray, Ill. Ind. Zool. I., pl. 55, Fig. 2 (Ody-pore) (1830-32).

Francolinus pictus.—Blyth, Cat. B. M. A. S., p. 251 (1849) (Pen, India) (part); Jerdon, B. of I. II., p. 561 (1863) (part); Blanf., J. A. S. B., XXXVI., p. 200 (1867) (Guzerat and Kutch); Blyth, Ibis, 1867, p. 157 (part); Beavan, Ibis, 1868, p. 383 (Gwalior); Hume, N. & E. of In. Birds, p. 538 (1873) (part); Lloyd, Ibis, 1873, p. 415 (Kathiawar); Butler, Str. Feath, IV., p. 6 (1876) (Mt. Abu); Butler, *ibid*, V., p. 211 (1877) (Abu, N. Guzerat); Ball, *ibid*, p. 419 (1877) (Mahanadi and Godavery); *id.*, *ibid*, VII., p. 225 (1878) (Raipur); Hume and Marsh., Game-B. II., p. 19 (1879) (part); Butler, Cat. B. of Sind, p. 54 (1879); Ward-Ram., Ibis, 1880, p. 70 (Afghanistan); Swin. & Barnes, Ibis, 1885, p. 131 (C. India); Oates ed., Hume's N. & Eggs, III., p. 420 (1890); O-Grant, Ibis, 1892, p. 40 (part); *id.*, Cat. B. M., XXII., p. 138 (1893) (part); *id.*, Man. Game B. I., p. 160 (1898) (part); Blanf. Fauna. B. I. Aves. IV., p. 137 (1898); Oates, Cat. Eggs B. M. I., p. 37 (1901) (part); King, Jour. B. N. H. S. XXI., p. 100 (1911) (Saugur); Whitehead, *ibid*, XXI., p. 168 (1911) (Shore).

VERNACULAR NAMES.—Titur (Bombay); Kala Titur (Mahratti).

Description.—Exactly like *F. p. pictus*, but much paler.

If series of *F. p. pictus* and *F. p. pallidus* are placed in two rows on their backs side by side *pallidus* gives an impression of comparatively bright pale, rufous lower parts; whilst *pictus* appears to

be a dull pale rather earthy rufous on these parts. This is most especially noticeable on the lower breasts, abdomens, vents and thigh-coverts.

Colours of the Soft Parts.—The same as in *F. p. pictus*.

Measurements.—The Northern form does not appear to be any larger than the Southern, and birds from the extreme North of the range of *pallida* are no larger than those from Ceylon.

24 birds examined by me vary from 131 to 146 mm., an average 140.1 mm., but probably two large series of both forms would show even less difference.

Distribution.—Practically the southern boundary of the Black Partridge is the Northern boundary of this bird. It is found as far South as Udaipur, Jawar, Saugur, Jhansi and Bundelkhand, but to the East in Behar is replaced by typical *pictus*. The British Museum series contains birds from Gondal, Deesa, Jhansi, Saugur, Ahmedabad, Abu, Neemuch and Bundelkhand.

Type Locality.—Odpore (Udaipur).

Nidification.—Quite indistinguishable in any way from that of true *F. pictus pictus*. The breeding time and the nature of ground selected is the same, and the eggs cannot be distinguished from one another.

It must, however, be noted that Whitehead found them breeding in Sehere in the months of April, May and June; the birds were common, and he found numerous nests, all in these three months.

Aitken found them breeding in Berar in the monsoons, principally in August and September, and it is interesting to note that he records that five is the largest number of eggs he has found in a clutch. Blewitt, however, says that in Jhansi 7 or 8 is the regular number of eggs laid. At the same time, amongst the few eggs I have examined were two hard-set clutches of 3 only from this very place. Over most of its range 4 or 5 eggs is probably the normal full number in a clutch.

Hume gives the following measurements for 20 eggs, and 9 of my own agree with them. "In length they vary from 1.3" to 1.48" (33.0 to 37.2 mm.), and in breadth from 1.1" to 1.25" (27.9 to 31.7 mm.). But the average of a score is 1.4" × 1.18" (35.5 × 29.6 mm.)

General Habits.—The habits of the Northern Painted Partridge do not differ in any way from those of the Southern bird.

They frequent much the same kind of cover and country, though in one instance Davidson found them in the Babul Jungle fringing a nullah running through village land in Sholapur, and several other writers have recorded them as regularly haunting sugarcane from beating which crop Vidal states that he obtained good bags.

Like the Southern bird, it does not appear to be much of a fighter. Hume says that "it is one of the least pugilistic of Game-birds, is easily caught in Quail nets, and very soon becomes extremely tame. It makes a very gentle and affectionate pet, and even though 5 or 6 of different sexes may be confined together, they always seem to live in perfect harmony."

Like the Black Partridge, they are noisy birds, and call frequently mornings and evenings through the breeding season as well as at odd times during the hotter hours of the day.

Hybrids between the Black and the Painted Partridges are very common, as one might expect between two game-birds so closely connected whose habitats overlap. After a very careful examination of the material available, I think these specimens must be considered true hybrids, and not intermediate specimens linking two geographical races of the same species. Over a considerable area both birds are to be obtained on the same ground running perfectly true to type, and it is only here and there in such areas that we come across these hybrids. Nowhere can it be said that this hybrid bird is the common form found in the locality. They are, however, very interesting specimens, for they seldom, if ever, show differences in plumage on the two sides of the body or broken and unequal markings. They just appear to be birds half-way between their two parents and undoubtedly prove that they have been evolved but recently from the same stock.

FRANCOLINUS CHINENSIS.

The Eastern or Chinese Francolin.

Le Perdrix de la Chine.—Brisson, Orn. I., p. 234 (1760) (China).

Tetrao chinensis.—Osbeck., Voy. en Chine II., p. 326 (1771) (China).

Tetrao pintadeanus.—Scop., del Flør. et Faun, p. 93 (1786).

Tetrao perlatus.—Gmel., Syst. Nat. I., p. 758 (1788) (China).

Perdix perlata.—Lath., Ind. Orn. II., p. 648 (1790) (China); Temm., Fig. et God. III., pp. 326-721 (1815).

Francolinus perlatus.—Stephen in Shaw's Gen. Zool. XI., p. 325 (1819) (China); Strickl., P. Z. S., 1842, p. 167 (China); Swinh., Ibis, 1860, p. 62 (Amoy); id., ibid, 1862, p. 50 (Hongkong); id, ibid, 1862, p. 259 (Foochow); Blyth, ibid, 1862, p. 387 (China); Swinh., ibid, 1867 p. 466, (Amoy); Anderson, Zool. Ex. Yunnan Aves, p. 672 (1878) (Bhamo).

Perdix (Francolinus) maculatus.—Gray, Zool. Misc., p. 2 (1831); id., Fasc. China, pl. 7 (1871).

Perdix phayrei.—Blyth, J. A. S. B., XII., p. 1011 (1843).

Francolinus sinensis.—Blyth, Cat. B. Mus. As. Soc., p. 251 (1849) (Pegu.); Gould., P. Z. S., 1859, p. 151 (Siam); Swinh., P. Z. S., 1863, p. 307 (S. China); id., Ibis, 1870, p. 359 (Hainan); id., P. Z. S., 1871, p. 400 (Canton); Ward-Ram., Ibis., 1875, p. 350 (Karen—nee); id, ibid., 1877, p. 468.

Francolinus pintadeus.—Blyth, Cat. B. Mus. As. Soc., XXIV., p. 480 (1855) (Pegu); Blanf, Ibis, 1870, p. 463 (Irawaddy Valley); Blyth & Wald., Manu. & Burma, p. 149 (1875).

Francolinus madagascariensis.—Hartl, Orn. Beitr. F. Madag., p. 280 (1861) (Madagascar); Newton, Ibis, 1861, p. 274 (Mauritius).

Francolinus pictus.—Schom. (nec. Jard. & Sel.), Ibis, 1864, p. 263 (Siam).

Francolinus chinensis.—Gray, Hand-L. B. II., p. 266 (1870) (China); Hume, N. & E. Ind. B., p. 539 (1873); id., Str. Feath. III., p. 171 (1875) (Upper Pegu); David and Ous., Ois. Chine, p. 400 (1877) (Cochin, China, S. China, Hainan); Hume, Str. Feath., VI., p. 443 (1878) (Karen-nee); Hume and Marsh, Game-B. II., p. 27 (1879); Oates, B. of B. B. II., p. 323 (1883); Ogilvie-Grant, Ibis, 1892, p. 39; id., Cat. B.M., XXII, p. 137 (1893); id., Man. Game—B. I., p. 107, 1893; Oates, J. B. N. H. S., X., p. 112 (1895) (Ruby Mines); Rippon, Ibis, 1896, p. 361 (Shan States); Oates, Man. Game—B. I. p. 164 (1898); Blyth, Fauna B. I. Aves, IV., p. 139 (1898); La Touche, Ibis, 1900, p. 50 (Fokien); Ogilvie-Grant, P. Z. S., 1900, p. 503 (Hainan); id., Ibis, 1900, p. 605 (Yunnan); Davies, *ibid*, 1901, p. 410 (Yunnan); Rip., Ibis, 1901, p. 537 (S. Shan States); Oates, Cat. Eggs B. M. I., p. 37 (1901); Kershaw, Ibis, 1904, p. 244 (Quantung, China); La Touche & Rick., *ibid*, 1905, p. 59 (Fokien); Macdonald, J. B. N. H. S. XVII, p. 496 (1906) (Mying Yan); Mears, *ibid*, XVIII., p. 87 (1907) (Chindwin); Harington, *ibid*, XIX., p. 310 (1909) (Bhamo); id., B. of Burma, p. 121 (1909); id., *ibid*, XX., p. 1011 (1911) (Maymyio); Venning, *ibid*, XXI., p. 632 (1912) (Chin Hills); Meinhert, Ibis, 1912, p. 97 (Mauritius); Cook, J. B. N. H. S., XXI., p. 675 (1912) (Karen Hills); Ingram, Nov. Zool. XIX., p. 270 (1912) (Yunnan); Cook, J. B. N. H. S. XXII., p. 270 (1913) (Kalaw); Higgins, *ibid*, XXIII., p. 368 (1914) (Manipur); Williamson, Jour. N. H. S., Siam, I., p. 47 (1914) (Bangkok); Irwin, *ibid*, p. 120 (1914); Gairdner, *ibid*, I., p. 151 (1915); Gyldenstolpe, *ibid*, p. 235 (1916) (N. Siam).

VERNACULAR NAMES.—Kha (*Burmese*); Kabaw wrenghi (*Manipur*) Chay-koo (*Chinese*); Nok-kahtah (*Siamese*).

Description.—*Adult Male*.—Forehead, lores, feathers round the eye and supercilium black; ear-coverts, cheeks and below the lores white; crown and nape fulvous buff, the central portion marked with black in varying degree; neck and back with longitudinal white streaks gradually changing to oval white spots on upper back; lower back, rump, upper tail-coverts and central tail feathers black with narrow wavy white bars; outermost tail-feathers blackish brown with white bars on basal half of outer webs; scapulars and shoulder-coverts chestnut with a varying amount of black, and with bold white ocelli; remaining coverts brown with white ocelli; quills brown with white bars and innermost secondaries like the scapulars.

Below, moustachial streak black; chin, throat and foreneck white, sometimes creamy white; neck and breast black, the feathers with white ocelli on either web near the tips; lower breast the same but with the two spots merging into one, or merely divided by the black shaft; posterior flanks barred brownish black and white, the latter sometimes being a pale fulvous; centre of abdomen and vent fulvous white or pale fulvous; under tail-coverts rufous-buff.

The range of variation in colour is great, but it seems to be individual and not geographical. Some birds have the whole plumage much blacker and richer in tone than others from the same locality. The amount of chestnut varies greatly in extent, but is always

present. The black coronal streak varies from a narrow central line to one so broad that it takes up practically the whole crown. The amount of black on the upper breast is much more extensive in some specimens than in others, and some individuals are again much more rufous below on the flanks and abdomen.

Colours of Soft Parts.—Bill black, the lower mandible horny at the base ; irides reddish brown, hazel brown or dark brown ; eyelids dull greenish or livid green ; legs dull orange-yellow to yellowish or reddish brown, varying a good deal in the brightness of tints, and assuredly brighter in the breeding season than at other times ; claws dark horny or purplish brown.

Oates describes the legs of one specimen as "clear orange-yellow."

Measurements.—Chinese birds average a good deal bigger than Burmese, Yunnan and Hainan birds, but I can see no other differences but this of size which hardly suffices to create a new race.

Length about 12 to 14 inches ; wing 132 to 161 mm. ; bill from front 23 to 27 mm. and from gape 25 to 28 mm. ; tarsus 44-45 mm.

Chinese (and Mauritius) birds vary in wing measurement from 147 to 161 mm., only one bird having a wing under 150, whilst the average of 20 birds is 153 mm.

30 specimens from Burma, Siam, Yunnan, Annam and Hainan vary in their wings between 132 and 151 mm. ; only one bird exceeding 150, and the average is 144·6 mm.

Siam birds are the smallest, running from 132 to 147, and averaging only 140·2 mm.

Adult Female.—Head like that of the male but duller, and the white replaced with dull rufous white ; upper back blackish with small white ocelli and pale brown edges to all the feathers ; lower back, rump and upper tail-coverts blackish with narrow rufous-white or rufous bars, and profuse brown freckling ; on the upper tail-coverts this freckling covers the whole feather except for the pale bases and a dark edging to the same. Below white, changing to pale rufous fulvous on flanks, vent and abdomen with bars of blackish-brown, numerous on foreneck and upper breast and decreasing towards the abdomen and thigh-coverts ; the chin and throat are occasionally sparsely speckled with black.

There is considerable individual variation in colour. Above the amount of rufous varies from practically nil to a considerable amount on scapulars and inner secondaries. Below the colour varies in depth from almost white to a clear bright rufous.

Colours of Soft Parts.—Similar to the same in the male, but duller ; the legs are generally paler and more yellow.

Measurements.—Wing from 137 to 151 mm., average 143·2. The Chinese birds average about 9 mm. more than the Burmese, etc.

Bill from front 22 to 26 mm., and from gape 23 to 27 mm. ; tarsus about 43 mm.

Hume gives the weight as 10 ozs. to 14 ozs., this apparently including both males and females.

The Young Male is like the adult female, but soon acquires a blacker more boldly marked breast with more chestnut on the back and scapulars.

The Young of both Sexes in First Plumage are like the adult female, but are much duller, and there are central pale shaft streaks to the feathers of the neck, upper back, scapulars and inner secondaries. The dark eye-streak and moustachial streak are absent or obsolete, and the under tail-coverts are paler and some times faintly barred.

Distribution.—South China, Hainan, Yunnan, Cochin China, Siam and the greater part of Burma and the Shan States in suitable localities. It does not appear to be found in Arrakan though it is not rare in parts of Pegu, and is common in the Chin Hills, and is found throughout in the East between these two points. Higgins has recorded in this Journal that he heard this bird calling “all over” the South-East of Manipur, and it certainly does occur in that State.

It has been imported into Mauritius and Madagascar.

Oates in his Manual of Game-Birds gives the habitat of this bird in Burma at great length, but since he wrote, it has been recorded from so many more places that it is hardly worth while quoting his remarks.

Harington merely remarks that in Burma it is “universal.”

Nidification.—The breeding season of the Chinese Francolin seems to be very extended. Oates records “this Francolin breeds in May or June, but Mr. D. D. Macdonald took a large number of eggs for me at Meiktila in September, some of which are now in the British Museum. It probably breeds in many months of the year according to locality. The nest is merely a depression in the ground, in which from 4 to 6, or probably more, eggs are laid. They are sharp-pointed ovals in shape, with little gloss, and are a pale buff, sometimes with a greenish tinge. They measure about 1.5" × 1.2".

Mr. Hopwood and Mr. Mackenzie obtained it breeding in Lower Burma in March and April, and on the other hand Harington, like Macdonald, found it breeding in the Chin and Kachin Hills in August, September and even October. It seems very probable that like the other Francolins it has two broods, one before the rains break and the second at the end of the rains. Kershaw says that in China also it has two broods in the year. It makes its nest, such as it is, either in grass-land, scrub jungle, or in bamboo jungle, and in the latter far more often than does either the Black or the Painted Francolin. The nest is the usual natural hollow or scrape in the

ground with a few chance leaves or bits of grass to line it. The eggs vary in number, normally, from 3 to 6, very rarely more, whilst 8 appears to be the maximum. In shape they are oval, inclined to be pyriform in a few cases, and nearly always very pointed at the small end; they are not, however, genuine peg-topped shaped eggs at all, and I have seen no example which could be so called. The colour varies from pale stone colour to pale olive-buff or pale olive-brown. One clutch in my collection is probably a very unusual one, being a light olive-slate of a tint I have seen in no other Francolin's egg.

Including the eggs in the British Museum, the average of 35 eggs is 35.6×29.6 mm.

Oates gives the range of variation in length as between 31.8 and 40.6 mm., and in breadth as between 26.7 and 30.5 mm. All my eggs come within these limits.

The texture is similar to that of *F. francolinus*, but rather smoother and finer, and the shell is not nearly so stout; in fact, for a game-bird's egg it is rather fragile and brittle.

General Habits.—The Chinese Francolin is very much like the Painted Francolin in its habits, etc., and like that Partridge prefers dry to damp localities, indeed in Burma its distribution seems to be entirely governed by that factor. Oates in his Hand-Book writes :

“ The Chinese Francolin is found in dry open forest and scrub
 “ jungle, and it generally keeps to hilly undulating country in
 “ preference to the low flat plains. It is found in nearly
 “ every part where the rainfall is moderate, and it avoids
 “ thick, humid forests. It frequents the smaller tracts of cul-
 “ tivation when these are surrounded by high grass and brush-
 “ wood intermingled with low trees.

“ Although this bird is found singly or in pairs, and never
 “ in coveys, very many birds congregate together in favourite
 “ localities. The cocks perch freely on the larger boughs of
 “ trees as well as on posts, stumps, ant-hills and other objects
 “ which raise them a few feet above the ground. Their loud and
 “ pleasant call is heard pretty well all the year round, but
 “ more especially on fresh, cold-weather mornings. When
 “ crowing they are not very shy; but they are difficult to
 “ detect and on being closely approached they drop very
 “ quietly to the ground and disappear quickly.”

They are favourite cage birds with the Chinese and Burmese, and are often allowed considerable liberty, as they soon become tame and confiding. It is probably due to the escape of tamed birds that the Chinese Francolin has been recorded as one of the birds to be found round about Bangkok.

Irwin has shown (*in loc. cit.*) that the surroundings of Bangkok are not at all the kind of country which this Partridge would choose for itself, all the higher ground having been artificially raised, and the remainder subject to flooding. At the same time Schomburgh, Swinhœ, Ricketts and others have all written about its frequenting, and being shot in rice fields. Possibly they only refer to these fields after the water has dried up, and when the paddy is more or less ripe, but they do not say so, and one always thinks of a rice field as a very wet place indeed.

The cry is a loud musical succession of notes of rather the same character as that of the Black Partridge, but easily distinguished from it. It has been syllabised as "ke-kai ke-kai" "ke-karr" by Swinhœ, and as "Hing puh tiy yay, koko" (it is no use my brother) by the Chinese.

Oates refers to this bird's affection for bamboo jungle: he says—

"This Francolin is rarely to be found in stubble, and I do not remember finding more than two birds in such ground in the course of three or four years' experience. On the other hand, almost every bamboo-clad hill side, if well beaten, will yield 5 or 6 birds. The bird is very loth to fly, and runs before the beaters till want of cover compels it to take to the air, and even when thus flushed, it will descend to the ground as soon as possible. The flight is very strong, and a bird on the wing affords a very pretty shot."

Although common almost everywhere in suitable country, it is nowhere numerous enough to make its sole pursuit an object of a day's shooting, and though Mackenzie, Hopwood, Wickham, Harington and others have shot many, they have generally formed part of a miscellaneous bag or odd birds shot on the march from one camp to another.

I have seen no hybrids between this bird, and the Black Francolin, but one would expect such to occur in South Manipur or the North Chin Hills, where the two species meet.

FRANCOLINUS GULARIS.

The Kyah or Marsh Partridge.

Wood Partridge.—Lath, Gen. Hist. VIII, p. 299 (1823).

Perdix gularis.—Temm, Pig. et Gal., III, p. 401, 731 (1815); Gray, III, Ind. Zool., I., pl. 56, fig. 1. (1830-32); Blyth, Cat. B. Mus. As. Soc., p. 251 (1849).

Perdix monogrammica.—Less., Trait d'Orn., p. 504 (1831).

Francolinus gularis.—Gray, List Gall. B., III., p. 34 (1831); Hodg., in Gray's Zool., Misc, p. 85 (1844) (Nepal); Ogilvie-Grant, Ibis., 1892, p. 46; id., Cat. B. M., XXII., p. 158 (1893); id. Man. Game-B. I., p. 122 (1895); Oates, Man. Game-B. I., p. 174 (1898); Blanford, Fauna, B. I. Aves., IV. p. 141, (1898); id., Cat. Eggs,

B. M., I., p. 38 (1901); Stuart Baker, Jour. B. N.H.S. XII., p. 492 (1899) (Cachar); Inglis, *ibid.*, XII., p. 677 (1899) (Cachar); *id.*, *ibid.*, XVI., p. 73 (1904) (Behar); Stuart, Baker, *ibid.*, XVII., p. 972 (1907), (Khasia Hills); Osmaston, *ibid.*, XXII., p. 544 (1910) (Gorakpur); Stevens, *ibid.*, XXIII., p. 724 (1915) (Upper Assam).

Otygornis gularis.—Jerd., B. of I. II., p. 573 (1863); Hume's N. and E. In. Birds, p. 544 (1873); Ball, Str. Feath., VII. p. 234 (1878) (N. Valley of Ganges); Hume and Marsh., Game-B. II. p. 59 (1879); Hume, Str. Feath., IX., p. 258 (1880) (Cachar); *id.*, *ibid.*, XI., p. 305 (1888); Oates, ed. Hume's N. and E., III., p. 437 (1890).

VERNACULAR NAMES.—Kyah, Khyr, Kaijah, (*Bengali*); Koi, Koera, Koi-sorai (*Assamese*); Bhil-titur, Jal-tetri (*Cachar and Sylhet*); Hoi Koli (*Plains Miri*).

Description—*Adult Male and Female*—Head from forehead to nape brown; lores and a narrow supercilium, widening to a broad patch behind the eye buffy-white; whole of the rest of the upper parts brown with bars of buffy-white edged with darker brown; on the longer upper tail-coverts and central tail feathers the bars become vermiculatus; on the whole of these parts the feathers are conspicuously white-shafted; outer tail-feathers deep chestnut with buff tips and sub-tipped brownish; wing-coverts, scapulars and inner secondaries like the back; primaries brown with chestnut on the inner webs, increasing in extent on the inner and extending to the outer webs on the innermost primaries; the secondaries change gradually from the colour of the primaries to that of the back.

A dark streak behind the eye below the white superciliary patch, cheeks whitish, changing to rusty chestnut on chin, throat and fore-neck; lower parts white to pale buff, each feather with black and then brown margins, the black and brown lessening in extent from breast to vent, and the white increasing in proportion; vent and centre of abdomen pale rufous and under tail-coverts a slightly darker tint of the same. Axillaries white and brown, under wing-coverts chestnut, except the smallest, which are brown and white.

The individual variation is not great, and consists almost entirely in the extent to which the lower parts and head are suffused with rufous. In a few birds this suffusion of rufous makes the whole bird appear much more red below, but in many specimens there is no rufous tinge at all except on the vent and under tail-coverts.

Colours of the Soft Parts.—Irides brown, crimson-brown to crimson; eyelids dull livid green or plumbeous green; bill black, the tip horny-white; legs and feet orange-yellow to dull red and redder in the male as a rule than in the female, and, as usual, redder and brighter in both in the breeding season than in the rest of the year; claws and spurs horny-brown. The female sometimes has a trace of spurs as well as the male.

Measurements.—Length about 15 inches, wing 162 to 186 mm., average of 30 specimens 172·4 mm.; tarsus 60 to 65 mm., bill at front

about 21 to 23 mm., and from gape 23 to 26 mm. The tail measures from 101 to 127 mm.

Hume says that the female is smaller than the male, but that he has had but few specimens to judge from. The British Museum series consists principally of unsexed birds, but from the few sexed specimens there appears to be little, if any, difference between them.

Distribution.—The Alluvial Plains watered by the Ganges and Brahmapootra from the North-West Provinces to the extreme East of Assam. South of the Brahmapootra it is common in Cachar, Sylhet, and Tippera, but does not extend into Arrakan. It is *not* uncommon in many parts of the Sunderlands of Jessore, Khulna, Barisal and Mymensingh, and is also found in the 24th Parganas. I have never seen it myself in the Khasia Hills, nor do I know of any country there at all suitable for it, but a wanderer might well range up from the foothills of Sylhet where it is very common.

Osmaston says it is rare in Gorukpore.

Type Locality.—Cachar.

Nidification.—There is but little on record about the breeding of the Swamp Partridge beyond the description of the nest and eggs taken by Mr. H. J. Rainey in Jessore, but nests have been taken by Messrs. H. A. Hole, C. M. Inglis, Chas. Primrose and myself on many occasions in various parts of S. Assam and the district of Goalpara. They are early breeders, and most eggs are laid in the end of March and early April, and some must be laid as early as February, as I have had eggs brought to me in early March which were on the point of hatching. Dr. H. N. Coltart and others have taken eggs in Behar in the same two months, April and March, and Rainey's eggs were taken in the former. In Mymensing, Tippera and Barisal they lay principally in the end of March, so that it would seem that throughout the rather restricted range of this bird its breeding habits are the same.

I have never found its nest anywhere but in reeds and heavy "nal" in swamps, except in a few instances when it had been placed on little half-submerged islands covered with cane brakes and a dense undergrowth of weeds and rank grass.

Generally it is placed in amongst growing and broken-down reeds and nal actually standing in water, sometimes mere mud or water a few inches deep, but sometimes in water of 18 inches or even greater depth. The nest itself is quite well-built, a matter of necessity in so precarious a position, and consists of a thick pad of rushes, grass and weeds, some 8 inches to a foot across, the sides well raised and the whole pad anything from 2 inches to 4 inches deep with a well-made hollow for the eggs to rest in. Occasionally the nest may be taken from amongst reeds on the dry banks or margins of swamps and ponds, and then it is not quite so compact and well-made.

In Behar this Partridge apparently sometimes nests in the thatching grass growing by tanks, similar to that described by Rainey, but I have myself seen no nest in such a position.

In Cachar and Sylhet we found the nests most difficult to locate, even after we had heard the males calling continually from one spot. They were always placed in the thickest patches of reeds or nal, and nearly always practically entirely hidden by the fallen stems of the dead stuff. Fortunately the hens are very close sitters, and by making a line through the reeds with half a dozen beaters one could get very close to the nest before she made off, usually with a tremendous fluster and loud cackles. Even then a very careful search is often required before the nest is actually discovered.

Five seems to be the maximum number of eggs laid, though 6 may possibly be found now and then. Often only three eggs are incubated, and I should consider 3 or 4 the normal clutch. At the same time I have been most unlucky in taking this bird's nest, finding but few even in Cachar and Sylhet, where the bird was very common forty years ago, and probably still is.

The eggs are not in the least like any of the other Francolins, and its nesting habits alone would lead one to infer that it must belong to a different genus to these birds. In shape they, the eggs, are rather long ovals, generally decidedly pointed at the smaller end. They are never peg-top or pyriform in shape, and the texture is very close and hard, often with tiny pits scattered here and there over the whole surface. In colour they are a pale stone, generally with a faint, reddish or rufescent tinge, and in most cases there are numerous small reddish freckles and blotches, sometimes confined to the larger end, sometimes scattered thinly over the whole egg.

24 eggs average 39.6×29.8 mm. ; the longest and shortest measure respectively 42.0×29.9 mm., and 38.1×29.3 mm. ; the broadest and most narrow 39.5×30.9 and 38.2×29.0 mm.

General Habits.—Whilst all the other species of Indian Francolins are found both in the plains and on the hills, this bird is essentially not only a bird of the plains, but is one which is found only in the lowest-lying swampy tracts, subject to flooding in the rains, and never wholly dry. It haunts principally the dense Ekra and elephant grass bordering rivers, big and little, and the miscellaneous jungle found over the never-ending swamps of Eastern Bengal and Assam. It certainly prefers reeds or grass to other kinds of cover, but is often also found in cane brakes, scrub and thorn bushes in, or on the borders of, marshy ground. In the height of the rains when the water everywhere rises so high as to make the swamps uninhabitable for anything but buffalo and water-fowl, the Kyah takes to the grass fields on the higher ground, but even then never seems to wander far from water.

It is a very active bird in amongst the reeds and elephant grass, clambering about them even more quickly and noiselessly than the Purple Coot, and I have several times watched them for some minutes thus clambering about without any apparent object in view before they again dropped down below and pursued their way on the ground. Where the water is fairly deep, *i.e.*, over the tarsus, or the mud is too thick they always work to and from their feeding grounds in this manner, but when actually feeding, they seem to keep more or less on the ground itself. In the mornings and evenings they come out into the more open grass alongside their jungles and also haunt the rice fields, especially when the paddy is long and the ears ripening. In Cachar we sometimes caught them out in the freshly-ploughed fields, but they seldom gave a shot, as before we were within distance down went heads and tails and they slunk off at a great pace into cover. I have also shot one or two birds out of mustard fields, and sugarcane patches are a favourite haunt.

On the wing it is rather a clumsy bird, though it attains quite a good pace once it gets away and fairly started. It rises with considerable fluster and whirring of wings, and nearly always with loud chuckles and cacklings such as I have heard no other Francolin give vent to. It is very difficult to flush, more perhaps from the nature of the country it frequents than because it is so confirmed a runner. Caught in the open it invariably first runs into cover, unless one is very close indeed to it, but it is so wary a bird that this seldom occurs. On the rare occasions on which I have come across it in grass it did not seem so hard to flush, and as it generally rose within a dozen or twenty yards it was an easy bird to hit. It is easy to kill also, for so big a bird, for its plumage is looser than that of the other Francolins and seems less able to resist shot.

Probably nowhere is the Swamp Partridge found in sufficient numbers to make a big bag possible, but there are certainly some of its haunts in Sylhet and Maimensingh where one could get anything from 10 to 30 brace with a line of elephants. Again at the height of the rains, about August and September, good bags may be made either by working the edges of the swamps on foot or by having beats on the numerous small islands left more or less dry in a vast sea of stagnant water.

One visits the islands in canoes or dug-outs, lands a few men on them to beat them out, and then gets capital snap shots as they dodge round the corner and make for the next islands. An addition to the excitement is the possibility of practically any kind of game turning up from a jungle-fowl to a buffalo or tiger, whilst the beaters have to exercise the greatest care not to get bitten by snakes which swarm on these islands during the floods.

Cripps, who worked the same swamps in Sylhet as I myself shot over some years later, says that when feeding in the more open parts one bird of the flock always mounts sentry on a bush or high up in the reeds. I have never noticed this myself, but certainly the birds are very fond of climbing high up into bushes and reeds, and even into a kind of low thorny tree which grows freely in swampy places, and thrives when the water comes ten feet up their trunks in the late summer. They roost regularly in such places, and never actually on the ground, but the place most often selected is some dense patch of elephant grass or nal, much broken down and tangled so as to make plenty of horizontal perching accommodation.

Their crow or call has been syllabised well by Col. Tickell a "chuckeroo chukeroo chuckeroo", but this is nearly always preceded by several single chucks or croaks before the bird gets into the swing of its full cry. It is a rather harsh call, and not nearly so musical or joyous as that of the Black Partridge, and is said to be much more like that of the Grey Partridge, a bird with which it is much nearer akin in every way.

The Kyab is practically omnivorous, every kind of seed and grain is eaten as well as young shoots of mustard, paddy and other crops. It also eats insects of all kinds, and a bird shot in Sylhet had been feeding on tiny little shell fish. Young birds are very good for the table, and even the old ones are quite nice eating, especially if they can be kept for a short time.

In disposition the Swamp Partridge is much more pugnacious than any of the other Francolins, and the Sylhet Mahomedans keep both this bird and the Watercock (*Gallixrex cinereus*) for fighting purposes and often much money is lost and won over a main between two champion Kyahs. They fight very much like Gamecock, but use their bills far more and their spurs far less. Each bird seems to aim at getting his adversary by the skin and feathers of the throat and neck, and once the coveted hold is obtained the lucky bird hauls the other round and round until the hold gives or the other bird falls exhausted. The fight never, as far as I know, proceeds a l'outrance as before such a point is reached the owner of the beaten bird pays up and rescues his warrior from further mauling.

Some of the captive birds are trapped in nooses to which they are called up by a decoy bird, but others are hatched from the eggs by the natives themselves, who tie them in a cloth round their bodies, the heat of which suffices for the purpose. At one time practically every Watercock kept in captivity was hatched in this manner as well as many of the Kyahs, but the habit was dying out even thirty years ago, and perhaps has now quite disappeared.

This Partridge becomes quite as tame as any of the other Francolins in captivity, and even though it is usually kept in a small cage it is allowed to run loose at least once every day for an hour or two, and favourite birds are made a great fuss over by their owners. The birds are extraordinarily obedient, and will run at once to their masters when called. I have been amused to watch the birds when they are taken out for their constitutionals. They follow their masters well, though often at a considerable distance, and whilst the latter stroll along in the open, the bird makes its way along through any cover which may be available, skulking from one piece to another, and taking advantage of every weed and tuft of grass on the way. If its master goes too far or too quickly to allow it to feed and follow at leisure, it will call loudly, standing very erect, and with outstretched neck, watching to see if its call is heard and attended to.

Jerdon refers to a writer in the Bengal Sporting Magazine who says that nearly every bird he shot was more or less scarred on the breast with marks received in fights with other birds. I have come across several specimens very badly scarred, but generally more about the neck than the breast.

Mr. Inglis has had these birds breed in captivity, but he has not recorded any success in rearing the young.

(*To be continued.*)



81



82



81a



82a



84



83a



83



84a



85a



85

THE COMMON BUTTERFLIES OF THE PLAINS
OF INDIA.

EXPLANATION OF PLATE N.

Figs. 81, 81a, <i>Hasora alexis</i>	♂	♀
„ 82, 82a, <i>Badamia exclamationis</i> ...	♂	♀
„ 83, 83a, <i>Sarangesa purendra</i>	♂	♀
„ 84, 84a, <i>Gangara thyrsis</i>	♂	♀
„ 85, 85a, <i>Celænorrhinus ambareesa</i> ...	♂	♀

THE COMMON BUTTERFLIES OF THE PLAINS
OF INDIA.

(INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY.

BY

T. R. BELL, C.I.E., I.F.S. (*retd.*)

(Continued from page 227 of Vol. XXVII.)

PART XXVIII.

With plate N.

Family—*HESPERIIDÆ*—(*continued*).

This key will probably be found to be applicable to all insects of the sub-families 1, 2, 3, 5, 6 and 9 enumerated on page 6. For subfamilies 4, 7 and 8, however, it will only serve for the limited number of skippers dealt with in detail in these papers.

Below will be found another key, for subfamilies, based chiefly upon structural characters:—

A.—*Wings* : held horizontal in repose. *Fore wing* :
vein 5 nearer to 6 than to 4 *Celaenorrhinæ* (1).

B.—*Wings* : held either erect or slanting in repose.

Fore wing : vein 5 various.

a. *Wings* : held either erect or slanting. *Fore wing* :
vein 5 always nearer to 6 than to 4 *Hesperiinæ* (2).

b. *Wings* : always held erect in repose. *Fore wing* :
vein 5 various.

a1. *Fore wing* : vein 5 various. *Palpi* : robust,
the second joint held pressed against face, erect ;
the third joint long, naked, directed out hori-
zontally, or nearly so, in front of head *Ismeneinæ* (3).

b1. *Fore wing* : vein 5 always nearer to 6 than to 4 ;
rarely from or nearly from the middle. *Palpi* :
never as in the *Ismeneinæ*.

a2. *Antennæ* : with the tip of club blunt,
never with a point, be that point ever so small.. *Pamphilinæ* (6).

b2. *Antennæ* : with the tip of club with a point
(*apiculus*), well marked in the majority of
cases, sometimes small, but invariably present.

a3. *Eyes* : blood red *Erionotinæ* (5).

b3. *Eyes* : never red of any hue.

a4. *Head* : breadth divided into antenna—
length always over 2.3 mm., or, in one
case, equal to it *Notocryptinæ* (9).

b4. *Head* : breadth divided into antenna—
length always under 2.3 or, in one case,
just over it (in the case of *Cupitha purreea*),
an insect otherwise otherwise abnormal and diffi-
cult to place *Plastingiinæ* (4)
Erynninæ (7).
Baorinæ (8).

These last subfamilies 4, 7 and 8 are very difficult to define by any simple characters of the perfect insect and Watson's old artificial divisions have been of necessity utilized to render the determination of genera possible. These, it will be remembered, are based upon the position of vein 5 of the forewing, whether it is straight throughout its length, and therefore not notably nearer to 4 than 6 or bent down at the origin towards vein 4, making that origin much nearer to vein 4 than it is to vein 6. The key to the genera would then, for these subfamilies, coincide with that for the subfamilies themselves, as under (for clearness' sake the *Notocryptinæ* have been included again as, perhaps, the head divided into antenna character may not be perfectly satisfactory):—

- a5. *Fore wing* : vein 5 straight throughout its length, not arising markedly nearer to 4 than to 6.
- a6. *Fore wing* : vein 11 running close to or actually touching vein 12.
- a7. *Palpi* : terminal joint plainly visible *Erynninæ* (7).
(Genus 28 *Baracus*).
- b7. *Palpi* : terminal joint concealed in the thick clothing of the second *Notocryptinæ* (9).
- b6. *Fore wing* : vein 11 quite separate from vein 12. (Genus 33 *Sancus*)
- a7. *Palpi* : terminal joint conspicuous, erect, long, slender, curving over vertex of head.
- a8. *Fore wing* : vein 3 from well before end of cell ; vein 3 of hind wing before end of cell *Erynninæ* (7).
(Genus 17 *Suastus*).
- b8. *Fore wing* : vein 3 immediately before end of cell ; vein 3 of hind wing from end of cell .. *Notocryptinæ* (9).
(Genus 36 *Iambrix*).
- b7. *Palpi* : terminal joint inconspicuous, entirely or almost entirely concealed in clothing of second joint.
- a8. *Palpi* : terminal joint erect .. *Notocryptinæ* (9).
(Genus 35 *Hyarotis*).
- b8. *Palpi* : terminal joint horizontal.
- a9. *Palpi* : small terminal joint comparatively conspicuous .. *Platingiinæ* (4).
(Genus 18 *Arnetta*).
- b9. *Palpi* : small terminal joint concealed in clothing of second *Platingiinæ* (4).
(Genus 19 *Zographetus*).
- b5. *Fore wing* : vein 5 deflected at origin, thus rising much nearer vein 4 than to vein 6 : the middle discocellular thus much longer than the lower.
- a6. *Antennæ* : short, the terminal hook minute, never as long as breadth of club ; antenna about 5mm., in length *Baorinæ* (8).
(Genus 31 *Gegenes*).

- b6. *Antennæ* of moderate length or long (from 6.5mm.) to 10mm., terminal hook short, practically never over 1mm., as long as or somewhat longer than breadth of club.
- a7. *Fore wing* : vein 2 much nearer base of the wing than to end of cell.
- a8. *Wings* : underside pure sulphur yellow, immaculate except for the black area along abdominal margin of hind wing. *Erynninæ* (7).
(Genus 29 *Cupitha*).
- b8. *Wings* : never pure immaculate, sulphur-yellow.
- a9. *Hind wing* : produced medially and with a large, white, discal patch, much blurred round the edges, showing through on upperside .. *Notocryptinæ* (9).
(Genus 34 *Udaspus*).
- b9. *Hind wing* : not produced medially, nor with such a patch.
- a10. *Hind wing* : underside clouded with grey but otherwise unmarked .. *Notocryptinæ* (9).
(Genus 32 *Notocrypta*).
- b10. *Hind wing* : underside marked with streaks (generally ochraceous) or dark spots .. *Plastingiinæ* (4).
(Genus 16 *Plastingia*).
- b7. *Fore wing* : vein 2 nearer end of cell than to base of wing.
- a8. *Palpi* : terminal joint distinct, sub-erect.
- a9. *Fore wing* : vein 3 equidistant between veins 2 and 4 (in male only) .. *Erynninæ* (7).
(Genus 25 *Telicota* = *Corone*).
- b9. *Fore wing* : vein 3 much nearer vein 4 than to vein 2, indeed from close to end of cell .. *Erynninæ* (7).
(Genus 26 *Padraona*).
- b8. *Palpi* : terminal joint concealed, porrect.
- a9. *Fore wing* : vein 3 equidistant between veins 2 and 4 .. *Erynninæ* (7).
(Genus 27 *Halpe*).
- b9. *Fore wing* : vein 3 much nearer 4 than to 2 .. *Baorinæ* (8).
(Genus 30 *Baoris*).

In the above the genera *Telicota* and *Padraona* are very like each other in general appearance and also very similar to *Ampittia* of the

subfamily *Pamphilinæ* ; the insects are all more or less orange with black band-like markings.

The following is a key to the genera of the subfamilies 1, 2, 3, 5 and 6 (*Celænorrhinæ*, *Hesperiinæ*, *Ismeneinæ*, *Erionotinæ* and *Pamphilinæ*) :—

(1) Subfamily *Celænorrhinæ*.

A.—Fore wing ; cell less than two-thirds the length of the costa.

a. *Antennæ* ; the tip acuminate.

a1. *Palpi* : terminal joint suberect 1. *Celænorrhinus*.
(Pl. N. figs.-85, 85a).

b1. *Palpi* ; terminal joint horizontally porrected in front of face.

a2. *Fore wing* ; not truncated at apex.

a3. *Hind wing* ; lower margin of cell not strongly arched between veins 2 and 3.

a4. *Hind wing* ; hardly, or not at all elongate ; hind tibiæ of male with a tuft of hair attached to proximal end.

a5. *Hind wing* ; lower margin of cell arched slightly between veins 2 and 3.. 7. *Sarangesa*
(Pl. N. figs. 83, 83a.)

b5. *Hind wing* ; lower margin of cell straight between veins 2 and 3.. .. 6. *Coladenia*.

b4. *Hind wing* ; elongate ; hind tibiæ of male densely fringed but without tuft of hair attached to proximal end 2. *Satarupa*.
(*Daimio*).

b3. *Fore wing* ; with lower margin of cell arched strongly between veins 2 and 3 .. 3. *Tagiades*.

b2. *Fore wing* ; apex broadly truncate 8. *Tapena*.

b. *Antennæ* ; tip blunt.

a1. *Fore coxæ* ; with a recumbent tuft of hair in the male 4. *Odontoptilum*.

b1. *Fore coxæ* ; with a radiating tuft of hair in the male 5. *Abaratha*.

In both these genera, *Abaratha* and *Odontoptilum*, the outline of the fore wing or the hind wing, sometimes of both wings, irregular, rather highly so in the hind wing of the former in the species *ransonnettii* ; all the species of the former genus are spotted with small spots while those of the latter are lined or marked with large, white spots.

2. *Hesperiinæ*.

A.—*Antennæ* : with the club curved .. 9. *Hesperia*. (Pl. M., figs. 80 80a).

B.—*Antennæ* ; with the club straight .. 10. *Gomalia*.

3. *Ismeneinæ*.

A.—*Hind wing* : vein 5 well developed.

a. *Hind wing* ; vein 3 close to end of cell.

a1. *Antennæ* ; club longer than the shaft. 11. *Ismene*.

(*Gecana*, *Burara*).

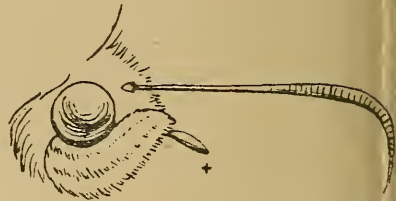
- b1. Antennæ* † club shorter than shaft.
a2. Fore wing † vein 1 distorted downwards near base 12. *Hasora*. (Pl. N. figs. 81, 81a).
b2. Fore wing † vein 2 not distorted 13. *Bibasis*.
b. Hind wing † vein 3 from well before end of cell 14. *Badamia*. (Pl. N. figs. 82, 82a).
B.—Hind wing † vein 5 wanting 15. *Rhopalocampta*.
 4. *Plastingiinae*.
 16. *Plastingia*.
 17. *Suastus*. (Pl. M. figs. 79, 79a).
 18. *Arnetta*.
 19. *Zographetus*.
 5. *Erionotinae*.
A.—Fore wing † vein 2 equidistant between base of wing and end of cell 20. *Matapa*.
B.—Fore wing † vein 2 nearer base of wing, equidistant between base of wing and vein 3. 21. *Gangara*. (Pl. N., figs. 84, 84a).
 6. *Pamphilinae*.
A.—Antennæ † club forming a hollow disc : spoon-shaped 22. *Taractrocera*. (Pl. M., figs. 74, 74a, 76 76a).
B.—Antennæ † club rounded.
a. Colour † orange and black 23. *Ampittia*.
b. Colour † brown, never orange 24. *Aëromachus*. (*Machachus*).
 7. *Erynninae*.
 25. *Telicota*. (*Corone*). (Pl. M., figs. 75, 75a).
 26. *Padraona*.
 27. *Halpe*. (*Thoressa*).
 28. *Baracus*.
 29. *Cupitha*.
 8. *Baorinae*.
 30. *Baoris*. (Pl. N., figs. 77, 77a (*Calloris*, *Chapra*, *Paranara*).
 31. *Gegenes*.
 9. *Notocryptinae*.
 32. *Notocrypta*.
 33. *Sancus*.
 34. *Udaspes*. (Pl. M., figs. 78, 78a).
 35. *Hyarotis*.
 36. *Iambrix*.

The above key will probably be unsatisfactory for most collectors, being based to a large extent upon venation which often cannot be

examined without the aid of a lens and benzine (which makes the veins stand out); the upper veins, along the costa of the fore wing, are often difficult to decipher although, in all skippers, they are easier than in most lepidopterous families as none of them are branched and all are invariably present. It is well to remember that veins 8 to 12 all end on the costa or upper margin of the wing, vein 7 always on the outer margin below the apex.

It would be, therefore, of considerable utility to have a key based on clearly evident characters, such as colours, markings, antennal lengths and so on. While it would not be possible to make such a key for all Indian genera with all their constituent species, it is quite feasible to compose one which will include all the genera as represented by the limited number of species existing in them for the purpose of these papers. Such a key is given below:—

4.—*Palpi* : with the second joint upturned, pressed closely against the face, the third joint long, slender, naked, porrect horizontally in front of the face (*vide* marginal figure).



Showing palpus of *Ismeneinae* with naked porrect third joint (X)

a. *Fore wing* : exceptionally long ; dark-brown with purplish gloss and with three yellowish, diaphanous, slender spots on disc which are much larger in the female than in the male

14. *Badamia*. (Pl. N., figs. 82, 82a.)

b. *Fore wing* : of ordinary shape, broad, of normal length.

a1. *Hind wing* ; *underside* : with a well-defined, diagonal, white *fascia* or band across it, or a yellow-white, large spot in the cell.

a2. *Hind wing* ; with the *cilia* orange red, very striking 13. *Bibasis*.

b2. *Hind wing* ; with *cilia* or fringe not orange-red 12. *Hasora*. (Pl. N., figs. 81, 81a.)

(*Parata*).

b1. *Hind wing* ; *underside* : without a diagonal *fascia*.

a2. *Hind wing* : *underside* : the whole anal area bright golden-yellow 15. *Rhopalocampta*.

b2. *Hind wing* : *underside* : the anal area like rest of wing.

a3. *Hind wing* : *underside* : streaked with white and greenish-black or brown 11. *Ismene*.

(*Burara*, Swinh.)

b3. *Hind wing* : *underside* : streaked with orange-red and brown 11. *Ismene*.

(*Gecana*, Swinh.)

B.—Palpi : never as in A.

a. *Antennæ* : club without point (*apiculus*) at extremity, blunt.



Terminal portion of Antenna of *Taractrocera*.

a1. *Antennæ* : club flattened and hollowed out like a spoon on one side (*vide* marginal figure)

22. *Taractrocera*. (Pl. M., figs 74, 74a, 76, 76a).

b1. *Antennæ* : club rounded, stout, not hollowed out on one side.

a2. *Hind wing* : with a whitish band across the disc on upperside 10. *Gomalia*.

b2. *Hind wing* : spotted with white, no band across disc 9. *Hesperia*.

(*Spialia*, Swinh.)
(Pl. M., fig. 80, 80a).

b. *Antennæ* : club with the tip not quite blunt, slightly acuminate-looking, sometimes with an extremely minute tip (*vide* the marginal figure).



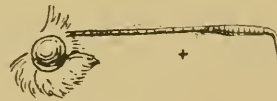
Antenna of *Gegenes*.

a1. *Wings* : upperside : black and orange. 23. *Ampittia*.

b1. *Wings* : upperside : silky-brown with indistinct row of spots ; expanse 25mm. 24. *Aëromachus*.
(*Machachus*, Swinh.)

c1. *Wings* upperside : ochreous-brown, immaculate ; expanse over 25 mm. 31. *Gegenes*.

c. *Antennæ* : club narrowed into a distinct point, often hooked (Pl. M., figs. 75, 77-79; Pl. N., figs 81-85), also marginal figure.)



Antenna of *Baoris*.

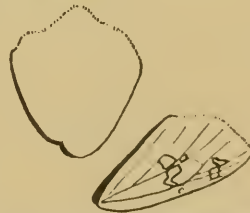
a1. *Eyes* : blood-red.

a2. *Size* : large, expanse over 65mm... 20. *Gangara*. (Pl. N., figs. 84, 84a).

b2. *Size* : medium, expanse under 50mm. 21. *Matapa*.

b1. *Eyes* : never red.

a2. *Hind wing* : obliquely truncate at apex.



Showing upperside of the fore wing of *Tapena thecatest* and shape of hind wing.

a3. *Hind wing* : prominently angled at middle of outer margin but not produced into points or teeth ; colour dark-brown all over with or without a few hyaline spots (*vide* marginal figure)

8. *Tapena*.

b3. *Hind wing* : produced to sharp teeth at the ends of the veins, more prominently at veins 3, 4 ; upper-side brown or golden-brown and many hyaline spots ; beneath suffused with white (*vide marginal figure*) 5. *Abaratha*.



Abaratha
Showing fore wing upperside of *Abaratha*
and shape of hind wing.

c3. *Hind wing* : outer margin irregular after truncation at apex but never toothed ; upperside ochreous brown suffused with white and with fine white lines ; beneath : whitish (*vide marginal figure*) 4. *Odontoptilum*.



Hind wing, upperside of *Odontoptilum undulatum*.

b2. *Hind wing* : not truncate at apex, instead, evenly rounded.

a3. *Hind wing* : underside immaculate, pure sulphur-yellow except anal margin which is broadly dark-brown 29. *Cupitha*.

b3. *Hind wing* : underside orange-yellow or ochreous-brownish (*Corone palmarum*) with, at least, a few fuscous markings.

a4. *Hind wing* : underside with a well defined, transverse, orange or ochreous band distinguished from the duller ground-colour and the base unmarked ; no distinct black cell-spot.

a5. *Hind wing* : underside ; ground colour orange-yellow ; male with discal stigma on upperside of fore wing 25. *Telicota*. (Pl. M., figs. 75, 75a).

b5. *Hind wing* : underside brownish ochreous ; male without stigma 25. *Telicota*. (*Corone*).

b4. *Hind wing* : underside as in *Telicota* ; with black cell-spot in *P. gola* ; the base marked somewhat indistinctly in *P. mæsoides*. 26. *Padraona*.

- c4. *Hind wing* : underside without any band distinguishable from the dark ground-colour ; upper-side immaculate dark-brown .. 28. *Baracus*.

In this key *Padraona* contains both *gola* and *mæsoides* although their transformations are very different and point to *gola* being more nearly related to *Ampittia* than to *Padraona* notwithstanding the neururation of the wings. *Baracus* is somewhat similar to *Taractrocera ceramas* (or *nicévillei*), (Pl. M. figs. 74, 74a) in general aspect in both sexes ; *Ampittia dioscorides* female is also like that species although the upperside of the male, with far more yellow markings, recalls *Telicota bambusæ* (Pl. M., figs. 75, 75a) or *Padraona mæsoides* or *gola*.

- c3. *Hind wing* : underside; not orange-yellow (in *Halpe honorei* it is ochreous-yellow with black spots).
 a4. *Hind wing* : upperside ; with a large, white discal patch only ; fore wing with white spots, the ground-colour dark-brown .. 34. *Udaspes*. (Pl. M, figs. 78, 78a).



Hind wing, underside, of *Tagiades obscurus*.

- b4. *Hind wing* : upperside: without such white, discal patch.

- a5. *Hind wing* : underside ; with the outside half white or the whole suffused with white ; in the former case, the upperside also pure white with black spots ; in the other case the ashy-white suffusion invading the upperside slightly (vide marginal figures)



3. *Tagiades*. Hind wing, underside of *Tagiades litigiosa*.

- b5. *Hind wing*: underside ; with a broad, dirty-white, sub-basal, transverse band bordered by a semi-circular series of black spots; a whitish-looking-insect.

2. *Satarupa*. (Daimio).

- c5. *Hind wing* : underside: with a very irregular, yellow-white band, transversely across and the ground-colour dark vinous-black, the base very dark (vide marginal figure)



Hind wing, underside, of *Hyarotis adrostus*.

35. *Hyarotis*.

d5. Hind wing : underside : powdered grey all over with black spots or uniform blackish-



Hind wing, underside, of *Suastus Tremius*.

- brown (*vide* marginal figure) .. 17. *Suastus*. (Pl. M., figs. 79. 79a)
- e5. Hind wing : underside : powdered grey with black spots, and besides a violet gloss ; antennæ exceptionally long .. 16. *Plastingia*.
- f5. Hind wing : underside : different from a5 to e5.

a6. Fore wing *upperside* : with a broad, pure white, transverse, discal band consisting of three large, contiguous spots (X) ; colour dark-brown (*vide* marginal figure) .. 32. *Notocrypta*.



Fore wing of *Notocrypta* showing markings.

- b6. Fore wing : *upperside* : immaculate ; colour dark sepia-brown ; an oval, elongated brand in male on underside. 33. *Sancus*.
- c6. Fore wing : *upperside* : an oblique, discal series of more or less indistinct, yellow (male), or distinct white (female) spots curving from beyond middle of inner margin to near costa ; or, rarely, nearly immaculate ; colour dark-brown with olive gloss 36. *Iambrix*.

d6. Fore wing : *upperside* : greyish fuscous with many, white spots all over it and a clouded, mottled appearance due to darker marbling .. 7. *Sarangesa*.

(Pl. N. 83, 83a).

e6. Fore wing : *upperside* : dark brown or brown and rufous mixed, or rufous ; with two or three large, diaphanous white, discal spots ; hind wing with no yellow patch on *upperside* (*vide* marginal figure).



Wings of *Coladenia* showing large, diaphanous, white discal spots (X).

- a7. Wings : *upperside* : ground colour rufous .. 6. *Coladenia*.
- b7. Wings : *upperside* : dark-brown 1. *Celænorrhinus*.

f6. *Fore wing: upperside:* dark-brown of different shades with comparatively small, white or yellow, discal (and generally, smaller, subapical) diaphanous white spots as in figures 77, 77a, Pl. M.; or (*Halpe honorei*) with yellow markings and large, yellowish, diaphanous, discal spots but, in this last case only, with large, discal, yellow patch on the upperside of hind wing (*vide* marginal figure of *Baoris* wing).



Fore wing of *Baoris* showing type of markings, *i.e.*; the small discal diaphanous, white spots (x).

a7. *Fore wing: upperside:* dark-brown with small, white, discal spots; never a yellow patch on hind wing.

a8. *Hind wing: underside:* mottled dark ochreous-brown with few pure-white or dusky spots on it 18. *Arnetta*.

b8. *Hind wing: underside:* disc mottled more or less bright ochreous with dark spots on it 19. *Zographetus*.

c8. *Hind wing: underside:* never mottled, at most suffused; and never with dark or *dusky* spots on it 30. *Baoris*. (Pl. N., figs. 77, 77a).

b7. *Fore wing: upperside:* dark-brown with small, white, discal spots: in one species (*honorei*) with much yellow marking and large, discal spots but this has a big, yellow, discal patch on upperside of hind wing; none have the underside of hind wing mottled though one (*hyrtacus*), has a large, white patch on the underside; another (*moorei*) has a more or less irregular, yellowish-white, transverse band on the underside; while *astigmata* has some pure-white, small, silvery spots on a rufous ground (like a *Baoris*).. 27. *Halpe*.

There is likely to be difficulty with this genus *Halpe* because of the diverse forms contained in it. In that case, recourse must be had to the venation and the other key. Of course any species of the genus can at once be distinguished from the genus *Coladenia* by the fact that (only *honorei* can be confused with that genus in this key) all members of *Coladenia* rest with the wings horizontal while *Halpe* keeps them closed over the back; also from all the orange marked (again it is only *honorei* that comes into question) butterflies: *Telicota*, *Paedraona*, *Ampittia*, by the fact that none of these have a yellow patch on the upperside of the hind wing and none have black spots on the underside (*honorei* has). Finally *astigmata* can be differentiated from any *Baoris* by the pure-white, silvery spots on the rufous ground of the underside of the hind wing and *hyrtacus* by the white patch in the same place.

No notice has been taken, in this last key, of the horizontal and erect positions of the wings because, after a butterfly has been captured, the fact whether it rests with the wings open and spread or closed is not ascertainable. The same is the case with papered specimens generally. Marginal figures have been added showing the different shapes of wings, the style of marking of the under sides of the hind wings and the size and arrangements of the diaphanous spots on the fore wings upon which differences are based.

The key to the 62 species, finally, will be as given below. All detail has been avoided as full descriptions are given under the life-histories of the different insects which will form the bulk of the letter-press dealing with the *Hesperiidæ*.

Genus 1. *Celcenorrhinus*.

A.—Fore wing: upperside \dagger with a row of indistinct, ochreous spots \dagger inside outer margin. Expanse: 50-56mm. *ambareesa* (1).
(Pl. N., figs. 85, 85a).

B.—Fore wing: upperside : no such spots.

- a. Hind wing: upperside : with medial, and discal series of orange spots, sometimes some of them obscure. Expanse: 50mm. *leucocera* (2).
b. Hind wing: upperside : no such orange spots *area* (3).

Genus 2. *Satarupa* (*Daimio*).

One species. Expanse 24mm. *milliana* (4).

Genus 3. *Tagiades*.

A.—Hind wing: upperside \dagger whole outer half white (black spots). Expanse 40-45mm. *litigiosa* (6).

B.—Hind wing: upperside \dagger outer half at most suffused with white in varying degree, the white greyish or bluish, never quite pure. Expanse: 50mm. *obscurus* (5).

Genus 4. *Odontoptilum*.

One species. Expanse : 45-50mm. . . . *angulata* (7).

Genus 5. *Abaratha*.

One species. Expanse : 40-45mm. . . . *rannonnetii* (8).

Genus 6. *Coladenia*.

One species. Expanse : 37-45mm. . . . *indrani* (9).

Genus 7. *Sarangesa*.

A.—*Wing : upperside* : rufous. Expanse :
32-37mm. *dan* (10).

B.—*Wing : upperside* : blackish-brown.

a. *Hind wing : underside* : with small, pale spots. Expanse : 32-35mm. . . . *purendra* (11).
(Pl. N., figs. 83, 83a).

b. *Hind wing : underside* : no such spots . . *dasahara* (12).

Genus 8. *Tapena*.

One species. Expanse : 40-45mm. . . . *thwaitesi* (13).

Genus 9. *Hesperia* (*Spialia*).

One species. Expanse : 25-30mm. . . . *galba* (14).
(Pl. M., figs. 80, 80a).

Genus 10. *Gomalia*.

One species. Expanse : 20-30mm. . . . *albofasciata* (15).

Genus 11. *Ismene*.

Divided into two by Swinhoe :—

A.—*Fore wing : upperside* : with a patch of *andraconia* (differently shaped scales) in male . . . *Gecana*.

B.—*Fore wing : upperside* : no sex-scales in the male . . . *Burara*.

A.—*Hind wing : underside* : brown with veins streaked orange red. Expanse : 55-62mm. *fergussoni* (16).
(*Gecana*).

B.—*Hind wing : underside* : white with veins greenish-brown or brown. Expanse :
52-57mm. *gomata* (17).
(*Burara*).

Genus 12. *Hasora*.

Generally divided into two, according as to whether the male has a sex-mark or not.

A.—*Male* : without sex-marks on wings : *Hasora*.

B.—*Male* : with sex-marks *Parata*.

A.—*Hind wing : underside* : with a largish, yellowish spot in the cell. Expanse :
50-60mm. *badra* (8).
(*Hasora*).

B.—*Hind wing : underside* : with a transverse, white band and no cell spot.

a. *Hind wing : underside* : with the edges of the pure-white band clearly cut, well-defined towards the inside, the basal area inside it strongly greenish violaceous.
Expanse : 37-44mm. *bulleri* (21).
(*Parata*).

b. *Hind wing : underside* ; the band not pure white, the edges somewhat blurred, the inner edge never clearly defined.

a1. *Fore wing : underside* ; with a subapical, small, whitish or yellowish dot.
 Expanse : 50mm. *chabrona* (19).
 (Hasora).

b1. *Fore wing : underside* ; no such subapical spot. Expanse : 50mm. .. *alexis* (20).
 (Parata)
 (Pl. N, figs. 81, 81a).

Genus 13. *Bibasis*.

Only one species. Expanse : 50mm. .. *sena* (22).

Genus 14. *Badamia*.

Only one species. Expanse : 45-60mm. .. *exclamationis* (23).
 (Pl. N., figs. 82, 82a).

Genus 15. *Rhopalocampta*.

Only one species. Expanse : 50-60mm. .. *benjamini* (24).

Genus 16. *Plastingia*.

Only one species. Expanse : 37mm... .. *submaculata* (25).

Genus 17. *Suastus*.

A.—*Hind wing : underside* ; grey, with some black dots or small spots. Expanse :
 35-45mm. *gremius* (26).
 (Pl. M, figs. 79, 79a).

B.—*Hind wing : underside* ; pale blackish brown with no spots. Expanse ; 30-40mm. *bipunctus* (27).

Genus 18. *Arnetta*.

One species. Expanse : 30mm. *vindhiana* (28).

Genus 19. *Zographetus*.

One species. Expanse : 35mm. *ogygia* (29).

Genus 20. *Gangara*.

One species. Expanse : 65-85mm. *thyrsis* (30).
 (Pl. N. figs. 84, 84a).

Genus 21. *Matapa*.

One species. Expanse : 40-50mm. *aria* (31).

Genus 22. *Taractrocera*.

A.—*Upperside* ; both wings dark rufous brown with orange or yellow spots or marks few in number. Expanse : 22-25mm. *ceramas* (33).
 (*nicévillei*).
 (Pl. M, figs- 74, 74a).

B.—*Upperside* ; both wings olive-brown with few, small, grey spots or marks. Expanse :
 25-30mm. *mœvius* (32).
 (Pl. M., figs. 76, 76a).

Genus 23. *Ampittia*.

Only one species. Expanse : 25mm. *dioscorides* (34).

Genus 24. *Aëromachus* (*Machachus*).

Only one species. Expanse : 22-25mm. *jhora* (35).

Genus 25. *Telicota*.

A.—*Hind wing : underside :* the base unmarked.

Expanse : 40-50mm. *palmarum* (38).
(*Corone*).

B.—*Hind wing : underside :* with the basal area always with one or two yellow spots.

a. Expanse ; never over 25mm. *mæsoides* (39)

b. Expanse never under 30mm.

a1 *Fore wing : upperside :* golden-ochreous, costal and outer, marginal line black ; a narrow, pale-blackish streak below upper and lower margins of cell ; a broad black, sub-oval shaped band from lower end of cell to submedian vein ; a black macular, marginal band consisting of elongated square spots decreasing in size upwards, one in each interspace. Expanse : 30-37mm. *augias* (37).

b1. *Fore wing*, like *augias*, except that the black, marginal band is not macular.

Expanse : 32-38mm. *bambusæ* (36).
(Pl. M., figs. 75, 75a).

Genus 26. *Padraona*.

Only one species. Expanse 26mm. *gola* (40).

Genus 27. *Halpe*.

A.—*Hind wing : underside :* a broad, grey-white transverse, medial band occupying one-third of area of wing. Expanse 35mm. *hyrtacus* (42).

B.—*Hind wing : underside :* with a much narrower, often irregular, white or yellowish band transversely across. Expanse : 32-35mm. *moorei* (41).

C.—*Hind wing : underside :* with no band of white colour.

a. *Colour :* orange and brown, the orange often predominating, particularly on the underside. Expanse : 35-38mm. *honorei* (44).
(*Thoressa*).

b. *Colour :* brown with white or yellowish white, discal dots or spots. Expanse : 45mm. *astigmata* (43).
(*Thoressa*).

Genus 28. *Baracus*.

One species. Expanse : 27-30mm. *hampsoni* (45).

Genus 29. *Cupitha*.

One species. Expanse : 27-38mm. *purreea* (46).

Genus 30. *Baoris*.

A.—*Antennæ :* short, never over 7.5mm.

a. *Fore wing : upperside :* small whitish dot or spot in the middle over the inner (abdominal) margin.

a1. *Hind wing : underside :* green-washed, fading with age to a more ochreous colour but always with the green shade. Expanse : 30-35mm. *colaca* (51).
(*Cultoris*).

- b1. *Hind wing : underside* : not washed with green,
- a2. *Hind wing : underside* : rufous or *subochracea* (53)
 rufous-brown. Expanse : 37-42mm. (*Chapra*)
 (Pl. M., figs. 77, 77a).
- b2. *Hind wing : underside* : grey or greyish. Expanse : 35-40mm. *mathias* (52).
 (*Chapra*).
- b. *Fore wing : upperside* : no spot in the middle over inner margin. Expanse : 30-32mm. *bada* (54).
 (*Parnara*).
- B.—*Antennæ* : longer, never under 9mm.
- a. *Fore wing : upperside* : two spots in the cell.
- a1. *Hind wing : underside* : unmarked.
 Expanse : 37-48mm. *farri* (47).
 (*Baoris*).
- b1. *Hind wing : underside* : always with some whitish dots. Expanse : 40-50 mm. *conjuncta* (50).
 (*Calloris*).
- c1. *Hind wing : underside* : with a broad, transverse *fascia*, medially across the disc, of a lighter grey than the rest (which may be slightly brownish). Expanse : 35-42mm... .. *canaraica* (55).
 (*Parnara*).
- b. *Fore wing : upperside* : without spots in the cell.
- a1. *Hind wing : underside* : distinctly rufous. Expanse : 40-45mm... .. *seriata* (49).
 (*Calloris*).
- b1. *Hind wing : underside* : dull ochreous umber brown, never rufous. Expanse : 40-45mm. *kumara* (48).
 (*Calloris*).

Genus 31. *Gegenes*.

One species. Expanse : 25-28mm. *nostradamus* (56).

Genus 32. *Notocrypta*.

A.—*Fore wing : upperside* : with one or, at the most, two small white dots outside the broad, white, discal band. Expanse 45-50mm. *feisthamelii* (58).

B.—*Fore wing : upperside* : with more than two small white dots or spots outside the broad, white, discal band. Expanse : 35-50mm. *restricta* (57).

Genus 33. *Sancus*.

Only one species. Expanse : 40-45mm. *subfasciatus* (59).

Genus 34. *Udaspes*.

One species. Expanse : 40-45mm. *folus* (60).
 (Pl. M., 78, 78a).

Genus 35. *Hyarotis*.

One species. Expanse : 40-52mm. *adrastus* (61).

Genus 36. *Iambrix*.

One species. Expanse : 28-30mm. *salsala* (62).

Of these *Iambrix salsala*, *Suastus gremius* (and *bipunctus*) may be at once known by the very conspicuous, long, slender third joint to the palpus; *Udaspes folus* and *Tagiades litigiosa* by the large amount of white ground-colour on the upperside of the hind wing; the two *Notocrypta* by the broad, pure-white, discal band on the fore wing; *Gegenes nostradamas* by the antennæ of only 5mm., the shortest of all skipper—antennæ, and the tiny point at the end of the club (it is, besides, only found in desert country); *Baoris farri* male by the large tuft of hair, or, rather, patch of hair, on the upperside of hindwing near the base; *Caltoris kumara* and *seriata* by their size and the absence of the spots in the cell of the forewing, the latter having a rufous underside to the hind wing which the former has not got; *Parnara canaraica* by the underside of the hindwing with the lighter, broad *fascia*; *Caltoris colaca* is distinguished from *Parnara bada* by having a white spot above the middle of the inner margin of upperside of fore wing; *Caltoris conjuncta* by its large size—it is the largest of all the *Baoris* group—and *Chapra mathias* and *subochracea* in the male by having a prominent, diagonal sex line or streak on the lower disc of the forewing. *Cupitha purrea* is at once recognizable by its yellow colour with the underside quite pure, unmarked except along the anal margin of the underside of hind wing where it is black; the male also has a convex, round "male-mark" on the underside of hind wing near the costa. The *Telicota* and *Padraona* lot as well as *Ampittia dioscorides* (male) are all orange with black, band-like markings on the upperside; the female *Ampittia* is rather like *Baracus* or *Taractrocera ceramas* on the upperside. *Gangara thyrsis* is unmistakable, being the largest of all these skippers, with enormous, yellowish, hyaline spots on the upperside of fore wing. *Matapa aria* and *Sancus subfasciatus* are quite unmarked on the upperside except that the male of the former has a distinct, diagonal, linear "male-brand"; *Sancus* male has an oval, dark male-mark on the underside of fore wing near the inner margin. *Plastingia submaculata* is very like *Suastus gremius* on the underside of hind wing.

(To be continued.)

HAND-LIST OF THE "BIRDS OF INDIA."

BY

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PART II.

(Continued from page 247 of this volume.)

184. (116) **Pomatorhinus schisticeps schisticeps.** *The Slaty-headed Scimitar-Babbler.*
P. schisticeps, *Hodg., As. Res. xix, p. 181 (1836), (Nepal).*
Nepal, Sikkim and Assam North of Brahmapootra.
185. (116) **Pomatorhinus schisticeps cryptanthus.** *Coltart's Scimitar-Babbler.*
Hartert, Bull. B. O. C. xxxvi, p. 35 (1915), (Margherita).
Hills South of Brahmapootra.
186. (116) **Pomatorhinus schisticeps mearsi.** *Grant's Slaty-headed Scimitar-Babbler.*
P. mearsi, *Ogilvie-Grant, Bull. B. O. C. xv, p. 39 (1805), (Taungdwin).*
Western Burma, Chin Hills and Arrakan.
187. (116) **Pomatorhinus schisticeps pinwilli.** *Sharpe's Slaty-headed Scimitar-Babbler.*
P. pinwilli, *Sharpe, Cat. B. M. vii., p. 413 (1883).*
N. W. Himalayas to Garhwal.
188. (117) **Pomatorhinus nuchalis.** *Tweeddale's Scimitar-Babbler.*
P. nuchalis, *Tweeddale, A. M. N. H. (4) xx., p. 535 (1877)*
(Thayetmyo.)
189. (118) **Pomatorhinus olivaceus olivaceus.** *The Tennasserim Scimitar-Babbler.*
P. olivaceus, *Blyth, J. A. S. B. xvi., p. 451, (1847), (Tennasserim).*
Tennasserim.
190. (118) **Pomatorhinus olivaceus ripponi.** *Harington's Shan Scimitar-Babbler.*
Harington, Bull. B. O. C. xvii, p. 9 (Shan States).
Shan States, Burma.
191. (120) **Pomatorhinus horsfieldi horsfieldi.** *The Deccan Scimitar-Babbler.*
P. horsfieldi, *Sykes, P. Z. S., 1832, p. 89 (Dukkun).*
Bombay, Madras, Mysore, Deccan.

192. (119) **Pomatorhinus horsfieldi melanurus.** *The Ceylon Scimitar-Babbler.*
P. melanurus, Blyth, J. A. S. B. xvi, p. 451 (1847),
 (Ceylon).
 Ceylon only.
193. (121) **Pomatorhinus horsfieldi obscurus.** *Hume's Scimitar-Babbler.*
P. obscurus, Hume, Str. Feath. i, p. 7 (1873), (Mt. Abu).
 Mt. Abu and Seoni.
194. (121) **Pomatorhinus horsfieldi travancoriensis.** *Southern Indian Scimitar-Babbler.*
Harrington, Jour. B. N. H. Soc. xxiii, p. 333 (1914)
 (Peermall, Travancore).
 Travancore, Nilghiri and Palni Hills.
195. (122) **Pomatorhinus ferruginosus ferruginosus.** *The Nepal Coral-billed Scimitar-Babbler.*
P. ferruginosus, Blyth, J. A. S. B. xiv, p. 597 (1845),
 (Darjiling).
 Nepal and Hills N. of Brahmapootra.
196. (114) **Pomatorhinus ferruginosus phayrei.** *Phayre's Scimitar-Babbler.*
P. phayrei, Blyth, J. A. S. B. xvi, p. 462 (1847)
 (Arrakan).
 Hills South of Brahmapootra and Chin Hills.
197. (123) **Pomatorhinus albigularis albigularis.** *Blyth's Scimitar-Babbler.*
P. albigularis, Blyth, J. A. S. B. xxiv, p. 274 (1855),
 (Muleyit Mt.).
 Mt. of Tennasserim South to Tavoy.
198. (123) **Pomatorhinus albigularis mariae.** *Walden's Scimitar-Babbler.*
P. mariae, Walden, A. M. N. H. (4) xv, p. 403 (1875).
 (Tounggoo Hills).
 Yemathen, Upper Burma and Karen Hills.
199. (125) **Pomatorhinus ruficollis ruficollis.** *The Nepal Rufous-necked Scimitar-Babbler.*
P. ruficollis, Hodg., As. Res. xix, p. 182 (1836), (Nepal).
 Nepal, Sikkim and Hills North of Brahmapootra.
200. (125) **Pomatorhinus ruficollis bakeri.** *Baker's Rufous-necked Scimitar-Babbler.*
Harrington, J. B. N. H. S. xxiii, p. 336 (1914), (Shillong).
 Hills S. of Brahmapootra, N.-E. Burma and Yunnan.
201. (128) **Pomatorhinus ochraceiceps ochraceiceps.** *Lloyd's Scimitar-Babbler.*
P. ochraceiceps, Walden, A. M. N. H. (4) xii, p. 487 (1873).
 Shan States, South to Tennasserim.

202. (127) **Pomatorhinus ochraceiceps austeni.** *Hume's Scimitar-Babbler.*
P. austeni, *Hume, Str. Feath x*, p. 152 (1881), (*E. Manipur*).
 Cachar, Manipur and Hills S. of Brahmapoetra to Naga Hills.
203. (128) **Pomatorhinus ochraceiceps stenorhynchus.** *Austen's Scimitar-Babbler.*
P. ochraceiceps, *Walden, J. A. S. B. xlvii*, p. 43 (1877), (*Sadiya*).
 Sadiya and Hills East of Dibong, Lakhimpur.
204. (129) **Pomatorhinus erythrogenys erythrogenys.** *Vigor's Rusty-cheeked Scimitar-Babbler.*
P. erythrogenys, *Vigors, P. Z. S.*, 1831, p. 173 (*W. Nepal*).
 N. W. Himalayas to Simla.
205. (129) **Pomatorhinus erythrogenys haringtoni.** *Baker's Rusty-cheeked Scimitar-Babbler.*
Stuart Baker, Bull. B. O. C. xxxiii, p. 133 (1914), (*Darjiling*).
 Himalayas, Garhwal to Sikkim.
206. (130) **Pomatorhinus erythrogenys maclellandi.** *McClelland's Scimitar-Babbler.*
P. maclellandi, *Jerd., B. of I. ii*, p. 32 (1863), (*Khasia Hills*).
 Hills S. of Brahmapoetra, Manipur to Chin Hills.
207. (130) **Pomatorhinus erythrogenys imberbis.** *Salvadori's Scimitar-Babbler.*
P. imberbis, *Salvadori, Mus. Civ. Geneva (2) vii*, p. 410 (1889), (*Yado N. E. Leito*).
 E. Burma from Ruby Mines S. to Tennasserim.
208. (130) **Pomatorhinus erythrogenys gravivox.** *David's Scimitar-Babbler.*
P. gravivox, *David, Ann. Sci. Nat. xviii* p. 2. (1873), (*South Shensi*).
 Bhamo Hills, Yunnan into China.
209. (131) **Pomatorhinus hypoleucus hypoleucus.** *The Arrakan Scimitar-Babbler.*
Othorhinus hypoleucus, *Blyth, J. A. S. B. xviii*, p. 71. (1844), (*Arrakan*).
 Hills South of Brahamapoetra, Chindwin and Arrakan.
210. (132) **Pomatorhinus hypoleucus tickelli.** *Tickell's Scimitar-Babbler.*
P. tickelli, *Blyth, J. A. S. B. xxiv*, p. 273 (1875), (*Tennasserim*).
 Tennasserim.

211. (133) **Xiphoramphus superciliaris.** *The Slender-billed Scimitar-Babbler.*
X. superciliaris, Blyth, *J. A. S. B.* xi, p. 175 (1842) (Sikkim).
 Hills N. and S. of Brahmapoetra, Sikkim.
212. (134) **Timalia pileata jerdoni.** *The Burmese Red-capped Babbler.*
T. jerdoni, Wald., *A. M. N. H.* (4) x, p. 61 (1872), (Pegu).
 Burma.
213. (134) **Timalia pileata bengalensis.** *The Bengal Red-capped Babbler.*
T. bengalensis, Godw—Aus., *J. A. S. B.* xli, part 2, p. 143 (1872), (Khasia Hills).
 Nepal to East Assam, Bengal.
214. (135) **Dumetia hyperythra.** *The Rufous-bellied Babbler*
Timalia hyperythra, Franklin, *P. Z. S.*, 1831, p. 118 (Ganges near Benares).
215. (136) **Dumetia albigularis albigularis.** *The Small White-throated Babbler.*
Malacocercus albigularis, Blyth, *J. A. S. B.* xvi, p. 453 (1847). (*S. India*) (Mysore).
 Southern India, Mysore to Ceylon.
216. (136) **Dumetia albigularis abuensis.** *The Mt. Abu White-throated Babbler.*
Harington, *J. B. N. H. S.* xxiii, p. 429 (1915), (Mt. Abu)
 Mt. Abu, Deesa to Mahableswar.
217. (137) **Gamsorhynchus rufulus rufulus.** *White-headed Shrike-Babbler.*
G. rufulus, Blyth, *J. A. S. B.* xiii, p. 371 (1844), (Darjiling.)
 Sikkim to Assam and Chin Hills.
218. (138) **Gamsorhynchus rufulus torquatus.** *The Ring-necked Shrike-Babbler.*
G. torquatus, Hume, *P. A. S. B.*, 1874, p. 107 (Youngzaleen River)
 South Burma and Karen-nee.
219. (139) **Pyctorhis sinensis sinensis.** *The Indian Yellow-eyed Babbler.*
Parus sinensis, Gm., *Syst. Nat.* i, p. 1012 (1788), (*Sino* [China])
 Whole of India and Burma.
220. (140) **Pyctorhis sinensis nasalis.** *The Ceylon Yellow-eyed Babbler.*
P. nasalis, Legge, *A. M. N. H.* (5) iii, p. 169 (1879) (Ceylon).
 Ceylon only.

221. (141) **Pyctorhis altirostris altirostris.** *Jerdon's Babbler.*
Chrysomma altirostris, Jerdon, Ibis (1862), p. 22 (Thayetmyo, Burma).
 Plains of Lower Burma.
222. (141a) **Pyctorhis altirostris griseigularis.** *Hume's Babbler.*
P. griseigularis, Hume, Str. Feath. v, p. 116 (1877), (Assam).
 Assam and Bhutan Dooars.
223. (141b) **Pyctorhis altirostris scindicus.** *The Sind Babbler.*
Harington, J. B. N. H. xxiii, p. 424 (1915), (Sukkur Sind).
 Sind.
224. (144) **Pellorneum ruficeps ruficeps.** *The Indian Spotted Babbler.*
P. ruficeps, Swainson, F. Bor-am. Birds, p. 487 (1831), (India) (Nilgiris).
 South India, N. to Khandesh and Chota Nagpore not Travancore.
225. (144a) **Pellorneum ruficeps granti.** *The Travancore Spotted Babbler.*
Harington, Bull. B. O. C. xxxiii, p. 81 (1913), (Travancore).
 Travancore.
226. (142) **Pellorneum ruficeps mandellii.** *Mandelli's Spotted Babbler.*
P. mandellii, Blanf., J. A. S. B. xli, p. ii, p. 165 (1844) (Sikkim).
 Nepal, Assam and N.-W. Burma.
227. (143) **Pellorneum ruficeps minus.** *Sharpe's Spotted Babbler.*
P. minus, Hume, Str. Feath. i, p. 298 (1873), (Thayetmyo).
 N. Lower Burma and Central Burma.
228. (145) **Pellorneum ruficeps subochraceum.** *The Malayan Spotted Babbler.*
P. subochraceum, Swinhæ, A. M. N. H. (4) vii, p. 259 (1871), (Rangoon).
 S. Lower Burma and Malay States.
229. (146) **Pellorneum palustre.** *The Marsh Spotted Babbler.*
P. palustre, Jerd., Ibis, 1872, p. 300 (Cherrapoonji, Assam).
 Assam, S. and E. of the Brahmapootra.
230. (147) **Pellorneum ignotum ignotum.** *The Assamese Babbler.*
P. ignotum, Hume, Str. Feath. v., p. 334 (1877), (Sadiya, Assam).
 Assam, South of Brahmapootra.

231. (148) *Pellorneum ignotum cinnamomeum*. *Rippon's Babbler*.
Drymocataphus cinnamomeus, *Rippon, Bull. B. O. C. xi*,
 p. 12 (1900), (*Loi Mai S. Shan. S.*).
 N. Burma and Shan States.
232. (147) *Scotocichla fuscicapilla fuscicapilla*. *The Brown-capped Babbler*.
Drymocataphus fuscicapillus, *Blyth, J. A. S. B. xxiii*,
 p. 815 (1849), (*S. W. Ceylon*).
 Southern Ceylon.
233. (147) *Scotocichla fuscicapilla babaulti*. *Well's Brown-capped Babbler*.
Wells, Bull. B. O. C., xxxix, p. 69 (1919), (*Trincomalee*).
 Northern Ceylon.
234. (149) *Drymocataphus nigricapitatus*. *The Black-capped Babbler*.
Brachypteryx nigricapitata, *Eyton, P. Z. S., 1839*, p.
 103 (*Malaya*).
235. (151) *Drymocataphus tickelli tickelli*. *Tickell's Babbler*.
Pellorneum tickelli, *Blyth, J. A. S. B. xxviii*, p. 414
 (1859), (*Tennasserim*).
 S. W. Assam, Cachar, Manipur to Pegu.
236. (152) *Drymocataphus tickelli assamensis*. *Austen's Babbler*.
D. assamensis, *Sharpe, Cat. B. M. vii.*, p. 557 (1883),
 (*Dikrang*).
 Eastern Assam.
- 237*. (153) *Turdinulus brevicaudatus brevicaudatus*. *The Short-tailed Babbler*.
Turdinus brevicaudatus, *Blyth, J. A. S. B. xxiv.*, p. 272
 (1855), (*Muleyit Mt.*).
 Mt. Muleyit in Tennasserim.
238. (154) *Turdinulus brevicaudatus striatus*. *The Streaked-Babbler*.
Turdinus striatus, *Blyth, J. A. S. B. xxxix, pt. 2*, p. 269
 (1870), (*Khasia Hills*).
 Assam and Manipur.
239. (154) *Turdinulus brevicaudatus venningi*. *Venning's Streaked Babbler*.
Harington, Bull. B. O. C. xxxiii, p. 44 (1913) (*Shan States*).
 Shan States and Yunnan.

* Birds of the genera *Turdinulus* and *Rimator* belong very doubtfully to the *Timeliidae* and may possibly have to be placed in a family by themselves near the Wrens.

240. (186) **Turdinulus roberti roberti.** *Austen's Wren-Babbler*-
Pnoëpyga roberti, *Godw-Aus. and Wald, Ibis*, 1875, p. 252.
(*Chaka, Manipur*).
Khasia, Cachar, Naga Hills and Manipur.
241. (186) **Turdinulus roberti guttaticollis.** *Grant's Wren-Babbler*.
T. guttaticollis, *O-Grant, Ibis*, 1895, p. 432. (*Miri Hills, Assam*).
Hills Ranges Eastern Assam, North and South.
242. (186) **Turdinulus epilepidotus davisoni.** *Davison's Wren-Babbler*.
T. davisoni, *O-Grant, Bull. B. O. C. xxv.*, p. 97 (1909).
(*Thoungyah, Burma*).
Tennasserim.
243. (186) **Turdinulus epilepidotus bakeri.** *Baker's Wren-Babbler*.
Harington, Bull. B. O. C. xxxiii, p. 44 (1913), (*S. Shan States, Na Noi*).
S. Shan States to Karonnee, Burma.
244. (185) **Rimator malacoptilus.** *The Long-billed Wren-Babbler*.
Blyth, J. A. S. B. xvi, p. 155 (1847), (*Darjiling*).
245. (155) ***Cursonia crispifrons.** *The Lime-rock Babbler*.
Turdinus crispifrons, *Blyth, J. A. S. B. xxiv*, p. 269,
(1855), (*Tennasserim*).
246. (156) ***Horizillas magna magna.** *The Red-headed Tree-Babbler*.
Malacopteryx magnum, *Eyton, P. Z. S.*, 1839, p. 103.
(*Malaya*).
247. (157) **Horizillas magnirostre.** *The Brown-headed Tree-Babbler*.
Alcippe magnirostris, *Moore, P. Z. S.*, 1854, p. 277.
(*Malacca*).
248. (158) **Erythrocichla bicolor.** *The Ferruginous Babbler*.
Brachypteryx bicolor, *Less., Rev. Zool.* (1839), p. 138.
(*Sumatra*).
249. (159) ***Æthostoma rostratum.** *Blyth's Babbler*.
Trichastoma rostrata, *Blyth, J. A. S. B. xi*, p. 795,
(1842), (*Malaya*).
250. (160) ***Malacocincla abbotti.** *Abbott's Babbler*.
Blyth, J. A. S. B. xiv, p. 601. (1845), (*Ramree, Arrakan*).

* The names *Gypsophila*, *Malacopteryx*, *Turdinus* and *Trichastoma* are all preoccupied.

251. (161) **Thringorhina guttata*. *Tichell's Spotted-Babbler*.
Turdinus guttatus, *Blyth, J. A. S. B. xxviii, p. 414,*
(1859), (*Muleyit Mt.*).
252. (162) *Thringorhina oglei*. *Austen's Spotted-Babbler*.
Actinura oglei, Godw.-Aus., J. A. S. B. xlv, pt. 2, p. 42,
(1877), (*Sadiya*).
253. (163) *Alcippe nepalensis nepalensis*. *The Nepal-Babbler*.
Siva nepalensis, Hodg., Ind. Rev., 1838, p. 89 (Nepal).
Nepal to Assam and Chin Hills.
254. (163) *Alcippe nepalensis fratercula*. *The Shan State's Babbler*.
A. fratercula, Rippon, Bull. B. O. C. xi, p. 11 (1900),
(*Shan States*).
Eastern Burma.
255. (163) *Alcippe nepalensis yunnanensis*. *Harington's Babbler*.
Harington, Bull. B. O. C., xxxiii, p. 63 (1913), (Talifu).
Yunnan.
256. (164) *Alcippe phæcephala phæcephala*. *The Nilgiri Quaker-Thrush*.
Timalia poiocephala, Jerd., Madr. Jour. L. S. xiii,
p. 169 (1844), (Nilgiri).
S. E. India and S. Travancore.
257. (165) *Alcippe phæcephala phayrei*. *The Arrakan Quaker-Thrush*.
A. phayrei, Blyth, J. A. S. B. xiv, p. 601 (1845),
(*Arracan*).
Assam and N. E. India.
258. (164) *Alcippe phæcephala brucei*. *The Bombay Quaker-Thrush*.
A. brucei, Hume, J. A. S. B. xxxix, pt. 2, p. 122 (1870),
(*Mahableswar*).
West and Central India to Lower Bengal.
259. (165) *Alcippe phæcephala haringtoniæ*. *The Upper Burma Quaker-Thrush*.
Hartert, Bull. B. O. C. xxv, p. 10 (1909), (Bhamo).
N. E. Upper Burma and N. Shan States.
260. (165) *Alcippe phæcephala magnirostris*. *The Lower Burma Quaker-Thrush*.
A magnirostris, Walden, Blyth's B. of Burma, p. 115
(1875), (*Karennee*).
S. E. Burma and West Siam.

* The genus *Thringorhina* should come next *Stachyris*.

261. (165) *Alcippe phaeocephala davisoni*. *The Tennasserim Quaker-Thrush.*
Harington, Jour., B. N. H. S., xxiii, p. 453 (1915), (Tavoy).
 Tennasserim Southwards.
262. (166) *Rhopocichla atriceps atriceps*. *The Black-headed Babbler.*
Brachypteryx atriceps, Jerd., M. J. L. S. x., p. 250,
(1839), (Trichoor Jungle).
 Nilgiris and S. W. India.
263. (167) *Rhopocichla atriceps nigrifrons*. *The Black-fronted Babbler.*
Alcippe nigrifrons, Blyth, J. A. S. B. xviii, p. 815 (1849),
(Ceylon.)
 Ceylon.
264. (168) *Rhopocichla atriceps bourdilloni*. *Bourdillon's Babbler.*
Alcippe bourdilloni, Hume, Str. Feath. iv, p. 399 (1876),
(Mynall).
 Tranvancore from N. to S.
265. (169) *Stachyrhis nigriceps nigriceps*. *The Black-throated-Babbler.*
Hodg., Blyth., J. A. S. B. xiii, p. 378 (1844), (Nepal).
 Nepal, Sikkim.
266. (169) *Stachyrhis nigriceps coltarti*. *The Assam Black-throated Babbler.*
Harington, Bull B. O. C. xxxiii, p. 61 (1913), (Margherita).
 Assam S. of Brahmapootra, Chin Hills.
267. (169) *Stachyrhis nigriceps davisoni*. *The Tennasserim Black-throated Babbler.*
S. davisoni, Sharpe, Bull. B. O. C. i, p. 7 (1892),
(Pahang).
 South Burma, Siam and Malay Peninsula.
268. (170) *Stachyrhis chrysæa chrysæa*. *The Nepal Golden-headed Babbler.*
S. chrysæa, Blyth, J. A. S. B. xiii., p. 379 (1844),
(Nepal).
 Nepal, Sikkim and Assam to Kachin Hills.
269. (171) *Stachyrhis chrysæa assimilis*. *The Burmese Golden-headed Babbler.*
S. assimilis, Walden, Blyth's B. of Burma, p. 116 (1895),
(Karennee.)
 Karennee, S. Shan States and N. Siam.

270. (171) **Stachyrhis chrysæa binghami.** *The Chin Hills Golden-headed Babbler.*
S. binghami, *Rippon, Bull. B. O. C. xiv, p. 84* (1904), (*Mt. Victoria*).
Chin Hills and N. Arrakan.
271. (172) **Stachyrhidopsis ruficeps ruficeps.** *The Red-headed Babbler.*
S. ruficeps, *Blyth, J. A. S. B. xvi, p. 452* (1847), (*Darjeeling*).
Nepal, Sikkim and Assam.
272. (172) **Stachyrhidopsis ruficeps bhamoensis.** *The Bhamo Red-headed Babbler.*
Harington, A. M. N. H. 8, Vol. ii, p. 245 (1908), (*Bhamo Hills*).
Bhamo Hill Tracts and S. Shan States.
273. (173) **Stachyrhidopsis rufifrons rufifrons.** *Hume's Babbler.*
Stachyrhis rufifrons, *Hume, Str. Feath. i, p. 479* (1873), (*Pegu*).
Burma N. to Chin Hills.
274. (173) **Stachyrhidopsis rufifrons ambigua.** *Harington's Red-fronted Babbler.*
Harington, Jour. B. N. H. S. xxiii, p. 631 (1915), (*Gunjong, N. Cachar*).
Sikkim, Assam N. and S. of Brahmapootra, Manipur.
275. (174) **Stachyrhidopsis pyrrhops.** *The Red-billed Babbler.*
Stachyrhis pyrrhops, *Blyth, J. A. S. B. xiii, p. 379* (1844), (*Nepal*).
Himalayas, Murree to Nepal.
276. (175) **Cyanoderma erythropterum erythropterum.** *The Red-winged Babbler.*
Timalia erythroptera, Blyth, J. A. S. B. xi, p. 794 (1842), (*Malay*).
Extreme South of Tennasserim.
277. (176) **Mixornis rubricapilla rubricapilla.** *The Yellow-breasted Babbler.*
M. rubricapilla *Tickell, J. A. S. B. ii, p. 576* (1833), (*Manbhum, Bengal*).
Sikkim to Assam and Burma.
278. (177) **Mixornis rubricapilla connectens.** *Kloss' Yellow-breasted Babbler.*
Kloss, Ibis, 1918, p. 207 (*Lat. 10° N. Malay Peninsula*).
Southern Tennasserim and Malay States.

279. (176) **Mixornis rubricapilla minor*. *Gyldenstolpe's Babbler*.
Mixornis gularis minor, *Gyldenstolpe*, *Kungl. Sv. Vet. Akad. Handl.* lvi, 1916, p. 60 (*Lat Bua Kas*).
 Northern, Central and Eastern Siam.
280. (178) *Schœniparus dubius dubius*. *The Tennasserim Tit-Babbler*.
Proparus dubius, *Hume*, *P. A. S. B.*, 1874, p. 109.
 (*Muleyit*).
 Tennasserim.
281. (179) *Schœniparus dubius mandellii*. *The Assam Tit-Babbler*.
S. mandellii, *Godw.-Aus.*, *A. M. N. H.* (4) xvii, p. 33, 1876,
 (*Naga Hills*).
 Assam, Chin Hills, W. Burma.
282. (179) *Schœniparus dubius intermedius*. *Rippon's Tit-Babbler*.
S. intermedius, *Rippon*, *Bull. B. O. C.* xi, p. 11 (1900).
 (*Nanoi S. Shan States*).
 Bhamo Hills to Shan States.
283. (179) *Schœniparus dubius genestieri*. *Oustalets Tit-Babbler*.
S. genestieri, *Oustalet*, *Bull. M. P.*, 1897, p. 210.
 (*Yunnan*).
 Yunnan.
284. (180) *Schœniparus rufigularis*. *The Red-throated Tit-Babbler*.
Minla rufigularis, *Mandelli*, *S. Feath.* i., p. 416, (1873),
 (*Bhutan Dooars*).
285. (181) *Pseudominla cinerea*. *The Dusky-green Babbler*.
Minla cinerea, *Blyth*, *J. A. S. B.* xvi, p. 449 (1849),
 (*Darjiling*).
286. (182) *Pseudominla castaneiceps castaneiceps*. *The Chestnut-headed Babbler*.
Minla castaneiceps, *Hodg.*, *Ind. Rev.*, 1838, p. 38 (*Nepal*).
 Nepal to Chin Hills, Manipur and Tennasserim.
287. (182) *Pseudominla castaneiceps brunneicaudata*. *The Shillong Chestnut-headed Babbler*.
Minla brunneicaudata, *Sharpe*, *Cat. B. M.*, vii, p. 609.
 (1883), (*Shillong*).
 Khasia Hills.

* The birds from the Shan States, Rippon's *sulphurea* = *rubricapillus*. Specimens from Siam are very doubtfully distinct but if kept separate must retain Gyldenstolpe's name.

288. (183) **Lioparus vinipectus vinipectus*. *Hodgson's Fulvetta*.
Siva vinipectus, *Hodg., Ind. Rev.*, 1838, p. 89. (*Nepal*).
 Himalayas, Simla to Sikkim.
289. (183) *Lioparus vinipectus austeni*. *Grant's Fulvetta*.
P. austeni, *O.-Grant, Bull. B. O. C. v*, p. 3 (1895),
 (*Manipur*).
 Assam, South of Brahmapootra.
290. (183) *Lioparus vinipectus ripponi*. *The Chin Hills Fulvetta*.
P. ripponi, *Harington, Bull. B. O. C. xxxiii*, p. 59 (1913).
 (*Mt. Victoria*).
 Chin Hills.
291. *Lioparus vinipectus sordidior*. *Rippon's Fulvetta*.
P. sordidior, *Rippon, Bull. B. O. C. xiii*, p. 60, (1903)
 (*Talifu*).
 Yunnan, W. China.
292. (183) *Lioparus vinipectus manipurensis*. *The Manipur Fulvetta*.
P. manipurensis, *O.-Grant, Bull. B. O. C.*, xvi, p. 123
 (1906), (*Manipur*).
 Manipur.
293. (184) *Lioparus chrysæus*. *The Golden-breasted Tit-Babbler*.
Proparus? chrysæus. *Hodg., Gray's Zool. Misc.* p. 84,
 (1844), (*Nepal*).

Sub-family BRACHYPTERYGINÆ.

Tesia and *Oligura* are probably Wrens, *Elaphronis* is I think, a Warbler somewhere near *Tribura* and *Locustella*.

The other species are all *Turdidæ*, *Myiophoneus* and *Arrenga* are true Thrushes and the other genera near the *Sascicolinæ* but worthy of being retained in a separate Sub-family.

Sub-family SIBIINÆ.

294. (203) *Sibia picaoides picaoides*. *The Long-tailed Sibia*.
S. picaoides, *Hodg., J. A. S. B. viii*, p. 38 (1839), (*Nepal*).
295. (204) *Leioptila capistrata capistrata*. *The Black-headed Sibia*.
Cinclosoma capistratum, *Vigors., P. Z. S.* (1831), p. 56.
 (*Himalayas*).
 Himalayas, Naini Tal to Dafla Hills.

* *Proparus* is a synonym of *Minla* and cannot be used. For the present I unite it with *Lioparus* of Blanford, the sole specie. of which, *Lioparus chrysæus*, is generically very close to those birds placed in the genus *Proparus* in the Avifauna of British India.

296. (204) **Leioptila capistrata pallida.** *The Pale Sibia.*
Hartert, *Kat. Vog. Senekenb Mus.*, p. 21 (1891), (*Simla*).
Himalayas, Hazara to Simla.
297. (205) **Leioptila gracilis.** *The Grey Sibia.*
Hypsipetes gracilis, McClell., *P. Z. S.*, 1839, p. 159
(*Assam*).
298. (206) **Leioptila melanoleuca melanoleuca.** *Tickell's Sibia.*
Sibia melanoleuca, Tickell, *Blyth, J. A. S. B.* xxviii, p.
413, (1859), (*Muleyit*).
Tennasserim, Bhamo Hills and E. Shan States.
299. (207) **Leioptila melanoleuca castanoptera.** *Fea's Sibia.*
Malacias castanoptera, Salvadori, *Ann. Mus. Civ. Gen.*
(ii), vii, p. 363, (1889), (*Monte Carin*).
Karennee and Western Shan States.
300. (208) **Leioptila annectens annectens.** *Blyth's Sibia.*
Leioptila annectens, Blyth, *J. A. S. B.* xvi, p. 450
(1847), (*Darjiling*).
Sikkim and Hills S. of Brahmapootra, Manipur.
301. (208) **Leioptila annectens saturata.** *Walden's Sibia.*
L. saturata, Walden, *Ibis*, 1875, p. 352 (*Karennee*).
Eastern Hills of Burma to Karennee.
302. (209) **Leioptila annectens davisoni.** *Davison's Sibia.*
L. davisoni, Hume, *Str. Feath.* v, p. 110 (1877),
(*Muleyit Mt.*).
South Tennasserim.
303. (210) **Leioptila pulchella.** *The Beautiful Sibia.*
Sibia pulchella, Godw.-Aus., *A. M. N. H.* (4), xiii, p. 160,
(1874), (*Khunho, Naga Hills*).
Cachar, Naga and Daphla Hills.
304. (211) **Actinodura egertoni egertoni.** *The Nepal Bar-wing.*
A. egertoni, Gould, *P. Z. S.*, 1836, p. 18 (*Sikkim*).
Nepal, Sikkim and Daphla Hills.
305. (211) **Actinodura egertoni khasiana.** *The Shillong Bar-wing.*
A. khasiana, Godw.-Aus. *J. A. S. B.* xv., pt. ii, p. 76,
(1876), (*Shillong*).
Khasia, Cachar and Naga Hills to Manipur.
306. (211) **Actinodura egertoni ripponi.** *Rippon's Bar-wing.*
A. ripponi, O. Grant, *Ibis*, 1907, p. 185. (*Mt. Victoria*).
Mt. Victoria, Chin Hills and Kachin Hills.
307. (212) **Actinodura ramsayi ramsayi.** *Ramsay's Bar-wing.*
Actinodura ramsayi, Wald. *A. M. N. H.* (4) xv, p. 402.
(1875), (*Karennee*).
Southern Shan States to Karennee.

308. (212) *Actinodura ramsayi radcliffei*. *The Ruby-Mines Bar-wing*.
Harington, Bull. B. O. C. xiii, p. 9, (1910), (Ruby Mines.)
 Ruby Mines District, Upper Burma.
309. (213) *Ixops nipalensis nipalensis*. *The Hoary Bar-wing*.
Cinclosoma nipalensis, Hodg., As. Res. xix, p. 145, (1836)
(Nepal).
 Nepal, Sikkim and Bhutan.
310. (214) *Ixops nipalensis daflænsis*. *Austen's Bar-wing*.
Actinodura daflænsis, Godw.—Aus., A. M. N. H. (4) xvi,
p. 340, (1875), (Daphla Hills).
 Daphla and Miri Hills.
311. (215) **Ixops nipalensis waldeni*. *Walden's Bar-wing*.
Actinodura waldeni, Godw.—Aus., P. Z. S., 1874, p. 46
(Japoo Peak, Naga Hills).
 Naga Hills and Manipur.
312. 215) *Ixops nipalensis poliotis*. *The Chin Hills Bar-wing*.
I. poliotis, Rippon, Bull. B. O. C. xv, p. 97, (1905), (Mt. Victoria).
 Chin Hills.
313. (216) *Staphidia castaneiceps*. *The Chestnut-headed Staphidia*.
Ixulus castaneiceps, Moore, P. Z. S., 1854, p. 141,
(Afghanistan) (Cachar).
 Hills S. of Brahmapootra.
314. (218) *Staphidia striata striata*. *Tickell's Staphidia*.
Ixulus striatus, Blyth, J. A. S. B. xxviii, p. 413, (1859),
(Tennasserim).
 Southern and Central Burmese Hills.
315. (217) *Staphidia striata rufigenis* *Hume's Staphidia*.
Ixulus rufigenis, Hume, Str. Feath. v, p. 108, (1877),
(Himalayas) (Darjiling).
 Sikkim and Hills N. of Brahmapootra and E. to Sadiya and Margherita.
316. (219) *Siva strigula strigula*. *The Stripe-throated Siva*.
S. strigula, Hodg., Ind. Rev., 1838, p. 89. (Nepal).
 Himalayas, Simla to W. Bhutan.
317. (220) *Siva strigula castaneicauda*. *Hume's Siva*.
S. castaneicauda, Hume, Str. Feath. v, p. 100 (1877)
(Muleyit Mt.).
 E. Bhutan, Assam, Chin Hills to Tennasserim.

* More material is required before the races of *Ixops* can be satisfactorily settled.

318. (221) **Siva cyanuroptera cyanuroptera.** *Hodgson's Blue-winged Siva.*
S. cyanuroptera, *Hodg., Ind. Rev.*, 1838, p. 88, (*Nepal*).
Himalayas, Nainital to E. Assam and Chin Hills.
319. **Siva cyanuroptera wingatei.** *The Yunnan Blue-winged Siva.*
S. wingatei, *O.-Grant, Bull. B. O. C. x*, p. 38, (1900), (*E. Yunnan*).
Bhamo Hills to Yunnan and Shan States.
320. (222) **Siva cyanuroptera sordida.** *The Dull Siva.*
S. sordida, *Hume, Str. Feath. v*, p. 104, (1877), (*Muleyit Mt.*)
Tennasserim and ? Malay Peninsula.
321. (222) **Siva cyanuroptera oatesi.** *Oates' Siva.*
Harington, Bull. B. O. C. xxxiii, p. 62, (1913), (*Mt. Byingyi.*)
Byingyi Mountain.
322. (223) **Yuhina gularis gularis.** *The Stripe-throated Yuhina.*
Y. gularis, *Hodg., As. Res. xix*, p. 166, (1836), (*Nepal*).
Nepal, Sikkim and Hills N. of Brahmapootra.
323. (223) **Yuhina gularis yangpiensis.** *Sharpe's Yuhina.*
Y. yangpiensis, *Sharpe, Bull. B. O. C. xiii*, p. 11, (1901)
(*Yangpi, Yunnan*).
Hills S. of Brahmapootra, Chin Hills to Yunnan.
324. **Yuhina diademata ampelina.** *Rippon's Yuhina.*
Y. ampelina, *Rippon, Bull. B. O. C. xi*, p. 12, (1900),
(*Warabum, Bhamo Hills*).
Yunnan and Bhamo Hills.
325. (224) **Yuhina occipitalis.** *The Slaty-headed Yuhina.*
Hodg., As. Res. xix, p. 166 (1836), (*Nepal*).
Nepal, Sikkim and Bhutan.
326. (225) **Yuhina nigrimentum nigrimentum.** *The Black-chinned Yuhina.*
Polyodox nigrimentum, *Hodg., Gray's Zool. Misc.*, p. 82,
(1844), (*Nepal*).
Himalayas, Garhwal to Assam, N. and S. Burma
and China.
- 327* (231) **Ixulus occipitalis.** *The Chestnut-headed Ixulus.*
Siva occipitalis, *Blyth, J. A. S. B. xiii*, p. 937, (1844).
(*Nepal*).

*The genus *Zosterops* is removed to a sub-family *Zosteropidae* which will be found near the *Dicaeidae*.

328. (232) *Ixulus flavicollis flavicollis*. *The Yellow-naped Ixulus*.
Yuhina flavicollis, Hodg., *As. Res.* xix, p. 167, (1836), (*Nepal*).
 Himalayas, Sutlej to Bhutan? Chin Hills.
329. (232) *Ixulus flavicollis baileyi*. *The Mishmi Ixulus*.
 Stuart Baker, *Bull. B. O. C.* xxxv, p. 17, (1914), (*Mishmi Hills*).
 Hills North of Assam.
330. (232) *Ixulus flavicollis harterti*. *The Chestnut-naped Ixulus*.
 Harington, *Bull., B. O. C.* xxxiii, p. 62, (1913), (*Sinlum Bhamo Hills*).
 Hills S. of Brahmapootra, Chin Hills, Bhamo Hills and Shan States.
331. (233) *Ixulus humilis humilis*. *Davison's Ixulus*.
I. humilis, Hume, *Str. Feath.* v, p. 106, (1877), (*Muleyt Mt.*)
 Tennasserim.
332. (233) *Ixulus humilis clarkii*. *Oates' Ixulus*.
Ixulus clarkii, Oates, *Bull. B. O. C.* iii, p. 41, (1894) (*Byingyi*).
 Byingyi, Shan States.
333. (234) *Erpornis xantholeuca*. *The White-bellied Herpornis*.
Erpornis xantholeuca, Hodg., *J. A. S. B.* xiii, p. 380, (1844), (*Nepal*).
 Nepal to Assam, N. & S., Manipur and Burma.
- Sub-Family LIOTHRICHINÆ.
334. (235) *Liothrix lutea callipyga*. *The Indian Liothrix*.
Bahila callipyga, Hodg., *Ind. Rev.*, 1838, p. 88, (*Nepal*).
335. (236) *Cutia nepalensis*. *The Nepal Cutia*.
 Hodg., *J. A. S. B.* v, p. 774, (1836), (*Nepal*).
336. (237) *Pteruthius erythropterus*. *The Red-winged Shrike-Til*.
Lanius erythropterus, Vig., *P. Z. S.* (1831), p. 22, (*Himalaya Mts.*)
337. (238) *Pteruthius æralatus æralatus*. *Tickell's Shrike-Til*.
P. æralatus, Tickell, *J. A. S. B.* xxiv, p. 267, (1855), (*Tennasserim 3,500—4,500 ft.*).
 Hills of Eastern Burma and Tennasserim.

338. (239) *Pteruthius melanotis melanotis*. *The Chestnut-throated Shrike-Tit*.
P. melanotis, Hodg., *J. A. S. B.* xxiv, p. 267, (1855),
 (Terai, E. Himalayas).
 Himalayas, Nepal to Assam N. & S.
339. (240) *Pteruthius melanotis intermedius*. *Hume's Shrike-Tit*.
Allotrius intermedius, Hume, *Str. Feath.* v, p. 112
 (1877), (Tennasserim.)
 The Eastern Hills of Burma, Bhamo to Tennasserim.
340. (241) *Pteruthius xanthochloris xanthochloris*. *The Green Shrike-Tit*.
P. xanthochloris, Hodg., *J. A. S. B.* xv, i, p. 448
 (1847), (Nepal).
 Nepal and Sikkim.
341. (241) *Pteruthius xanthochloris occidentalis*. *The Simla Shrike-Tit*.
Harington, *Bull. B. O. C.* xxxiii, p. 82 (1913), (Dehra Dun).
 North-West Himalayas.
342. (241) *Pteruthius xanthochloris hybrida*. *The Chin Hills Shrike-Tit*.
Harington, *Bull. B. O. C.* xxxiii, p. 82 (1915), (Mt. Victoria).
 Chin Hills.
343. (242) *Æthorhynchus lafresnayeri*. *The Great Iora*.
Iora lafresnayeri, Hartl., *Rev. Zool.*, 1844, p. 401 (Malacca).
344. (243) *Ægithina tiphia tiphia*. *The Common Iora*.
Motacilla tiphia, Linn. *Sys. Nat. Ed.* p. 186 (1758),
 (Bengal).
 India, Burma and Siam.
345. (243) *Ægithina tiphia zeylonica*. *The Ceylon Iora*,
Motacilla zeylonica, Gm., *Syst. Nat. i*, p. 964 (1788),
 (Ceylon).
 Ceylon, Travancore and the S. of Madras.
346. (244) *Ægithina viridissima*. *The Green Iora*.
Iora viridissima, Bonap., *Consp. Av. i*, p. 397 (1850),
 (Sumatra).
347. (245) *Ægithina nigrolutea*. *Marshall's Iora*.
Iora nigrolutea, Marshall, *Str. Feath. iv*, p. 410 (1876),
 (Meerut).
 The dry portions of Central India.

- 348.* (246) *Myzornis pyrrhoura*. *The Fire-tailed Myzornis*.
Hodg., J. A. S. B. xii, p. 984 (1843), (Nepal).
349. (248) *Chloropsis aurifrons aurifrons*. *The Gold-fronted Chloropsis*.
Phyllornis aurifrons, Temm., Pl. Col. 484 (1829), (Cachar).
Himalayas, Garhwal to Assam and Burma.
- 350.† (248) *Chloropsis aurifrons davidsoni*. *The Malabar Chloropsis*.
Stuart Baker, Bull. B. O. C. xli. p. 2 (1920), (Malabar).
W. Coast of India, Khandalla to Ceylon.
351. (248) *Chloropsis aurifrons inornata*. *The Siam Chloropsis*.
Kloss, Ibis, 1918. p. 198 (Lat Bua Kao, Siam).
S. W. Siam and Tennasserim on the extreme E.
352. (249) *Chloropsis hardwickii hardwickii*. *The Orange bellied Chloropsis*.
C. hardwickii, J. & S. Ill. Orn., Add., p. 1 (1829), (Nepal).
353. (250) *Chloropsis icterocephala chlorocephala*. *The Burmese Chloropsis*.
Phyllornis chlorocephalus, Wald., A. M. N. H. (4) vii. p. 241 (1871), (Tonghoo).
354. (251) *Chloropsis zosterops*. *The Malachite Shouldered Chloropsis*
Vigors, App. Mem. Life Raffl., p. 674 (1830), (Tennasserim).
355. (252). *Chloropsis jerdoni*. *Jerdon's Chloropsis*.
Phyllornis jerdoni, Blyth, J. A. S. B. xiii, p. 392 (1844), (Madras).
356. (253) *Chloropsis cyanopogon*. *The Blue-whiskered Chloropsis*.
Phyllornis cyanopogon, Temm., Pl. Col. 512, fig. i. (1829), (Sumatra).
- 357.‡ (256) *Hilarocichla rufiventer*. *The Rufous-bellied Shrike-Tit*.
Pteruthius rufiventer, Blyth, J. A. S. B. xi, p. 18 (1843), (Darjiling).

* Very doubtfully *Timeliina*.

Chalcopteryx is certainly not *Timeliina* and possibly was rightly placed with the *Dicaeidae*.

† *Turdus malabaricus* of Gmelin p. 837, is preoccupied by the same author, p. 816, and cannot be used.

‡ The Genus *Irena* should probably be placed in the *Tardidae* near *Cochoa*. *Melanochlora* is a true Titmouse.

358. (257) *Mesia argentauris*. *The Silver-eared Mesia*.
Hodgson, *Ind. Rev.*, 1838, p. 88 (Nepal).
359. (258) *Minla ignitincta*. *The Red-tailed Minla*.
Hodg., *Ind. Rev.*, 1838, p. 33 (Nepal).
- 360.* (262) *Hypocolius ampelinus*. *The Grey Hypocolius*.
Bonap., *Consp. Av. i*, p. 336 (1850), (N. E. Africa).
- Sub-family BRACHYPODINÆ.
361. (265) *Criniger tephrogenys tephrogenys*. *The Malayan White-throated Bulbul*.
Trichophorus tephrogenys, *Jard. and Sel., Ill. Ind. Orn. P. xxvii* (1833), (No locality), (S. Tennasserim).
Extreme S. of Tennasserim and Malay Peninsula.
362. (263) *Criniger tephrogenys flaveolus*. *The White-throated Bulbul*.
Trichophorus flaveolus, *Gould, P. Z. S.*, 1836, p. 6 (India), (Cachar).
Sub-Himalayas, Nepal to Chittagong Hill Tracts.
363. (264) *Criniger tephrogenys burmanicus*. *The Burmese White-throated Bulbul*.
C. burmanicus, *Oates, Fauna, B. I., Aves i*, p. 256 (1889), (Toung-hoo).
Hills E. of Salwin, Yamethin to Moulmein.
364. (266) *Criniger tephrogenys griseiceps*. *Hume's White-throated Bulbul*.
C. griseiceps, *Hume, S. F. i*, p. 478 (1873), (Upper Pegu).
S. Arrakan, Irrawaddy—Sittang from Thayetmyo to Rangoon.
365. *Criniger pallidus grandis*. *The Yunnan White-throated Bulbul*.
Stuart Baker, Bull. B. O. C. xxxvii, p. 15 (1917) (Yunnan).
Yunnan and S. Shan States.
366. (267) *Tricholestes criniger criniger*. *The Hairy-backed Bulbul*.
Brachypodius (?) *criniger*, *Blyth, J. A. S. B. xiv*, p. 577 (1845), (Malacca).
South of Tennasserim and whole Malay Peninsula.
367. (268) *Alophoiscus phaeocephalus*. *The Crestless White-throated Bulbul*.
Ixos phaeocephalus, (Hartl.), *Rev. Zool.* (1844), p. 401 (Malacca).

* *Leptopercile* and *Cephalopyrus* are *Regulidæ* and *Psaraglossa* a true Starling.

368. (269) **Hypsipetes psaroides psaroides.** *The Himalayan Black Bulbul.*
H. psaroides, Vigors., P. Z. S., 1831, p. 43 (Himalayas)
(Simla.)
 Western Himalayas to Bhutan.
369. (269) **Hypsipetes psaroides nigrescens.** *The Assam Black Bulbul.*
Stuart Baker, Bull. B. O. C., xxxvii, p. 15 (1917), (Chin Hills).
 Assam N. and S. of Brahmapootra, Manipur, Chin Hills, Arrakan.
370. (270) **Hypsipetes psaroides concolor.** *The Burmese Black Bulbul.*
H. concolor, Lyth, J. A. S. B. xviii, p. 816 (1849), (Tennasserim).
 E. Burma, Shan States, S. Burma to Muleyit, Yunnan and N. Siam.
371. (271) **Hypsipetes psaroides ganeesa.** *The Southern Indian Black Bulbul.*
H. ganeesa, Sykes, P. Z. S., 1832, p. 80 (Deccan).
 Hill ranges of S. India and Ceylon.
372. (272) **Hemixus flavala flavala.** *The Himalayan Brown-eared Bulbul.*
H. flavala, Hodg., J. A. S. B. xiv, p. 572 (1845), (Nepal).
 Himalayas to Kachin Hills and Yunnan.
373. (273) **Hemixus flavala davisoni.** *Davison's Brown-eared Bulbul.*
H. davisoni, Hume, S. F. v., p. 111 (1877), (Tennasserim).
 Tennasserim, Meetan and Toungyah.
374. (274) **Hemixus flavala hildebrandi.** *Hildebrand's Brown-eared Bulbul.*
H. hildebrandi, Hume, S. F. ii, p. 508 (1874), (Salween District).
 Salween and Karen Hills.
375. (275) **Hemixus maclellandi maclellandi** *The Rufous-bellied Bulbul.*
Hypsipetes maclellandi, Horsf., P.Z.S., 1839, p. 5 (Assam).
 Himalayas to Chin Hills and Arrakan.
376. (276) **Hemixus maclellandi tickelli.** *Tickell's Bulbul.*
Hypsipetes tickelli, Blyth, J.A.S. B. xxiv, p. 275 (1855), (Interior of Tennasserim).
 Southern Shan States, Karennee and Tennasserim.

377. (276) **Hemixus maclellandi holtii.** *Swinhoe's Bulbul.*
Hypsipetes holtii, *Swinhoe*, *Ibis*, 1861, p. 266 (*Foochow Pehling Hills*).
 Kauri Kachin Hills, N. Shan States, Yunnan and China.
378. (277) **Alucurus striatus.** *The Striated Green Bulbul.*
Trichophorus striatus, *Blyth*, *J. A. S. B.* xi, p. 184 (1842), (*Nepal*).
379. (278) **Molpastes hæmorrhous hæmorrhous.** *The Madras Red-vented Bulbul.*
Muscicapa hæmorrhousa, *Gmelin*, *S. N.* i, p. 941 (1789), (*Ceylon*).
 Ceylon and S. India, Travancore, Mysore to 18° on the E. and 20° on W.
380. (278) **Molpastes hæmorrhous pallidus.** *The Central Indian Red-vented Bulbul.*
Stuart Baker, *Bull. B. O. C.* xxxvii, p. 15 (1917), (*Deesa*).
 India N. of last race to Behar and W. Bengal, Rewah, Cutch, etc.
381. (279) **Molpastes hæmorrhous burmanicus.** *The Burmese Red-vented Bulbul.*
M. burmanicus, *Sharpe*, *Cat. B. M.* vi, p. 125 (1881), (*Pegu*).
 Manipur, Burma S. to Rangoon, E. to Sittoung R.
382. (280) **Molpastes hæmorrhous nigripileus.** *The Tennasserim Red-vented Bulbul.*
Pycnonotus nigripileus, *Blyth*, *J. A. S. B.* xvi, p. 472, (1847), (*Tennasserim*).
 E. of the Sittoung R. in S. Burma to Malay Pen.
- * 383. (281) **Molpastes hæmorrhous chrysorrhoides.** *The Chinese Red-vented Bulbul.*
Haematornis chrysorrhoides, *LafrRev. Lod.* p. 367 (1845), (*China*).
 Kachin Hills, Shan States and N.-E. Tennasserim into China.
384. (282) **Molpastes hæmorrhous bengalensis.** *The Bengal Red-vented Bulbul.*
M. bengalensis, *Blyth*, *J. A. S. B.* xiv, p. 566 (1845), (*Bengal*).
 Himalayas, Kumaon to E. Assam, N. Behar, E. Bengal.

* *Muscicapa atricapilla* of Vieill is preoccupied G Linne and the next oldest name is that never used.

385. (283) **Molpastes hæmorrhous intermedius.** *The Punjab Red-vented Bulbul.*
Pycnonotus intermedius, *Jerdon, B. of I. ii, p. 95*
 (1867), (*Murrez*).
 Punjab, N. W. Provinces, N. Oudh and N. W. Himalayas.
386. (284) **Molpastes leucogenys.** *The White-checked Bulbul.*
Brachypus leucogenys, *Gray, Hardw. Ill. Ind. Orn. ii,*
pl. 35 (1830), (*Darjiling*).
387. (285) **Molpastes leucotis.** *The White-eared Bulbul.*
Ixos leucotis, *Gould, P.Z.S. 1836, p. 6* (*India Orientali*),
 Sind, Punjab, North N.-W. Provinces and Central
 Provinces E. to Saugur.
388. (287) **Xanthixus flavescens flavescens.** *Blyth's Bulbul.*
Pycnonotus flavescens, *Blyth, J. A. S. B. xiv, p. 568*
 (1845), (*Arrakan*).
 Hills S. of Brahmapootra. Manipur, Looshai and
 Arrakan.
389. (287) **Xanthixus flavescens vivida,** *The Muleyit Bulbul.*
Stuart Baker, Bull. B. O. C. xxxvii, p. 16 (1917), (*Muleyit*
Mt.).
 Kauri Kachin Hills, Shan States, Karennee, S.
 Burma and Malay P.
390. (288) **Otocompsa emeria emeria.** *The Bengal Red-whiskered Bulbul.*
Lanius emeria, *Lin., S. N. i, p. 137* (1766), (*Bengal*).
 Himalayas, Simla to E. Assam, Bengal, Orissa,
 Burma, Andamans.
391. (289) **Otocompsa emeria fuscicaudata.** *The Southern Red-whiskered Bulbul.*
O. fuscicaudata, *Gould, P. Z. S., 1865, p. 664* (*Madras*).
 Southern India S. of range of *emeria*.
392. (290) **Otocompsa flaviventris flaviventris.** *The Black-crested Yellow Bulbul.*
Vanga flaviventris, *Tickell, J. A. S. B. ii, p. 573*
 (1833), (*Dholbhum*).
 India, Burma and N. Siam.
393. (290) **Otocompsa flaviventris minor.** *Kloss' Black-crested Yellow Bulbul.*
Kloss, Ibis, 1918, p. 200 (*Koh Lak*).
 Tennasserim, S.-W. Siam and Malay Peninsula.
394. (291) **Pinarocichla euptilosa.** *The Crested Brown Bulbul.*
Bachypus euptilosus, *J. and S., Ill. Orn. iv., pl. ii*
 (1836), (*Singapore*).

395. (292) **Spizixus canifrons canifrons.** *The Finch-billed Bulbul.*
Spizixos canifrons, Blyth, J. A. S. B. xiv, p. 571
 (1845) (*Khasia Hills*).
 Hills S. of Brahmapootra, Arrakan and Chin Hills.
396. (292) **Spizixus canifrons ingrami.** *The Yunnan Finch-billed Bulbul.*
Bangs, Bull. Mus. Com. Zool. lviii, No. 6, p. 285 (1914),
 (*Mengtze.*)
 Yunnan and S. Shan States.
397. (293) **Trachycomus ochracephalus.** *The Yellow-crowned Bulbul.*
Turdus ochracephalus, Gmel. S. N. i, p. 821 (1788),
 (*Ceylon and Java.*)
 Siam, Tennasserim, Sumatra, Java and Borneo.
398. (294) **Iole malaccensis.** *The Streaked Bulbul.*
Hypsipetes malaccensis, Blyth, J. A. S. B. xiv, p. 574
 (1845), (*Malacca*).
399. (295) **Iole icterica.** *The Yellow-browed Bulbul.*
Criniger ictericus, Strick, A. M. N. H. xviii, p. 411
 (1844), (*Mahableswar*).
400. (296) **Iole virescens virescens.** *The Olive Bulbul.*
I. virescens, Blyth, J. A. S. B. xiv, p. 573 (1845)
 (*Arrakan.*)
 Cachar, Sylhet, Tippera, W. Burma to Pegu.
401. (296) **Iole virescens cinnammomeoventris.** *The Malay Olive Bulbul.*
Stuart Baker, Bull. B. O. C. xxxvii, p. 16 (1917)
 (*Tennasserim*).
 Malay Pen. from Tennasserim to extreme S.
402. (296) **Iole virescens lonnbergi.** *The Siam Olive Bulbul.*
Criniger lonnbergi, Gyldenstolpe, Kung. Sven. Vetén
Handl. 50, No. 8, p. 24 (1913), (Bang-hue-hom N. Siam).
 South Shan States and Siam.
403. (297) **Iole nicobariensis.** *The Nicobar Bulbul.*
Hypsipetes nicobariensis, Horsf. v, Moore, Cat. i, p. 257
 (1854), (*Nicobars*).
404. **Rubigula webberi.** *Webber's Bulbul.*
Hume, S. F. viii, p. 40, 63 (1879), (Tonka).
 Malay Pen, Siam, Tennasserim, Borne.
- 405 (298) **Pycnonotus analis.** *The Yellow-vented Bulbul.*
Turdus analis, Horsf., Trans. L. S. xviii, p. 147 (1820)
 (*Java*).

406. (299) *Pycnonotus finlaysoni finlaysoni*. *Finlayson's Stripe-throated Bulbul*.
P. finlaysoni, *Strick, A. M. N. H.* (1) *xiii*, p. 411 (1844),
 (*Malayan Is.*).
 Tennasserim E. of Sittoung R., Malay Pen., etc.
407. (300) *Pycnonotus finlaysoni davisoni*. *Davison's Stripe-throated Bulbul*.
Ixus davisoni, *Hume, S. F.* *iii*, p. 301 (1875), (*Arrakan*).
 Arrakan, Chin Hills to Tennasserim W. of Sittoung R.
408. (301) *Pycnonotus melanicterus*. *The Black-capped Bulbul*.
Muscicapa melanictera, *Gmel., S. N.* *I*, p. 941 (1789),
 (*Ceylon*).
409. (302) *Pycnonotus xantholæmus*. *The Yellow-throated Bulbul*.
Brachypus xantholæmus, *Jerd., Madr. J. L. S.* *xiii*,
pt. 2, p. 122 (1844) (*Eastern Ghats W. of Nellore*).
 Travancore, Myore and E. Ghats.
410. (303) *Pycnonotus gularis*. *The Ruby-throated Bulbul*.
Brachypus gularis, *Gould, P. Z. S.* 1835, p. 186 (*Belgaum*).
411. (304) *Pycnonotus cyaniventris*. *The Blue-bellied Bulbul*.
Blyth, J. A. S. B. *xi*, p. 792 (1841), (*Malay Peninsula*).
412. (305) *Pycnonotus luteolus*. *The White-browed Bulbul*.
Hæmatornis luteolus, *Less., Rev. Zool.* 1840, p. 35†
 (*India*), (*Bombay*)
413. (306) *Pycnonotus blanfordi*. *Blanford's Bulbul*.
Jerdon, Ibis, 1862, p. 20 (*Pegu*).
414. (307) *Pycnonotus plumosus*. *The Large Olive Bulbul*.
Blyth, J. A. S. B. *xiv*, p. 567 (1845), (*Singapore*).
415. (308) *Pycnonotus simplex*. *Moore's Olive Bulbul*.
Less., Rev. Zool., 1839, p. 167 (*Sumatra*).
416. (309) *Pycnonotus pusillus*. *The Small Olive Bulbul*.
Salvadori, Ucc. Bern., p. 200 (1874), (*Sumatra*).
417. *Pycnonotus xanthorrhæus*. *Anderson's Yellow-vented Bulbul*.
Anders., P. A. S. B. 1869, p. 265 (*Kak'yen Hills*).
 Mt. of China. Yunnan, Kachin Hills, N. Shan States.

418. (310) **Microtarsus melanocephalus melanocephalus.**
The Black-headed Bulbul.
Lanius melanocephalus, Gmel., S. N. i, p. 309 (1788)
(Sandwich in maris Australis).
 E. Bengal, Assam, Burma, Siam to Borneo and
 Palauan.
419. (312) **Microtarsus melanocephalus fusciflavescens.**
The Andaman Black-headed Bulbul.
Brachypodius fusciflavescens, Hume, S. F. i., p. 297
(1873), (Andamans).
 S. Andaman Island.
420. (313) **Microtarsus poiecephalus.** *The Grey-headed*
Bulbul.
Brachypus poiocephalus, Jerd., Madr. J. L. S. x., p. 246
(1830) (Travancore).
 Malabar Coast, Belgaum to S. of Travancore.
421. (311) **Microtarsus cinereiventris.** *The Grey-bellied*
Bulbul.
Brachypodius cinereiventris, Blyth, J. A. S. B. xiv.
p. 576 (1845), (Tippera).
 Same range as *M. m. melanocephalus.*
422. (314) **Kelaertia penicillata.** *The Yellow-eared Bulbul.*
Pycnonotus penicillatus, Blyth, J. A. S. B. xx., p. 178
(1851) (Ceylon).
 Ceylon only.

Family SITTIDÆ.

423. (315) **Sitta himalayensis.** *The White-tailed Nuthatch.*
Jard. & Selby, Ill. Ind. Orn. iii, pl. 144 (1835), (Hima-
layas) (Kashmir).
424. (321) **Sitta castaneiventris castaneiventris.** *The*
Chestnut-bellied Nuthatch.
Frank., P. Z. S. 1831, p. 121 (Vindhyan Hills).
 Plains of India South to the Wynaad.
425. (316) **Sitta castaneiventris cinnamomeoventris.** *The*
Cinnamon-bellied Nuthatch.
S. cinnamomeoventris, Blyth, J. A. S. B. xi, p. 439
(1842). (Darjiling).
 Himalayas from Muree to the Shan States.
426. (317) **Sitta castaneiventris neglecta.** *The Burmese*
Nuthatch.
S. neglecta, Wald., A. M. N. H. (4) v, p. 218 (1870),
(Youngheo, Karen Hills).
 Southern Burma.

427. (318) **Sitta europaea nagaensis.** *Austen's Nuthatch.*
S. nagacsis, Godw.-Aus., P. Z. S., 1874, p. 44 (Sopromah,
Naga Hills).
 Naga and Cachar Hills.
428. **Sitta europea griseiventris.** *Kinnear's Nuthatch*
Kinnear, Bull. B. O. C. xl, p. 142 (1920). (Mt. Victoria)
 Chin Hills.
429. (318) **Sitta victoriae.** *The Chin Hills Nuthatch.*
S. victoriae, Rippon, Bull. B. O. C. xiv, p. 83 (1904),
(Mt. Victoria).
 Chin Hills.
430. (319) **Sitta magna.** *The Giant Nuthatch.*
Ward-Ramsay, P. Z. S., 1876, p. 677 (Karennee).
431. (320) **Sitta kashmiriensis.** *Brook's Nuthatch.*
Brooks, P. A. S. B., 1871, p. 279 (Kashmir).
432. (322) **Sitta neumayer obscura.** *The Eastern Rock*
Nuthatch.
S. syriaca obscura. Zar. & Loud., Orn. Monats. 1905,
p. 76.
433. (323) **Sitta leucopsis leucopsis.** *The White-checked*
Nuthatch.
S. leucopsis, Gould, P. Z. S., 1840, p. 113 (Himalayas).
434. (324) **Sitta formosa.** *The Beautiful Nuthatch.*
Blyth, J. A. S. B. xii, p. 938 (1843) (Darjiling).
 Sikkim and Hills South of Brahmapootra.
435. (325) **Sitta frontalis frontalis.** *The Velvet-fronted Blue*
Nuthatch.
S. frontalis, Horsf., Trans. L. S. xiii, p. 162 (1821) (Java).
- Family DICRURIDÆ.
436. (326) **Dicrurus annectens annectens.** *The Crow-billed*
Drongo.
Buchanga annectens, Hodg., Ind. Rev. i, p. 326 (1837)
(Nepal).
 India, Burma and Malay Pen.
437. (326) **Dicrurus annectens siamensis.** *The Siamese Crow-*
billed Drongo.
Kloss, Ibis, 1918, p. 226 (Koh Lak, S.-W. Siam).
 S.-W. Siam and ? S. Tennasserim.
438. (327) **Dicrurus macrocercus macrocercus.** *The Black*
Drongo.
D. macrocercus, Vieill., Nouv. Dic. d'His Nat. ix, p. 588
(1017), (India) (Orissa).
 India to the foothills of the Himalayas.

439. (327) **Dicrurus macrocercus albirictus.** *The Himalayan Black Drongo.*
D. albirictus, *Hogd., Ind. Rev. i, p. 326 (1837) (Nepal).*
Himalayas to Northern Chin Hills.
440. (327) **Dicrurus macrocercus minor.** *The Ceylon Black Drongo.*
D. minor, *Layard, A. M. N. H. (2) xiii, p. 129 (1854) (Ceylon).*
Ceylon and ? Travancore.
441. (327) **Dicrurus macrocercus cathoecus.** *The Chinese Black Drongo.*
D. cathoecus, *Swinh., P. Z. S., 1871, p. 377 (China).*
Burma, Siam, Shan States and S. China.
442. (328) **Dicrurus leucophæus longicaudatus.** *The Indian Grey Drongo.*
D. longicaudatus, *Hay, Jerd. Madr. L. S. xiii, 2, p. 121 (1845) (Nilghiris).*
Continental and extreme N. W. India.
443. (328) **Dicrurus leucophæus stevensi.** *The Himalayan Grey Drongo.*
Stuart Baker, Nov. Zool. xxv., p. 295 (1918) (Darjiling).
Himalayas to Northern Chin Hills.
444. (328) **Dicrurus leucophæus hopwoodi.** *The Assam Grey Drongo.*
Stuart Baker, Nov. Zool. xxv, p. 295, (1918) (Dacca).
E. Bengal, S. Assam, N. Chin, Kachin Hills to Yunnan.
445. (329) **Dicrurus leucophæus nigrescens.** *The Burmese Grey Drongo.*
D. nigrescens, *Oates, Hume's N. and E. 2nd ed., i, p. 208 (1889), (Rangoon).*
Burma and S. Chin, Kachin and Shan States.
446. (333) **Dicrurus leucophæus disturbans.** *The South Burmese Grey Drongo.*
Stuart Baker, Nov. Zool. xxv., p. 293 (1918) (Amherst).
Peninsula Burma and Siam.
447. (330) **Dicrurus cœrulescens.** *The White-bellied Drongo.*
Lanius cœrulescens, *Linn., S. N. i, p. 134 (1766) (Bangala).*
448. (331) **Dicrurus leucopygialis.** *The White-vented Drongo.*
Blyth, J. A. S. B. xv, p. 198 (1846), (Ceylon).
449. (332) **Dicrurus leucogenys.** *The White-cheeked Drongo.*
Buchanga leucogenys, *Wald., A. M. N. H. (4) v, p. 219 (1870), (Cambodia, Malacca, China, Japan).*

450. (334) **Chaptia ænea anea**. *The Northern Bronzed Drongo*.
Dicrurus æneus, Vieill., *Nouv. Dict. d'Hist. Nat.* ix.
 p. 586, (1817), (Bengal), (Dacca).
 N. India, N. Burma, Chin and Kachin Hills,
 Yunnan, Hainan.
451. (334) **Chaptia ænea malayensis**. *The Southern Bronzed Drongo*.
C. malayensis, A. Hay, Blyth, *J. A. S. B.* xv., p. 294
 (1846), (Malacca).
 India S. of Himalayas, S. Bengal, Sunderbunds
 Central and S. Burma, Siam, etc.
452. (335) **Chibia hottentotta hottentotta**. *The Indian Hair-crested Drongo*.
Corvus hottentottus, Linn, *S.-N.* i, p. 155 (1766), (Sikkim).
453. (336) **Dissemuroides andamanensis**. *The Small Andamanese Drongo*.
Dicrurus andamanensis, Tytler, *Beavan, Ibis*, 1867, p.
 323 (Andamans), (Port Blair).
454. (337) **Dissemuroides dicruriformis**. *The Large Andamanese Drongo*.
 Hume, *Str. Feath.* i, p. 408 (1873), (Cocos Is., Andamans).
455. (338) **Dissemurulus lophorhinus**. *The Ceylon Black Drongo*.
Dicrurus lophorhinus, Vieill., *Nouv. Dict. d'Hist. Nat.* ix,
 p. 587 (1817), (Ceylon).
 Ceylon and Travancore.
456. (339) **Bhringa remifer tectirostris** *The Indian Lesser Racket-tailed Drongo*.
B. tectirostris, Hodg., *Ind. Rev.* i, p. 325 (1837), (Eastern Nepal).
 Northern India from E. Nepal, Burma, Yunnan
 and N. Siam.
457. (340) **Dissemurus paradiseus paradiseus**. *The Larger Racket-tailed Drongo*.
Cuculus paradiseus, Linn, *S.-N.* ed. xii, p. 172 (1766),
 (Siam).
 Siam and South Tennasserim.
458. (340) **Dissemurus paradiseus rangoonensis**. *The Rangoon Racket-tailed Drongo*.
Edolius rangoonensis, Gould, *P. Z. S.*, 1836, p. 5.
 (Rangoon). Central Burma, S. Chin Hills, S. Shan
 States and N. Siam.

459. (340) **Dissemurus paradiseus grandis.** *The Assam Racket-tailed Drongo.*
Edolius grandis, Gould, P. Z. S., 1836, p. 5 (Assam).
 India N. of Sambalpur and Godaveri, Assam to Yunnan.
460. (340) **Dissemurus paradiseus otiosus.** *The Andaman Racket-tailed Drongo.*
Richmond, Pro. U. S. Nat. Mus. xxv, p. 291 (1902)
(Andamans).
 Andamans.
461. (340) **Dissemurus paradiseus nicobariensis.** *The Nicobar Racket-tailed Drongo.*
Stuart Baker, Nov. Zool. xxv, p. 302 (1918), (Nicobars).
 Nicobars.
462. (340) **Dissemurus paradiseus malabaricus.** *The Malabar Racket-tailed Drongo.*
Lanius malabaricus, Lath., Ind. Orn. i, p. 66 (1790),
(Malabar).
 India S. of the range of *D. p. grandis.*
463. (340) **Dissemurus paradiseus ceylonensis.** *The Ceylon Racket-tailed Drongo.*
D. ceylonensis, Sharpe, Cat. Birds B. M. iii, p. 264
(1877), (Ceylon).
 Ceylon.
- Family TROGLODYTIDÆ.
464. (341) **Certhia himalayana himalayana.** *The Himalayan Tree-Creeper.*
C. himalayana, Vig., P. Z. S., 1831, p. 174 (Himalaya).
 Himalayas, Kashmir to Assam N. of Brahmapootra.
465. (341) **Certhia himalayana yunnanensis.** *The Yunnan Tree-Creeper.*
C. yunnanensis, Sharpe, Bull. B. O. C. xiii (1902),
(Yunnan).
 Yunnan.
466. (342) **Certhia familiaris hodgsoni.** *Hodgson's Tree-Creeper.*
C. hodgsoni, Brooks, J. A. S. B. xli, p. 74 (1872),
(Kashmir)
 Kashmir, Murree Hills.
467. (343) **Certhia familiaris nipalensis.** *The Nepal Tree-Creeper.*
C. nipalensis, Blyth, J. A. S. B. xiv, 2, p. 581 (1845),
(Nepal).
 Nepal, Sikkim, Bhutan, E. Assam.

468. (343) **Certhia familiaris khamensis.** *The Tibet Tree Creeper.*
C. khamensis, Bianchi, *Shape's H. L. iv*, p. 355 (1903)
 (Kham U. Mekeng).
 S. E. Tibet.
469. (344) **Certhia discolor discolor.** *The Sikkim Tree-Creeper.*
C. discolor, Blyth, *J. A. S. B. xiv*, p. 580 (1845),
 (Darjiling).
 Nepal to E. Assam and E. Burmese Hills to
 Karennee.
470. (344) **Certhia discolor victoriae.** *The Chin Hills Tree-Creeper.*
C. victoriae, Rippon, *Bull. B. O. C. xvi*, p. 87 (1906),
 (Mt. Victoria).
 Chin Hills.
471. (345) **Certhia discolor manipurensis.** *Hume's Tree-Creeper.*
C. manipurensis, Hume, *Str. Feath. x*, p. 151 (1881),
 (Manipur).
 Hills South of the Brahmapootra.
472. (346) **Certhia stoliczkae** *Stoliczka's Tree-Creeper.*
Brooks, J. A. S. B. xlii, 2, p. 256 (1873), (Sikkim).
473. (347) **Salpornis spilonotus.** *The Spotted Grey Creeper.*
Certhia spilonota, Frank, *P. Z. S.*, 1831, p. 21 (Ganges
 between Calcutta and Benares).
474. (348) **Tichodroma muraria.** *The Wall-Creeper.*
Certhia muraria, Linn., *S. N. xii ed.*, p. 184 (1766), (S.
 Europe).
475. (349) **Sphenocichla humei.** *Hume's Wedge-billed Wren.*
Heterorhynchus humei, Mandelli, *Str. Feath. i*, p. 415
 (1873), (Native Sikkim).
476. (350) **Sphenocichla roberti.** *Robert's Wedge-billed Wren.*
Godw.-Aus, Ibis, 1875 p. 251 (Hemeo, N. Cachar).
477. (351) **Troglodytes troglodytes nipalensis.** *The Nepal Wren.*
T. nipalensis, Hodg., *Blyth J. A. S. B. xiv*, p. 589 (1845),
 (Nepal).
 Garhwal, Nepal, Sikkim and Bhutan.
478. (352) **Troglodytes troglodytes neglecta.** *The Kashmir Wren.*
T. neglectus, Brooks, *J. A. S. B. xli*, 2, p. 328 (1872),
 (Kashmir).
 Kashmir and Simla Hills.

479. (352) **Troglodytes troglodytes magrathi.** *Whitehead's Wren.*
*Whit head, Bull. B. O. C. xxi, p. 19 (1907), (Safed Koh).
 Baluchistan, Chitral and N.-W. Frontier.*
480. (352) **Troglodytes troglodytes tibetana.** *The Tibetan Wren.*
Walton, Bull. B. O. C. xv., p. 95 (1905), (Tibet).
481. (352) **Troglodytes troglodytes talifuensis.** *Sharpe's Wren.*
*T. talifuensis, Sharpe, Bull. B. O. C. xiii, p. 77 (1902),
 (Talifu).
 Yunnan.*
482. (353) **Elachura punctata.** *The Spotted Wren.*
*Troglodytes punctatus, Blyth, J. A. S. B. xiv, p. 589
 (1845).*
483. (353) **Elachura haplonota** *Baker's Wren.*
*Stuart Baker, Ibis, 1892, p. 62 (Hungrum, N. Cachar).
 N. Cachar Hills.*
484. (354) **Urocichla longicaudata longicaudata.** *The Long-tailed Wren.*
*Pncepyga longicaudata, Moore, P. Z. S., 1854, p. 7
 (N. India) (Khasia Hills)
 Assam Hills, S. of Brahmapootra.*
485. (354) **Urocichla longicaudata reptata.** *Bingham's Long-tailed Wren.*
*U. reptata, Bingham, Bull. B. O. C. xviii, p. 54 (1903),
 (Loi-pang-Nan).
 Mekong Valley.*
486. (354) **Urocichla longicaudata oatesi.** *Rippon's Long-tailed Wren.*
*U. oatesi, Rippon, Bull. B. O. C. xiv, p. 83 (1904), (Mt. Victoria).
 Chin Hills, Burma.*
- 487.* (354) **Urocichla longicaudata kauriensis.** *Harington's Long-tailed Wren.*
*U. kauriensis, Harington, A. M. N. H., 8, Vol. ii, p. 246,
 (1908), (Watan, Bhamo Hills).
 Kauri Kachin Hills.*
488. (354) **Urocichla longicaudata sinlumensis.** *The Sinlum Wren.*
*U. sinlumensis, Harington, A. M. N. H., 8, Vol. ii, p. 246 (1908), (Sinlum, Upper Burma).
 Bhamo District, Upper Burma.*

* The relationship of 486 7 to one another is doubtful and more specimens are required.

489. (355) **Urocichla caudata.** *The Tailed Wren.*
Tesia caudata, Blyth, *J. A. S. B.* xiv, p. 589 (1845)
 (Darjiling).
490. (356) **Pncœpyga squamata.** *The Scaly-breasted Wren.*
Microura squamata, Gould, *Icon. Av.*, pl. v (1837).
 (Himalayas), (Cachar).
491. (357) **Pncœpyga pusilla.** *The Brown Wren.*
Hodg., *P. Z. S.*, 1845, p. 25 (Nepal).

Family REGULIDÆ.

492. (358) **Regulus regulus himalayensis.** *The Himalayan Gold-Crest.*
R. himalayensis, Jerd., *B. I.* ii, p. 206 (1863), (*N. W. Himalayas*).
 Himalayas, Kashmir to Sikkim.
493. (358) **Regulus regulus yunnanensis.** *The Yunnan Gold Crest.*
R. yunnanensis, Rippon, *Bull. B. O. C.* xix, p. 19
 (1906), (*W. Yunnan*).
 Yunnan.
494. (259) **Leptopœcile sophiæ sophiæ.** *The Turkestan Tit-Warbler.*
L. sophiæ, Severtz., *Turk. Jevot. in I. C. Moskov.* viii, 2
 p. 135 (1873), (*Issuk-Kul*).
 Turkestan to Kansu and Gil.
495. (259) **Leptopœcile sophiæ obscura.** *The Tibetan Tit-Warbler.*
L. obscura, Przew., *Zap. Im. A. N. and St. P. lv.*, p. 80
 (1887), (*N.-E. Tibet*).
 S., S.-E., and N. E. Tibet.
496. (260) **Cephalopyrus flammiceps.** *The Fire-capped Tit-Warbler.*
Ægithalus flammiceps, Burton, *P. Z. S.*, 1835, p. 153
 (Himalayas).

Family SYLVIDÆ.

497. (359) **Agrobates galactodes familiaris.** *The Brown-backed Warbler.*
Sylvia familiaris, Menet., *Cat. Reis. Cauc.*, p. 32 (1832),
 (*S. Caucasus*).
 Trans-Caucasia to Baluchistan and N. W. India.
498. (360) **Locustella certhiola.** *Pallas' Grass-hopper Warbler.*
Motacilla certhiola, Pall., *Zoo. Rosso-Asiat.* i, p. 509
 (1811), (*ultra-Baicalen*).

499. (361) **Locustella lanceolata.** *The Streaked Grass-hopper Warbler.*
Sylvia lanceolata, *Temm-Man., d'Orn. 2nd ed., iv, p. 614* (1840), (*Irrtum*).
500. (362) **Locustella nævia straminea.** *The Turkestan Grass-hopper Warbler.*
L. straminea, *Serertz., Turkest. Jevot., p. 66* (1873), (*Turkestan*).
501. (363) **Acrocephalus stentoreus brunnescens.** *The Indian Great Reed-Warbler.*
Agrobates brunnescens, *Jerd., Madr. J. x, p. 269* (1839), (*Trichinopoly*).
502. (364) **Acrocephalus arundinaceus orientalis.** *The Eastern Great Reed-Warbler.*
Salicaria turdina orientalis, *Temm, and S. Faun. Jap. p. 50* (1850), (*Japan*).
503. (365) **Acrocephalus bistrigiceps.** *Schrenck's Reed-Warbler.*
Swinh., Ibis., 1860, p. 51 (*Amoy*).
504. (366) **Acrocephalus dumetorum.** *Blyth's Reed-Warbler*
Blyth, J. A. S. B. xviii. p. 815 (1849), (*Kargopol, N. Russia*).
505. (367) **Acrocephalus agricola agricola.** *The Paddy-field Warbler.*
Sylvia (Acrocephalus) agricola, *Jerd., Madr. J. xviii, pt. ii, p. 131* (1844), (*Nellore*).
 Breeding swamps, Kashmir.
506. **Acrocephalus concinens.** *The Chinese Paddy-field Warbler.*
Calamoherpe concinens, *Swinh, P. Z. S., 1870, p. 432* (*Peking*).
 N. W. Frontier 8,000 feet. Breeding hill-sides in bushes.
507. (368) **Acrocephalus macrorhynchus.** *The Large-billed Reed-Warbler.*
Phyllopeuste macrorhynchus, *Hume, Ibis, 1869, p. 357* (*Rampur*).
508. (369) **Tribura major.** *The Large-billed Bush-Warbler.*
Dumeticola major, *Brooks, J. A. S. B. xli, p. 77* (1872), (*Kashmir*).
509. (370) **Tribura intermedia.** *The Burmese Bush-Warbler.*
Dumeticola intermedia, *Oates, Str. Feath. ix, p. 220* (1883), (*Canal Lock, Pegu*).

510. **Tribura tacsanowskia.** *Swinhoe's Bush-Warbler.*
Locustella tacsanowskia, Swinh., *P. Z. S.*, 1871, p. 355
 (*Trans Baikal*).
 . Baikal to Ussuri land, China and Burma.
511. (371) **Tribura thoracica.** *The Spotted Bush-Warbler.*
Dumeticola thoracica, Blyth, *J. A. S. B.* xiv, p. 584
 (1845), (*Nepal*).
 Nepal, Sikkim and Assam.
- 512.* (372) **Tribura luteoventris.** *The Brown Bush-Warbler.*
Hodg., *P. Z. S.*, 1845, p. 30 (*Nepal*).
513. (200) **Elaphrornis palliseri.** *The Ceylonese Warbler.*
Brachypteryx palliseri, Blyth, *J. A. S. B.* xx, p. 178
 (1837), (*Ceylon*).
514. (374) **Orthotomus sutorius sutorius.** *The Indian Tailor-bird.*
Motacilla sutoria, Forst., *Ind. Zool.* I, p. 7 (1769) (?)
 (*Calcutta*).
 India, N. and C. Burma.
515. (374) **Orthotomus sutorius maculicollis.** *The Malay Tailor-bird.*
O. maculicollis, Moore, *P. Z. S.*, 1854, p. 309 (*Malacca*).
 Siam, Peninsula Siam and Burma.
516. (375) **Orthotomus atrigularis.** *The Black-necked Tailor-bird.*
Tenm., *Pl. Col. livr.* 101 (1836), (*Malacca and Borneo*).
517. (376) **Orthotomus ruficeps.** *The Red-headed Tailor-bird.*
Edela ruficeps, Less, *Tr. d'Orn.*, p. 309 (1830), (*Java*).
518. (377) **Lusciniola melanopogon mimica.** *The Moustached Sedge-Warbler.*
L. mimica, Madaraz, *Vorlauf. ub. einen neuen Roles.*
 (1903). (*Transcaspia*).
- 519.† (378) **Cisticola erythrocephala.** *The Red-headed Fan-tail Warbler.*
Blyth, *J. A. S. B.* xx, p. 523 (1851), (*Nilghris*).
520. (379) **Cisticola tytleri tytleri.** *The Yellow-headed Fan-tail Warbler.*
Jerd., *B. I.* ii, p. 176 (1863), (*Dacca*).
 Base of Himalayas, Bbutan to E. Assam and Kachia Hills.

* There can I think be no doubt that Hartert is right in uniting *luteoventris* and *mandellii*. The individual variation is great.

† The genus *Cisticola* still wants careful working out.

521. (380) **Cisticola tytleri volitans.** *The Golden-headed Fan-tail Warbler.*
Calamanthella volitans, Swinh., *Journ. N. China, As. Soc.* (1859), (*N. China*).
South Burma, Siam, Malay Peninsula.
522. (381) **Cisticola cisticola cursitans.** *The Rufous Fan-tail Warbler.*
Prinia cursitans, Frank., *P. Z. S.*, 1831, p. 118 (?)
(Shillong).
523. (382) **Franklinia gracilis.** *Franklin's Wren-Warbler.*
Prinia gracilis, Frank., *P. Z. S.*, 1831, p. 119 (*Vindhyani Hills*).
524. (383) **Franklinia rufescens.** *Beavan's Wren-Warbler.*
Prinia rufescens, Blyth, *J. A. S. B.*, xvi, p. 456 (1847),
(*Arracan*).
525. (384) **Franklinia buchanani.** *The Rufous-fronted Wren-Warbler.*
Prinia buchanani, Blyth, *J. A. S. B.* xiii, p. 376 (1844),
(*Bengal*).
526. (385) **Franklinia cinereocapilla.** *Hodgson's Wren Warbler.*
Prinia cinereocapilla, Mocre, *P. Z. S.*, 1854, p. 77 (*Nepal*).
527. (386) **Laticilla burnesi.** *The Long-tailed Grass Warbler.*
Eurycercus burnesi, Blyth, *J. A. S. B.* xiii, p. 374
(1844) (*Upper Sind*).
528. (387) **Laticilla cinerascens.** *Day's Long-tailed Grass-Warbler.*
Eurycercus cinerascens, Wald., *A. M. N. H.* (4) xiv, p. 156 (1874), (*Dhubri*).
529. (388) **Graminicola bengalensis bengalensis.** *The Large Grass Warbler.*
G. bengalensis, Jerd., *B. of I.* ii, p. 177 (1863), (*Ganges*).
Below Himalayas, Bhutan, Assam and N. Burma.
530. (388) **Graminicola bengalensis striatus.** *The Siam Grass Warbler.*
G. striatus, Styan, *Bull. B. O. C.* i, p. 6 (1892),
(*Hainan*).
Hainan, Siam, S. E. Tennasserim.
531. (389) **Megalurus palustris.** *The Striated Marsh-Warbler.*
Horsf., *Trans. Lin. Soc.* xiii, p. 159 (1820), (*Java*).

532. (390) **Schœnicola platyura.** *The Broad-tailed Grass-Warbler.*
Timalia platyura, Jerd., Madr. Jour. L. S. xiii, p. 170
(1844) (Nilghiris).
533. (391) **Acanthoptila nipalensis.** *The Spiny Warbler.*
Timalia nipalensis, Hodg., As. Res. xix, p. 182 (1836),
(Nepal).
534. (392) **Chætornis locustelloides.** *The Bristled Grass-Warbler.*
Dasyornis locustelloides, Blyth, J. A. S. B. xi, p. 602
(1842), (none), (Faridpore).
535. (393) **Phragmaticola ædon.** *The Thick-billed Warbler*
Musicapa ædon, Pall., Reise. iii, p. 695 (1776), (Dauria).
536. (394) **Hippolais rama.** *Sykes' Tree-Warbler.*
Sylvia rama, Ayres, P. Z. S., 1832, p. 89 (Dekkan, India).
537. (395) **Hippolais pallida pallida.** *The Olivaceous Tree-Warbler.*
Curruca pallida, Hemp., and Ehr., Symb. Phys. Aves, pl.
66 (1833), (Nile).
538. (396) **Hippolais caligata.** *The Booted Tree-Warbler.*
Sylvia caligata, Licht. Eversm., Reise Buchara, p. 128
(1823), (Am. Usk).
539. **Hippolais languida.**
Curruca languida, Hemp. and Ehr., Symb. Phys. cc. (1833),
(Syria).
540. (397) **Hippolais obsoleta.** *The Desert Tree-Warbler.*
Salicaria obsoleta, Severtz., Turkest. Jevotn. p. 63 (1873),
(Moscow).
541. (398) **Sylvia communis icterops.** *The Indian White-throat.*
S. icterops, Menétr., Cat. rais. Cauc. 1 p. 34 (1832), (Ta-
bysch).
Caucasus to Baluchistan and India.
542. (399) **Sylvia hortensis crassirostris.** *The Eastern Orphean Warbler.*
Sylvia crassirostris, Cretz., Atlas Reise Rupp. p. 49
(1826), (Nubia).
543. (400) **Sylvia nana nana.** *The Desert Warbler.*
Curruca nana, Hemp. and Ehr. Symb. Phys. cc. (1833),
(Sinai).
544. (401) **Sylvia althea.** *Hume's Lesser White-throat.*
Hume, Str. Feath. vii, pp. 60, 62 (1878), (India) (Kashmir.)

545. (402) **Sylvia curruca affinis.** *The Indian Lesser White-throat.*
S. affinis, *Blyth, J. A. S. B. xiv, p. 564 (1845) (India).*
Breeding Siberia, winter India.
546. (403) **Sylvia curruca minula.** *The Small White-throat.*
S. minula, *Hume, Str. Feath. i, p. 198 (1873), (Bharalpur).*
Breeding Transcaspia to Afghanistan.
547. (404) **Herbivocula schwarzi.** *Radde's Bush-Warbler.*
Sylvia schwarzi, *Radde, Reis. Sibir. Vog., p. 260 (1863), (Tarei Nor).*
548. (405) **Phylloscopus affinis.** *Tickell's Willow-Warbler.*
Motacilla affinis, *Tick., J. A. S. B. ii, p. 576 (1833), (Borabhum).*
549. (406) **Phylloscopus tytleri.** *Tytler's Willow Warbler.*
Brooks, Ibis, 1872, p. 23 (Kashmir).
550. (407) **Phylloscopus collybita tristis.** *The Brown Willow-Warbler.*
P. tristis, *Blyth, J. A. S. B., p. 966, (1843), (Calcutta).*
Petchora to S. Urals, winter in India.
551. (412) **Phylloscopus collybita sindianus.** *The Sind Willow-Warbler.*
P. sindianus, *Brooks, Str. Feath. viii, p. 476 (1880), (Sind).*
Russian Steppes to Kharakorum, winter in India?
Ladak.
552. (408) **Phylloscopus indicus.** *The Olivaceous Willow-Warbler.*
Sylvia indica, *Jerd., Madr. Jour. L. S. xi., p. 6 (1840), (India).*
553. (409) **Phylloscopus fuliginiventer.** *The Smoky Willow-Warbler.*
Horornis fuliginiventer, *Hodg., P. Z. S., 1845, p. 31 (Nepal).*
554. (410) **Phylloscopus fuscatus fuscatus.** *The Dusky Willow-Warbler.*
Phyllopneuste fuscata, *Blyth, J. A. S. B. xi., p. 113 (1842), (Calcutta).*
555. **Phylloscopus fuscatus homeyeri.** *Dybowskii's Willow Warbler.*
Phyllopneuste homeyeri, *Dybowskii, Eull. Soc. Zool. France 1883, p. 358 (Kamschatka),*

556. (411) *Phylloscopus neglectus neglectus*. *The Plain Willow Warbler*.
P. neglectus, *Hume, Ibis*, 1870, p. 143 (*Punjab*).
 Breeding Transcaspia to Persia.
557. *Phylloscopus neglectus lorenzii*. *The Caucasian Willow-Warbler*.
Phyllopneuste lorenzii, *Loung, Beit Henn. Fauna Kaukars* p. 28 (1887), (*North Caucasus*).
 Breeding Caucasus.
558. (413) *Phylloscopus maculipennis*. *The Grey-faced Willow-Warbler*.
Abrornis maculipennis, *Blyth, Ibis*, 1867, p. 27 (*Nepal*).
559. (414) *Phylloscopus pulcher*. *The Orange-barred Willow-Warbler*.
Blyth, J. A. S. B. xiv, p. 592 (1845), (*Nepal*).
560. (415) *Phylloscopus proregulus newtoni*. *Pallas' Himalayan Willow-Warbler*.
P. newtoni, *Gatke, Ibis*, 1889, p. 579 (*India*).
 Himalayas, Hazara to Bhutan.
561. (416) *Phylloscopus subviridis*. *Brooks' Willow-Warbler*.
Reguloides subviridis, *Brooks, P. A. S. B.*, 1872, p. 148 (*N.-W. Provinces*).
562. (418) *Phylloscopus humii humii*. *Hume's Willow-Warbler*.
Reguloides humii, *Brooks, Str. Feath*, vii, p. 131 (1878), (*N.-W. India*).
 Breeding Tianschan and N.-W. Himalayas.
563. (417) *Phylloscopus humii præmium*. *The Crowned Willow-Warbler*.
Mathews and Iredale, Aus. Avian Record, iii, p. 44 (1915), (*Russia*).
 Breeding Siberia to Kamschatka, ? N. Tibet and Ladak.
564. (419) *Phylloscopus humii mandellii*. *Mandelli's Willow-Warbler*.
Reguloides mandellii, *Brooks, Str. Feath*, viii, p. 389 (1880), (*Sikkim*).
 Sikkim E. to Tibet.
565. (420) *Acanthopneuste borealis borealis*. *The Arctic Willow-Warbler*.
Phyllopneuste borealis, *Blas. Naum.*, 1858, p. 313 (*Lake Ochotska*).
 Breeding from Norway to Kamschatka.

566. (420) **Acanthopneuste borealis xanthodryas.** *The Japanese Artic Willow-Warbler.*
Phylloscopus xanthodryas, *Swinh. P. Z. S.*, 1863, p. 296 (Amoy).
 Breeding Japan and Kuriles.
567. (421) **Acanthopneuste nitidus nitidus.** *The Green Willow-Warbler.*
Phylloscopus nitidus, *Blyth, J. A. S. B.*, xii, p. 965 (1843) (Calcutta).
 Breeding Caucasus to Afghanistan and Chitral.
568. (422) **Acanthopneuste nitidus viridanus.** *The Greenish Willow-Warbler.*
Phylloscopus viridanus, *Blyth, J. A. S. B.* xii, p. 967, (1843), (Calcutta and Nepal).
 Russia to Turkestan, N. Kashmir and Tibet.
569. (423) **Acanthopneuste nitidus plumbeitarsus.** *Middendorff's Willow-Warbler.*
Phylloscopus plumbeitarsus, *Swinh., Ibis*, 1861, p. 330 (Taku and Peking).
 Transbaikalia to N. China.
570. (424) **Acanthopneuste magnirostris.** *The Large-billed Willow-Warbler.*
Phylloscopus magnirostris, *Blyth, J. A. S. B.* xii, p. 966 (1843), (Calcutta).
571. (425) **Acanthopneuste tenellipes.** *The Pale-legged Willow-Warbler.*
Phylloscopus tenellipes, *Swinh., Ibis*, 1860, p. 53 (Amoy).
572. (426) **Acanthopneuste lugubris.** *The Dull Green Willow-Warbler.*
Phyllopneuste lugubris, *Blyth, A. M. N. H.* xii, p. 98 (1843), (Calcutta).
573. (428) **Acanthopneuste occipitalis occipitalis.** *The Large Crowned Willow-Warbler.*
Phyllopneuste occipitalis, *Blyth, J. A. S. B.* xiv, p. 593 (1845), (S. India).
 Himalayas.
574. (427) **Acanthopneuste occipitalis coronata.** *Temminck's Crowned Willow-Warbler.*
Ficedula coronata, *Temm. and Schl., Faun. Jap. Aves.*, p. 48 (1847), (Japan).
 East Siberia to Japan.
575. (429) **Acanthopneuste trochiloides trochiloides.** *Blyth's Crowned Willow-Warbler.*
Acanthiza trochiloides, *Sunder., Physio. Saltsakapets Tidsk. i* (1838), (Calcutta).
 W. Himalayas to Sikkim.

576. (429) *Acanthopneuste trochiloides harterti*. *Baker's Willow-Warbler*.
Stuart Baker, Bull. B. O. C. xxxi, p. 36 (1912), (Khasia Hill).
 Mts. South of Brahmapootra.
577. (430) *Acanthopneuste davisoni*. *The Tennasserim White-tailed Willow-Warbler*.
Oates, Hume's N. and E., 2nd. Ed., p. 209 (Tennasserim).
578. (431) *Cryptolopha affinis*. *The Allied Flycatcher Warbler*.
Abrornis affinis (Hodg.) Horsf. and Moore, Cat. i, p. 341 (1854), (Nepal).
579. (453) *Cryptolopha burkii burkii*. *The Black-browed Flycatcher Warbler*.
Sylvia burkii, Burton, P. Z. S., 1835, p. 153 (Himalaya).
 Himalayas to E. Assam, N. and S. of Brahmapootra
580. (432) *Cryptolopha burkii tephrocephala*. *Anderson's Flycatcher Warbler*.
Culcipeta tephrocephalus, Anderson, P. Z. S., 1871, p. 213 (Bhamo).
 Hills of N.-E. Burma.
581. (434) *Cryptolopha xanthoschista xanthoschista*.
Hodgson's Grey-headed Flycatcher Warbler.
Phyllopneuste xanthoschistos, Hodg., Gray, Cat. B. and M. Nepal and Tibet, p. 151 (1846) (Nepal).
 W. Himalayas to Sikkim.
582. (435) *Cryptolopha xanthoschista jerdoni*. *Brook's Grey-headed Flycatcher Warbler*.
Abrornis jerdoni, Brooks, P. A. S. B., 1871, p. 248 (Eastern Himalayas), (Cachar).
 Bhutan to Chin Hills.
583. (436) *Cryptolopha poliogenys*. *The Grey-cheeked Flycatcher Warbler*.
Culcipeta poliogenys, Blyth, J. A. S. B. xvi, p. 441 (1847), (Darjiling).
584. (437) *Cryptolopha castaneiceps*. *The Chestnut-headed Flycatcher Warbler*.
Abrornis castaneiceps, Gray, Cat. B. and M., p 66 (1846) (Nepal).
585. (438) *Cryptolopha cantator*. *Tickell's Flycatcher Warbler*.
Motacilla cantator, Tick. J. A. S. B. ii, p. 576 (1833), (Borabhum, Bengal).

586. (439) **Cryptolopha fulviventor.** *Austen's Flycatcher Warbler.*
Reguloides fulviventor, *Godw.-Aus., J. A. S. B. xliii, pt. ii, p. 167 (Dansiri, Assam).*
587. (440) **Abrornis superciliaris superciliaris.** *The Yellow-bellied Flycatcher Warbler.*
A. superciliaris, Tick., J. A. S. B. xxviii, p. 414 (1859), (Himalayas).
Western Himalayas to Mishmi Hills. ? N. Burma.
588. (440) **Abrornis superciliaris schwaneri.** *The Burmese Yellow-bellied Flycatcher Warbler.*
A. schwaneri, Blyth, ex. Temm. M. S. p. 169 (1870), (Bangermassing, Borneo).
S. Assam, Burma, Siam, Malay Peninsula to Borneo.
589. (441) **Abrornis schisticeps schisticeps.** *The Black-faced Flycatcher Warbler.*
Culicipeta schisticeps, Hodg., Gray. Cat. M. and B., Nepal, p. 67 (1846), (Nepal.)
Himalayas, Garhwal to Assam.
590. (441) **Abrornis schisticeps ripponi.** *Sharpe's Flycatcher Warbler.*
Cryptolopha ripponi, Sharpe, Bull. B. O. C. xiii, p. 10 (1902), (Gyi.-dzin-Sehan).
West Yunnan (? Shan States and Bhamo Hills).
591. (442) **Abrornis albogularis albogularis.** *The White-throated Flycatcher Warbler.*
A. albogularis, Moore, P. Z. S., 1854, p. 106 (Nepal.)
592. (443) **Abrornis flavigularis.** *The Yellow-throated Flycatcher Warbler.*
Godw.-Aus., J. A. S. B. xvi, pt. ii, p. 44 (1877), (Sadiya, Assam.)
593. (444) **Tickellia hodgsoni.** *The Broad-billed Flycatcher Warbler.*
Abrornis hodgsoni, Moore in Horsf. and M. Cat. i, p. 412 (1854), (Sikkim.)
594. (445) **Scotocerca inquieta striata.** *The Streaked Scrub-Warbler.*
Melizophilus striatus, Brooks, Ibis, 1872, p. 180 (Punjab, India.)
595. (446) **Neornis flavolivaceus flavolivaceus.** *The Abernant Warbler.*
N. flavolivacea, Blyth, J.A.S.B. xiv, p. 590 (1845), (Nepal).
Himalayas, Sutlej to Assam and Manipur.

596. (446) **Neornis flavolivaceus intricatus.** *The Shan Aberrant Warbler.*
Hartert, Vog. Pal. p. i, 533 (1909), (Tai-pai-schan).
 Chin Hills to Shan States.
597. (447) **Horornis acanthizoides acanthizoides.** *Verreaux Bush-Warbler.*
Abornis acanthizoides, Verr., Nouv. Arch. Mus. Par. vi,
Bull. p. 37 (1871), (Szetchuan).
 Shan States, China.
598. (447) **Horornis acanthizoides brunnescens.** *Hume's Bush-Warbler.*
Horeites brunnescens, Hume, Ibis, 1872, p. 109 (Darjiling).
 Nepal to E. Assam, Manipur and Looshai Hills.
599. (448) **Horornis fortipes fortipes.** *The Strong-footed Bush-Warbler.*
H. fortipes, Hodg., P. Z. S., 1845, p. 31 (Darjiling).
600. (449) **Horornis albiventris.** *The White-bellied Bush-Warbler.*
Neornis albiventris, Godw.-Aus., J. A. S. B. xiv, pt. 2,
p. 199 (1876), (Manipur).
601. (450) **Horornis pallidus pallidus.** *The Pale Bush-Warb-
 ler.*
Horeites pallidus, Brooks, J. A. S. B. xli, pt. 2, p. 78
(1872) (Kashmir).
 Himalayas to W. Assam, N. of Brahmapoetra.
602. (450) **Horornis pallidus osmastoni.** *Osmaston's Bush-
 Warbler.*
Hartert, Bull. B. O. C. xxi, p. 107 (1908), (Andamans).
 Andamans only.
603. (451) **Horornis pallidipes.** *Blandford's Bush-Warb-
 ler.*
Phylloscopus pallidipes, Blanf., J. A. S. B. xli, 2, p. 162
(1872), (Sikkim).
604. (452) **Horornis major.** *The Large Bush Warbler.*
Horeites major, Moore, P. Z. S., 1854, p. 105 (Nepal).
605. (453) **Horornis cantans canturians.** *The Chinese Bush-
 Warbler.*
Arundinax canturians, Swinh., Ibis, 1860, p. 52, (Amoy).
606. (454) **Phyllergates coronatus.** *The Golden-headed War-
 bler.*
Orthotomus coronatus, Jerl. and Blyth, P. Z. S., 1861,
p. 200, (Sikkim).

607. (455) **Horeites brunnifrons.** *The Rufous-capped Bush-Warbler.*
Orthotormus brunnifrons, Hodg., P. Z. S., 1845, p. 29, (Nepal).
608. (456) **Cettia cetti cettoides.** *The Eastern Bush-Warbler.*
C. cettoides, Hume, Str. Feath. i, p. 194 (1873), (Sind).
609. (457) **Urophlexis squameiceps.** *Swinhœ's Reed-Warbler.*
Tribura squameiceps, Swinh., P. Z. S., 1863, p. 292 (Canton).
610. (458) **Suya crinigera crinigera.** *The Brown Hill-Warbler.*
S. crinigera, Hodg., As. Res. xix, p. 183 (1836), (Nepal).
611. (458) **Suya crinigera cooki.** *Harington's Brown Hill-Warbler.*
Harington, Bull. B. O. C. xxxi, p. 109 (1913), (Thayetmyo). Northern Burma.
612. (458) **Suya crinigera yunnanensis.** *The Yunnan Brown Hill-Warbler.*
Harington, Bull. B. O. C. xxxi, p. 110 (1913), (Yunnan). Yunnan and ? Shan States.
613. (459) **Suya atrigularis.** *The Black-throated Hill-Warbler.*
Moore, P. Z. S., 1854, p. 77 (Darjiling).
614. (460) **Suya khasiana.** *Austen's Hill-Warbler.*
Godw.-Aus., A.M.N.H. (4) xviii, p. 412 (1876), (Shillong).
615. (461) **Suya superciliaris.** *Anderson's Hill-Warbler.*
Anderson, P.Z.S., 1871, p. 212 (Momein, Chinese Frontier).
616. (462) **Prinia gracilis lepida.** *The Streaked Wren-Warbler.*
P. lepida, Blyth, J. A. S. B. xviii, p. 376 (1844), (Indus Valley).
617. (463) **Prinia flaviventris flaviventris.** *The Yellow-bellied Wren-Warbler.*
Orthotomus flaviventris, Deless., Rev. Zool., 1840 p. 101 (Bhutan).
618. **Prinia flaviventris sindianus,** *Ticehurst's Wren Warbler.*
Ticehurst, Bull. B. O. C. Vol. xl. No. cclii. p. 157 (1920), (Sukkur, Sind and N. W. F. Provinces.)
619. (464) **Prinia socialis socialis.** *The Ashy Wren-Warbler.*
P. socialis, Sykes, P. Z. S., 1832, p. 89 (Deccan) South India.

620. (464) *Prinia socialis stewarti*. *Stewart's Ashy Wren-Warbler*.
P. stewarti, *Blyth, J.A.S.B.*, xvi, p. 455 (1847) (*Agra*).
 North and North-East India to Assam.
621. (465) *Prinia sylvatica sylvatica*. *The Jungle Wren-Warbler*.
Jerd., *Madr. Jour. L. S.* xi, p. 4 (1840) (*Seegor, Nūlghiris*)
 Practically all plains India with exception noted below.
622. *Prinia sylvatica valida*. *The Ceylon Jungle Wren-Warbler*.
Drymoica valida, *Blyth, J. A. S. B.* xx., p. 180 (1851).
 (Ceylon.)
 Ceylon only.
- 623 *Prinia sylvatica rufescens*. *The Aboo Jungle Wren-Warbler*.
Drymœpus rufescens Hume, Ibis, 1872, p. 110 (*Mt. Aboo*).
 Mt. Aboo.
624. (466) *Prinia inornata inornata*. *The Indian Wren-Warbler*.
P. inornata, *Sykes, P.Z. S.*, 1832, p. 89 (*Deccan*).
 Practically the whole of India.
625. (467) *Prinia inornata jerdoni*. *The Ceylon Wren-Warbler*.
Drymoica jerdoni, *Blyth, J. A. S. B.* xvi, p. 459 (1847)
 (Ceylon).
 Ceylon only.
626. (467) *Prinia inornata burmanica* *The Chin Hills Wren-Warbler*.
Harrington, Bull. B. O. C. xxxi, p. iii (1913), (*Mandalay*).
 Northern Burma.
627. (468) *Prinia inornata blanfordi*. *The Tennasserim Wren-Warbler*.
Drymœca blanfordi, *Wald, Blyth's B. of Burma*, p. 118
 (1875), (*Thayetmyo*).
 Tennasserim.

(To be continued.)

INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S.

(With 4 Text-figures.)

(Continued from page 269 of Volume XXVII.)

Part IX.

In this part the large subfamily Libellulinae is completed. The genus *Nannophya*, which was omitted in error, is now given, together with the descriptions of two new species of *Lyriothemis* which have been published since this work was begun.

I take the opportunity also of correcting a number of errors which have crept into the text, and amongst these must especially be mentioned that of the malposition of the figures of *Lyriothemis cleis*, *Potomarcha obscura* and *Lathrecista asiatica*.

Genus—LYRIOTHEMIS.

78. **Lyriothemis tricolor**, Ris, Cat. Coll. Selys, pp. 1063-1065. (1916).
Lyriothemis cleis, Ris, Cat. Coll. Selys, pp. 108, 111 (1909).
Lyriothemis cleis, Brauer.

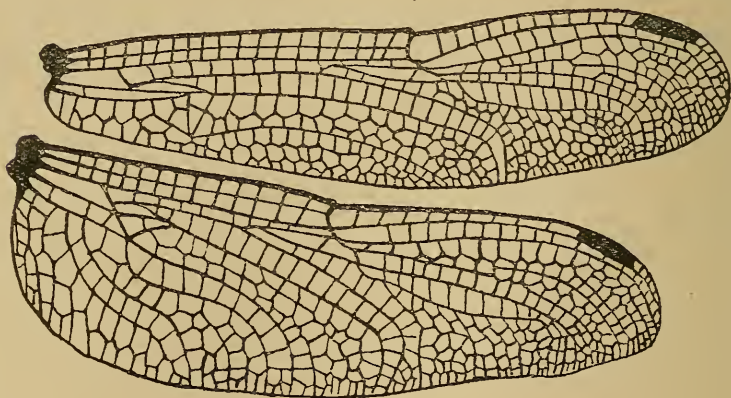


Fig. 68. Wings of *Lyriothemis tricolor*, Ris.

♂ (adult).

Head: labium bright yellow, middle lobe blackish; labrum, face and forehead bright yellow; a metallic, bluish green, nearly quadrate spot on the centre of upper surface of forehead; vesicle metallic, bluish green; occiput bright yellow.

Prothorax black.

Thorax deep mahogany blackish brown with bright yellow markings as follows:—two rather narrow, long, oval, antehumeral spots on the front about midway between the median dorsal carina and humeral suture, the space between them much darker brown than the rest of the thorax, spots on the tergum and two very broad, lateral bands, the posterior of which covers the whole of the metepimeron save for a narrow border behind and below: the legs ringed with yellow at their bases, the legs themselves entirely black.

Abdomen very robust: segments 2 and 3 moderately, dorso-ventrally dilated tapering thence to the anal end, triquetral in cross section: dorsum dark reddish yellow, segment 1 with a transverse yellow stripe, segments 2 and 3 a lighter olive green tint, their bases finely darkened, the greater part of the dorsum of the 9th segment and the whole of the 10th black.

Superior anal appendages small and black, the inferior shorter, only a little shorter than the superior.

Genitalia deep black, closely resembling those of *cleis*, hamules very large, cupped on the ventral surface. Lobe not quite half as high, narrow and pointed.

Wings hyaline, slightly tinted, the apices diffusely brown: in the forewing a brown ray in the costal space not extending quite as far as the first antenodal nervure, a similar ray in the hindwing and a narrow ray in the cubital space: stigma black, about 5 mm. in length: 15 to 16 antenodals in the forewing: an accessory, cubital nervure in the hind: trigones in both wings traversed, the hypertrigone of the forewing only traversed: occasional supplementary nervures to the bridge.

♀ Head: labium black with two small yellow spots at its base: face and forehead pale olivaceous, greyish shades at the anteclypeus and middle of postclypeus: basal mark of forehead nearly black, broader at the sides than in the male.

Thorax as for male except that the dark area on the dorsum is more marked and the antehumeral spots are smaller.

Abdomen very robust, nearly parallel-sided to the anal end, a reddish yellow in colour, the lateral border of segment 3 narrowly black; a moderately broad, dark line on the dorsal carina from the 3rd to the 8th segment; 9th segment black except for a narrow, lateral margin; 10th bright brown, very small.

Anal appendages black.

Wings broader than in the male and reticulation closer, suffused with a dirty yellow, the apices being diffusely brown as far as stigma; the basal marking broader than in the male; the ray in the forewing extends half-way to the 1st antenodal and in the hind as far as that structure; antenodal nervures in forewing 16 to 17; all trigones traversed, the hypertrigone only so in the forewing, supplementary nervures to the bridge and in the hindwing, in the cubital space also.

Hab.—Burma.

79. *Lyriothemis mortoni*, Ris, Cat. Coll. Selys, p. 1065 (1916).

Lyriothemis acigastra, Selys, Odon. des Birmanie (1891).

Calothemis acigastra, Selys, Ann. de Dresden (1878).

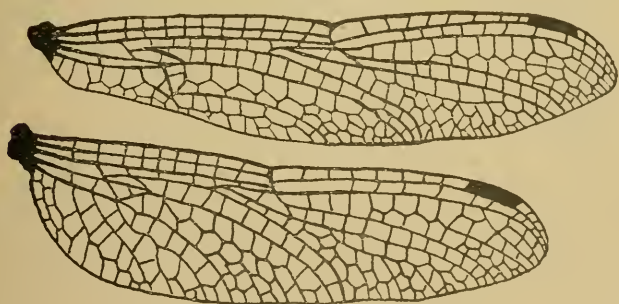


Fig. 69. Wings of *Lyriothemis mortoni*.

This species is described from a single male from Lower Burma. It differs from *acigastra* considerably, by the thoracic pattern being different, the yellow antehumeral spots are not convergent, the humeral stripe is absent so that the characteristic, curved marking of *acigastra* is not present.

The abdomen differs widely in shape, segments 2 and 3 are moderately dorso-ventrally dilated, segment 4 viewed from above is very broad, in profile moderately depressed.

The colour is the same as seen in *acigastra*.

Anal appendages are nearly as long as the combined length of segments 9 and 10, narrow as seen from above, slightly divergent at the base, the ends acuminate, in profile they are curved in a blunt convexity at about their distal third. There is a single small spine before this convexity. Inferior appendages are not quite as long as the superior.

Genitalia: 2nd segment very similar to *acigastra* but the hamules are fissured for rather more than their distal half and the outer border is filled with a bright yellow membrane, the lobe is depressed and narrow.

Hab.—Lower Burma.

Genus—BRACHYTHEMIS.

80. *Brachythemis gestroi*, Selys.

Two females taken at Gauhati, Assam, by Mr. T. Bainbrigge Fletcher, April 1920.

Abdomen 24 mm. Hindwing 31 mm. Expanse 64 mm.

Head: eyes broadly contiguous: vesicle large, rounded: occiput small: suture broad and deep and separating two rounded, finely pitted, horse-shoe shaped areas on the front.

Eyes olivaceous and yellow at the sides and below, a reddish brown cap above: vesicle reddish with a metallic lustre: occiput reddish brown, the area behind bright yellow: upper part of frons metallic blue: labium, labrum and face yellowish with a reddish flush above.

Prothorax with a moderately sized posterior lobe, rather smaller than that of *Sympetrum*, bilobed, but slightly notched. Fringed with a ruff of longish hairs. Ochreous. Thorax bulky, dark olivaceous or brownish yellow with a greenish tinge. Legs blackish brown, the femora ochreous at the base and this turning to brown distally. Hind femora with a row of 7 spines, the distal ones (4) very large, the proximal ones small.

Abdomen tapering from the base to the apex, triquetral, especially in the distal segments. A transverse ridge on the 2nd and 3rd segments, poorly marked ones on the 4th and 5th. Anal appendages robust, conical.

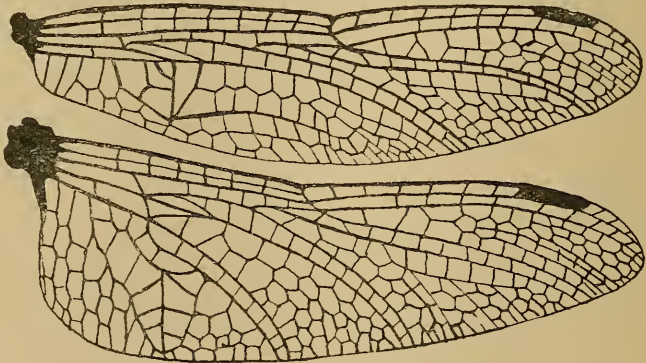


Fig. 70. Wings of *Brachydiplax gestroi*.

Abdomen a golden yellow in colour, the transverse ridges, intersegmental sutures and lateral borders finely mapped out in black. An obscure, diffuse, black, subdorsal fascia which runs from the 4th segment, gradually broadening until it covers most of the 8th and all the 9th and 10th segments.

Wings hyaline, the bases slightly saffronated as far out as the trigones: reticulation close: node slightly proximal to the middle of the wing: trigones in line with one another, that of the hindwing slightly distal to the arc, both entire, that of forewing broad, its costal side about equal to half of its proximal and its distal side angulated outwards: subtrigone of forewing with 3 cells, (in one of the two specimens the basal cell of the subtrigones is traversed by a curved nervure): no supplementary nervures to the bridge: only 1 cubital nervure to all the wings: discoidal field dilated strongly at the termen, begins with two rows of cells for 4 cells outward only, 7 antenodal nervures, the last complete: stigma long (4mm.), that of the hindwing distinctly larger than that of forewing, yellowish: 8th nervure arising from the anal angle of the trigone in the hindwing: only 1 row of cells between Rs and Rspl (5 and 5a): Ms (Msp.) well formed in the forewing only: sectors of arc long in the forewing, lying between the 1st and 2nd antenodals, of greater length in the hindwing.

The large size of this insect at once distinguishes it from all other Indian species of the genus as does also the unicolourous thorax. The general facies resembles an *Orthetrum* or a *Crocothemis* but the 2 rows of cells in the discoidal field will readily distinguish it from both of these, whilst the dilated field will also distinguish it from a *Sympetrum* for which it might be mistaken.

Genus—NANNOPHYA.

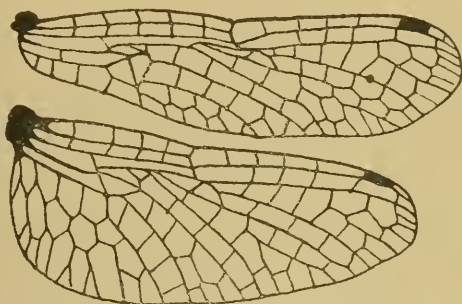


Fig. 71. Wings of *Nannophya pygmaea*, Ramb.

Nannophyæ, Ramb., *Neur.* pp. 26, 27. (1842)—Hagen., *Stett. ent. Ztg.* 10, p. 171 (1849)—Brauer., *Zool. bot. Wien.* 18, pp. 369–726 (1868)—Karsch., *Ent. Nach.* 15, p. 256 (1889).

Nannodythemis, Brauer., *Zool. bot. Wien.* 18, pp. 369–726 (1868).—Kirby., *Trans. Zoo. Soc. Lond.* 12 (1889)—Karsch., *Ent. Nach.* 15, p. 260 (1880)—Kirby., *Cat.* p. 44 (1890)—Tillyard., *Proc. Linn. Soc. N. S. Wales.* 33, p. 444.

Fylla, Kirby., *T. Z. S. Lond.* 12, pp. 259, 313 (1889).

Nannophya, Ris., *Cat. Coll. Selys* (1911).

Head relatively large; eyes fused shortly; forehead projecting but slightly and without any marked foreborder; suture deep; vesicle high, rounded or as a small ridge.

Prothorax with a moderately large posterior lobe, depressed or projecting but slightly and fringed with long hairs.

Thorax rather narrow. Legs small and slim. In the male the hinder femora with small, widely-spaced, evenly-sized spines and with a single longer one at the end; middle femora with fewer but more widely spaced spines. Armature of the female similar in the middle femora, the hind with a row of very long spines. Tibial spines numerous, very long and slim; claw hooks moderately robust.

Abdomen short, dilated at the base, then somewhat fusiform or cylindrical, the end segments being somewhat flattened, 9th and 10th segments very small.

Genitalia, Secondary; lamina flat and depressed; hamules very tiny, the external a slim, black pointed hook, the inner separated from it by a curved fissure, depressed and nearly quadrate; lobe higher than the hamules, projecting and somewhat rightangled, coated with long black hairs.

The female with a robust projecting scale; border of segment not dilated; end of ventral plate broadly rounded, projecting and reaching nearly to the end of the 9th ventral plate.

Wings short, the hind with a broad anal field; reticulation very open, so much so that the trigone is apt to be lost in the general reticulation; trigones of the forewing in line with that of the hind; sectors of arc fused for a long distance in the forewing, the separation abrupt and widely divergent; arc between the 1st and 2nd antenodals; 5 to 6 antenodals in the forewing, the final complete; trigone in the hindwing at the arc or a little distal; 8th nervure (CuI) in the hindwing and forewing widely separated from the anal angle of the trigone; 1 cubital nervure in the forewing, 1 or 2 in the hind; the costal side of the trigone in the forewing broken, the parts on either side of the fracture approximately equal or the proximal part the longer (the bend is usually about the centre or a little distal to it); costal side of trigone in the hind straight or bent, the bend then being further distal; all trigones, hypertrigones and subtrigones in the forewing free; no accessory nervures to the bridge; 1 row of cells between 5 and 5a (Rs and Rspl), the latter, imperfectly developed; 8th (CuI) nervure in the forewing moderately curved; the discoidal field with 1 row of cells at the beginning, dilated at the termen; no distinctly formed loop in the hindwing; stigma small and the membrane very small.

This genus should have been included in the fourth group, following immediately after *Palpopleura* and before *Brachydiplax* and is easily distinguished by the broken costal side of the trigone in the forewing and by the separation of the 8th nervure from the anal angle of the trigone, only 5 to 6 antenodals and the discoidal field with but a single row of cells at its commencement. The small size and the very open reticulation of the wings is another guide.

81. *Nannophya pygmæa*, Ramb., Neur. p. 27 (1842)—Brauer, Zool. bot. Wien. 18, p. 726 (1868)—Selys., Pollen und Van Dam Madago. Sns., p. 18 (1868)—Id. Mitth. Mus. Dres., p. 295 (1878)—Id. Ann. Mus. civ. Genov. 27, p. 460 (1889).—Karsch, Ent. Nach. 15, p. 256 (1889).—Kirby, Cat., p. 45 (1890).—Laidlaw, P. Z. S. Lond. I., p. 72 (1902)—Martin, Mission Pavie. (p. 7. sep) (1914).

Nannophya exigua, Hagen, Stett. ent. Ztg. 28, p. 91. (1867)—Brauer, Zool. bot. Wien. 18, p. 726 (1868)—Selys, Ann. Mus. civ. Genov. 14, p. 305 (1879).

Fylla exigua, Kirby., T. Z. S. Lond. 12, p. 345, tab. 52, fig. 6 (1889).

♂ Bright carmine red; the labium, labrum (which has yellow spots at its middle), a narrow basal line to the forehead, the prothorax, the dorsum of the thorax, the underside of the thorax in its fore half and a moderately broad band on the sides black.

Specimens in the British Museum have the face yellow, the eyes with a red cap to their summit, the vesicle and occiput olivaceous and the sides of the thorax yellow.

Abdomen bright red in the adult or ochreous in teneral specimens, with a small comma-like mark on each segment. The 8th segment black on the dorsum. Anal appendages red or yellow, the superior short and slim, the inferior moderately broad and of the same length as the superior. Legs entirely black,

Wings delicate, the base saffronated, in the forewing as far as the trigone, in the hind as far as the distal side of trigone or a cell beyond. The extent of the saffronation somewhat variable in extent and intensity. Stigma very small, yellow with black borders.

♀ Face and forehead bright yellow, as is also the thorax, the black markings being better defined and broader.

Abdomen reddish brown or ochreous, the segments bordered with black, 2 and 3 having bright yellow, narrow, basal rings.

In the British Museum specimens, the abdomen is yellow and the first 3 segments are without markings, the 4th segment is brown in the middle and with a yellow basal annule and a black, diffuse apical annule, 5 and 6 are similar but the basal annule extends posteriorly on to the sides so that in segment 6, the dorsum appears to have a broad, brown triangle on its dorsum with its apex directed basally. Segments 8 to 10 black.

Genitalia: border of segment 8 undilated: end of ventral plate broadly rounded and projecting, extending nearly to the end of the 9th ventral plate; the two terminal segments very small.

Hab.—N. W. India, Assam and Upper Burma. Dr. Laidlaw has reported it from N. Lakhimpur, Assam (R. Ind. Mus., 1914).

ERRATA AND ADDENDA.

Vol. XXV.

1. Plate I, the cubital space has not been shown in the forewing, compare with the diagram of wing on Plate III.
2. Page 454, line 4 of first para., "160" should read "300".
3. Page 463, line 32, 464, line 10, 465, lines 48 and 54 and page 471, line 4, "ovae" should read "ova".
4. Plate "XI" should read "XII", and on Plate XI, fig. 3 and Plate X, figs. 2 and 4, the antennae which have been drawn filiform, should be clubbed. These antennae will be dealt with separately when dealing with the Gomphines.
5. In the Explanation of Plate XII, "Cordulia" should be "Corduline".
6. In the Explanation of Plate VII, "Argia gomphoides" should be "Indoneura gomphoides".
7. In the Explanation of Plate VI, "E. dispar" should read "P. dispar".
8. In the Explanation of Plate IX, line 3, "E. dispar" should read "P. dispar", and on line 12 "Argia gomphoides" should read "Indoneura gomphoides".
9. On Plate III, the cubital nervure, denoted as "cu" in the explanation, has not been shown in the diagram. It is a short, transverse nervure, crossing the cubital space.
10. On page 610, line 16, for "small" read "anal", and on line 19, for "Cordulinae" read "Cordulinae".
11. On page 615, line 11, delete "Brachydiplax" and add after that line:—
 1. Trigone of forewing with the costal side bent as in Tribe I., only a single row of discoidal cells. *Nannophya*.
 2. Trigone of forewing with the costal side not bent., at least 2 rows of discoidal cells. *Brachydiplax*.
12. On page 618, for line 3 and the remainder of the key, substitute:—

“ ii ” Wings long and broad.
 Subtrigone formed of 2 or 3 cells.
 a. Only 6 antenodal nervures.
 x. Neuration greyish white, almost invisible.
 Stigma bicolorous *Selsiothemis*.
 y. Neuration black and distinct. Stigma unicolorous *Macrodiplax*.
 b. Nearly constantly 7 antenodal nervures . . *Urothemis*.”

13. On page 622, line 29, after "hyaline", add "Apices of wings of male, often diffusely dark brown."

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14. Page 142, lines 27 and 35, for "distal" read "proximal".

15. Page 143, the wings shown are those of *Lathrecista asiatica* and not those of *Lyriothemis cleis*.

16. Page 144, the wings shown are those of *Lyriothemis cleis* and not those of *Potomarcha obscura*.

17. Page 145, line 15, for "no" read "only very occasionally".

18. Page 146, the wings shown are of *Potomarcha obscura* and not those of *Lathrecista asiatica*.

19. On page 147, line 15, for "femoræ", read "femora", and on lines 48 and 49, for "similaris", read "simulans".

20. On page 156, line 32, for "1st and 2nd", read "2nd and 3rd".

21. On page 491, after line 4, put:—

"*Brachydiplax indica*, Kirby.

Brachydiplax gestroi, Selys, Odonates des Birmanie."

22. In the fig. on page 494, the final antenodal nervure in the forewing, should be shown incomplete.

23. On page 497, line 49, for "interior" read "anterior".

24. On page 505, line 50, delete "Western", and for "Bombay", read "Assam".

25. Pages 516 and 517, for "erythoea" read "erythraea".

26. On page 929, delete line 23.

Finally I must correct a statement made in the introduction to the sub-family Libellulinae on page 613 of Vol. XXV. Here I mentioned that the order adopted by Dr. Ris in his exhaustive work on the subfamily, was more for the sake of convenience in classification than for any natural phylogenetic sequence.

This is not so and it is extremely probable that Dr. Ris has followed very closely the actual line of evolution pursued by these insects.

(To be continued.)

ON SMALL MAMMALS FROM THE KACHIN PROVINCE,
NORTHERN BURMA.

BY

OLDFIELD THOMAS.

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I owe to the kindness of the authorities of the Bombay Natural History Society the opportunity of working out two small collections of mammals from the north of Burma, which have been received by them. One was made by Mr. P. M. Leonard in the extreme north and the other by Mr. F. Kingdon Ward a little further south and east, but both in the Kachin Province, the northernmost section of Burma, which runs up between North-Eastern Assam and the Chinese boundary, and is drained by the upper affluents of the Irrawady. All this country is at a very high level—6,000' and upwards.

This region is so little surveyed that the Collectors have found it advisable to record the latitude and longitude of the localities where they obtained the specimens—a most useful proceeding in little known countries.

As might be expected, there are several new forms to be described, notably the pretty flying squirrel I have named after Mr. Leonard, the fine stoat, *Mustela hamptoni*, which represents *M. subhemachalana* in this region, and the large Bamboo-rat, *Rhizomys wardi*, of Imaw Bum.

The two collections coming from one faunal area I have not thought it necessary to make two separate lists, but the specimens are all credited to their respective collectors.

The majority of Mr. Ward's specimens were obtained high up on the great mountain Imaw Bum.

With their usual generosity a first set of the species, and all the types, have been presented to the National Museum by the Bombay Natural History Society.

(1) RHINOLOPHUS LUCTUS, Temm.

♂ 16. Kangfang, Ngawchang Valley, 5,000'.—F. K. Ward.

(2) SOREX BEDFORDIÆ, Thos.

♂ 1. Imaw Bum, 9,000'.—F. K. Ward.

(3) SORICULUS CAUDATUS, Hodgs.

♂ 3, 14. Imaw Bum, 9—11,000' F. K. Ward.

The anterior teeth of these specimens quite agree with those of *S. caudatus*, and equally differ in their small size from those of the Mishmi *S. baileyi*, Thomas.

(4) SORICULUS MACRURUS, Blanf.

♂ 11, 12; ♀ 13. Imaw Bum, 11,000'—F. K. Ward.

The variation in the degree of vaulting of the skull makes me now rather doubtful whether *S. irene* of Szechwan should have been separated from *S. macrurus*.

(5) NECTOGALE SIKHIMENSIS, deWint.

(a) Nani Tamai. Lat. 27-50'. Long. 97-43'—P. M. Leonard.

(b) No. 7 Lat. 27-57'. Long. 97-40'. 4,000'—P. M. Leonard.

(6) PRIONODON PARDICOLOR, Hodgs.

Two native skins. 28 10' N. 97 30'E. and 28 5'N. 97 25'E.—P. M. Leonard.

(7) MUSTELA HAMPTONI, sp. n.

♂ 27. W. Flank of Imaw Bum, 9,000'—F. K. Ward.

(♂ Mogok, Upper Burma, 4,400'. 12 June 1906. Collected and presented by H. Hampton, Esq. B. M. No. 6. 8. 12. 1.)

Nearly related to *M. subhemachalana*, but larger.

General characters very much as in *subhemachalana*, the dull fulvous upper colour (between "cinnamon brown" and "sayal brown" of Ridgway), the scarcely lighter lower colour, the whitish chin, and the cylindrical, black-tufted tail all as in that animal. But the size, as may be seen by the skull measurements below, is so materially larger that the two forms can certainly not be considered the same, while the tail is also longer and its black tuft better developed.

Skull as in *subhemachalana*, but much larger.

Dimensions of the type, succeeded, in parentheses, in the case of the skull by those of a rather younger, but fully grown, male of *subhemachalana* :—

Head and body 304mm ; tail 172, hindfoot 55, ear 29.

Skull, greatest length 61.5 (54.3), condylo-basal length 61.5 (53.5), zygomatic breadth 30 (26.3), interorbital breadth 12.7 (11), mastoid breadth 28.3 (23), palatal length 28.5 (24), length of bulla 17 (15), front of canine to back of M¹ 18.2 (15.4), carnassial, length on outer side 6.8 (6), M¹ 5 (4.7) × 3.5 (3).

Hab. of type Imaw Bum, Lat. 26—10'. Long 98—30'. Alt. 9,000'. Another specimen from Mogok, Upper Burma.

Type:—Adult male. B. M. No. 20. 8. 7. 5. Original number 27. Collected 29th October 1919 by F. Kingdon Ward. Presented by the Bombay Natural History Society.

This fine stoat is clearly distinguished from *M. subhemachalana* by its greater size, and from all the forms of the *M. sibirica* group by its black-tipped tail.

An old male of it in summer pelage was presented to us in 1906 by Mr. H. Hampton from Mogok, but was not distinguished from *M. subhemachalana* until now. As a specimen it is not so suitable to be made the type as that sent by Mr. Ward, but Mr. Hampton should be recognised as the first discoverer of the species.

(8) *MUSTELA STRIGIDORSA*, Gray.

2 ♂ 27°50' N. 97 50' & 97 43'E—P. M. Leonard.

(9) *MUSTELA KATHIAH*, Hodgs.

♀ 13. 27 58'N. 98 36'E. 7,000'—P. M. Leonard.

(10) *PETAURISTA SYBILLA*, Thos. & Wrought.

♂ 4. 27 55'N. 97 40'E. 7,000'—P. M. Leonard.

♂ Burmo-Chinese Frontier Mr. Lewis.

Both essentially similar to Mr. Mackenzie's original specimens from the Chin Hills.

(11) *PTEROMYS ALBONIGER*, Hodgs.

♂ 5, 13 ♀. 6. 28 N. 97 30'E, and near by 6,000'—P. M. Leonard.

(12) *PTEROMYS (HYLOPETES) LEONARDI*, sp. n.

♂ 18. 28 5'N. 97 25'E. Alt. 8,000'—P. M. Leonard.

A small species allied to *alboniger*, but with a striking general resemblance to *Belomys pearsoni*.

Size rather smaller than in *alboniger*. Fur long and fine, hairs of back about 15—16mm. in length. General colour above blackish buffy, the hairs with long blackish slaty bases and buffy tips. Under surface pinkish buffy, the chest and axillary regions white. Edges of parachute broadly black. Face and streaks running up sides of neck clearer buffy. Ears large, about as in *alboniger*, much larger than in the other small species of this region; their bases outside prominently black, and their nearly naked surfaces with minute black lines. Hands and feet blackish, lighter along their inner edges terminally. Tail very thick and bushy; its wool-hairs buffy, its long hairs glossy blackish.

Skull considerably smaller than that of *alboniger*; postorbital processes less developed. Palate unusually arched between molars, its posterior median projection strongly developed.

Teeth far smaller than those of *P. alboniger*, p^1 of normal proportions.

Dimensions of the type, measured on the skin:—

Head and body 180mm.; tail 125, hindfoot 39.

Skull, greatest length (approximate) 43.5; zygomatic breadth 27; nasals 13.5; interorbital breadth 9.5; breadth across postorbital processes 16; intertemporal breadth 10.6; breadth of braincase 21; palatilar length 19.5; tooth series exclusive of p^3 8.4; molars only 6.3.

Hab.—Kachin Province, N. Burma; exact position as recorded above.

Type.—Adult but not old male. B. M. No. 20. 8. 8. 2. Original number 18. Collected 11th January 1917, by P. M. Leonard.

This beautiful little Flying Squirrel is readily distinguished from the majority of the oriental species of *Hylomys* by its comparatively large ears, in which respect it agrees with *P. alboniger*, a larger species with much larger teeth. It has a strong superficial resemblance to *Belomys pearsoni*, but is undoubtedly a *Pteromys*.

It is named after its collector, Mr. P. M. Leonard, to whom the Bombay Natural History Society is indebted for the interesting series of mammals of which it forms a part.

(13) CALLOSCIURUS CASTANEOVENTRIS AQUILC, Wrought.
2 ♂. 27 55'N. 97 40'E. 6,000'.—P. M. Leonard.

The undersurface of this squirrel is of a paler and brighter rufous than that of the nearly allied *C. c. bonhotei* of Sze-chwan.

While making this comparison I have noticed that the squirrel of this group from Sze-chwan referred by Mr. Glover Allen (Mem. Mus. Harvard. XL. No. 4, p. 233, 1912.) to *C. c. bonhotei* is certainly not that form, and needs description. It may be called:—

CALLOSCIURUS CASTANEOVENTRIS GLOVERI, sp. n.

Much smaller than *C. c. bonhotei*. Back paler and more suffused with buffy. Under surface brighter rufous, about as in *aquilo*, this colour running down the legs to the heels. Ears prominently ochraceous, those of *bonhotei* uniformly like head. Tail grizzled greyish, much paler than in *bonhotei*.

Dimensions of the type:—

Head and body 212mm.; tail 195; hindfoot 53.

Skull, greatest length 50.5; condylo-incisive length 45; upper tooth series, exclusive of p³ 9.6.

Hab.—Nagchuka, Western Sze-chwan. Alt. 10,000'.

Type.—Adult female. B. M. No. 13. 9. 13. 3. Collector's number 230, Harvard number 7829. Received in exchange from the Museum of Comparative Zoology, Harvard. Collected 14 August 1908, by W. R. Zappey.

Named in honour of Mr. Glover Allen, in whose excellent paper on Sze-chwan mammals this not unnatural error of determination occurs. With the type and several other specimens before me I have been enabled to correct the naming with confidence.

(14) CALLOSCIURUS QUINQUESTRIATUS, And.

♂ 16, 18 ♀ .13, 15 17, 19. Sima, Myitkyina. 4,500'—
P. M. Leonard.

♂ 4. Naru. 24 58'N. 97 42'E.—P. M. Leonard.

♂ 20. W. Flank of Imaw Bum 26 10'N. 98 30'E.—
F. Kingdon Ward.

The striped undersurface is very variable both in the intensity and in the relative proportions of the black and white lines, the Sima series alone showing all the extremes. Some specimens have very

broad white bands, the white extending along the inner sides of both fore and hind limbs, while in others these bands are narrow and are restricted to the trunk. And the median black line may be either deep black or grizzled grey.

(15) *DREMOMYS PERNYI*, M. Edw.

♂ 18, 19. Imaw Bum. 6—7000'—F. K. Ward.

(16) *TAMIOPS SPENCEI*, sp. n.

♀ 22, 23. 28 22'N. 97 40'E. Alt. 10,000'—P. M. Leonard.

A reddish suffused species with inconspicuous striping and very long fur.

Size about as in *maclellandi*. Fur very long and soft, more so than in any others of the Museum series; hairs of back about 12—13mm. in length, apart from the longer bristle hairs. General colour strongly suffused with dull rufous, not so olivaceous as usual. Striping very little developed, the median black stripe alone definitely developed, and even that rather short. The other stripes only faintly distinguishable as stripes at all, subequal in breadth, the inner one greyish buffy, the next brownish rufous, followed by the broad dull buffy band which represents the usual outer light stripe; this ends behind the shoulders and does not connect with the subocular. Hairs of undersurface dark slaty with dull creamy tips. Crown dull olivaceous. Hairs of ear-tufts black with white tips. Tail hairs ringed with black and dark ochraceous.

Hind-foot of type 33mm.

Hab.—N. Kachin Province, N. Burma, at 28 22'N. 97 40'E. This position would appear to be in the Nam Kiu Mountains.

Type:—Adult female; skin without skull. B. M. No. 20. 8. 8. 6. Original number 22. Collected 30 December 1916.

This seems to be a very distinct species, not nearly allied to other members of *Tamiops*. It is readily distinguished by the extreme inconspicuousness of the striping, the dull rufous suffusion in the general colour and the very long fur. Unfortunately the heads of both specimens have been damaged by shot, so that the face markings are not very visible, and the skulls have been destroyed.

“Shot in snow”.

I have named this pretty species in honour of Mr. R. A. Spence, of Bombay, who is now continuing the onerous but most valuable work of managing the collecting part of the Mammal Survey of India, a duty so long and ably carried on by Mr. W. S. Millard.

(17) *RATTUS NIVIVENTER*, Hodgs.

♂ 17. E. Flank of Imaw Bum range, 8,000'—F. K. Ward.

(18) *RATTUS BOWERSI*, And.

♂ 11, 12.² 14, 15, 16. Kachin Province, 6—8,000'—P. M. Leonard.

(19) *RATTUS EDWARDSI*, Thos.

♂ 17. 28 5'N. 97 25'E., 8,000'—P. M. Leonard.

A great extension of the known range of this species.

(20) *RATTUS EHA*, Wrought.

♂ 5, 21. ♀ 4. Imaw Bum. 26 10' 98 30'—F. K. Ward.

(21) *APODEMUS PECIOSUS ORESTES*, Thos.

♂ 15. ♀ 7, 8, 9, 22, 24, Imaw Bum 8—9,000'—F. K. Ward.

(22) *MICROTUS (EOTHENOMYS) CACHINUS*, sp.n.

♂ 6. ♀ 2. Imaw Bum, 9,000'—F. K. Ward.

Near *M (E) melanogaster eleusis* of Yunnan, but larger and with smaller bullæ.

Colour of type as in *eleusis*, or slightly paler. Ears and feet as in that animal. Tail rather longer.

Skull larger and heavier than in *eleusis*; interorbital region longer and more parallel-sided. Palatal foramina narrowed in their posterior third. Bullæ decidedly smaller than in *eleusis*, an antero-posterior diameter parallel with the middle line of the skull 6 instead of 6.7mm.

Teeth essentially similar to those of *eleusis*, and equally differing from those of other forms by the more complicated m^3 , which has four well developed salient angles on each side. But they are markedly larger.

Dimensions of the type:—

Head and body 108; tail 56; hindfoot 19; ear 15.

Skull, greatest length 26.5; condylo-incisive length 26; zygomatic breadth 16; nasals 8.1; interorbital breadth 4.7; palatal foramina 5; upper molar series (crowns) 6.5.

Hab.:—as above.

Type:—Adult female. B. M. No. 20. 8. 7. 14. Original number 2. Bombay number 1919—221. Collected 29 June 1919, by F. Kingdon Ward.

Distinguishable by its larger size and smaller bullæ from *M. m. eleusis*, the only form of the group which has the same complicated m^3 .

(23) *RHIZOMYS WARDI*, sp. n.

♂ 23, 25. ♀ .26 (skull only) Imaw Bum, 9,000'—F. K. Ward.

Closely related to *R. vestitus* of Sze-chwan, but rather larger and colour darker.

Size distinctly greater than in *vestitus*, as indicated by the skull. General colour as in that animal and similarly without the isolated white hairs characteristic of *R. senex* and *pruinosis*; but the tone is darker owing to the tips of the hairs being sepia instead of "snuff

brown". Colours in other respects quite the same. Tail apparently longer, but the material of *R. vestitus* is deficient in this respect.

Skull in general shape as in *vestitus* but larger throughout, and more heavily ridged. Height decidedly greater. On the occipital plane the lateral mastoid insets are in all cases very much larger.

Dimensions of the type, measured in the flesh:—

Head and body 380mm; tail 95; hindfoot 51; ear 19.

Skull, male type and female paratype, condylo-basal length 84.5, 81.5; condylo-incisive length 84, 80; zygomatic breadth 62, 57.5; mesial height of zygoma 8.5, 8.5; nasals 31×12.2 , 29×11 ; anteorbital foramen 7×7 , 7×6.5 ; greatest breadth on frontals 25; intertemporal breadth 10, 9.6; height of crown from alveolus f m³ 38, 37; occipital plane, height from basion 30, 29.5; breadth 40.5, 38; mastoid inset on occipital plane 13×8.5 , 12.8×7.8 ; palatal foramina 6.5, 6.5; upper molar series (crowns) 15.5, 16.5.

Hab.:—West flank of Imaw Bum at 9,000'.

Type:—Adult, but not old male, the basilar suture still open. B. M. No. 20. 8. 7. 15. Original number 23. Collected 25th October 1919. by F. Kingdon Ward. The female skull old, with closed basilar suture.

This fine animal, which I have great pleasure in naming after its discoverer Mr. Kingdon Ward, is the largest member of the genus. It is most closely allied to the Sze-chwan *R. vestitus*, but may be distinguished by its greater size and different colour and the detailed characters of its skull. The specimens in our series of *vestitus*, are all precisely similar to one another in colour, while among their skulls there are several with closed basilar sutures.

(24) *OCHOTONA ROYLEI*, Ogilv.

♂ 10. Imaw Bum, 9,000'—F. K. Ward.

THE FLORA OF THE INDIAN DESERT.
(JODHPUR AND JAISALMER.)

BY

E. BLATTER, S. J. AND PROF. F. HALLBERG.

PART VII.

With 3 plates.

(Continued from page 279 of Vol. XXVII.)

PART II—(concluded).

ECOLOGICAL NOTES.

Sand Formation.

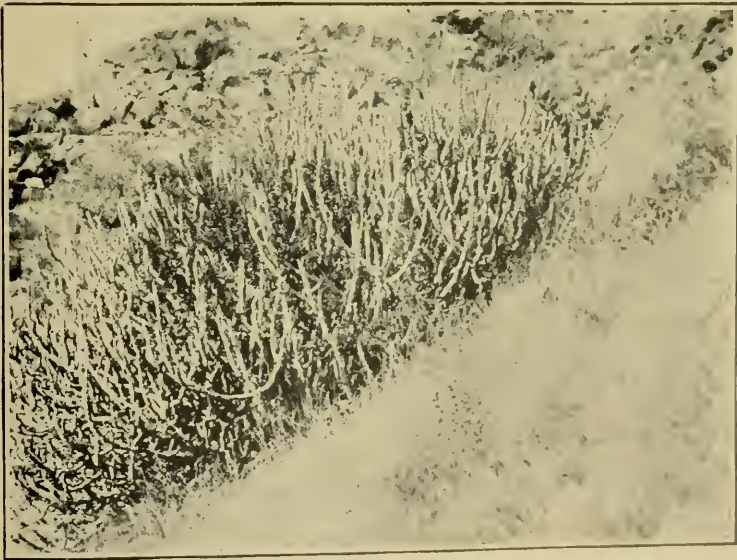
A considerable portion of Western Rajputana is covered by blown sand chiefly consisting of well ground quartz grains, but also of flakes of hornblende and felspar, as well as fragments of the local rocks. In addition, grains of carbonate of lime have been found, some of which are casts of minute *foraminifera*, proving that some of the sand, at least, has been carried by the wind from the distant limestone hills of Cutch. In fact, the whole sand mass is slowly moving in the direction SW-NE, the prevailing winds of the district being the south-west and north-east monsoons, of which the former is the strongest.

The action of the wind on the sand results in the formation of dunes of various shapes, depending on the local configuration of the country, on the variation of strength and direction of the wind, and on the supply of material. Sometimes they form with extreme rapidity, a railway track being covered in a few hours, as often happens south of Phalodi. Sometimes they may be nearly stationary, as in a hollow between two hills, or when protected from the wind by a ridge. Pl. XXXVI-A. shows such a stationary dune at Barmer on which traces of water erosion may be distinguished, and which supports a shrubby vegetation. The lighter patches visible all round the large dune are secondary recent dunes, devoid of vegetation, as is the small sandy river-bed visible to the left. When the leeward slopes of the protecting hill are steep, there is generally a deep trench between the hill and the dune, due to eddy currents, and without vegetation on the sandy side on account of constant shifting. Where the hill-slope is gentle, the protected dune may form close to the slope, as is shown on Pl. XXIV-A. The view is taken towards SW. The dune crest shows clearly a case of reversible action of the wind, and the plant family of *Cyperus arenarius* on the right, previously partly swamped by the reversed crest, is seen recovering the lost ground.

Where a dune is advancing its leeward slopes are invariably steep, and without vegetation, if the motion is rapid enough. If the sand is wet, the grains carried by the wind erode the surface in a curious manner, an instance of which is shown on Pl. I-A. Note the small cubical block of wet sand on the right. That the blown sand is capable of eroding a far harder material as well, may be gathered from Pl. I-B. The photo shows one of several small exposed limestone crags on a wind-swept ridge near Phalodi. The rock is whitish, hard, and fine-grained. The SW surface is sloping, polished, and very finely furrowed longitudinally.



A.—Edge of lime-stone plateau, 2 miles North-East of Jaisainer. *Barleria acanthoides*, *Pappophorum Aucheri*, *Grewia populifolia*.



B.—On rocky hill side at Barmer (Jodhpur State). *Euphorbia neriifolia* associated with *Barleria prionitis* var. *diacantha*, surrounded by low grass.



The opposite side is steep and rough. The most interesting phenomenon, however, is caused by two very hard, flint-like yellowish nodules enclosed in the rock. These show hardly a trace of erosion, and remain sticking out from the polished surface of the rock, causing an eddy to be formed in the sand-laden stream of air. The result is the formation of a smooth cup in the rock in front and on the sides of each nodule, and a sloping central longitudinal ridge behind. This is precisely the same phenomenon as may be observed when an obstacle is placed in a hard snowdrift, which is being acted upon by dry, wind-driven snow.

Another characteristic action of the wind on the surface of the sand is the sorting of the sand particles, resulting in the formation of wind-ripples. Pl. II B. shows a rippled surface of a dune-crest near Loharki. Where these ripples are formed they are in a constant forward motion as long as the wind is strong enough. Under these circumstances, germination of seeds is of course impossible, and the area shown in the photo is totally devoid of vegetation.

The sand formation includes some of the most characteristic associations of the region. It is evident that on a rapidly shifting dune, hardly any plants can obtain a footing (Plates I-A., II-B.). Occasionally, however, even in such places, some of the seeds carried along with the sand are able to germinate during the rainy period, when the sand is less mobile. The character of the seedling will then determine whether the plant is able to develop further, after the sand has become drier. Plate II-A. shows part of an almost bare dune-area, facing NE near Loharki village, on which scattered specimens of the following plants were noted: *Calotropis procera*, *Leptadenia spartium*, *Crotalaria burhia*, *Indigofera argentea*, *Aerua pseudo-tomentosa*, *Citrullus colocynthis*, *Farsetia jacquemontiana*, *Eleusine sp.*, *Panicum turgidum*. This list gives a fair idea of an early stage in the colonisation of a shifting dune. Of the plants mentioned, *Calotropis procera* is perhaps best fitted to survive, being a rapidly growing, coarse shrub very indifferent as to habitat. Plate XXV-A. shows the western slope of a dune near Phalodi, with a pure association of this shrub. *Indigofera argentea* is also a typical dune pioneer (see Plate VII-B., showing the eastern slope of the north-end of the above mentioned dune, colonised exclusively by this plant). It owes its peculiar fitness as a sand-plant to its mode of growth. The thick, woody stem protrudes from the sand a few inches, and supports on its top a crown of twiggy branches, spreading out horizontally. Where, as in the above habitat, the individual plants grow tolerably close, the flat crowns form a layer, preventing the wind from reaching the surface and stirring up the sand to any marked degree. Even if the sand should be disturbed, the naked part of the stem will generally prove tall enough to protect the green crown from being swamped. In addition, the root is a strong, very long tap-root, woody like the stem, and capable of descending to a great depth in search for water.

Where the sand has spread out over a larger, horizontal area, it is soon colonized by the two species of *Aerua*: *Ae. tomentosa* and *Ae. pseudo-tomentosa*. Such an association close to Sodakoer village is shown in Plate XXII-A., and is generally a very noticeable feature in the landscape, on account of the greyish white appearance of the shrubs, as contrasted with the brownish tints of the surrounding gravel area. In the instance in question, the association contains islands of slightly elevated sand-mounds, bearing families of *Capparis decidua*, their elevated position being due to the capacity of the lower, rambling branches of the shrubs to retain blown sand. These families were attacked by the root-parasite *Cistanche tubulosa*, now in flower, which in Plate XXII-B. may be seen breaking through the compact top-layer of damp sand.

On Plate XXXII-A. is shown the edge of the dune area close to Loharki village, which is figured on Plate II. Here a family of *Calotropis procera* has succeeded in colonising not only the thin layer of sand on the plain below, but also the

steep lee-side of the dune, while *Aerua tomentosa* has obtained a footing on the dune-edge itself. A detail of the edge is shown on Plate XV-A., where the two pioneers are joined by *Leptadenia spartium* and *Panicum turgidum*. The former of these plants may also succeed in colonising a bare dune-area, as may be seen on the low dunes along the road from Jodhpur to Kailana. Generally, however, it is a secondary arrival, and is rarely a dominant plant of an association, although it is common. It is apparently absent from the neighbourhood of Barmer. It appears that in the above locality the advance of the dune is actually being checked by vegetation. In the elevated dune-area south of the spot, the sand is already practically subdued (see Plate XV-B.), so that the amount of sand which reaches the edge is insufficient to permit the dune to advance. Thus the only bare or nearly bare area of the dune is a narrow, windswept belt close to the edge (see Plate II), from which the sand is carried out over the plain.

Close on the abovementioned pioneers follows the perhaps most abundant plant of the region, *Crotalaria burhia*, which quickly overruns any sufficiently established sandy area, unless the area in question is too densely covered by pioneer vegetation to resist invasion effectively. A characteristic association of *Crotalaria burhia*, *Leptadenia spartium*, *Aerua pseudo-tomentosa*, and *Panicum turgidum*, covering several square miles of the elevated dune area above Loharki, is shown in Plate XV-B. The grass mentioned is too weak and rambling to be able to resist the wind alone, but appears as soon as the shrubby plants have developed sufficiently to afford it a support. From our observations it appears that the *Crotalaria* is able ultimately to prevail, whenever it has obtained a footing, against the other characteristic sand plants (see Plates VII-A., XVII-A & B., XX-A & B., XXXII-B., XXXIII-B.). This is perhaps the only instance noticed within the region of a plant being able to crowd out others already established.

The above mentioned plants generally grow in large tufts (see Plates XVI, XVII, etc.), separated by bare spaces which now are invaded by other plants. Conspicuous among these are several low-growing species of *Convolvulus*, species of *Polygala*, etc. *Breweria latifolia*, a plant of a habit not unlike that of *Crotalaria burhia*, is often found associated with the latter, especially in the Jaisalmer region, and is a typical sand plant.

Calligonum polygonoides is another plant, chiefly growing on sand, and deserves special notice, because of its remarkable ability of adaptation to diverse circumstances. When growing on dunes it prefers the very crest which it may entirely monopolise. Such a case is shown in Plate XIII, which gives two pictures of the first outlier of the Loharki dune area met with along our route. Parts of the crest of this dune were rapidly changing as may be gathered from Plate I-A. The roots of the stunted *Calligonum* shrubs were sometimes considerably exposed, the finest ramifications, moved by the wind, tracing fine circles in the sand. At the foot of this dune, the usual *Crotalaria*—*Aerua* association was observed (Plate XIV-A., foreground), the *Aerua* extending further up the slope than the *Crotalaria*. Nearer the crest grew a number of grasses, among which we noted *Panicum turgidum* and *Pennisetum cenchroides*, a large *Cyperaceæ* and some specimens of *Indigofera argentea*, together with the rare *Rhynchosia arenaria* (sp. nov.), here observed for the first time.—On Plate XXXI-A. (left), another low dune near Marwar-Lohawat is shown, the crest of which is also clothed with *Calligonum* shrubs. The plant was best developed round Bhikamkor. Plate XXVIII-B. shows a spot near the railway station, where the vegetation consists of a mixture of gravel and sand plants. Here, and especially a little further south along the railway line, where the sand layer on the gravel plain was thicker, the *Calligonum* was abundant, growing in the form of a rounded bush, often reaching 5-6 feet in diameter, having a number of branches, 1-2 inches thick from the base and sometimes being in flower. For the behaviour of *Calligonum* as a climber see under the gravel-formation.

An order of some importance for the process of sand-binding is the *Cyperaceæ*, some of the stoloniferous members of which are able to arrest the advance of a dune more effectively than any other group of plants observed by us. On Plate XXV-A. is shown part of the eastern slope of the north end of the dune 3 miles S W of Phalodi mentioned above. The slope is covered by a dense mat of *Cyperus arenarius*. A similar case is represented in Plate XXIV-A., where a struggle between the same plant and the dune, on the leeward (NE-slope) of which it grows, can be plainly distinguished. The dune has, probably early in the rainy season, made an attempt to destroy the plant family, but failed, so that now the plant has again mounted to the dune crest by means of long stolons. We never observed this species to the windward of a dune; but once a family had established itself on the E—NE-slopes, no other plant seemed to have a chance of invading the same locality.

Among the commonest sand grasses we note several species of *Eragrostis*. Most conspicuous among these is *E. tremula*, a very beautiful grass, which was observed at its best at Osian. *E. ciliaris* is also common, preferably on moist sand. *Cenchrus catharticus* is another common grass, which does not escape notice, owing to its method of seed dispersion. The small spikelets have curved awns, thus readily sticking to the clothes of man or the coat of animals, and being very difficult to remove. We have seen sheep so covered with these spikelets that the animals had to be shorn. *Pennisetum prieurii* has a very similar habit to that of the last plant, but the spikelets lack the curved awns. *P. cenchroides* also grows on sand, and is common all over the region.

Having now described the general aspect of the sand formation, we add a few details from our notes.

The sandy plains round Jodhpur (Plate XVII) have already been mentioned. They extend towards Mandor (Plate VI-A.) and have throughout a very uniform vegetation with *Crotalaria burhia* as predominant plant. On the plain north of Balarwa *Calotropis procera*, *Crotalaria burhia* and *Indigofera ovalifolia* are uniformly distributed, while here and there occur clumps of *Capparis decidua*. Between Balarwa and Osian we have first a plain with *Capparis*, etc., later dune sand. The most conspicuous feature of the vegetation at the time of our visit was here the abundance of a large Compositous plant, with yellow flowers, *Pulicaria wightiana*, which associates with *Crotalaria*, *Aerua*, etc. Round Osian there are a number of low dunes, from which two views taken close to the railway station are shown on Plate XX. The following plants are the commonest: *Leptadenia spartium*, *Zizyphus rotundifolia*, *Capparis decidua*, *Panicum turgidum*, *Cenchrus catharticus*, *Arnebia hispidissima*. The presence of a number of tolerably large shrubs indicates a greater age of these dunes. We noted that *Leptadenia spartium* here had a distinct stem, supporting a fairly large crown, a habit quite different from that of the shrubby plants, branched from the base, invariably observed nearer to Jodhpur (Plate XVI). The abundance of *Calligonum* on the Bhikamkor dunes has already been referred to. In this place, *Cenchrus catharticus* and *Citrullus colocynthis* were also common, while *Crotalaria burhia* and *Indigofera ovalifolia*, as well as *Leptadenia* were far less common than usual. These dunes made the impression of being of a comparatively recent date. We noticed here that the dune sand becomes quite firm when wet and may even support the weight of a man. A short distance W of Bhikamkor there are other dunes without *Calligonum*, but with numerous *Lycium barbarum*. Here *Sericostoma pauciflora* is also common and reaches an unusual size, up to two feet in height and three or four feet across. *Blepharis indica* also occurred in unusually large specimens. In addition, the following plants were particularly noticeable: *Farsesia jacquemontiana*, *Boerhavia diffusa*, and the grasses *Aristida funiculata*, *A. adscencionis*, *Cenchrus catharticus*, *Panicum turgidum*.

Having lost much time at Bhikamkor, we determined not to halt at any other

station before Phalodi, the terminus of the railway. The following notes are thus taken from the train :—

At Sameran station: *Crotalaria burhia*, *Cenchrus catharticus*, *Aerua tomentosa* and *Ae. pseudo-tomentosa*, *Zizyphus sp.*, *Capparis decidua*. The previously very conspicuous *Pulicaria wightiana* is now rare. At mile 55: *Mimosa hamata*. Near Marwar Lohawat tufted grasses occur on the sandy soil, particularly *Andropogon iwarancusa* and *Elionurus hirsutus* (see Plate XXXI-A., foreground). In places the sand threatens to cover up the railway track. Here *Aerua pseudo-tomentosa* is by far the commonest species of its genus. It may be distinguished from *Ae. tomentosa* from a distance by means of the colour of the sepals, which give the inflorescences a pinkish hue. Trees are rare in this neighbourhood. At mile 68: *Aerua tomentosa* again common. At mile 69: *Crotalaria burhia* and *Eleusine sp.* At mile 70: *Mimosa hamata* abundant, and also a very large grass, *Panicum antidotale*, previously noticed at Osian. [At mile 71 on more gravelly soil: *Elionurus hirsutus* and *Eleusine sp.* abundant.] At mile 72: *Calligonum*, *Elionurus hirsutus*, *Pennisetum cenchroides*. At mile 76: *Eleusine sp.*, *Aristida hirtigluma* (chiefly a rock grass), tufts of *Panicum antidotale* and *Pennisetum cenchroides*, both species of *Aerua*. *Calotropis procera* is the commonest shrub up to about mile 77. [Beyond this point the soil again is more gravelly, and *Zizyphus sp.* is predominant up to Phalodi. The grass is here very short.]

The dune vegetation round Phalodi, which shows several beautifully distinct associations, has been described above. North of Phalodi there are large fields of both species of *Aerua*, sometimes mixed, sometimes growing separately. The low dunes met with were overgrown with grasses, *Calligonum*, and *Blepharis sindica*. The road from Bap to Shihad first passes over gravelly ground for about 7 miles. Then follow sandy plains, where *Clerodendron phlomidis* occurs locally, together with *Mimosa hamata* and *Lycium barbarum*; on the roots of some of these shrubs *Cistanche tubulosa* is parasitic. *Calligonum* and *Leptadenia* have entirely disappeared. Large tufts of *Panicum antidotale* mingle with the shrubs. Patches of *Eleusine* families show green among the surrounding stretches of *Aristida mutabilis* and other withered grasses, the resulting association being observed at intervals upto Shihad. In other places, particularly on the drier ridges, where the sand is looser, tufted grasses grow such as *Andropogon iwarancusa* and *Elionurus hirsutus*. *Acacia senegal* occurs here and there on the grasslands, as also does *Grewia populifolia*. A small lily, *Dipcadi erythræum*, now in fruit, is sparsely distributed among the grass. (A bulb flowered in Bombay.) At Shihad the most notable tree is *Zizyphus rotundifolia*. Between Shihad and Loharki, *Leptadenia* again appears, but is not common until nearer to the latter place. *Grewia populifolia* associates with *Clerodendron phlomidis*. About half way, there is a rise in the ground, the soil being firmer and more gravelly. Later sandy soil again predominates, with a vegetation of *Elionurus hirsutus*, mixed with tufts of *Pennisetum cenchroides* and *Andropogon iwarancusa*. *Capparis decidua* is now the predominant shrub. The order *Cucurbitaceæ* is well represented. The sand gets finer as the road descends. *Calotropis procera* becomes abundant, while *Crotalaria burhia* and *Aerua tomentosa* attain an unusual size, associating with *Panicum antidotale*. *Zizyphus rotundifolia* abounds north of the road. The soil then again changes into gravel, often barren, and finally the dune area described above is entered, Plate XIII-B. showing its most eastern promontary. The road winds in and out among the dunes for about two miles, the vegetation consisting chiefly of *Capparis*, *Leptadenia*, *Aerua pseudo-tomentosa*, *Citrullus vulgaris*, *Panicum turgidum* and *Panicum antidotale*. After having passed a few low ridges of reddish clay, the traveller reaches Loharki. The dunes at this place have been described above. About 6 miles west of Loharki, the sand grass flora was well developed. We noted



A.—A large old dune surrounded by smaller ones of younger date East of highest hill near Barmer.



B.—Partial view of hill range in the neighbourhood of Barmer.

Panicum turgidum, *Elyonurus hirsutus*, *Pennisetum cenchroides*, *Andropogon iwarancusa*, all large and tufted, associated with *Aerua pseudo-tomentosa* and *Clerodendron phlomidis*. On the low dunes met with further on, *Rhynchosia arenaria* was common. *Zizyphus rotundifolia* abounds, but prefers gravelly soil (Plate XXIII-A.). The dunes then become almost covered with *Haloxylon salicornicum*, a plant observed only in this neighbourhood. Although abundant on sand, it reaches its best development on gravel, and it will be referred to later under the corresponding formation. It associates with *Crotalaria burhia* and *Aerua tomentosa*. *Capparis decidua* now becomes more common, *Zizyphus* less so. The *Aerua*-association met with near Sodakoer village has been described above. It is surrounded by a belt of *Haloxylon*, showing dark in the distance to the right on Plate XXII-A. Hardly any notes were taken of the vegetation along the road from Sodakoer to Jaisalmer. The most noticeable feature was perhaps the local abundance of *Cassia obovata* on a few dunes about half way.

Some characteristic dune associations near Jaisalmer have been described above. The sandy plains were here very similar to those round Jodphur, *Crotalaria burhia* predominating (see Plate XXXII-B., XXXIII).

Between Jaisalmer and Devikot *Cenchrus catharticus* is common everywhere on sandy soil, but has here a more prostrate habit than in the east. On the Devikot sands, *Lycium barbarum* is conspicuous and often associated with *Capparis decidua* and *Panicum antidotale* (Plate XVIII-A.). About three miles south of Devikot a range of dunes is passed which show many bare, wind-swept slopes with shifting sand, but which are generally covered by *Crotalaria*, etc. *Clerodendron* is common among these dunes, and there are large tufts of *Panicum antidotale*. *Daemia extensa* is often found climbing on the larger shrubby plants. Nearer to Vinjorai village, *Calligonum* and *Leptadenia* grow on dunes. On the sandy plain SE of the village the vegetation consists of *Zizyphus* and *Prosopis*, *Eleusine* sp., *Elyonurus hirsutus* and other grasses, several species of *Heliotropium*, *Mimosa hamata* and *Indigofera ovalifolia*. The two species of *Aerua* are not common here. Below Kotda hill *Calligonum* occurs on sandy ground together with a few *Aerua* families and the grasses *Panicum turgidum*, *Elyonurus hirsutus*, *Pennisetum cenchroides*. On the hill itself a small dune has accumulated on which, curiously enough, *Euphorbia neriifolia* has been able to establish itself. To show how a small dune in a fairly sheltered spot may be invaded by a variety of plants, we give the following list of species observed here: *Calligonum*, *Lycium*, *Capparis*, *Sericostoma*, *Crotalaria burhia*, *Aerua pseudo-tomentosa*, *Tephrosia* sp., *Calotropis*, *Indigofera argentea*, *Citrullus colocynthis*, *Cyperus arenarius*, *Cenchrus catharticus*, *Panicum turgidum*.

Along a sandy dried up river bed at Barmer, *Cadaba indica* and *Salvadora oleoides* abound. They are associated with *Euphorbia neriifolia*, *Commiphora*, *Panicum antidotale*, etc.

Throughout the region, on sufficiently firm, sandy soil, a few peculiar species of fungi were common. The specimens collected have not yet been determined.

Gravel Formation.

We group under the above heading the associations peculiar to the coarser type of sand, or gravel, covering large areas in our region. The fairly sharp distinction between sand and gravel is probably due to the sorting action of the wind, which picks up and transports the grains of the former, depositing them finally in dunes, but which cannot move the pebbles of the latter to any large extent.

Plate XIV-A., taken from an elevated point east of Loharki, gives a good idea of the dreary monotony of a gravel plain. The intervals between the gravel pebbles are large enough to allow the scanty rain water to escape, and with it any chance particles of humus carried to the spot by the wind. The difference

between the sand and gravel, from an ecological point of view, is then, that the capillary cavities between the grains of the former are capable of retaining water, but that the surface layer, as it dries up, is liable to be shifted by the wind; while the surface layer of the latter remains firm, in spite of which it is unsuitable to support vegetation on account of deficiency in water.

From what has been said it is not surprising, that the colonisation of a gravel area is a slow process, and that bare patches, such as are shown on Plate XIV-A., are of frequent occurrence. In this particular case it is possible that another factor has been active, the locality being crossed by several foot-paths, and by the "high-road" from Bap to Jaisalmer visible at the farther edge of the bare area. Plate XIV-B. shows a detail of the habitat mentioned. The surrounding association consists of high, tufted grasses and *Leptadenia spartium*, while on the bare patch itself grow isolated specimens of *Eleusine aristata* and *E. aegyptiaca*, *Aristida mutabilis*, *Fagonia cretica*, *Cleome papillosa*, *Boerhaavia diffusa*. All are common gravel plants, and at least the two last, typical of the formation. *Boerhaavia* is perhaps best adapted, having a strong woody tap-root penetrating to a considerable depth. Its branches are weak and very long, and wither at the end of the rains. Instead of spreading out in all directions, which they of course would do, were there no wind, the branches are kept parallel by the action of the wind, those to windward being thrown right over.

Other typical gravel plants have stiff, more or less woody branches, which lie flat on the ground. An example of this habit is furnished by *Corchorus antichorus* (Plate IV-B.), the branches of which form dense mats, and should be able to resist the long period of drought, producing new leaves during the rainy season. This plant has a tap-root of enormous length. *Setzenia orientalis* (Plate IV-A.), on the other hand, has weak, almost succulent, short branches radiating from a very short central stem, forming a star-like plate on top of the tap-root.

Of other typical gravel plants of the flat-growing habit we note first *Tribulus terrestris* and *T. alatus*, the former being universally distributed throughout the region, the latter rare, and only observed by us in the neighbourhood of Jaisalmer. Further, the following species of *Indigofera*: *I. liniifolia*, abundant in the east along the railway line, absent in the north along our route, *I. trigonelloides*, fairly common in the eastern and northern part of our region, absent in the west, *I. enneaphylla*, a rare plant, only found at Mandor and Balarwa, *I. anabaptista*, common all over the region, formerly supposed to be confined in India to Sind and the Punjab, and to be very rare. At Balarwa all these species of *Indigofera* were associating with *Corchorus antichorus*, the plants giving the ground a peculiar, spotted appearance (Plate XXVIII-A., foreground).

There is also a group of gravel plants with a bushy habit. Here belong the already mentioned *Leptadenia spartium* (also on sand), *Fagonia cretica* (also on rocks), *Cleome papillosa*; further *Breweria latifolia* (also on sand and rocks), *Scricostoma pauciflora*, and most species of *Heliotropium* (Plate XXXIV-A.). *Salvia aegyptiaca*, a shrubby Labiate is typical of the formation, but is absent from the western half of our region. *Blepharis sindica* prefers gravel to other habitats, and is abundant everywhere. The same may be said of *Anticharis linearis*, while *A. glandulosa* var. *cærulea* is rather rare, and only found south of Jaisalmer.

The parasite *Striga euphrasioides* mostly attacks grasses on gravelly soil. The plant was not found between Phalodi and Jaisalmer.

Mollugo nudicaulis and *M. cerviana* are two small annuals growing on fine gravel. They both have rosulate leaves.

A plant with an interesting distribution along our route is *Haloxylon salicornicum*, which we only found in the neighbourhood of Sodakoer. It suddenly appeared a few miles east of this village, often growing on a small mound (Plate

XVIII-B.), probably formed by accumulation of blown sand, which the dense intertwined branches of the shrub prevent from being carried away by rain. The plant, which also grew profusely on the slopes of the low dunes along the road, attained its best development in a dry gravelly river-bed two miles east of Sodakoer (Plate XXX), and was not observed west of this village. In the river-bed referred to we came across a small grove of good-sized *Cordia rothii* (Plate XXX), surrounded by a belt of *Calotropis procera* (Plate XXX-A.). The last mentioned shrub is as common on gravel as on sand (Plate XXXII-A.).

Most trees and shrubs of the region belong to the gravel formation. We note as particularly gregarious *Zizyphus rotundifolia*, which formed quite a forest in a spot between Loharki and Sodakoer shown in the background of Plate XXIII-A.; on the margin of the bare gravel area in foreground of this view stands an isolated specimen of *Prosopis spicigera*, another common tree, of a poor looking habit. It sometimes forms small forests together with *Salvadora oleoides* and *Gymnosporia montana* (Plate VIII-A.), or occurs in shrubberies of *Capparis decidua* (Plate XXVIII-A.). Plate XXVIII-B. shows the scrub vegetation at Bhikamkor, where the soil, originally gravelly, is being slowly covered by dune sand. In this locality, some trees seem to thrive particularly well. An unusually large specimen of *Capparis decidua*, which species generally has a shrubby habit, is shown on Plate IX-A. *Calligonum polygonoides*, in localities such as the above, sometimes becomes a large climber, with a thick stem, and pendulous branches, a habit quite different from the usual appearance of the plant when growing on dune sand. Such specimens are rare, however. Except two at Bhikamkor, only one more was noted, climbing on a *Zizyphus* tree, between Loharki and Sodakoer. One of the former is shown on Plate IX-B. entirely covering the crown of a *Prosopis* tree, and associated with *Cocculus cebacha*, another rambling plant. The smaller trees on the plate are specimens of *Gymnosporia montana*, a good deal larger than usual.

A view of the gravel plain near Jodhpur (towards Kailana) with drifts of sand here and there is shown on Plate VI-B. Perhaps *Leptadenia spartium* is the commonest plant here. The curious habit of this shrub may be made out from Plate XVI; in A. it associates with *Aerua tomentosa*, while in B. it supports a generally prostrate, straggling Compositous plant, *Launcea chondriloides*. The plant is not eaten by animals, and consequently may often be seen protecting other, more palatable species, while close by free growing individuals may be practically eaten up. For a different habit of *Leptadenia*, see under the sand formation.

Eleusine aristata and *E. aegyptiaca* are two grasses, preferring gravelly soil, often, as at Bhikamkor, covering the ground with their scapes, bearing on top the four short spikes in the form of a horizontal cross. *E. flagellifera* is also found on gravel, but more often on sand. *Perotis latifolia* is a rare gravel grass, commonest about Bhikamkor.

Between Phalodi and Bap, the gravel flora consisted first chiefly of *Corchorus anticharis*, *Eleusine* sp., *Crotalaria burhia*, *Indigofera ovalifolia*, *Tephrosia* s. *Convolvulus* sp.; later on, chiefly in the neighbourhood of water holes, of *Bergia odorata*. The *Eleusine* specimens grow unusually tall. Almost bare gravel patches are frequent, on which occur *Cleome papillosa* and *Aristida hystricula*, the latter a pretty grass, growing in small, isolated, shining tufts. The most conspicuous gravel plant between Bap and Shihad is *Blepharis indica*. *Panicum turgidum* was observed growing prostrate on gravel at Loharki, its habit being quite different from that of the straggling individuals so common on dune sand. It had culms about two feet in length, and very small spikes.

Plate III-B. gives some idea of the gravel plain round Jaisalmer, dotted with *Zizyphus* and *Capparis* shrubs. *Setzeniu orientalis* was common here, and *Tribulus alatus* occurred, as well as the much commoner *T. terrestris*.—A small, pretty tufted gravel grass, *Pappophorum elegans*, in habit not unlike *Aristida*

hystriacula but with light green spikes, frequents like the latter, bare grave patches round Jaisalmer and elsewhere. Further away from the town, the plain becomes more sandy (Plate XXXIII-A., on which the Fort may still be distinguished in the distance, and XXXIII-B.).

The flat, gravelly plain near Devikot had in many places been inundated, and here grasses, sedges and species of *Ammannia* grew luxuriantly. Especially was this the case about three miles north of the village, where a shallow, artificial lake had been constructed, now almost dry. *Mimosa hamata* is very common round such places. The gravel vegetation close to the village was well developed. We noted *Heliotropium undulatum* and *Sericostoma pauciflora* (Plate XXXIV-A.), *Boerhaavia diffusa*, *Tribulus terrestris* and *T. alatus*, *Seetzenia orientalis* (Plate IV-A.) The order *Ficoideæ* was unusually well represented. Round Vinjorai, *Blepharis indica* and *Capparis decidua* are common on gravel. SW of Seu village the gravel grass flora is particularly well developed. *Eleusine* sp., *Aristida* sp. and *Chloris pallida*, all low grasses, grow here in large patches, the last mentioned conspicuous because of its whitish, withered spikes. *Striga euphrasioides* abounds here, especially, on moist ground. Along the path towards Kotda, the gravel vegetation becomes more shrubby, and consists chiefly of *Salvadora*, *Capparis*, *Acacia senegal*, *Lycium*, *Zizyphus* and *Calotropis*. Nearer Kotda hill sandy soil predominates.

Rock Formation.

Apart from isolated hills and rocky ridges of no great extent, the following three larger rocky areas were visited by us:—

A. *The Kailana-Jodhpur-Mandor plateau.*

Resting unconformably on the older Malani lavas, there is here an extensive sandstone plateau, rising abruptly from the plain and reaching perhaps 200 feet in height. Jodhpur city is situated close to the southern edge of this plateau (see Plate III-A.), and the Jodhpur-Phalodi railway line follows its eastern margin. Near Kailana, there are some detached outliers. No indubitable organic remains are known from this plateau, but other evidence points to its Vindhyan origin. In all probability the thickness of the deposits must previously have been considerable, and what is left is subject to severe denudation. The rock generally consists of a rather fine, gritty, reddish material, and is an excellent building stone; at the same time it is well suitable for carving, as parts of the imposing Jodhpur Fort testify. Round Mandor the surface of the plateau is often cracked into large rectangular slabs, particularly noticeable in the rocky depressions (Plate XXVII-A.).

B. *Jaisalmer plateau and outliers.*

The town of Jaisalmer is built on an outlier of this plateau, the fort occupying its highest part (see Plate III-B.). The strata, which are highly fossiliferous, are well exposed in many places close to the town. We give the following sections (thickness of strata approximate):—

- (a) Section of the hill with corner-tower of town-wall, east of guest-house.
 1. About 60 feet of yellowish brown sandstone, rather brittle, with large marine shells and (near top) small sea-urchins;
 2. About 35 feet of greyish, harder sandstone, apparently without fossils.
- (b) Section of scarp north-east of guest-house:
 1. About 5 feet of very hard, fine-grained dark brown limestone without fossils, subdivided into several layers by means of thin, interstratified, gritty sheets.
 2. About $\frac{1}{2}$ feet of very hard, dark purplish limestone containing masses of shell-fragments.
 3. About 15 feet of soft, gritty, yellowish brown sandstone, with numbers of marine shells, excellently preserved.
 4. Limestone.



A.—*Euphorbia nerifolia* vegetation on the Barmer hills.



B.—*Barleria prionitis* var. *diacantha* on rock debris near Barmer (Jodhpur State).

The considerable fossil material collected by us (Mollusca, Brachiopoda, Echinodermata) has not yet been worked out, but previous determinations admit of no doubt about the Jurassic age of the strata.

Jaisalmer town is built entirely of limestone from these deposits, and there is hardly a house without beautifully carved doors, or window frames or lattices of some sort. The harder varieties of the stone take a fine polish.

The height of the plateau above the surrounding plain hardly exceeds 100 feet and denudation is very rapid on its margins (see Plate XXXV-A.). Plate VIII-A. gives some idea of the desolate appearance of its surface. Outliers of the plateau are visible in the background of Plate XXXIII-B.

C. Barmer hills.

These are chiefly of volcanic origin, consisting of Malani rhyolites, and reach a considerable height. Near Barmer town (Plate XXVI-B.) the lavas are rather porphyritic, and of a brownish colour. Plate XXXVI-B. gives another view of these hills.

Near the town, at the base of the hills, there is a narrow fringe of sandstones, overlying the lavas, and containing obscure plant fossils and shells. These deposits are of an uncertain age (1).

The three areas mentioned show distinct differences as regards the floristic composition of their associations. Many species occur only in one or two areas, while some are common to all three, but show striking variations in their numerical relations.

One of the most characteristic rock plants is *Euphorbia neriifolia*. This shrub is common in the Jodhpur area, particularly round Kailana lake (Plate V-A.) and on the plateau above Mandor (Plate XXIX-A.). The terraces on the slopes of the above mentioned rocky depression close to the latter place (Plate XXVII-A.) are almost bare except for numerous well developed *Euphorbia* shrubs. Round Jaisalmer the plant is rare, being only observed near Amarsagar (Plate XIX-A.). It becomes extraordinarily abundant in the Barmer region, where it covers whole hillsides (Plate XXXVII-A, XXXVI-B.) The shrub forms a favourite support for a number of climbing and twining plants, such as *Sarcostemma brevistigma* (Plate XXI-A.) and various species of *Convolvulus* (Plate XXI-B.; the shrub in the centre of the *Euphorbia* family is *Capparis decidua*). On Plate XIX-A. the *Euphorbia* specimens support *Rhynchosia minima*, var. *laxiflora*; other plants on this view are *Grewia populifolia*, *Crotalaria burhia*, *Sida* sp., *Barleria acanthoides*, *Aerua tomentosa*, *Tephrosia* sp., *Justicia simplex*, *Eleusine* sp., *Aristida* sp. On Kotda hill the plant is associated with the following species: (1) *Solanum albicaule* (rambling); (2) *Capparis decidua*; (3) *Rhynchosia minima* var. *laxiflora* (twining); (4) *Grewia populifolia*, *Vernonia cinerascens*, *Commiphora*, *Cardiospermum* (twining). *Asparagus racemosus* (climbing); (5) *Salvadora oleoides*; (6) *Vernonia cinerascens*; (7) *Mimosa hamata*. On plate XXXV-B., *Euphorbia* is shown associating with *Barleria prionitis* var. *diacantha*, *Pupalix* sp. (rambling), *Boerhaavia verticillata* (rambling), *Commiphora*. A large shrubbery near Barmer, close to the foot of the hills, consisted of: *Euphorbia neriifolia*, *Solanum albicaule* (rambling), *Mimosa hamata*, *Boerhaavia verticillata* (rambling), *Capparis decidua*, *Panicum antidotale*, *Pupalix* sp. (rambling), *Vernonia cinerascens*, *Barleria acanthoides*, *Gymnosporia montana*, *Calligonum polygonoides*, *Achyranthes aspera* (rambling), and one of the Cucurbitaceæ (climbing).

Barleria prionitis var. *diacantha* (var. nov.) just mentioned as occurring at Barmer was observed in no other locality. Here, however, the plant grew in profusion on the rocky debris of some of the lower hill-slopes, sometimes forming pure associations (Plate XXXVII-B.). *Barleria hochstetteri*, also found at Barmer (on rocks), was observed nowhere else. In the other rocky areas, the genus was

(1) See T. D. LaTouche: *Geology of Western Rajputana*:—Mem. Geol. Surv. of India, Vol. XXXV, Part I.

represented by *Barleria acanthoides*, a typical rock plant particularly abundant round the edges of the Jaisalmer plateau. Here it generally associated with a grass, *Pappophorum aucherii* and a small shrub, *Grewia populifolia* (Plate XXXV-A.). The last mentioned plant, although preferring rocks, also frequents other habitats. Another member of the *Acanthaceæ*, *Ruellia patula* var. *alba*, grows exclusively on rocks. It is absent from the Jaisalmer area.

Cruciferae is a rare order in our region, and represented only by the genus *Farsetia*. Of the two species collected, *F. macrantha* sp. nov. was abundant on the Barmer hills, the only habitat. The order *Violaceæ* is represented by a single species, the rock plant *Viola stocksii*, and this is rather rare, occurring only at Jaisalmer, Kotda and Barmer on our route. It is a poor looking plant not much suggestive of the better favoured members of its genus. *Polygala erioptera*, a plant abundant throughout the region, often occurs on rocks, and so do various *Malvaceæ*. Of the order *Zygophyllaceæ*, the commonest rock plant is *Fagonia cretica* (Plate XXIV-A., XXVII-A.), but it is perhaps as common on gravel.

The order *Geraniaceæ* is represented by *Monsonia senegalensis*; it is, however, a rather rare plant, the best locality observed being the flat top of a small detached outlier of the Jodhpur plateau, along the road to Kailana. On this hill-top (from which the general view shown in Plate VI-B. was taken), the parasite *Striga orobancheoides* was abundant, and had a luxurious, much branched habit; it grew on *Lepidagathis trinervis*, another typical rock plant (Plate XXVII-A.) only observed in the Jodhpur area and at Bhikamkor. The hill top was covered with grasses (*Eleusine aristata* and *E. aegyptiaca*, species of *Aristida*), and *Aerua tomentosa* had been able to establish itself.

Commiphora mukul (Plate VIII-B.) is common enough on the rocky slopes N-E of Jaisalmer, but otherwise rare. It has, like *Euphorbia nerifolia*, been observed supporting *Sarcostemma brevistigma* (Plate VIII-A.).

Of the order *Leguminosæ*, the commonest rock plant is no doubt *Indigofera cordifolia*, which in some places, particularly round Kailana lake, literally coloured the hills gray. It associates with the two above mentioned species of *Eleusine*, and *Aristida funiculata*. The plant is by no means bound to rocky habitats, being equally abundant on gravelly soil. A typical inhabitant of rocky places, however, is *Tephrosia petrosa* (sp. nov.), which is tolerably common in all the three principal areas.

The order *Ficoideæ*, most members of which are gravel or sand plants, is represented, on rocks exclusively, by *Orygia decumbens*. This plant is commonest in the Jodhpur and Barmer areas, being comparatively rare round Jaisalmer, and not observed at all on isolated hills.

Of the *Compositæ*, the most typical rock plant is perhaps *Pegolettia senegalensis*, which occurs throughout the region, but not very commonly. Many species of *Heliotropium* are to be found on rocks, although none exclusively. The same may be said about various species of *Convolvulus*; one new species of this genus, *C. gracilis*, was however only observed on the Barmer hills, where it was quite common.

Salsola foetida was locally common near the top of the highest hill close to Barmer. This plant was otherwise rare, being only observed in two places along the northern part of our route growing on gravel. Another member of the *Chenopodiaceæ*, *Haloxylon recurvum*, is a typical, though rare, rock plant, being only observed on some isolated hills near Vinjorai and Kotda. In the former locality the species associated with the usual rock plants, chiefly with *Orygia decumbens*.

Another rare rock plant is *Schweinfurthia sphaerocarpa* (Plate XXIII-B., (left); *Anticharis linearis*, shown on the same plate, attains its best development on gravel. The very common *Bouchea marrubifolia*, one of the *Verbenaceæ* is a typical rock plant, although rarely observed in other localities.

As might have been expected, the *Cyperaceæ* are almost totally absent from the rocky areas. So much the more abundant are certain grasses, particularly species of *Aristida* (Plate XXII-B.), which at once make their presence known to the pedestrian by means of the troublesome awns attached to the seeds. These often collect in round balls, a couple of inches in diameter, which are carried out across the plains by the wind, a method of seed dispersion efficient enough to account for the great abundance of these grasses. What has just been said does not apply to the very pretty *Aristida hirtigluma*, which is far less common than the other species, and not at all troublesome. Where it occurs in any large quantity, it is very conspicuous, its families shining silvery white in the bright sunlight. Plate XIX-B. shows a small black rhyolite knoll west of Loharki, colonised by a family of this species. It appears, that no other plant can compete with the grass in such a habitat, or rather that the grass is the only plant fit for it. We observed, however, some scattered, often dwarfed specimens of *Fagonia cretica*, *Cleome papillosa*, *Gracilea royleana*, *Aristida hystricula*, *Pappophorum elegans*, *Boerhaavia diffusa*, *Aerua tomentosa*, *Euphorbia* sp., *Blepharis indica*. A similar association with *Aristida hirtigluma* as dominant species was observed from the train 73.5 miles from Jodhpur, west of the railway line, in a similar habitat. On the hills round Bada Bag in the Jaisalmer area the species is common, and also on a low range of hills between Jaisalmer and Devikot. A small isolated lava hill just north of this range was covered with *Fagonia cretica*. *Euphorbia neriifolia*, which is absent on the range mentioned, becomes common south of Devikot.

Of other grasses, *Gracilea royleana* is a pretty little grass, preferring a rocky habitat. *Elionurus royleanus* is common in all the rocky areas. *Oropetium thomæum* is less common. *Tragus racemosus* is rare, chiefly observed round Jaisalmer and at Kailans. *Latipes senegalensis* is another rather rare rock grass, of an unusual habit.

We give a list of the commonest plants observed on rocky ground on Kotda hill: (1) At the foot of the hill, among pebbles, *Eleusine aristata* and *E. ægyptiaca*, *Aristida funiculata* and *A. hirtigluma*, *Gracilea royleana*, *Crotalaria ovalifolia*. (2) In a rocky depression, *Salvadora*, *Acacia senegal*, *Capparis*, *Grewia populifolia* and *G. villosa*, *Blepharis indica*. (3) Higher up *Fagonia cretica*, *Farsetia jacquemontiana*, *Anticharis linearis*, *Cleome* sp., *Tribulus terrestris*, *Polygala erioptera*, *Aristida hystricula*. (4) Nearer to top *Commiphora*, *Barleria acanthoides*, *Lindenbergia urticæfolia*, *Orygia decumbens*, *Ruellia patula*, *Eleusine flagellifera*. Round the village and fort, *Euphorbia neriifolia* (on rock and sand).

A single specimen of the fern *Actinopteris dichotoma* was collected on a hill slope at Barmer.

At Bhikamkor, after heavy rain, evidence of Cryptogamic life was apparent on the rocks close to the station. Minute, black lichens were observed on the stones, and algæ in the form of small gelatinous brown lumps among the grass. liver-wort was also noted.

Ruderal Formation.

Under this heading we bring together various classes of plants, which in one way or another, owe their presence in the region to certain changes brought about by man, excluding cultivated plants in the strict sense.

A. Ruderals Proper.

This group includes plants to be found only in the immediate vicinity of the dwellings of man.

The hard ground within the villages and towns often abounds in species of *Trianthema*. Thus four species, one of two varieties, were found about Jaisalmer town. *T. pentandra* is the commonest species. On the hard sandy and gravelly

soil just west of Loharki, this plant abounded, associated with scattered specimens of *Tribulus terrestris*. Similarly *Trianthema monogyne* and *T. hydaspica* covered large stretches of ground in and near the village of Seu. The latter plant is absent in the east.

We give a list of some other plants frequenting similar localities: various species of *Amarantus*, the commonest being *A. polygamus*; several species of *Corchorus*, *Sida* and *Abutilon*, particularly *A. indicum*; *Solanum nigrum* and *S. xanthocarpum*, the former absent in the west, the latter in the north; *Datura fastuosa*, not very common; *Tephrosia purpurea*, chiefly in the east; *Euphorbia granulata* and *E. microphylla*; *Vernonia cinerea* and *Tridax procumbens*, the former near Jodhpur, Jaisalmer and Barmer, the latter only at Jodhpur; *Aristolochia bracteata* in the south-west; *Zygophyllum simplex*, preferring rocks in or about villages; *Boerhaavia diffusa*, abundant everywhere (indigenous, chiefly a gravel plant); *Eragrostis viscosa* about Jodhpur (several other species of this genus may be counted as ruderals, preferring sandy soil in or about the villages).

The vegetation on the inner slopes of the pond-dam at Bap was characteristic. It consisted of *Trianthema triquetra* and *T. hydaspica*, *Limeum indicum*, *Zygophyllum simplex* and *Salsola foetida* (the last mentioned being a rather rare plant, only observed at Sodakoer, and on the Barmer hills, where it was common locally). At high-water level, there was a line of seedlings of *Eclipta erecta*; this plant, although ruderal, appears to be in great need of water, which is the reason for our describing its behaviour at Barmer under the aquatic formation.

We noted the total absence of several ruderals, abundant in the Deccan, such as *Argemone mexicana*, *Opuntia*, *Saponaria vaccaria* and *Scoparia dulcis*.

B. Weeds of cultivation.

This section consists of plants, unintentionally introduced together with seeds and seedlings of cultivated plants, as well as of indigenous plants, preferring cultivated ground.

(1) Weeds on sandy fields.

These are not many. The commonest is *Diger arvensis* which is, however, absent from the vicinity of Jodhpur. It is probably introduced. *Mollugo hirta* may be referred here. It occurs only in the western half of our region, and is probably also introduced. *Gisekia pharnaceoides*, an indigenous sand plant, prefers cultivated ground.

(2) Weeds on the fields with richer soil within the villages.

Unfortunately there are not many fields with a rich soil to be found. Plate XXVII-B. shows a field at Ba'arwa, entirely covered with *Leucas aspera*, otherwise a rare plant, probably introduced. In the village mentioned, two other species of the genus, *L. nutans* and *L. stricta* were collected, not observed anywhere else. *L. urticæfolia* is a proper ruderal, fairly well distributed, while *L. cephalotes* was only found at Jodhpur and Mandor. Several species of *Alysicarpus*, all introduced, and rare within our region, are found in similar localities.

(3) Weeds of irrigated gardens and fields.

Of these, the introduced *Sesbania aculeata* should be mentioned. *Peristrophe bicalyculata*, probably also introduced, frequents margins of irrigated fields and irrigation channels. Of other plants, belonging here, we note particularly species of *Ammannia* and *Bergia*, also the semi-aquatic ruderal *Eclipta erecta*.

C. Escapes.

One of the most remarkable plants of the region is *Citrullus vulgaris*, the water melon. It grows in almost every field of "Jowari" and "Bajri"

and among other crops. Originally cultivated, it has now completely established itself, and requires no care whatever, preferring however a sandy soil. It is public property, every traveller being allowed to partake of the cooling fruit to his heart's content, and it is indeed very refreshing after a hot camel ride. Several other cultivated members of the *Cucurbitaceæ* seem to establish themselves in the fields, and thrive without being further cared for.

Sesamum indicum, a plant much cultivated in the region (for oil), seems to persist in and spread from a field on which it has been grown. The plant was not observed in the vicinity of the larger towns. We noted it often attacked by a kind of spike-disease.

In the village of Phalodi, we observed two huge specimens of *Tamarix orientalis*, evidently planted, with stems perhaps a yard in diameter. Other trees were seen outside the village. A number of small shrubs and seedlings of this species occurred in the neighbourhood of the parent plants, and appeared to thrive well on sandy ground.

* * * *

Those interested in the agriculture of our region and matters connected therewith are referred to: K. D. Erskine, *The Western Rajputana States Residency and The Bikaner Agency* (Rajputana Gazetteers, Vol. III-A.). The commonest crops observed by us on our route were: the grasses *Pennisetum typhoides* (bajra) and *Andropogon sorghum* (jowar); the pulses *Phaseolus aconitifolius*, *Phaseolus mungo* var. *roxburghii*, *Cyanopsis psoralioides*. *Sesamum indicum* and *Citrullus vulgaris* have already been mentioned as common escapes.

Among the trees cultivated in and round villages we note *Prosopis spicigera* (which when growing near water sometimes loses its spines and becomes quite a fine tree), *Ficus bengalensis* and *Ficus religiosa*, *Zizyphus jujuba*, *Azadirachta indica*, *Poinciana elata*, *Mangifera indica*.

In the irrigated gardens near the principal towns, such as Balsamand (close to the edge of the rocky plateau near Jodhpur), Bada Bag (in a rocky depression in the Jaisalmer plateau, Plate XI), and Amarsagar (near Jaisalmer, Plate XII-B.) are to be found most of the trees, shrubs and herbs commonly cultivated in Western India.

SUMMARY OF THE RESULTS FROM THE INDIAN
MAMMAL SURVEY

OF THE

BOMBAY NATURAL HISTORY SOCIETY.

(BY R. C. WROUGHTON.)

(Continued from page 313 of Volume XXVII.)

APPENDIX.

I think a complete list of the forms (species, sub-species, &c.), obtained by the Mammal Survey to date will be of value to Members in more ways than one. Since the record by me of the result of each collection many alterations have been shown to be required, the present list shows the names as revised to date. A reference to the body of the Summary will show why names have had to be changed, together with references to papers where still further details on the subject are available. From the present list Members can correct their copies of the original Reports if they so wish and can deduce for themselves in what direction help in obtaining specimens is most urgently needed (*vide* para. on DESIDERATA of the introduction to the Summary, Vol XXV. p. 550).

To facilitate reference I give first a numbered list of the collections made and second a complete list of the forms obtained, adding against each the numbers of the collections in which it occurred.

List of the Collections.

- | | |
|-----------------------|--|
| 1. East Khandesh. | 16. Dry Zone, Central Burma
and Mount Popa. |
| 2. Berars. | 17. Tenasserim. |
| 3. Cutch. | 18. Ceylon. |
| 4. Nimar. | 19. Bengal. |
| 5. Dharwar. | 20. Chindwin. |
| 6. Kanara. | 21. Gwalior. |
| 7. Central Provinces. | 22. Koyna Valley. |
| 8. Bellary. | 23. Sikkim.. |
| 9. Mysore. . | 24. Sind. |
| 10. Kathiawar. | 25. Chin Hills. |
| 11. Coorg. | 26. Darjiling. |
| 12. Palanpur. | 27. Bhutan Duars. |
| 13. S. Ceylon. | 28. Kalimpong. |
| 14. Shan, States. | 29. Pegu. |
| 15. Kumaon. | |

List of the forms obtained.

PRIMATES.

Gen.—HYLOBATES.

- H. hoolock. 14. 20. 25.
H. lar. 17.

Gen.—MACACA.

- M. pelops. 23.26.
M. rhesus. 7.15.19.23.26.27.
M. assamensis. 14.16.20.
M. leonina. 20.
M. adusta. 17.
M. sinica. 5.6.8.9.11.22.
M. pileata. 13.18.
M. fascicularis. 17.

Gen.—PITHECUS.

- P. hypoleucus. 11.
P. priam. 13.18.
P. schistaceus. 15.23.
P. melamerus. 14.
P. entellus. 1.2.4.7.10.12.19.
P. ent. anchises. 5.6.8.11.22.
P. femoralis keatii. 17.
P. johni. 11.
P. kephalopterus. 13.
P. ursinus. 18.
P. shortridgei. 20.
P. pileatus. 20.
P. obscurus. 17.
P. phayrei. 16.20.25.29.

Gen.—NYCTICEBUS.

- N. coucang. 17.25.29.

Gen.—LORIS.

- L. lydekkerianus. 9.
L. tardigradus. 18.
L. malabaricus. 11.

CHIROPTERA.

Gen.—ROUSETTUS.

- R. leschenaulti. 11.15.16.17.22.27.28.
R. seminudus. 13.18.

Gen.—PTEROPUS.

- P. giganteus giganteus. 2.3.4.5.7.8.9.10.12.15.18.19.22.23.27.
29.

Gen.—CYNOPTERUS.

- C. sphinx sphinx. 6.9.11.13.14.15.16.18.19.20.23.25.26.27.
 C. sphinx gangeticus. 4.7.12.
 C. brachyotis angulatus. 17.

Gen.—EONYCTERIS.

- E. spelæa. 17.

Gen.—MACROGLOSSUS.

- M. minimus sobrinus. 17.

Gen.—RHINOLOPHUS.

- R. affinis. 20.27.
 R. rouxi. 5.6.9.13.15.18.28.
 R. ferrum-equinum. 23.
 R. lepidus. 6.7.15.16.19.22.
 R. monticola. 15.20.28.
 R. perniger. 14.23.25.
 R. luctus. 17.
 R. beddomei. 6.11.18.
 R. trifoliatus. 17.26.
 R. pearsoni. 15.26.

Gen.—HIPPOSIDEROS.

- H. armiger. 14.15.16.20.25.26.28.
 H. lylei. 14.
 H. lankadiva. 6.7.8.9.
 H. speoris. 5.6.8.9.11.13.18.
 H. larvatus. 14.16.20.
 H. brachyotus. 6.12.18.19.
 H. fulvus. 3.5.6.7.8.9.10.12.13.14.16.17.18.19.20.22.23.24.26.
 27.28.

Gen.—MEGADERMA.

- M. spasma trifolium. 5.6.11.13.16.17.18.20.29.

Gen.—LYRODERMA.

- L. lyra. 1.4.5.6.7.8.9.12.14.15.19.22.23.27.

Gen.—NYCTERIS.

- N. tragata. 17.

Gen.—BARBASTELLA.

- B. darjelingensis. 26.27.28.

Gen.—PLECOTUS.

- P. homochrous. 15.

Gen.—TYLONYCTERIS.

- T. fulvida. 14.17.20.23.25.26.28.29.
 T. aurex. 5.6.11.

Gen.—NYCTALUS.

- N. labiatus*. 25.26.28.
N. joffrei. 25.

Gen.—PIPISTRELLUS.

- P. mordax*. 26.
P. shanorum. 14.
P. ceylonicus chrysothrix. 1.5.8.9.19.22.
P. ceylonicus indicus. 6.11.
P. ceylonicus subcanus. 3.10.12.24.
P. lophurus. 17.
P. kuhli kuhli. 24.
P. kuhli lepidus.
P. babu. 7.26.27.
P. cadornæ. 26.
P. austenianus. 14.
P. paterculus. 14.16.20.
P. coromandra. 2.5.9.11.13.14.15.19.23.26.27.28.29.
P. mimus mimus. 1.2.3.5.6.7.8.9.10.11.12.13.15.18.19.20.23.
 25.27.
P. mimus glaucillus. 24.

Gen.—HESPEROPTENUS.

- H. tickelli*. 5.6.18.19.27.

Gen.—SCOTOZOUS.

- S. dormeri dormeri*. 1.5.7.8.19.27.
S. dormeri caurinus. 3.10.12.

Gen.—SCOTOPHILUS.

- S. kuhli*. 1.3.5.6.7.9.12.14.15.16.18.19.23.27.29.
S. castaneus. 17.
S. wroughtoni. 1.5.6.7.9.10.11.12.15.16.18.19.23.27.29.

Gen.—SCOTEINUS.

- S. pallidus*. 24.

Gen.—SCOTOMANES.

- S. ornatus*. 23.26.

Gen.—MYOTIS.

- M. sicarius*. 26.
M. peytoni. 6.
M. muricola. 17.23.27.
M. caliginosus. 23.
M. siligorensis. 15.

Gen.—LEUCONOE.

- L. hasselti*. 18.

Gen.—MURINA.

- M. aurata. 23.
 M. tubinaris. 25.26.28.
 M. cyclotis. 23.25.26.28.
 M. huttoni. 15.
 M. rubex. 26.

Gen.—HARPIOCEPHALUS.

- H. lasyurus. 26.27.

Gen.—KERIVOULA.

- K. picta. 5.22.
 K. hardwickei. 26.
 K. crypta. 6.

Gen.—MINIOPTERUS.

- M. fuliginosus. 13. 15.16.22.

Gen.—RHINOPOMA.

- R. kinneari. 3.4.10.19.
 R. hardwickei. 3.5.7.8.10.12.19.21.24.

Gen.—EMBALLONURA.

- E. monticola. 17.

Gen.—TAPHOZOUS.

- T. melanopogon. 1.2.4.6.7.8.16.17.
 T. perforatus. 3.10.
 T. theobaldi secatus. 4.
 T. kachhensis kachhensis. 1.3.8.9.10.12.19.23.24.
 T. kachhensis nudaster. 16.
 T. longimanus. 6.7.8.9.12.16.17.19.20.22.29.

Gen.—SACCOLAIMUS.

- S. saccolaimus. 6.18.19.

Gen.—TADARIDA.

- T. tragata. 3.5.9.10.12.24.

Gen.—CHOEREPHON.

- C. plicatus. 17.

INSECTIVORA.

Gen.—TUPAIA.

- T. belangeri belangeri. 29.
 T. belangeri chinensis. 23.27.28.
 T. belangeri siccata. 14.16.20.25.
 T. belangeri tenaster. 17.
 T. clarissa. 17.

Gen.—HEMIECHINUS.

H. collaris. 3.12.24.

Gen.—PARAËCHINUS.

P. blanfordi. 24.

P. micropus. 3.10.12.24.

Gen.—GYMNURA.

G. gymnura minor. 17.

Gen.—TALPA.

T. micrura. 23.26.

Gen.—SORICULUS.

S. nigrescens. 15.23.26.

S. caudatus. 15.23.26.27.28.

S. leucops. 23.

Gen.—PACHYURA. } Not worked out.
Gen.—CROCIDURA. }

Gen.—ANOUROSOREX.

A. squamipes. 25.

Gen.—CHIMARROGALE.

C. himalayica. 23.26.

Gen.—NECTOGALE.

N. sikkimensis. 23

Gen.—GALEOPTERUS.

G. peninsulæ. 17.

CARNIVORA.

Gen.—FELIS.

F. tigris. 6.11.17.

F. pardus. 5.6.9.11.13.14.16.18.19.27.

F. viverrina. 18.

F. ornata. 2.3.10.24.

F. rubiginosa. 5.13.18.

F. bengalensis. 11.14.15.16.17.20.23.25.

F. temmincki. 14.16.

F. affinis. 1.3.4.5.6.7.10.11.12.15.16.18.19.20.22.24.27.28.

F. torquata. 10.

F. caracal. 3.

Gen.—VIVERRA.

V. zibetha zibetha. 20.23.25.26.27.28.

V. zibetha pruinosa. 14.17.

V. megaspila. 16.17.20.

Gen.—VIVERRICULA.

- V. malaccensis.* 3.5.7.10.11.12.13.15.16.17.18.19. 20. 22. 24. 27.
28.

Gen.—PRIONODON.

- P. pardicolor.* 23.25.

Gen.—PARADOXURUS.

- P. crossi.* 7.15.
P. niger. 5.8.11.13.18.19.22.
P. strictus. 23.27.
P. birmanicus. 16,20.
P. ravus. 17.29.
P. aureus. 18.
P. jerdoni. 11.

Gen.—PAGUMA.

- P. leucomystax robusta.* 17.
P. grayi. 15.23.25.
P. larvata intrudens. 14.

Gen.—ARCTOGALLIDIA.

- A. leucotis.* 17.29.

Gen.—HEMIGALUS.

- H. derbianus incursor.* 17.

Gen.—ARCTICTIS.

- A. binturong.* 17.

Gen.—MUNGOS.

- M. auropunctatus.* 27.
M. auropunctatus helvus. 12.19.21.
M. auropunctatus pallipes. 24.
M. nepalensis. 19.
M. birmanicus. 29.
M. mungo ferrugineus. 24.
M. mungo mungo. 19.21.23.27.
M. mungo pallens. 12.15.
M. mungo mœrens. 1.2.3.4.7.10.
M. mungo ellioti. 5.8.9.11.22.
M. lanka. 18.
M. fuscus. 11.
M. flavidens. 13.18.
M. smithi. 7.12.13.18.19.22.
M. vitticollis. 11.
M. urva. 17.23.25.27.

Gen.—HYÆNA.

H. hyæna. 1.3.4.7.15.19.24.

Gen.—CANIS.

C. pallipes. 3.10.19.

C. indicus indicus. 14.15.16.19.20.23.25.27.28.

C. indicus kola. 1.3.4.7.10.12.21.24.

C. lanka. 18.

C. naria. 5.6.9.11.22.

Gen.—CUON.

C. dukhunensis. 2.4.4.7.11.15

C. rutilans. 16.

Gen. VULPES.

V. bengalensis. 1.3.5.7.10.12.15.19.23.24.

V. leucopus. 3.24.

V. montana. 15.23.

Gen.—MARTES.

M. flavigula flavigula. 15.20.23.25.27.28.

M. flavigula peninsularis. 17.

M. gwatkinsi. 11.

Gen.—MUSTELA.

M. subhemachalana. 23.

M. strigidorsa. 25.

M. kathiah. 15.26.

Gen.—HELICTIS.

H. personata. 16.29.

Gen.—MELLIVORA.

M. indica. 3.19.

Gen.—ARCTONYX.

A. collæis. 25.

Gen.—LUTRA.

L. lutra. 11.15.18.23.28.

L. tarayensis. 7.16.20.24.25.

Gen.—AONYX.

A. cinerea. 11.15.16.20.

Gen.—AILURUS.

A. fulgens. 23.

Gen.—URSUS.

U. torquatus. 14.20.

Gen.—HELARCTOS.

H. malayanus. 14.20.

Gen.—MELURSUS.

M. ursinus. 11.13.19.

RODENTIA.

Gen.—PETAURISTA.

P. oral. 2.19.

P. lylei venningi. 16.

P. philippensis. 6.11.

P. lanka. 13.

P. candidulus. 20.25.

P. nobilis. 23.

P. albiventer. 15.

P. sybilla. 17.

Gen.—BELOMYS.

B. trichotis. 20.

Gen.—PTEROMYS.

P. (H). alboniger. 17.20.23.25.26.27.

P. (H). phayrei probus. 16.20.25.

P. (H). belone. 17.

P. (H). spadiceus. 16.

Gen.—RATUFA.

R. indica indica. 5.6.9.22.

R. indica superans. 11.

R. indica bengalensis. 11.

R. indica centralis. 7.11.19.

R. macroura macroura. 18.

R. macroura melanochra. 13.

R. macroura dandolena. 13.18.

R. gigantea. 14.23.26.28.

R. gigantea lutrina. 20.25.

R. phæopepla phæopepla. 17.

R. phæopepla marana. 16.29.

R. fellii. 20.

Gen.—DREMOMYS.

D. lokriah lokriah. 20.23.26.

D. lokriah bhotia. 23.

D. macmillani. 20.25.

D. pernyi. 25.

D. rufigenis opimus. 20.

D. rufigenis adamsoni. 14.16.20.

Gen.—CALLOSCIURUS

C. sladeni sladeni. 20.25.

C. sladeni rubex. 20.

C. sladeni shortridgei. 20.

- C. sladeni millardi.* 20.25.
C. sladeni fryanus. 20.
C. sladeni careyi. 20.25.
C. sladeni haringtoni. 20.25.
C. ferrugineus. 16.29.
C. atrodorsalis atrodorsalis. 14.
C. atrodorsalis shanicus. 14.16.
C. stevensi. 20.
C. crumpi. 23.
C. epomophorus davisoni. 17.
C. erythræus kinneari. 20.25.
C. erythræus nagarum. 20.25.
C. erythræus crotalius. 20.

Gen.—TOMEUTES.

- T. phayrei.* 14.16.
T. pygerythrus pygerythrus. 29.
T. pygerythrus janetta. 16.20.
T. lokroides lokroides. 23.26.27.28.
T. lokroides owensi. 28.
T. mearsi mearsi. 25.
T. mearsi virgo. 20.25.
T. mearsi bellona.

Gen.—FUNAMBULUS.

- F. palmarum palmarum.* 9.
F. palmarum brodiei. 18.
F. palmarum kelaarti. 13.18.
F. palmarum favonicus. 13.
F. palmarum olympius. 18.
F. palmarum bellarius. 5.8.
F. bengalensis. 19.
F. robertsoni. 2.4.7.
F. wroughtoni. 11.
F. tristriatus numarius. 5.6.
F. pennanti pennanti. 1.2.4.5.7.10.15.19.21.22.23.
F. pennanti argentescens. 24.
F. pennanti lutescens. 3.10.12.
F. layardi. 18.
F. kathleenæ. 13.18.
F. sublineatus. 11.

Gen.—MENETES.

- M. berdmorei berdmorei.* 17.29.
M. berdmorei decoratus. 16.

Gen.—TAMIOPS.

- T. macclellandi macclellandi.* 20.23.26.

T. macclellandi manipurensis. 20.25.

T. macclellandi barbei. 14.17.

Gen.—MARMOTA.

M. himalayana. 23.

Gen.—PLATACANTHOMYS.

P. lasiurus. 11.

Gen.—GERBILLUS.

G. gleadowi. 12.

Gen.—DIPODILLUS.

D. nanus. 10.12.24.

Gen.—MERIONES.

M. hurrianæ. 3.10.12.24.

Gen.—TATERA.

T. indica. 1.2.4.7.10.12.15.19.21.

T. sherrini. 24.

T. hardwickei. 5.6.11.22.

T. cuvieri. 8.9.

T. ceylonica. 13.18.

Gen.—BANDICOTA.

B. malabarica. 5.6.7.9.10.11.12.13.18.22.

B. elliotana. 19.27.

B. savilei. 16.

Gen.—GUNOMYS.

G. bengalensis. 15.19.20.23.26.27.28.

G. gracilis. 18.

G. varius. 17.29.

G. lordi. 22.

G. kok. 1.4.5.7.8.9.10.11.12.22.

Gen.—NESOKIA.

N. griffithi. 15.

N. huttoni. 24.

Gen.—DACNOMYS.

D. millardi. 26.

Gen.—RATTUS.

R. validus. 17.

R. nitidus nitidus. 15.23.26.28.

R. nitidus obsoletus. 25.

R. kelaarti. 18.

R. macmillani. 20.

R. rattus tikos. 17.

R. rattus tatkonensis. 20.

Gen.—LEGGADILLA.

- L. platythrix. 1.2.4.5.7.9.22.
 L. sadhu. 3.10.12.
 L. cinderella. 3.
 L. shortridgei. 16.
 L. hanningtoni. 11.
 L. grahami. 11.
 L. gurkha. 15.19.
 L. phillipsi. 2.4.12.
 L. surkha. 8.
 L. siva. 9.

Gen.—MUS.

- M. dubius. 5.6.8.9.10.10.11.12.13.14.15.16.18.19.20.23 25.26.
 27.28.
 M. homourus. 14.15.16.20.23.25.26.27.28.
 M. bactrianus. 24.

Gen.—LEGGADA.

- L. booduga. 1.2.3.4.5.6.7.8.9.10.11.12.13.15.16.18.19.20.21.22.
 25.27.29.
 L. pahari. 23.26.28.
 L. cookii. 14.20.25.
 L. nitidula nitidula. 29.
 L. nitidula popæa. 16.
 L. booduga. 1.2.3.4.5.6.7.8.9.10.11.12.13.15.16.18.19.20.21.22.
 25.27.29.

Gen.—CŒLOMYS.

- C. mayori. 18.
 C. bicolor. 13.

Gen.—VANDELEURIA.

- V. rubida. 15.
 V. dumeticola. 16.23.25.26.27.28.
 V. nilagirica. 11.
 V. oleracea oleracea. 2.4.5.7.10.19.
 V. oleracea spadicea. 12.
 V. oleracea modesta. 15.
 V. oleracea marica. 19.

Gen.—GOLUNDA.

- G. ellioti. 1.2.4.5.6.7.11.15.19.22.27.
 G. newera. 18.
 G. watsoni. 3.10.12.24.

Gen.—CHIROPODOMYS.

- C. peguensis. 17.

Gen.—APODEMUS.

A. sylvaticus rusiges. 15.

Gen.—MICROTUS (ALTICOLA).

M. (A). roylei. 15.23.

Gen.—NYCTOCLEPTES.

N. cinereus. 14.17.

Gen.—CANNOMYS.

C. badius. 20.23.25.26.27.

C. pater. 16.29.

C. castaneus plumbescens. 14.

Gen.—ACANTHION.

A. leucurus leucurus. 1.2.5.9.10.11.12.15.18

A. leucurus cuneiceps. 3.24.

A. hodgsoni. 27.

A. klossi. 16.17.

Gen.—ATHERURUS.

A. macrourus. 17.

Gen.—LEPUS.

L. ruficaudatus. 15.19.21.23.26.27.

L. nigricollis. 5.6.8.9.11.22.

L. singhala. 13.18.

L. simcoxi. 1.2.4.7.

L. dayanus. 3. 10.12.24.

L. mahadeva. 7.

L. peguensis. 16.20.

Gen.—OCHOTONA.

O. roylei. 15.23.

UNGULATA.

Gen.—BIBOS.

B. gaurus. 5.6.11.

Gen.—PSEUDOIS.

P. nahoor. 23.

Gen.—CAPRICORNIS.

C. sumatrensis milne-edwardsi. 17.29.

Gen.—NEMORHÆDUS.

N. goral. 15.

Gen.—TETRACERUS.

T. quadricornis. 2.5.7.

Gen.—ANTILOPE.

A. cervicapra 1.5.10.11.24.

Gen.—GAZELLA.

G. bennettii. 1.3.7.10.21.24.

Gen.—MUNTIACUS.

M. grandicornis. 14.16.17.20.25.

M. vaginalis. 20.23.27.

M. aureus. 2.7.15.

M. malabaricus. 6.11.18.

Gen.—AXIS.

A. axis axis. 5.6.7.11.

A. axis ceylonensis. 18.

Gen.—RUSA.

R. unicolor. 5.11.15.17.18.22.27.

Gen.—MOSCHUS.

M. moschiferus. 23.

Gen.—MOSCHIOLA.

M. meminna. 6.11.13.18.

Gen.—TRAGULUS.

T. ravidus. 17.

T. canescens. 17.

Gen.—SUS.

S. cristatus cristatus. 5.8.10.11.18.20.22.27.

S. cristatus jubatus. 17.

Gen.—DICERORHINUS.

D. sumatrensis sumatrensis. 17.

Gen.—MANIS.

M. crassicaudata. 3.6.8.9.11.13.18.19.

M. pentadactyla. 16.29.

ANGLING AROUND BOMBAY.

BY G. D. TRAYLEN.

Of Votaries of the Rod resident in Bombay, comparatively few practice or give thought to this form of recreation, although excellent fishing is within easy reach of anyone seeking it. It may be that it is not generally known, what fish are to be taken, where to look for them, or what gear to use; others again, may possibly have made an attempt, but owing to their venture having been made at the wrong time and place, results were not conducive to further trial. In as few words as possible I will endeavour to write down my experiences regarding: Firstly, the Fish which may be taken, Secondly, Places where they may be found and lastly, Suitable Tackle, and Lures.

The Bahmin (*Polynemus tetradactylis*), local vernacular, "Raos," comes easily first as a really good fighter who gives excellent sport. He takes the lure with a rush, gives several runs, and is not one's fish until actually in the boat, moreover he is good for the table.

Quoting the late Mr. Afalala, as an authority, "the Bahmin is stronger weight for weight than the Salmon, quite as game and without the vice of sulking".

The Begti (*Lates calcarifer*), local vernacular "Dungara" or "Kajura", known in Southern India as the "Nair" is another excellent sporting fish.

When angling for Bahmin and Begti one occasionally is taken by a "Scer"; this seldom happens, as he rarely comes into the estuaries, but the "Gobra" or Rock Cod, the "Tamas" a species of bream, the "Powla" of the Shad family will take the same lure, a small Shark sometimes bolts the bait, and if too near the bottom, a repulsive species of Eel will intrude, and give some trouble in cutting away and bending on fresh gear. I limit further remarks to the Bahmin and Begti, these two fish being best worth attention.

The Bahmin may be taken anywhere in Bombay Harbour and round the Coast, where a strong current runs over rocks. The Shoal at Sunk Rock Beacon is a favourite haunt, but he will be found off the Prongs Light House and in the openings through the reef which extends from Colaba to Malabar point; at the Kansas Rock or Gull Island, the Shoal at Middle ground Battery, at Tucker Beacon, Hog Island, and as far up as the rocks at the Customs Bundar, Thana, and he no doubt feeds at other places in the harbour where the tide runs strongly over a rocky bottom. Though Bahmin may be present, one never gets a run excepting at the very end of the flow at slack water and during the whole of the Ebb tide.

From August to October he will certainly be in evidence at these times of tide; From November to May he is somewhat irregular in attendance, in June and July he may possibly be present in force, but few would care to venture in the early part of the monsoon, because of Squalls and the heavy combers which roll over the Shoals. Sometimes the Bahmin comes up stream in numbers, and takes voraciously for about an hour or hour and a half, at other times he takes right down to the last of the ebb, so that one need not be discouraged should there be nothing doing for an hour or so after anchoring, for he well repays a little patience. I have already stated that the Begti is occasionally present in Bahmin waters, but in the monsoon months he ascends the creeks and rivers and will be found beyond Kalyan, a good pool for Begti during August and September is near the Railway Bridge over the Ulhas river at Kalyan going north, i.e., towards Titvala, this pool will be seen on the left hand side of the bridge and near the right bank of the river. A deep channel through the rock opens out into a broad reach in appearance somewhat like the neck of a bottle, and the pool is just where the neck joins the shoulder. Unless one has a boat it is better to approach from the left bank and cast from the rocks. A small silvery fish which the native fishermen will procure, or a live prawn, floated

two to three feet beneath the surface are the best baits, although a spoon or silver devon will answer when the stream runs strongly. Heavy fish of 20 to 30 pounds are taken here. Begti frequent many other places on the Bassein Thana Creek, the rocks where the stream narrows near the Collector's bungalow, Goa Bundar, the rocks in main stream Parsick, the small creek which runs under the Railway Bridge at Mumbra and two places further up that creek, one being the rocks opposite Diwa and the other the pool immediately below the stone "bund" rather less than a mile higher up (it is desirable to have a boat to negotiate this creek). In the main stream from Mumbra to Kalyan there are several rocky shoals, notably one about a mile below Kalyan and another close to the new bridge which leads to Bhiwindi. Undoubtedly the Begti is in the river from its mouth to the higher reaches, and many other likely spots might be found by drifting down stream on the Ebb near low water, taking bearings of those places where rocky obstructions create a rapid stream, for Begti appear to feed near the exits of passages through boulders and in the eddies caused by such obstructions.

The question of Tackle is productive of unlimited controversy, most Anglers have their own theories and favourite rods, but it necessarily follows that as all men are not physically the same, a rod which the one handles with ease would be too heavy and fatiguing for another less robust. When fishing from a boat in salt water, rods are subject to rough usage, and unless one is particularly careful, sun, wind and weather plus occasional collision with the boat or its fixtures and, last but not least, the pull of the stream plus that of the fish will speedily put a perfect weapon out of gear.

The ordinary shop "Sea Rod" appears to be made specially for the Cod, Plaice, etc., found in home waters, and is no more suitable for Bahmin and Begti than it would be for Bass. Almost any rod will serve providing it is sufficiently stiff to comfortably carry the weight of sinker and lure plus the pull of the Stream. Without deflecting more than about 300, it should bend throughout its entire length, for many rods I have seen in use have had a good top, but being too stiff in the butt joint the result has been a break when the Bahmin has made one of his sudden rushes, or when giving him the butt prior to gaffing. For preference, I would choose a two jointed rod with whole cane butt and green heart top, in length from 8.6 to 10 feet and sufficiently light to enable one to make a cast of about twenty yards with one hand.

If the corkgrip is tightly wound over for about twenty inches, with strong hemp cord, it makes a firm hold in all weathers. In play it should bend in a half circle or more from butt to top, and not merely from middle to top in the form of a hook with a long shank; the reason for this will be appreciated when one is playing a Bahmin whose steadfast purpose is to run under the boat and cut the line, or bore for the anchor rope to the same end. The Bahmin has no teeth, but his mouth has a hard bony ridge serrated like a file and he is frequently held by one barb of the hook catching under this, it is the spring of the rod which secures the hook hold and the hook becomes free as soon as the net or gaff takes the weight of the fish. Too supple a rod is not desirable for two reasons. 'A' one has to remember that frequently the fish are on feed for only an hour or two hours, and too supple a rod means longer time in getting him to net and many chances are lost. 'B' it is rather a tax on the good nature of one's companion, if fishing in company, it being expedient that all other lines shall be reeled up when a Bahmin is being played. A good Calcutta Ringal (Bamboo) silk lapped in two or three places in each segment, the butt packed and lapped with good hemp cord for about twenty inches, good brass winch fittings and "Snake" rings of copper or brass wire (not iron or steel) will render good service. The winch or reel should have a large drum for rapid recovery of line, Nottingham pattern reels with optional check and line guard are excellent, size not less than four inches and five inches for preference;

brass lining is desirable as it almost eliminates the chances of a jamb. Those Anglers who have reels of the old pattern with small centre spindle, may get useful work from them, if a few yards of stout blind cord are first wound on the spindle before reeling on the backing line. The importance of getting line back *quickly* when the fish rushes towards, instead of from, the boat when struck, is obvious, especially as one does not know whether or not the hook is fairly home or merely engaged with the hard bony ridge he has in lieu of teeth and gums.

It is desirable to pay particular attention to the business end of the line. *Eschew gut and Gimp*, and mount all hooks on fine steel wire, for the Bahmin is an adept at gymnastics and his gyrations are fast and furious in his endeavours to bottom and, aided by the rocks, rub the annoyance from his jaws; he will also bore away head down and repeatedly thrash the trace with his powerful tail. This matter may be considered as of vital importance, for unless a good hook hold is secured, all else is of little consequence. Stout "Eyed trebles" are very satisfactory in use and numbers 3 and 4 the most useful sizes. The hook *must* be stout or it will straighten out in playing an average fish of seven pounds weight. A very useful method of mounting hooks, is to twist a loop in a short length of steel wire, this loop being sufficiently large to pass easily over the eye of a treble and down its shank, the free end of looped wire should be turned twice and secured through the eye of a second treble, so the looped mount should measure over all about one and half inches from top of loop to top of eye, a pair of round nosed pliers is a useful tool for this purpose and also for bending on wire traces to swivels.

In using hooks so mounted, for Bahmin take an unmounted treble we term the Lip hook, pass the loop of *mounted* treble over the eye of lip hook, the trace is attached to this lip hook, one barb of which is passed through the nose of live bait, and one barb of mounted hook is inserted in the side of bait between the pectoral and dorsal fins. The Bahmin invariably attacks the head of live bait, if spinning live or dead bait the loop of a second mounted treble may be passed over the first mounted treble and one barb be inserted in the bait, midway between the Ventral and Caudal fins, so as to curve and to make it spin. This tail hook should always be used from August to November, as Begti and Seer are then occasionally present, and as they make a rear attack, the lure should be so guarded. Without diagrams, this description has necessarily become somewhat lengthy, but I think the importance of a good hook hold is paramount and the merits of this particular method of mounting is, that it is extremely simple and convenient, moreover, one can depend upon it.

For traces, I do not think there is any thing better than steel wire, "Killin" wire is very good, and so is the wire from galvanized steel rope, this may be obtained in all sizes, and a six foot length will provide a number of good traces and hook mounts, besides giving one's servant a little amusement in untwisting and separating it. A useful form of trace is about two feet of stout wire bent on to a double swivel at one end, a single swivel at the other, to the single swivel attach about four feet or less of fine wire the free end being bent on to the eye of the lip hook already described. The Weight or Sinker must not be forgotten, as so much depends upon having the bait at the right depth. The Tide Tables given in the daily papers show the great variations in rise and fall, and the strength of stream naturally varies with the height of tide. A convenient type of weight is an oblong of $2 \times 1\frac{1}{2}$ inches with holes at the two top corners through which a length of line folded to form a six inch loop, one end of the weight, and another loop of about an inch at the other end. The long loop is bent through the double swivel and serves for adding extra weight if required, the free end of casting line is attached to the shorter loop. This form of weight also serves the purpose of an "anti-kinker" which prevent one's line

from twisting. Sinkers may be made of aluminium, brass, and lead; several of different weights are necessary, from aluminium which is extremely light to lead weighing up to six ounces, of course, any other form of sinker will answer the purpose, but the thin metal "anti-kinker" should not be omitted for in practice the comfort of it will be appreciated. Of Lines there are many, a very useful one is a length of about twenty-five yards of number 3 or 4 plaited silk dressed line, bent on to 100 yards of plaited flax backing. One can cast out twenty yards or so of silk dressed line with a turn of the wrist, and the "anti-kinker" referred to above ensures it coming back without twist, every time.

When using live bait, the boat man will procure such in advance or will catch them with hand lines when the boat is anchored at the place one is angling from; it is always expedient to take a few mullet of about four inches, to provide against a shortage of live bait; they are generally procurable in the bazar and may be spun on the same mount. In August and September a four inch Silver Devon or a two inch spoon is possibly the best lure on a strong tide, and live bait or spun mullet if there is a tide of less than six feet. As the bottom over most shoals is particularly rough and scraggy, it is better not to cast when the tide is low and weak, but to use a float to keep one's gear from fouling. The float should be so arranged that it may be easily released when one has a run, a fixed float meaning almost certain disaster.

When the Bahmin is present in force and on the feed, he takes anything going without being particular as to the manner in which it is offered, at other times he has to be searched for and humoured. When the stream is running strongly one has only to pay out line a few yards at a time with a sink and draw motion, the stream carries out the lure, and the Bahmin will make his rush. By this method one is always covering the same stretch of bottom backwards and forwards.

When there are fewer fish about, one needs to cover more ground and search for them, rather than to hang out one line in the hope that he will come along presently—here let me digress with a note of warning; *never to lay down a rod, with a baited line in the water*, unless first taking the precaution of securing the butt, for at any moment a rush may come, and the rod be snatched from the boat. An effective and killing method of searching water may be explained by referring to the dial of a watch and to assume one's boat is anchored in the centre with the stream running strongly towards 12 o'clock; swing in the bait and let out from 20 to 25 yards of line, then with the left hand draw in a yard or so of line at a time with a sink and draw motion, coil up line on seat of boat then cast out about 20 yards or so, so that lure strikes the water at about 7-30. The bait sinks with a curve and then rises with a curve at about 10 and swings round to 12. Recover line as before and try the same cast at 5-30, the bait will sink and rise and continue round to 12 again. If not taken, repeat these casts and in successive throws reduce the radius a yard or so at a time, until all the water in $\frac{3}{4}$ of a radius of about 20 yards near the boat has been tried. If no result, leave line out at 12 o'clock, secure the rod, and rest a few minutes, for it will be fairly safe to assume that no Bahmin are present, otherwise in the area of water covered a touch would be almost certain. Sometimes he takes a devon or spoon immediately it touches water, but in most instances, his rush is made when the lure is rising on the upward curve. One must be particularly careful to *feel* the lure when it is at right angles to the boat, that is about either 9 or 3, as if the current is not strong and the weight is heavy one catches the bottom and this means loss of part of line with its appendages. If one has the bad luck to get so caught, it is sometimes possible to get free, by pulling the line nearly taut and to put the helm over so that the current will swing the boat over the entangled bait, when an upward pull immediately over it, will often effect its release. To get in to the proper position to perform this operation, it may be necessary for the

boatman to unhitch and pay out a few more yards of the mooring rope, and it is expedient to be sure this means is provided for when anchoring, as some boatmen would let out all the cable at the start.

Occasionally one will observe Bahmin rising and swirling all round the boat and yet not get a run, at these times plenty of natural food may be in the water, and he has no use for one's carefully prepared lure, however a nice prawn or a small spoon or Silver Devon cast at right angles to the boat, will sometimes induce him to make a mistake.

Sea water is particularly rough on tackle ; on returning home it is a good plan to drop all hooks, traces and artificial baits into a basin of water in which a little common washing soda has been dissolved ; after a few minutes, remove, drain and hang up to dry, then oil and put away for further use. Line should be reeled off into a tub of fresh water, be left to soak for half an hour and then be drawn through the hand to remove as much water as possible and afterwards be wound on a line-drier and then be left in a draught until dry ; unless this is done, line quickly rots. Rusty steel mounts and traces are not safe to use, nothing will emphasise this more forcibly than the loss of a fish which has made a good fight and in the end has gained his freedom through defective tackle.

In conclusion, I might say, few boat-men can be trusted to use the gaff; in spite of coaching they *will* strike at, instead of pull into, the fish. They make better use of a landing net. The average weight of Bahmin taken in the Estuary is seven pounds and fifteen pounds is the limit, out at sea they run heavier. The tackle described and methods of use are not claimed as being the best, they are at least effective in all round practice and ensure sport. At Sunk Rock, one may often observe the Light-keepers haul in fish after fish, by means of a stout pole with a length of signal line to which is attached a yard of stout brass wire, and for lure a six inch Silver Devon ; they are out to catch, and the fish has no chance, but is simply hauled round to the net if well hooked. Any one with almost any sort of tackle will catch Bahmin at times, but there is little satisfaction in going for them with gear which would hold a whale. The Bahmin is a really good sporting fish, he stands up to one and fights to the last and there is satisfaction in knowing that the light strong tackle one is using takes fish when coarser gear does not ; moreover, after playing a fish he sometimes gets the best of it and is never ours until he lays kicking in the bottom of the boat, his big eyes seeming to express astonishment at finding himself there. A blow on the head puts him out of his misery, and it is well to remember this, especially if a "Gobra" comes to the net, as this fish lives for some hours out of water and one is apt to regret should he be found gasping in the basket when arriving on shore. Bahmin, Begti, Seer and Gobra are quite good for the table, one's friends appreciate *freshly caught* fish and when a good catch has been made there are Hospitals and other Institutions where such gifts are welcome, thus we may have the satisfaction of knowing that although our sport has entailed the taking of life, the victims have in the end fulfilled their natural destiny.

A LIST OF DRAGONFLIES FROM MAHABLESHWAR.

BY MAJOR F. C. FRASER, I.M.S.

I believe that I am correct in saying that the Mahableshwar Hills have not yet been worked for Dragonflies, so profiting by an enforced stay in India owing to having been granted Home leave, but no passage wherewith to avail myself of it, I decided that it would help to pass away the weary period of waiting if I made a short odonatological survey of the above mentioned Hills.

The period embraced was from the 20th April to the 1st May which being the ultra dry season, it must be confessed, was not the best possible time of the year for such a survey. However the amateur collector in this country can never be more than an opportunist as he is transferred far too often ever to be able to make a complete pro-annual survey of any district.

Mahableshwar, in spite of its high annual rainfall, is singularly dry and the only water I found was a small, rather dirty, artificial lake used exclusively as a dhobikhanah and a stream which resulted from the water percolating through the band which encloses the lake to the west.

This stream meanders for but a short distance in the dry season and may be said to terminate at Lingmala, two miles from Mahableshwar, where the water, if the stream has not run dry (The bed of the stream was dry this year at the foot of the Falls) topples over into the ravine at the head of the Yenna Valley.

Only one species appears to breed in the lake, but most of the other dragonflies breed in the stream whilst a few ascend from the plains below.

A break in the river at Lingmala, a height of about 4,000 feet, creates a gap between the fauna of the hills and that of the plains and also apparently isolates a number of plain species which have followed up the retreating line of water as the stream fails from below upwards. This following up of the retreating line of water probably accounts for so many of the plain species enumerated below, attaining to such great altitudes, which in many cases is more than double that of any previously recorded.

Their isolation is important as it should eventually lead to some differentiation and specialisation, but except for a local race of *Aciagrion hisopa* and a brilliantly coloured form of *Orthetrum chrysostigma*, I failed to find any sign of this taking place at present. It is possible however that a new *Caconeura* which I found to be moderately common along the aforementioned stream, is an offshoot of a form common to the Southern Hills and Ceylon. This new species I have named after Dr. Annandale, the present Director of the Zoological Survey of India.

SYSTEMATIC.

Aeshninae.

1. *Anax guttatus*, Burm. Only 3 males seen, 2 of which were hawking over the stream and the third was settled on a tree bordering the road above the lake.
2. *Anax immaculifrons*, Ramb. Very plentiful, indeed more so than I have ever seen it elsewhere, a circumstance which is probably due to the confined limits of its breeding places.

Many males were seen at any one time and females which are usually rare, could quite occasionally be seen in the act of ovipositing. They were so shy and wary that it was only by taking an unfair advantage of them as they were partially

submerged in the act of ovipositing, that I managed to take three specimens. In every case the male attended the female, hovering in the air about a foot above it and driving off other covetous males. The capture of the females quite failed to scare away the protecting males, which with fine courage returned again and again to the spot until their very persistence invited capture.

The dimensions of this fine insect are as follows :—

Male: length 77 mm., expanse 110 mm., hindwing 52 mm., abdomen 52 mm., antenodal nervures to forewing 17/18, hindwing 11/14. Female: length 82 mm., expanse 128 mm., hindwing 60 mm., abdomen 57 mm., antenodal nervures forewing 21/23, hindwing 15/16.

Gomphinae.

3. *Ictinus*, sp. One male seen along stream. It was probably *I. rapax*.

Libellulinae.

4. *Potomarcha obscura*, Ramb. Only a few specimens seen which were perched on twigs in jungle below the lake band.
5. *Orthetrum sabina*, Drury. A few specimens in reeds and grass along the river banks.
6. *Orthetrum chryso stigma*, Brauer. Moderately common along river banks in the upper reaches of the stream and especially so in a swamp below the lake band. Adult males were a bright blue all over but younger specimens had the thorax pale olivaceous green marked with black. The species was frequently seen pairing and ovipositing in the stream.
7. *Orthetrum pruinatum neglectum*, Ramb. Several males seen along upper part of stream, all freshly emerged and not markedly pruinosed.
8. *Diplacodes trivialis*, Ramb. Very common everywhere about the hills, settled on the ground or hovering close over its surface on roadsides, in open waste places and more rarely in the jungle. Only a few were seen along the course of the stream but it was common on the shore of the lake. Old specimens were markedly pruinosed, the eyes were a deep ultramarine blue and the stigma was blue from pruinescence.
9. *Neurothemis intermedia intermedia*, Ramb. Common in the jungles, usually settled amongst grasses or reeds.
10. *Crocotthemis servilia*, var *erythraea*, Fabr. Only a few males seen of this yellow variety and these usually around the shores of the lake.
11. *Trithemis aurora aurora*, Burm. A few of either sex seen over a pool at Lingmala, 4,000 ft. This was the extreme limit of the water and that the insect was not seen further up the stream, seems to prove that it had followed up the retreating water and thus attained to an extraordinary altitude for such a typical plain species.
12. *Trithemis festiva*, Fabr. Common along the stream. Several adult males were seen strikingly marked with yellow on the abdomen and in only a few of the adults were these markings fully obsolete.
13. *Trithemis kirbyi kirbyi*, Selys. Four males only seen, one of which was on the road side immediately below the lake band and the others sporting themselves on the trap rock above the Lingmala Falls. They were very wary as usual and I failed

to catch any. The orange fascia on the wings was very extensive and combined with the brilliant red of the body, rendered the insect a most conspicuous object.

14. *Trithemis pallidinervis*, Kirby. Only a single female taken which was perched on a twig on the lower slopes of Connaught Peak 4,300 feet. No others were seen, the occurrence of this insect at such an extraordinary altitude must be very rare.
15. *Bradinopyga geminata*, Ramb. Only a single female seen which was occupying a typical situation for this insect, on trap rock. Its cryptic colouring harmonised so well with the grey granite that had it not shifted its position I should have failed to notice it.
16. *Pantala flavescens*, Fabr. Moderately common. Usually seen hovering over roads and open spaces throughout the hills. I saw one in the Gymkhana garden one evening, hawking mosquitoes until it was quite dark.
17. *Tramea limbata*, Ramb. Not common. A few specimens seen in company with *Pantala* in similar situations to that insect and a single specimen taken beside the stream. The ground colouring of the abdomen in this male was more nearly crimson than reddish-brown. The basal wing marking was simple.
18. *Tramea basilaris burmeisteri*, Burm. Common in company with *Pantala*. A very familiar insect along all the roads in Mahableshwar.

Corduliinæ.

19. *Epopthalmia*, sp. Several specimens seen, usually flying high or swiftly along the roads or in open spaces in the jungles. I failed to take any but they appeared to be *E. frontalis*.
20. *Macromia cingulata*, Ramb. Several seen but only one male captured. The dimensions and appearance of this specimen compare closely with my specimens taken in Poona and are as follows:—

Length 61 mm., hindwing 37 mm., abdomen 45 mm. antenodal nervures to forewing 12, hindwing 8. Stigma black. Costa black for its inner three quarters. In addition to the usual markings on the abdomen, there is a moderately large, basal, lateral bordering spot of yellow on the 9th segment.

Libellaginæ.

21. *Rhinocypha bisignata*, Selys. Only 3 specimens seen, 2 males and a female, taken over a pool at Lingmala. They do not differ more from type than can be explained by the usual slight variations inherent in members of this sub-family. This species is usually taken at an altitude of from 2,000 to 2,500 feet, whereas Lingmala is at an altitude of 4,000 feet.
22. *Ceriagrion coromandelianum*, Fabr. Only a single specimen seen, a male which was settled on grass beside the stream.
23. *Agriocnemis pygmaea*, Ramb. Uncommon. A few males and a female taken over a shallow pool beside the road, immediately below the lake band.
24. *Ischnura aurora*, Brauer. Not uncommon amongst low grass and herbage beside the upper part of the stream. In all the males, there is a triangular or oval, black spot at the apex of the 6th abdominal segment which may or may not be connected to the apical, black ring. At the base of the 8th segment, there is

a black, triangular marking and in some specimens the apex of the 7th segment bears a blue annule, incomplete in the middle of dorsum. This blue annule in one specimen, is indicated by two minute blue spots lying within the black, and there are two similar spots of blue lying within the black on the dorsal surface of the 10th segment.

25. *Pseudagrion decorum*, Ramb. Only a single female seen, no males seen or taken.
26. *Pseudagrion hypermelas*, Selys. Moderately common along the upper reaches of the stream.
27. *Aciagrion pallidum*, Selys. One female taken in dense jungle near the upper part of stream.
28. *Aciagrion hisopa*, race *krishna*, nov. The ground colouring of the prothorax, thorax and of the post-ocular spot is a deep lilac blue, which unfortunately fades after death or in alcohol. In the male the last 3 segments of the abdomen are of a royal, purplish blue, with, in a few specimens only, a small, elongated spot of black on the sides of the 8th segment. There is also quite occasionally a basal and mid-dorsal marking of black on the 10th segment. The ground colouring of the female is a pale greenish yellow, the 9th and 10th segments only being royal blue. Occasionally the apical border of the 8th segment is blue and frequently the basal third of the 9th is black, so that the blue on the 8th is enclosed and appears as a broad, blue annule.

Prior to a series of heavy thunderstorms, on the 23rd May, a large number of these insects emerged from the water. In their general condition they were useless as specimens, and so a few days later I went to collect the adult specimens, but found the insects quite scarce, especially the females which had apparently penetrated into the surrounding jungle.

Incidentally I may mention that I have often noticed that the simultaneous emergence of a large number of dragonflies infallibly portends heavy rain. This emergence was not a coincidence as two other species participated at the same time. What obscure instinct prompts this quickening, it is hard to say, but it is certain that insects, as a rule, can give a far better forecast of the monsoon than our most talented meteorologists.

29. *Copera marginipes*, Ramb. Common. Large numbers of white, teneral specimens appeared on the same date as the previous. They frequented the scrub lining the banks of the stream throughout the whole of its course.
30. *Caconeura annandalei*, sp. nov. Males moderately common, females very rare, especially after the 23rd May, on which date most of the species emerged. No adult forms were seen until the 26th.

Male: Length 35.5 mm., abdomen 29 mm., hindwing 20 mm., postnodal nervures, forewing variable 13, 16, hindwing constant 12. Head: labrum ochreous with a black spot at the base; sides of face pale, rest of head velvety black, except in not fully adult forms in which there is a more or less obscure reddish line traversing the vertex at the level of the anterior ocellus. Eyes olivaceous brown above, pale green below and with a broad, equatorial belt of brown separating the two colours abruptly.

Prothorax jet black in adults but with a spot of bright yellow in younger forms, in continuation of the humeral line.

Thorax black marked as follows:—bright red, narrow, humeral bands with a golden sheen which taper posteriorly, two broad,

yellow bands on the sides separated by a diffuse band of black. The upper band, especially in adults, is clouded with ochreous approximating to red in some specimens.

Legs black with a yellow annule at the base of the femora and a bright yellow stripe in the length of the extensor surface of the tibiæ.

Abdomen, ground colour white or creamy, marked broadly with black. The latter obscures most of the ground colouring on the dorsum and sides but small basal spots are left on the 2nd to 7th segments and the ventrum and middle portion of the sides are yellowish. There is a very fine, middorsal, ochreous line on the 2nd to 4th and sometimes 5th segments.

Wings hyaline; stigma pale-brown. The nervure *ab* is vestigial in all specimens and *Cu*² is only 3 cells in length.

Anal appendages robust black and not differing from the generic type.

The general male approximates to the colouring of the female. The humeral and lateral bands are creamy instead of red or ochreous. The white colouring on the abdomen is more in evidence and there is a broad, creamy white stripe on the vertex of the head replacing the obscure reddish one. The black on the thorax has not the deep velvety appearance of the adult. The superior anal appendages are white.

Female: Length 35.5 mm., abdomen 30 mm., hindwing 20 mm., post nodal nervures, forewing 13/15, hindwing constant 12.

Markings very similar to those of the male but no other colouring save ivory white and black. The labrum dirty white or brownish. The humeral line white and broader than in the male. The basal spots on the abdominal segments are larger and form almost complete, basal annules. The black encloses an obscure, white spot at the side of the apex of each segment and there is a creamy white, middorsal stripe on segments 8, 9 and 10. The apical borders of the 10th segment and the anal appendages are white. A fine, middorsal pale brown stripe on all segments from 2 to 7.

Hab. Settled on ferns, grasses or twigs along the whole length of the stream from its origin to Lingmala. Females keep to the jungle in the near neighbourhood.

Chloroneura quadrimaculata, Ramb. Common around lake; generally keeping to the shelter afforded by the stone walls. Found also in various sections of the river where it passes through ravines. A good number were seen at Lingmala. Mr. F. H. Gravely has found this insect in the Yenna Valley so that it apparently has a continuous distribution from Mahableshwar 4,500 ft. to Satara, ca 2,500 ft. I have traced its distribution from Satara to Khandala at the top of the ghat overlooking the Bombay plains from which latter however it is absent. 2,000 ft. I believe is about its lower limit.

BOMBAY NATURAL HISTORY SOCIETY'S
MAMMAL SURVEY OF INDIA, BURMA AND CEYLON.

REPORT No. 33, HIGH WAVY MOUNTAINS, MADURA DISTRICT.

By R. C. WROUGHTON, F.Z.S.

COLLECTION	No. 33.
LOCALITY	High Wavy Mountain.
DATE	May 1917.
COLLECTED BY	S. H. Prater.
EARLIER REPORTS:—	For previous reports, see Vols. XXV., pp. 472, 1918, and XXVI. pp. 1025 & 1031.

This Collection was made by Mr. S. H. Prater for the Mammal Survey. The area dealt with is very restricted, comprising about 10 square miles. The locality is the small town of Kambam and a Forest Hut and clearing 10 miles away by a Forest Road, on top of a precipitous hill, *i.e.*, the High Wavy Mountain.

The area is described by Fr. Blatter elsewhere in this Journal (Vol. XXV., p. 290) from which I extract the following:—

The lower slopes of the mountain are well covered with deciduous forest above which is a belt of bare, rocky grass land.

The top of the hill consists of an undulating plateau, at about 5,100', perhaps 15 square miles in area which is entirely covered with a continuous dense evergreen forest which runs down in long irregular shaped masses for a considerable distance into the valleys on either side.

The very great proportion of the specimens were taken at Kambam, and though of interest from the point of view of distribution, *e.g.*, in the case of *Leggadilla siva*, there is nothing new to the list of the Survey.

Among the 20 specimens from the mountain however are two small animals which seem to be rather young; unfortunately only one skull accompanied the two skins, and still more unfortunately this was destroyed in cleaning and it is now impossible to even place the specimens generically with any confidence.

The following in alcohol accompanied the other specimens:—

<i>Cynopt. sphinx</i> , Vahl ... 1	<i>Funamb. palmarum</i> , L. ... 1
<i>Hippos. atratus</i> , Kel ... 7	" <i>sublineatus</i> , Waterh. 1
<i>Meqad. s. horsfieldi</i> , Blyth 1	<i>Tatera cuvieri</i> , Waterh. ... 1
<i>Pipist. mimus</i> , Wrought. 4	<i>Millardia mellada</i> , Gray ... 2
<i>Taphoz. longimanus</i> , Hardw. 2	<i>Rattus r. wroughtoni</i> , Hint. 1
<i>Crocibura</i> , sp. 1	<i>Leggadilla siva</i> , Thos. & Ryl. 5
	<i>Leggada booduga</i> , Gray ... 4

Including these the Collection contains 125 specimens of 24 forms divided among 21 genera.

(1) *MACACA SINICA*, L.

The Bonnet Monkey.

(Synonymy in No. 5.)

Kambam, ♂ 3, ♀ 1.

(2) *CYNOPTERUS SPHINX*, Vahl.

The Common Plantain Bat.

(Synonymy in No. 4.)

Kambam, ♂ 3, ♀ 1.

(3) *MEGADERMA SPASMA HORSFIELDI*, Blyth.

The Malabar Megaderm.

1863. *Megaderma horsfieldi*, Blyth., Cat. Mamm. Mus., p. 23.

1918. *Megaderma spasma horsfieldi*, K. Andersen, A. M. N. H., 9. 11. p. 384.

High Wavy Mountains, ♂ 1, ♀ 1.

This species was also obtained by the Survey in Dharwar, Kanara and Coorg. In the Reports on these collections it was entered as *M. s. trifolium*. The present sub-species was differentiated by K. Andersen in 1918 (A. M. N. H. 9 11, p. 93).

(4) *LYRODERMA LYRA*, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

Kambam, ♂ 1.

(5) *HIPPOSIDERUS ATRATUS*, Kelaart.

The Ceylon Leaf-nose.

1852. *Hipposiderus atratus*, Kelaart, Prod. Faun. Zeyl., p. 16.

Kambam, ♂ 2, ♀ 4.

This form has already been taken by the Survey in Ceylon, Bengal and Tenasserim. It was recorded however in the Reports as *fulvus*. It was conceded specific rank by K. Andersen in 1918 (A. M. N. H. 9. 11, p. 380).

(6) *PIPISTRELLUS MIMUS*, Wrought.

The Southern Dwarf Pipistrel.

(Synonymy in No. 1.)

(7) *TAPHOZOUS LONGIMANUS*, Hardw.

The Long-armed Sheath-tail.

(Synonymy in No. 6.)

Kambam, ♂ 1, ♀ 2.

One of these specimens appears to be a partial albino, a phase which seems to be not uncommon in this species.

(8) *PACHYURA*, sp.

The Musk-rat.

Kambam, ♂ 3.

(9) HERPESTES FUSCUS, Waterh.

The Malabar Mongoose.

(Synonymy in No. 11.)

High Wavy Mountains, 5,000, ♂ 1.

(10) HERPESTES EDWARDSI ELLIOTTI, Wrought.

(Synonymy in No. 1) under *Mungos mungo*.

Mr. Thomas has given me the following note to explain the change in name above.

With regard to the name here used for the Indian Mongoose it has been recently pointed out by Dr. J. A. Allen of New York, that the animal on which the earlier names *Mungos mungo* were based was really a South African Banded Mongoose, to which those names, both generic and specific, should therefore be transferred.

After careful examination of the literature concerned we are prepared to accept this conclusion, which results in the old and well-known term *Herpestes* again becoming available for the ordinary Mongooses.

With regard to the specific name of the Common Mongoose, we find that the earliest available is *edwardsi*, which was given in 1812 by Geoffrey (Descr. de l'Egypte. 11, pp. 138, 139. 1812) to Edwards's figure (Birds, pl. 199, 1750) of a specimen which lived in captivity in London and was clearly an example of the common Indian species.

The indistinct stripes shown in this plate and mentioned in the description, are evidently merely the artist's method of illustrating the annulations of the fur, so marked in the Mongoose.

(11) CANIS NARIA. Wrought.

The South Indian Jackal.

Kambam, ♂ 1, ♀ 1.

This species has been taken many times by the Survey but is recorded in the Reports (Nos. 5, 6, 9, 11, and 22) as *C. indicus*. It was separated from that species by myself in this Journal, Vol. XXIV, p. 651.

(12) VULPES BENGALENSIS, Shaw.

The Indian Fox.

(Synonymy in No. 1.)

Kambam, ♂ 1, ♀ 1.

(13) RATUFA INDICA MAXIMA, Schreber.

The Malabar Giant Squirrel.

1784. *Sciurus maximus*, Schreber, Saugth. IV ; p. 784.

1786. *Sciurus malabaricus*, Scopoli Del. Faun. Flor. Ins. 11, p. 85.

1891. *Sciurus indicus*, Blanford, Mamm. No. 239. p. 372, var. 3.

High Wavy Mountains 5,000'—6,000', ♂ 3, ♀ 1.

This is the first time the Survey has found this form of the common red giant squirrel.

(14) FUNAMBULUS PALMARUM PALMARUM, L.

The Madras Palm Squirrel.

(Synonymy in No. 2.)

Kambam, ♂ 4 (1 juv.), ♀ 3.

(15) FUNAMBULUS SUBLINEATUS, Waterh.

The Malabar Pigmy Squirrel.

(Synonymy in No. 11).

High Wavy Mountains, ♂ 2, ♀ 2.

The species has already been taken by the Survey in Coorg.

(16) TATERA CUVIERI, Waterh.

The Madura Antelope Rat.

1838. *Gerbillus cuvieri*, Waterhouse, P. Z. S.; p. 56.

1891. *Gerbillus indicus*, Blanford, Mamm. No. 264 (*partim*).

Kambam, ♂ 5, ♀ 2.

This species has already been received from Bellary and Mysore, in the Reports however it was labelled as *indica*, on the other hand the specimens from Ceylon reported originally as *cuvieri* proved ultimately to be *ceylonica*. The genus is dealt with in this Journal, Vol. XXV, p. 40, et seq., 1917.

(17) MILLARDIA MELTADA, Gray.

The Dekhan Metad.

(Synonymy in No. 1.)

Kambam, ♂ 6, ♀ 2.

(18) BANDICOTA MALABARICA, Shaw.

The Malabar Bandicoot.

(Synonymy in No. 5.)

Kambam, ♂ 1, ♀ 1.

(19) GUNOMYS KOK, Gray.

The Common Mole-rat.

(Synonymy in No. 1.)

Kambam, ♂ 6.

(20) RATTUS RATTUS WROUGHTONI, Hint.

The Nilgiri Tree Rat.

1918. *Rattus rattus wroughtoni*, Hinton, J. B. N. H. S. XXVI., p. 62.

High Wavy Mountains 5,000', ♂ 4.

(21) GOLUNDA ELLIOTI, Gray.

The Indian Bush Rat.

(Synonymy in No. 1.)

Kambam, ♂ 2 (1. juv.).

(22) LEGGADA, Sp. ?

Kambam, ♂ 2 (5,000').

These two specimens reached here with only one skull and I regret to say that was destroyed in cleaning. From a cursory examination of the uncleaned skull I believe they belong to the Genus *Leggada*. Both are young and the only specimen at all resembling them is that of *Leggada famula*.

(23) LEGGADA BOODUGA, Gray.

The Indian Wild Mouse.

(Synonymy in No. 1.)

Kambam, ♂ 4, ♀ 2.

(24) LEGGADILLA SIVA, Thos. & Ryl.

The Mysore Leggadil.

(Synonymy in No. 9.)

Kambam, ♂ 4, ♀ 4.

The type was taken by the Survey in S. Mysore but no other specimen was known until these arrived.

REPORT NO. 34, TRAVANCORE.

By R. C. WROUGHTON, F. Z. S.

COLLECTION	...	...	No. 34.
LOCALITY	...	...	Travancore.
DATE	...	...	May to November 1915.
COLLECTED BY	...	...	S. N. Pillay.
EARLIER REPORTS	..	..	For previous reports see Vol. XXV, p. 472, 1918, and XXVI p. 1025 and 1031.

This collection was made for the Mammal Survey by Mr. R. S. Pillay. It represents the Fauna of the Travancore State, which stretches North and South, between the Sea and the Western Ghats from the Cochin boundary, about 10 N. Latitude to Cape Comorin.

There is nothing of outstanding interest in the collection but it is interesting to obtain specimens of true *F. tristriatus* (for the first time by the Survey).

Mr. Pillay has in each case given the Tamil and Malayan names and these are recorded in the Report.

I think the present is a favourable occasion to record the re-appearance of *Vivera civettina*.

This animal was described by Blyth from Malabar so long ago as 1862 (J. A. S. B. XXXI, p. 322) and was then stated to be not uncommon, yet from then till now no other specimen has been taken until the Society obtained two which had lived and died in the Trivandrum Zoological Gardens.

The following is a detailed list of the forms in the collection: they are 25 in all, divided among 23 genera:—

(1) *MACACA SINICA*, L.

The Bonnet Monkey.

Tam.:—Korangu; Mal.:—Koraiigu.

(Synonymy in No. 5.)

Boothaundy, ♀ 2.

(2) PITHECUS PRIAM, L.

The Madras Langur.

Tam.:—Vella Manthi ; Mal.:—Manthi.

(Synonymy in No. 13.)

Aramboli, ♂ 1.

(3) PTEROPUS GIGANTEUS, Brunn.

The Indian Flying Fox.

Tam.:—Vavval ; Mal.:—Vauval.

(Synonymy in No. 2.)

Trevandrum ♂ 1 ; Chalay ♀ 2 ; Mudavarum ♂ 2 ; ♀ 1.

(4) ROUSETTUS LESCHENAULTI, Desm.

The Indian Rousset.

Tam. and Mal.:— Narichel (Bat generally).

(Synonymy in No. 11.)

Suchundrum, ♂ 2, ♀ 1 ; Mylandy, ♀ 2 ; Terur, ♀ 1.

(5) CYNOPTERUS SPHINX, Vahl.

The Common Plantain Bat.

(Synonymy in No. 4.)

Vulany, ♂ 2, ♀ 1 ; Kalli, ♂ 1, ♀ 1 ; Azhur, ♂ 1.

(6) HIPPOSIDEROS SPEORIS, Schreb.

Schneider's Leaf-nose.

(Synonymy in No. 5, under *Dukhunensis*.)

Nagercoil, ♂ 3, ♀ 1 ; Arambol, ♂ 2, ♀ 6.

Dr. Andersen revived this name for *dukhunensis* as used in these Reports (A. M. N. H. 9, 11, p. 383, 1918).

(7) LYRODERMA LYRA, Geoff.

The Indian Vampire Bat.

(Synonymy in No. 1.)

Azhur, ♂ 1.

(8) RHINOPOMA HARDWICKEI, Geoff.

Hardwicke's Mouse-tail.

(Synonymy in No. 3.)

Marungoor, ♂ 1, ♀ 2.

(9) TAPHOZOUS MELANOPOGON, Temm.

The Black-bearded Sheath-tail.

(Synonymy in No. 1.)

Nagercoil, ♀ 3 ; Cape Comorin, ♂ 1 (no skull).

Suchnudrum, ♂ 1, ♀ 4 (2 skulls missing), Bheemanagari, ♂ 1 (no skull).

(10) PACHYURA, Sp.

The Musk Rat.

Tam.:—Nachali.

Trevandrum, ♀ 5.

(11) FELIS AFFINIS, Gray.

The Jungle Cat.

Tam.:—Veruthu or Vallipuli; Mal.:—Kauthu Vanken.

(Synonymy in No. 1.)

Bheemanagari, ♀ 1 (juv.).

(12) PARADOXURUS NIGER, Desm.

The Southern Manoori.

Tam.:—Maranany; Mal.:—Pazhavunny.

Bhoothapaundy, ♀ 1 (juv.)

(13) LUTRA TARAYENSIS, Hodg.

The Smooth Indian Otter.

Tam.:—Niru-Kuka; Mal.:—Dalwai-Bek.

(Synonymy in No. 7 under *L. macrodus*).

Ankulam Lagoon, Trevandrum, ♂ 1.

Hodgson's name is older than Gray's *macrodus*.

(14) HERPESTES EDWARDSI ELLIOTI, Wrough.

The Carnatic Mongoose.

(Synonymy in No. 21.)

Tam.:—Keeripillai; Mal.:—Keeri.

Killiar (Trevandrum), ♂ 2; Tambanur, ♀ 2; Trevandrum, ♂ 1,
♀ 2.

(15) FUNAMBULUS PALMARUM COMORINUS, Wrough.

The Travancore Palm Squirrel.

Tam.:—Anil; Mal.:—Annan.

1905. *Funambulus palmarum comorinus*, Wroughton, J. B. N. H. S. XVI
p. 411.

Kulatoor ♂ 1; ♀ 1; Nagercoil ♂ 5 ♀ 4; Aramboly ♂ 1, ♀ 1;
Pazhadur ♂ 4, ♀ 5; Boothpaundy ♂ 2, ♀ 1; Thalakady ♂ 1,
♀ 1.

(16) FUNAMBULUS TRISTRIATUS, Waterh.

The Forest Palm Squirrel.

Tam.:—Anil; Mal.:—Annan.

(Synonymy in No. 5.)

Ariachalay, ♀ 1; Valoy ♂ 2, ♀ 1; Azhur, ♂ 1, ♀ 1.

(17) TATERA CUVIERI, Waterh.

The Madura Antelope Rat.

Tam.:—Velleli; Mal.:—Vayaleli.

1838. *Gerbillus cuvieri*, Waterhouse, P. L. S. p. 56.

1891. *Gerbillus indica*, Blanford, Mamm. No. 264.

Valey ♂ 2, ♀ 1; Aakalum ♂ 2 (1. juv.); Trevandrum ♀ 1;
 Azhur ♂ 1; Nagercoil ♀ 2; Aramboly ♀ 1 (1. juv.).
 Bhootapaundy ♀ 1 juv.

(18) BANDICOTA MALABARICA, Shaw.

The Malabar Bandicoot.

Tam.:—Perichazhi.

(Synonymy in No. 5.)

Trevandrum, ♀ 4; Vellany, ♂ 1 Bhootapaundy, ♀ 1;
 Thalakady, ♀ 1.

(19) GUNOMYS KOK, Gray.

The Southern Mole Rat.

Tam.:—Avayan or Perichazhi.

(Synonymy in No. 1.)

Vellany, ♂ 1 juv.; Pennamangalum, ♂ 1.

(20) RATTUS RATTUS RUFESCENS, Gray.

The Indian House Rat.

Tam.:—Yeli.

(Synonymy in No. 1.)

Aramboly ♂ 1, ♀ 2; Chakkay ♀ 1; Thalakady ♀ 1;
 Pazhuvur ♂ 1, ♀ 3; Nagercoil ♂ 2, ♀ 2.

(21) RATTUS RATTUS WROUGHTONI, Hint.

The Nilgiri Tree Rat.

1918. *Rattus rattus wroughtoni*, Hinton, J. B. N. H. S. XXVI, p. 62.

Trevandrum ♂ 4, ♀ 6; Vellany ♀ 2; Valey ♀ 2.
 Chakkay ♂ 1; Kadium Lagoon ♂ 1; Azhur ♂ 2, ♀ 1;
 Pazhadur ♂ 1, ♀ 1.

(22) MUS URBANUS, Hodg.

The Indian House Mouse.

Tam. and Mal.:—Handeli.

(Synonymy in No. 5.)

Trevandrum ♂ 6, ♀ 3; Chalay ♀ 2.

The oldest name *dubius* Hodg. proves to be preoccupied by a S. American species, Hodgson's name *urbanus* must therefore be used.

(23) LEGGADA BOODUCA, Gray.

The Indian Wild Mouse.

(Synonymy in No. 1.)

Chenkody ♂ 2, ♀ 3; Azhur ♂ 1; Vellany ♀ 1; Cape
 Comorin ♂ 1, ♀ 3.

(24) LEPUS NIGRICOLLIS, Cuv.

The Black-naped Hare.

Tam.:—Muyal.; Mal.:—Chevian.

(Synonymy in No. 5.)

Payyakaad ♂ 1.

(25) *MANIS CRASSICAUDATA*, St. Hill.

The Indian Pangolin.

Tam. :—Azhungoo.

(Synonymy in No. 3.)

Alyanaad? 1 juv.

REPORT NO. 35, PROME.

BY R. C. WROUGHTON, F.Z.S.

COLLECTION	...	...	No. 35.
LOCALITIES	...	...	Prome.
DATE	...	...	Sept. 1916 to Feb. 1917.
COLLECTED BY	...	...	J. M. D. Mackenzie.
<i>Earlier Reports</i> :—	..	..	For previous reports, see Vol. XXV., p. 472, 1918, and XXVI, p. 1025 and 1031.

This is a small collection made by Mr. J. M. D. Mackenzie, I.F.S., in the Southern part of Prome and is in fact a continuation northwards of his Pegu collection, which has already been reported upon (No. 29). The forms now sent are constantly identical with those obtained in Pegu or further South by the Survey, and it is evident that here we have not reached the boundary line of the fauna reported on from Mt. Popa and northwards (No. 16).

There are in all 54 specimens representing 13 forms in as many genera.

The following is a detailed list of the specimens :—

(1) *MACACA ASSAMENSIS*, McCl.

The Assam Macaque.

(Synonymy in No. 16.)

Theme, 35 miles S. E. of Prome, ♀ 2 (1 juv.)

(2) *PITHECUS MELAMERUS*, Ell.

The Shan Langur.

1909. *Presbytis melamerus*, Elliot, A. M. N. H. S. IV, p. 267.

1917. *Pithecus shanicus*, Wroughton, J. B. N. H. S. XXV, p. 46.
30 miles S. E. of Prome, ♂ 1, ♀ 1.

(3) *MEGADERMA SPASMA MEDIUM*, K. And.

The Malay Megaderm.

1918. *Megaderma spasma medium*, K. Andersen, A. M. N. H., 911, p. 383.
30 miles S. E. of Prome, ♂ 2.

Members of this species (*spasma*) have of course been received over and over again in the Survey Collection, but it is only comparatively lately that Dr. Andersen has distinguished 7 sub-species, of which 5 are represented in our area. Hitherto they have been reported as *spasma trifolium*, but it may be helpful to record the following :—Specimens from Dharwar, Kanara, Coorg, and High Wavy Mountain are *M. s. horsfieldi*; from Ceylon, *M. s. ceylonense*; from Chindwin *M. s. majus*; Pegu, Tenasserim and Prome *M. s. medium*; Mt. Popa *M. s. minus*.

(4) TUPAIA BELANGERI, Wagn.

The Pegu Three Shrew.

(Synonymy in No. 17.)

35 miles S. E. of Prome, ♂ 2.

(5) PETAURISTA CINERACEUS, Blyth.

The Tenasserim Flying Squirrel.

(Synonymy in No. 29.)

35—40 miles S. E. of Prome, ♂ 1, ♀ 1.

This is the first mention of this species in the Survey List. It was originally described from Arakan.

(6) RATUFA PHAEOPEPLA MARANA, Thos. and Wrough.

The Mt. Popa Giant Squirrel.

(Synonymy in No. 16.)

30 miles S. E. of Prome, ♂ 1, ♀ 1.

(7) CALLOSCIURUS FERRUGINEUS, T. Cuv.

The Burmese Bay Squirrel.

(Synonymy in No. 16.)

Theme, 35 miles S. E. of Prome, ♂ 1, ♀ 2; 30 miles S. E. of Prome, ♂ 1, ♀ 1.

(8) TOMEUTES PYGERYTHRUS, Geoff.

The Pegu Squirrel.

(Synonymy in No. 29.)

Theme, 35 miles S. E. of Prome ♂ 8, ♀ 7; 30 miles S. E. of Prome ♂ 3, ♀ 2. 40 miles S. E. of Prome ♂ 2.

(9) MENETES BERDMOREI, Blyth.

The Tenasserim Ground Squirrel.

(Synonymy in No. 17.)

35 miles S. E. of Prome ♀ 1.

(10) TAMIOPS MACCLELLANDI BARBEI, Blyth.

The Burmese Dwarf Squirrel.

(Synonymy in No. 14.)

35 miles S. E. of Prome ♀ 3.

(11) RATTUS RATTUS KHYENSIS, Hint.

The Shan Tree Rat.

1918. *Ratus ratus khyensis*, Hinton J. B. N. H. S. XXVI. p. 60.

Theme, 30 miles S. E. of Prome ♀ 1.

(12) GUNOMYS VARIUS, Thos.

The Malay Mole Rat.

(Synonymy in No. 17.)

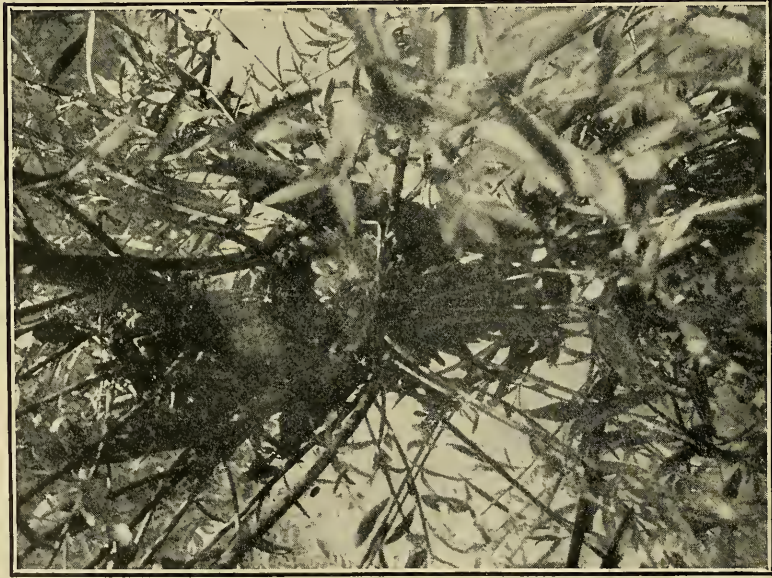
Prome ♂ 3, ♀ 1; Tharrawaddy ♂ 3, ♀ 1.

(13) CANNOMYS PATER, Thos.

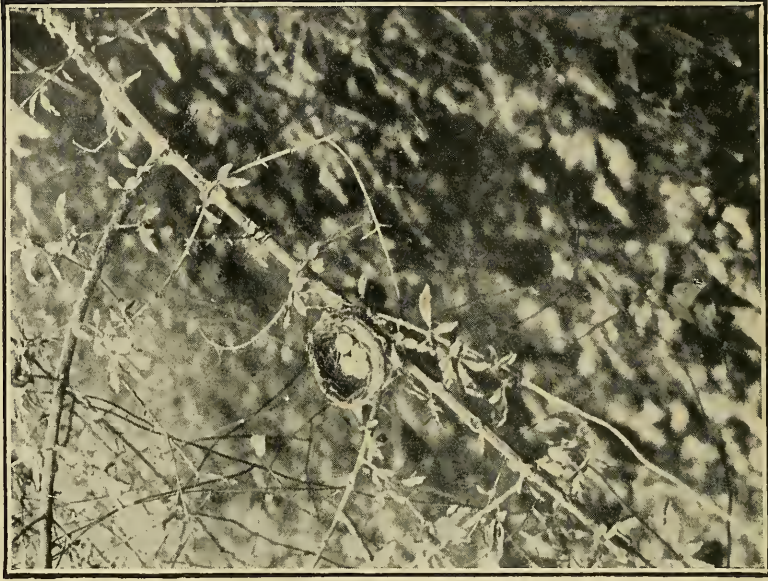
The Mt. Popa Bamboo Rat.

(Synonymy in No. 29.)

35—40 miles S. E. of Prome ♂ 2.



Nest of the White-cheeked Bulbul, *Molpastes leucogenys*.



Nest of the Indian Paradise Flycatcher, *Tersiphone paradisi*.

A LIST OF THE BIRDS OF DHARMSALA.

BY

CAPTAIN R. W. G. HINGSTON, M.C., M.B., I.M.S.

(With three Plates and one Text Figure.)

The birds mentioned in this list represent a collection made on the southern slope of that portion of the Lesser Himalaya known as the Dhauladhar Range in the immediate vicinity of Dharmsala. The range itself stands as an imposing barrier along the northern flank of the Kangra Valley. It rises here to a height of 16,000 to 17,000 feet and is clothed with forest up to an altitude of about 11,000 feet.

I have made mention only of those species which I have seen within the actual limits of the range, though some of them ascend no higher than the very foothills. My observations have been confined to altitudes above 4,000 feet, and I have no concern with the distribution of species below that level. Most of my remarks refer to the subject of local vertical migration and to the altitudinal limits within which the different species are confined. My observations were, made over a period of no more than nine months, from November 1918 to July 1919. They cannot, therefore, be considered in any way complete. Nevertheless they may serve as a foundation on which others can build with further accuracy and precision.

I am much indebted to Mr. C. H. Donald, F.Z.S., for his kindness and assistance especially with regard to the identification of Birds of Prey. Indeed, without his help in this matter, I have no doubt that the following list of birds would have been still more incomplete :---

The Jungle Crow—*Corvus macrorhynchus*.

A resident species. Common, noisy, ubiquitous. Widespread over both the valley and the range. In summer many birds leave the valley to ascend to cooler heights. Observed in summer as high as 15,000 feet.

The Yellow-billed Blue Magpie—*Urocissa flavirostris*.

Abundant, resident. Keeps to the wooded areas of the range. In winter collects into small parties that love to associate with a flock of jays. A local migrant that moves up and down the slope in accordance with the change of season. Its winter zone on the range is between 4,000 and 7,000 feet; its summer zone between 6,000 and 9,000 feet.

The Indian Tree-pie—*Dendrocitta rufa*.

A bird of the Kangra Valley. Not common. Occasionally seen at the very foot of the range, but not observed above 4,000 feet.

The Black-throated Jay—*Garrulus lanceolatus*.

Uncommon, I suppose a resident. Seen occasionally on the northern slopes of Dharmkote between 6,000 and 7,000 feet.

The Himalayan Jay—*Garrulus bispecularis*.

A rare bird in these parts. Met with on one occasion only, in the Keytal nullah at 6,300 feet.

The Red-billed Chough—*Graculus eremita*.

A common and noisy resident of the snow-line. Keeps almost exclusively to the alpine pastures. Moves slightly up and down the slope in accordance with the change of season. In winter may descend as low as 8,000 feet; in summer ascends as high as 14,000 or 15,000 feet.

The Yellow-billed Chough—*Pyrrhocorax alpinus*.

Resident on the snow-line. Less common than the red-billed species. Both these Choughs haunt the same elevations, move up and down the slope within the same altitudinal limits and intermingle in a common flock.

The Indian Grey Tit—*Parus atriceps*.

Common, familiar, resident. Usually seen in pairs or small parties. Less inclined than other tits to associate in the insectivorous troops. Frequents the Kangra Valley and ascends the range in summer to at least 9,000 feet.

The Green-backed Tit—*Parus monticola*.

Resident. The most common tit of the range. Seen everywhere, usually in the company of creepers, warblers and other insectivorous birds. A local migrant up and down the slope in accordance with the change of season. In winter keeps to the main valley and a low-lying zone along the range up to 6,500 feet; in summer ascends to a higher altitudinal zone between 6,000 and 9,000 feet. Nest taken at 6,000 feet.

The Red-headed Tit—*Ægithaliscus erythrocephalus*.

Another common, resident species. One of the most familiar members of the hunting flocks of insectivorous birds. Moves little, if at all, in accordance with the change of season. Seen up to 7,500 feet.

The Yellow-cheeked Tit—*Machlolophus xanthogenys*.

Resident and fairly common. Frequently seen between 5,000 and 7,000 feet.

The Crested Black Tit—*Lophophanes melanolophus*.

Abundant, resident. A tit of higher altitudes than any of the previous species. A common member of the troops of hunting birds. Moves up and down the slope in accordance with the change of season. In winter descends to the valley and haunts the hill-side up to 7,000 feet; in summer ascends to higher zone between 7,500 and 10,000 feet.

The Brown Crested Tit—*Lophophanes dichrous*.

Uncommon. Probably resident. Seen near tree-limit in summer at 11,000 feet.

The Red-headed Laughing-Thrush—*Trochalopteryx erythrocephalus*.

A common species. Resident and a great skulker in the trees. In winter collects into small parties that keep to the thickest jungle. Moves up and down the slope in accordance with the change of season. In winter occupies a low zone on the range between 4,000 and 7,000 feet; in summer ascends to a higher zone between 7,000 and 11,000 feet.

The Eastern Variegated Laughing-Thrush—*Trochalopteryx variegatum*.

Abundant, resident, noisy. A local migrant that moves up and down the slope in accordance with the change of season. In winter remains on the range between 4,000 and 7,000 feet. In summer ascends to the rhododendron scrub near the limit of the trees between 7,000 and 11,000 feet.

The Himalayan Streaked Laughing-Thrush—*Trochalopteryx lineatum*.

The commonest of the laughing-thrushes. Resident on the range. Skulks in the long grass and undergrowth. Moves up and down the slope in accordance with the change of season. In winter descends to the valley and occupies a low mountain zone between 4,000 and 6,500 feet. In summer ascends to a higher zone between 6,000 and 9,500 feet. Its summer haunts are, therefore, confined to an altitudinal belt somewhat lower than the two preceding species. Nests taken between 6,000 and 7,000 feet.

The Common Babbler—*Argya caudata*.

Not very common. A resident. Frequents the valley and ascends the slopes of the range to a height of 7,000 feet.

The Jungle Babbler—*Crateropus canorus*.

Common in the Kangra Valley. Comes to the foot of the range. Not seen to ascend the hill-side above 4,000 feet.

The Red-billed Babbler—*Stachyrhidopsis pyrrhops*.

Fairly common. A resident. In winter collects into small flocks that keep to the scrub and heavy undergrowth. Ascends at least to 6,500 feet.

The Plain-brown Tit-Babbler—*Proparus vinipectus*.

Rare. Probably resident. Taken on one occasion only, on the northern slope of Dharmkote at 6,500 feet. It was in the company of a troop of hunting birds.

The Himalayan Whistling-Thrush—*Myiophoneus temmincki*.

Common, resident, ubiquitous. Haunts every mountain stream; also frequents dry nullahs and wooded rocky slopes. A local migrant. Moves up and down the hill-side in accordance with the change of season. In winter descends to the valley and keeps to a low mountain zone between 4,000 and 8,000 feet. In summer ascends to a high zone between 6,000 and 11,000 feet. Nests taken between 6,000 and 7,000 feet.

The Indian Blue Chat—*Larvivora brunnea*.

Fairly common. A summer visitor to the range. Most probably winters in the Kangra valley. In summer ascends to at least 7,000 feet.

The Black-headed Sibia—*Lioptila capistrata*.

A conspicuous resident species. Common on the range in winter. Seems exclusively arboreal in its habits. A local migrant. Moves up and down the slope in accordance with the change of season. In winter remains in a low mountain zone between 4,500 and 6,500 feet. In spring ascends to higher elevations, but I have not been able to find its summer haunts in this area of the range. It is possible that this species may pursue a local east to west migration in addition to its ascent and descent.

The Stripe-throated Siva—*Siva strigula*.

Common on the range in winter. Collects in flocks which associate with tits, warblers and other insectivorous birds. Inclined to skulk in the thicker trees. A local migrant. Moves up and down the slope in accordance with the change of season. In winter keeps to a low zone between 4,000 and 7,000 feet. I have not seen it during the summer in this part of the range. As in the case of the Sibia, I suspect that this bird also may pursue a lateral migration.

The Indian White-eye—*Zosterops palpebrosa*.

A summer visitor to the range. Very abundant. A few birds winter on the lower slopes. In April large flocks arrive and spread themselves over the mountain-side.

The Yellow-naped Ixulus—*Ixulus flavicollis*.

Uncommon. Probably a resident. Moves through the forest in the company of insectivorous troops. Taken only at 6,500 feet.

The Red-billed Liothrix—*Liothrix lutea*.

Rare in these parts. Taken only on one occasion; near the civil station of Dharmsala at 5,000 feet.

The Red-winged Shrike-Tit—*Pteruthius erythropterus*.

Common. Often seen in winter. A familiar member of the Himalayan troops of insectivorous birds. A local migrant. Moves up and down the slope in accordance with the change of season. In winter remains in a low zone between 4,500 and 6,500 feet; in summer ascends to higher elevations, but I have not been able to define its summer zone in this area of the range.

The Green Shrike-Tit—*Pteruthius xanthochloris*.

Much less common than the red-winged species. Taken on the northern slope of Dharmkote at 6,500 feet. Probably a local migrant that moves up and down the slope occupying high and low zones alternately in the same way as the red-winged species. In winter it joins in the troops of Himalayan insectivorous birds.

The Fire-cap—*Cephalopyrus flammiceps*.

Seen only on a few occasions. A summer visitor arriving in March. Noted on the range as high as 7,000 feet.

The Himalayan Black Bulbul—*Hypsipetes psaroides*.

Abundant, resident. A noisy, social bird. Flocks gather on the tops of the trees, they make a great clamour amongst the rhododendrons when seeking the nectar from the flowers. A local migrant. Moves up and down the slope in accordance with the change of season. In winter occupies the main valley and a low belt along the range between 4,000 and 7,000 feet. In summer ascends to a higher zone between 6,000 and 10,000 feet. Nests taken at 6,000 feet.

The Punjab Red-vented Bulbul—*Molpastes intermedius*.

A resident species. Common and familiar. Frequents the Kangra Valley and a low-lying zone along the foot of the range. Ascends to the civil station, but not seen above 5,000 feet. Does not move at the change of season.

The White-cheeked Bulbul—*Molpastes leucogenys*.

Common, familiar, resident. Frequents every garden in both civil and military stations. Uninfluenced by the change of season. Seen up to 7,000 feet. Nests freely at 6,000 feet.

The White-tailed Nuthatch—*Sitta himalayensis*.

Uncommon. The only species of Nuthatch seen in Dharmasala. Usually found amongst a troop of varied insectivorous birds. Noted between 7,000 and 9,000 feet.

The Black Drongo—*Dicrurus ater*.

A summer visitor. Abundant in the valley and on the range. Arrives in April. Ascends the range to about 7,000 feet. Nests taken at 6,000 feet.

The Indian Ashy Drongo—*Dicrurus longicaudatus*.

A summer visitor. Less common than the previous species. Probably keeps to a higher altitudinal zone than The Black Drongo. Seen on the range only at altitudes between 9,000 and 10,000 feet.

The Himalayan Tree-Creeper—*Certhia himalayana*.

Resident, abundant. A common member of almost every insectivorous troop. A local migrant. Moves up and down the slope in accordance with the change of season. In winter remains in the Kangra Valley and in a low zone along the hill-side between 4,300 and 6,500 feet. In summer ascends to a higher altitudinal zone between 6,000 and 10,000 feet.

The Wall-Creeper—*Tichodroma muraria*.

A winter visitor to the lower slopes of the range and probably to the Kangra Valley. Seen frequently about the cliffs and granite boulders near the streams at an altitude of 4,000 feet.

The Kashmir Wren—*Anorthura neglecta*.

A fairly common resident. Usually hides in crevices of the rock, or conceals itself beneath boulders, or skulks in the heavy undergrowth near the bank of a mountain stream. A local migrant. It moves up and down the range in accordance with the change of season. In winter seen between 4,000 and 6,500 feet. In summer leaves these low elevations and ascends to a higher zone between 6,000 and 10,000 feet.

The Goldcrest—*Regulus cristatus*.

Uncommon. Probably a resident. Joins in the hunting troops of insectivorous birds. Met with in winter only; on Dharmkote at 6,700 feet.

Blyth's Reed-Warbler—*Acrocephalus dumetorum*.

Uncommon. Taken in June only at 6,000 feet. I suppose a summer visitor from the peninsula.

- The Indian Tailor-bird—*Orthotomus sutorius*.
Resident in the Kangra Valley and at the very foot of the range. Not seen to ascend above 4,000 feet.
- Tickell's Willow-Warbler—*Phylloscopus affinis*.
A summer visitor from the plains of India. Taken at an altitude of 6,800 feet.
- Hume's Willow-Warbler—*Phylloscopus humii*.
A summer visitor. Very abundant. Arrives in April in large flocks. Spreads itself over the hill-side and ascends to 9,000 feet.
- The Green Willow-Warbler—*Acanthopneuste nitidus*.
Probably a bird of passage from the plains to the higher elevations in the Himalaya. Taken in the civil station only; at 4,700 feet.
- The Greenish Willow-Warbler—*Acanthopneuste viridanus*.
A summer visitor to the range. Very abundant in the season. Numbers arrived in March and April. They ascend the slopes of the range to at least 10,000 feet.
- Blyth's Crowned Willow-Warbler—*Acanthopneuste trochiloides*.
Resident. The most common warbler of the range. A member of almost every insectivorous troop. A local migrant. Moves up and down the slope in accordance with the change of season. In winter remains on the range between 4,000 and 8,000 feet. In summer ascends to a higher zone between 8,000 and 10,000 feet.
- Hodgson's Grey-headed Flycatcher-Warbler—*Cryptolopha xanthoschista*.
A common, familiar, resident species. Moves little, if at all, with the change of season. Often accompanies the insectivorous troops. Noted at all altitudes on the range up to 8,500 feet. Nests freely at 6,000 feet.
- The Pale Bush-Warbler—*Horornis pallidus*.
Not common. Met with occasionally in the undergrowth and brushwood. Noted in winter up to 6,000 feet. Not seen in summer.
- The Ashy Wren-Warbler—*Prinia socialis*.
A bird of the Kangra Valley. It comes to the foot-hills of the range, but not seen to ascend above 4,000 feet.
- The Jungle Wren-Warbler—*Prinia sylvatica*.
Found also in the Kangra Valley and at the very foot of the range. Not seen above 4,000 feet.
- The Bay-backed Shrike—*Lanius vittatus*.
A bird of the Kangra Valley. Common in summer. Enters the foot hills of the Dhauladhar range, but not seen to ascend above 5,000 feet.
- The Rufous-backed Shrike—*Lanius erythronotus*.
Resident and common at low elevations. Frequents the cultivated areas of the valley and comes to the foot of the main range. Not seen above 4,500 feet.
- The Common Wood-Shrike—*Tephrodornis pondicerianus*.
Found in the Kangra Valley near the foot-hills of the range. I suppose a resident. Not seen above 4,000 feet.
- The Short-billed Minivet—*Pericrocotus brevirostris*.
Common and resident. The numbers increase in March and April at which time the new arrivals may be seen ascending the mountain side. The sexes appear to be very unequal in number. It is usual to see one or two males in the company of a troop of females. A local migrant according to season up and down the range. In winter many birds remain in a low zone between 4,000 and 6,500 feet. In summer they retire to higher altitudes usually between 6,000 and 10,000 feet.
- The Dark-grey Cuckoo-Shrike—*Campophaga melanoschista*.
A summer visitor to the foot of the range. Not seen above 5,000 feet.

The Indian Oriole—*Oriolus kundoo*.

A summer visitor. Common in the valley and at the foot of the range. First arrival noted in April. Not seen above 5,000 feet.

The Black-headed Myna—*Temenuchus pagodarum*.

A summer visitor to the valley and the foot-hills of the range. Arrives early in April. Seen to ascend as high as 5,000 feet.

The Common Myna—*Acridotheres tristis*.

Abundant, familiar, resident. Common about houses and villages. Seen to ascend the main range up to 7,000 feet.

The Jungle Myna—*Aethiopsar fuscus*.

A resident species. Common in the Kangra Valley. Enters the foot-hills of the range, but not seen to ascend above 5,000 feet.

The Sooty Flycatcher—*Hemichelidon sibirica*.

A bird of passage in this part of the range. Numbers arrive in April. The birds are then common everywhere, and are usually seen on the exposed tops of the trees from where they make skilful sallies into the air. Seen to ascend to 10,000 feet.

The Orange-gorgeted Flycatcher—*Siphia strophciata*.

Shy and uncommon. An early summer visitor. Taken in the rhododendron in company with insectivorous troops. Captures insects on the ground and in the trees. Seen up to 7,000 feet.

The Slaty-blue Flycatcher—*Cyornis leucomelanurus*.

A summer visitor. Arrives on the range in March. Fairly common in jungle and undergrowth. Hunts its prey in the bushes and associates with insectivorous troops. Seen up to 8,000 feet.

The White-browed Blue Flycatcher—*Cyornis superciliaris*.

A summer visitor. Common in the season. Arrives in March. A familiar, confiding bird; it keeps to the low jungle and the thicker trees; makes short sallies amidst the branches; chases insects along the boughs or descends to capture them on the ground. Seen up to 9,000 feet. Nests taken at 6,000 feet.

The Blue-throated Flycatcher—*Cyornis rubecoloides*.

The least common of the three Blue Flycatchers.—A summer visitor. Not seen before May, but probably arrives earlier. A bird of somewhat retiring nature; haunts the more secluded glens; hunts its prey amongst the under growth; keeps to a lower zone than the previous two species. Seen up to 6,000 feet. Nests taken in holes on earthy banks at 6,000 feet.

The Verditer Flycatcher—*Stoparola melanops*.

A summer visitor. Arrives in March. Common, conspicuous, familiar; widespread everywhere, in gardens, jungle and forest. Takes its prey by flights in the air; also descends to the ground. Seen up to 9,500 feet. Nests taken at 6,000 feet.

The Brown Flycatcher—*Alseonax latirostris*.

A summer visitor. Uncommon, inconspicuous. Makes its sallies amongst the inner branches of the trees. Seen up to 6,000 feet.

The Rufous-tailed Flycatcher—*Alseonax ruficaudus*.

Seen on a few occasions in April. Probably a bird of passage. Ascends at least to 6,000 feet.

The Grey-headed Flycatcher—*Culicicapa ceylonensis*.

A summer visitor. Arrives in March. Familiar, abundant, skilful. Often resorts to glades, gardens and open spaces. Makes sallies amidst the inner branches of the trees. Seen up to 9,000 feet. Nests taken at 6,000 feet.

The Rufous-bellied Niltava—*Niltava sundara*.

A summer visitor to the range. I think some birds winter in the foot-hills. Uncommon, retiring. Keeps to the secluded glens and jungle.

Hunts insects in the low undergrowth and often descends to the ground. Seen up to 6,500 feet.

The Indian Paradise Flycatcher—*Tersiphone paradisi*.

A summer visitor. First arrival noted in April. Common and familiar. Keeps to the wooded glens and the shade of the thicker trees. Nests at 6,000 feet and not seen at a higher altitude than this.

The Yellow-bellied Flycatcher—*Chelidorhynch hypoxanthum*.

A bird of passage. Numbers pass through in March. Some few winter on the lower slopes of the range. Very abundant at the migrating season. Flocks then gather in shady places, usually about the trees that grow over moist ravines. The birds are then incessantly active, making swift sallies into the clear air. Seen up to 7,000 feet.

The White-browed Flycatcher—*Rhipidura albifrontata*.

A common species in the Kangra Valley. Comes to the foot of the range, but not seen to ascend above 4,000 feet.

The White-throated Fantail Flycatcher—*Rhipidura albicollis*.

A bird of the Kangra Valley. Some few winter in the foot-hills and in summer ascend the main range. An active little species, always bustling about the bushes, hunting its prey upon the branches or making short sallies into the air. Likes well-shaded places, especially glens and moist ravines. It occupies a higher altitudinal zone than the previous species. Seen up to 6,000 feet. Nests taken between 4,000 and 6,000 feet.

The Common Pied Bush-Chat—*Pratincola caprata*.

Resident. Common at the foot of the range. Probably extends over the whole valley. Once seen as high as 6,000 feet.

The Indian Bush-Chat—*Pratincola maura*.

A bird of the lower foot-hills. Common. Noted in summer to ascend the main range up to 6,000 feet.

The Dark-grey Bush-Chat—*Oreicola ferrea*.

Resident. Very common. Winters in the Kangra Valley and on the foot hills of the range. In summer ascends the range to at least 9,000 feet. Nests taken at 6,000 feet.

The Red-tailed Chat—*Saxicola chrysopygia*.

A solitary specimen taken in February at 4,500 feet. It was probably a bird of passage.

The Western Spotted Forktail—*Henicurus maculatus*.

A common and conspicuous resident. Found in all the hill streams between 4,000 and 7,000 feet.

The Little Forktail—*Microcichla scouleri*.

Resident. Fairly common. Frequents higher elevations than the previous species. Usually seen near the waterfalls on the main range where it picks up the little water-insects thrown out of the stream with the rising spray. Frequents a zone between about 6,000 and 8,000 feet.

The White-capped Redstart—*Chimarrornis leucocephalus*.

A common and conspicuous resident species. Frequents every mountain stream. A local migrant. Moves up and down the slope in accordance with the change of season. In winter descends to the Kangra Valley and occupies a zone along the range between 4,000 and 7,000 feet. In summer deserts the valley and the lower elevations of the range and ascends to occupy a higher altitudinal zone between 6,500 and 12,000 feet.

The Blue-fronted Redstart—*Ruticilla frontalis*.

A resident species. Not uncommon. Keeps to the woods and undergrowth. A local migrant. Moves up and down the slope in accordance with the change of season. In winter keeps to a low zone between 4,000 and 6,500 feet. In summer ascends to a higher zone where it is usually found about the rhododendron scrub between 6,500 and 11,000 feet.

The Indian Redstart—*Ruticilla rufiventris*.

Uncommon. Seen occasionally in winter near the foot of the snowy range at 5,000 feet. Probably breeds at higher elevations.

The Plumbeous Redstart—*Rhyacornis fuliginosus*.

Resident on the range. Common about all the streams. A local migrant. Moves up and down the slope in accordance with the change of season. In winter remains low down on the range between 4,000 and 7,000 feet. In summer ascends to a higher zone between 6,000 and 10,500 feet.

The Golden Bush-Robin—*Tarsiger chrysaus*.

Uncommon. Met with from time to time in winter between 4,000 and 6,000 feet. I expect a permanent resident that moves up and down the slope with the change of season. Not seen in summer, but probably retires to high altitudes on the range.

The Red-flanked Bush-Robin—*Ianthia rufilata*

Common in winter. Resident. Often selects some special site in the forest where it may always be found. A local migrant that ascends and descends the slope in accordance with the change of season. In winter remains in a low zone between 4,000 and 6,500 feet. In summer retires to a loftier zone between 7,000 and 11,000 feet.

The Blue-headed Robin—*Adelura caeruleiceps*.

A common and permanent resident. A local migrant. Moves freely with the change of season. In winter occupies a low zone between 4,000 and 7,000 feet, though an odd straggler may ascend to 9,000 feet. In summer retires to a loftier zone between 7,000 and 11,000 feet, where many of the birds may be found almost at the extreme limit of the trees.

Hodgson's Grandala—*Grandala caelicolor*.

Very rare. Seen on one occasion only; near the head of the Keytal nullah in winter at a height of 7,400 feet. Though this bird is said to be insectivorous I found it feeding on a mountain fern. Mr. Whistler tells me that this species has not hitherto been recorded within Punjab limits.

The Brown-backed Indian Robin—*Thamnobia cambaiensis*.

Very common. Resident. A bird of the valley and the foot-hills. Not seen to ascend the range above 5,000 feet.

The Magpie-Robin—*Copsychus saularis*.

A summer visitor. Common and familiar. Arrives early in April. Frequents the gardens in both civil and military stations. Seen as high as 6,500 feet. Nests taken at 6,000 feet.

The Central-Asian Blackbird—*Merula maxima*.

This blackbird was met with only once; in May on the main range at 9,300 feet.

The White-collared Ouzel—*Merula albicincta*.

Uncommon. Resident. A bird of considerable altitudes. Moves up and down the slope in accordance with the change of season. In winter descends to 6,000 feet. In summer ascends to near tree-limit where I have seen it amidst the rhododendron scrub between 9,000 and 11,000 feet.

The Grey-headed Ouzel—*Merula castanea*.

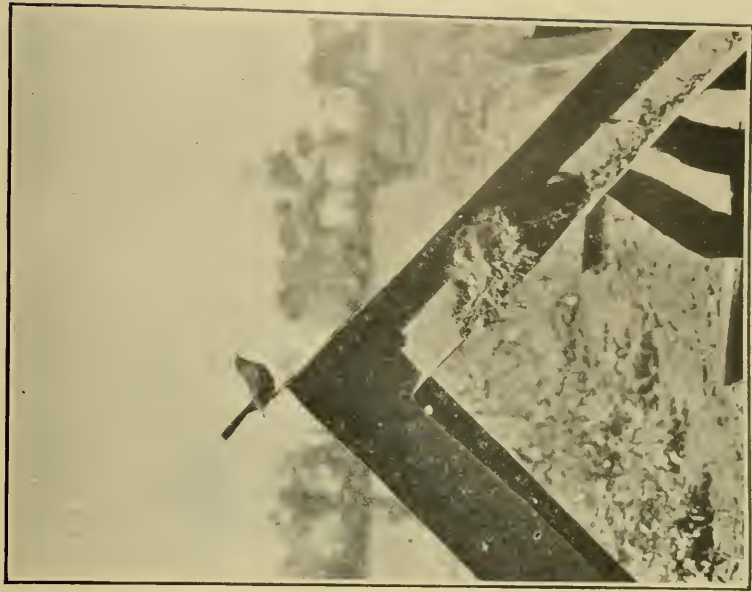
A common and widespread resident. Not seen here to associate in flocks. A local migrant. Moves up and down the slope in accordance with the change of season. In winter remains in a low zone along the range between 4,000 and 6,500 feet. In summer ascends to a higher zone between about 7,000 and 9,500 feet.

The Grey-winged Ouzel—*Merula bouboul*.

A common resident. Keeps to well-wooded areas. A local migrant. Ascends and descends the flanks of the range in accordance with the change of season. In winter remains low down on the range between



Nest of Tickell's Ouzel, *Merula unicolor*.



Nest of the Brown-backed Indian Robin, *Thamnobita cambaensis*.

4,000 and 7,000 feet. In summer ascend to a higher zone between about 6,500 and 9,000 feet.

The Black-throated Ouzel—*Merula atrigularis*.

A winter visitor to both the valley and the range. Very abundant in the cold season. Associates in large flocks which are met with everywhere up to 7,000 feet.

Tickell's Ouzel—*Merula unicolor*.

I have seen this ouzel only once. This was in April at 6,500 feet when the bird was probably passing through on migration.

The Chestnut-bellied Rock-Thrush—*Petrophila erythrogastra*.

Probably a permanent resident wintering in the foot-hills. In February a number appeared in the civil station. Haunts forestclad cliffs. In summer ascends to considerable elevations between 9,000 and 11,000 feet.

The Blue-headed Rock-Thrush—*Petrophila cinclorhyncha*.

A summer visitor. Common and conspicuous. Arrives in April. Frequents trees rather than rocks. Seen on the range up to 7,500 feet. Nest taken at 6,000 feet.

The Western Blue Rock-Thrush—*Petrophila cyanus*.

Fairly common in suitable places. In winter haunts the streams and moraines at the foot of the main range between 4,000 and 5,000 feet. In summer disappears from this elevation; I suppose it ascends to loftier areas on the range.

The Missel-Thrush—*Turdus viscivorus*.

A permanent resident at high elevations. Fairly common. Moves up and down the slope in accordance with the change of season. In winter seen to descend to 6,000 feet. In summer retires to near tree-limit at about 10,000 feet.

The Small-billed Mountain-Thrush—*Oreocincla dauma*.

A rare species. Taken on one occasion in thick jungle near the foot of the main range at 4,000 feet.

The Plain-backed Mountain-Thrush—*Oreocincla mollissima*.

Uncommon. Seen occasionally in the winter months at an altitude of 6,000 feet.

The Brown Dipper—*Cinclus asiaticus*.

A permanent resident. Common along the mountain streams. It here frequents a zone between 6,000 feet and the snow-line and I have never seen it below this altitude. Feeds largely on the larvæ of caddisflies.

The Eastern Alpine Accentor—*Accentor nepalensis*.

Fairly common. Resident on the main range. Keeps to high elevations and found usually near the snow-line. In winter descends to 8,000 feet and possibly lower. In summer retires to the alpine pastures at about 12,000 or 13,000 feet.

The Altai Accentor—*Accentor himalayanus*.

A permanent resident of considerable altitudes. Habits and distribution appear similar to those of the previous species. Both associate in a common flock.

The Black-throated Accentor—*Tharrhaleus atrigularis*.

An uncommon species. Seen in winter only. Taken early in March in the Keytal nullah at 6,300 feet. It was in the company of a flock of Jerdon's Accentors.

Jerdon's Accentor—*Tharrhaleus jerdoni*.

A common resident on the main range. In winter associates in moderate flocks that enter gardens and frequent grassy places. A local migrant. Moves up and down the range in accordance with the change

of season. In winter found on the lower and intermediate slopes between 4,500 and 6,500 feet. In summer ascends to near tree-limit between 9,000 and 11,000 feet.

The Spotted Munia—*Uroloncha punctulata*.

Taken in the valley during May close to the foot of the main range. Nesting at this period. Altitude, 4,000 feet. Not seen at higher elevations.

The Black and Yellow Grosbeak—*Pycnorhamphus icteroides*.

A rare species. Seen on one occasion only; in winter at 6,000 feet. Jones records this bird as frequenting the Simla Hills, and Whistler states that it is common at Dalhousie; so it is a little difficult to understand why the species is so rare here.

The Red-headed Bullfinch—*Pyrrhula erythrocephala*.

A permanent resident. Frequents high altitudes. Moves up and down the range in accordance with season. Descends in winter to 6,000 feet. In summer ascends to the highest belt of trees.

The Brown Bullfinch—*Pyrrhula nepalensis*.

Rare. I suppose a resident that moves with the change of season up and down the slope. A pair taken in winter on Dharmkote at 6,000 feet. They were haunting the forest of oak and rhododendron.

The Pink-browed Rose-Finch—*Propasser rhodochrous*.

Common. Resident. Widespread in winter over the lower and intermediate slopes. Gathers into large flocks; usually one or two males with a troop of females. Frequents grassy places, and enters gardens in both civil and military stations. A local migrant. Ascends and descends the slope in accordance with the change of season. In winter found everywhere between 4,000 and 7,000 feet. In summer retires to higher altitudes where it may be found between 7,500 and 11,000 feet.

The Common Rose-Finch—*Carpodacus erythrinus*.

Large numbers seen to pass through in April. I suppose birds of passage from the plains to greater heights. There seems to be the same disproportion in the numbers of the sexes as in the case of the previous species.

The Dark Rose-Finch—*Procarduelis nepalensis*.

Frequently seen in summer at high elevations on the snowy range. Associates in flocks that feed on the alpine pastures. Usually found in summer between 10,000 and 11,000 feet. Not observed in winter.

The Himalayan Greenfinch—*Hypacanthis spinoides*.

Not common. I suppose a permanent resident. Small flocks observed in winter on the lower slopes of the main range.

The Yellow-throated Sparrow—*Gymnorhis flavicollis*.

Collects into large flocks about the fields and grassy hills up to an altitude of 4,000 feet. Not seen on the wooded slopes.

The House-Sparrow—*Passer domesticus*.

Abundant, widespread, resident. Frequents all villages, gardens, bungalows up to an altitude of at least 6,500 feet.

The Cinnamon Tree-Sparrow—*Passer cinnamomeus*.

A very common resident. Keeps to the trees and jungle. Met with in both stations at all months. Ascends to at least 7,000 feet. Nests taken at 6,000 feet in May and June.

The White-capped Bunting—*Emberiza stewarti*.

A permanent resident. Fairly common. A local migrant. Moves up and down the slope in accordance with the change of season. In winter occupies a low zone on the range between 4,000 and 6,500 feet. In summer ascends to a higher zone between about 6,500 and 9,000 feet.



Nest of the Grey-headed Ouzel, *Merula castanea*.

The Eastern Meadow-Bunting—*Emberiza stracheyi*.

Resident. The most common bunting on the range. In winter congregates in flocks that frequent gardens and grassy places. A local migrant that ascends and descends the range in accordance with the change of season. In winter remains in a low zone between 4,000 and 7,000 feet. In summer ascends to higher elevations between 7,000 and 10,000 feet.

The Kashmir Martin—*Chelidon kashmiriensis*.

A summer visitor in small numbers. Occasionally seen between 8,000 and 10,000 feet.

The Crag-Martin—*Ptyonoprogne rupestris*.

Seen about the cliffs and moraines near Lower Dharmsala. Altitude, 4,500 feet.

The Swallow—*Hirundo rustica*.

A summer visitor. Frequents the Kangra Valley as far as the foot of the range. Not seen above 4,000 feet.

The Wire-tailed Swallow—*Hirundo smithi*.

A summer visitor. Common in the valley about streams and bridges. Not seen on the main range above 5,000 feet.

Syke's Striated Swallow—*Hirundo erythropgia*.

A summer visitor. Common. Frequents both the valley and the range. First noted early in April. No swallow remains on the range during the winter months.

The European Striated Swallow—*Hirundo rufula*.

A single bird met with on Dharmkote in April at an altitude of 6,500 feet was probably of this species.

The Large Pied Wagtail—*Motacilla maderaspatensis*.

A bird of the valley. Found near the foot-hills of the range, but not common. I suppose a resident. Seen up to 4,000 feet.

The Grey Wagtail—*Motacilla melanope*.

Found in winter in the foot-hills between 4,000 and 5,000 feet.

The Tree-Pipit—*Anthus trivialis*.

Not observed above the foot of the range in winter. Ascends in spring to at least 6,000 feet.

The Indian Tree-Pipit—*Anthus maculatus*.

A common and permanent resident. In winter associates in flocks. Frequents gardens and open patches in the neighbourhood of trees. A local migrant. Moves up and down the slope in accordance with the change of season. In winter is found on the foot-hills between 4,000 and 6,000 feet. In summer ascends to a higher zone between 7,500 and 11,000 feet.

The Brown Rock-Pipit—*Anthus similis*.

Fairly common. A permanent resident of both grassy areas and rocky hill sides. Extends from the foot of the range to at least 9,000 feet. Nests taken at 4,000 feet.

The Indian Pipit—*Anthus rufulus*.

A resident near the foot of the range. Haunts the fields and cultivated areas. Not seen above 4,500 feet.

Hodgson's Pipit—*Anthus rosaceus*.

A rare species. I suppose a resident that moves according to season up and down the slope. Found in summer on the alpine pastures in the company of rose-finches and accentors, altitude, 10,000 feet.

The Upland Pipit—*Oreocorys sylvanus*.

Rare. A single bird taken in February at 4,600 feet.

Brook's Short-toed Lark,—*Calandrella tibetana*.

I expect a summer visitor to the range. Taken in May at 5,600 feet.

The Crested Lark—*Galerita cristata*.

Common. A permanent resident of the waste areas at the foot of the range. I expect also a bird of the main valley. Not seen above 4,500 feet.

The Purple Sun-bird—*Arachnechthra asiatica*.

A bird of the Kangra Valley. So far as I have seen a summer visitor only. It reaches the foot of the main range, but not seen above 4,000 feet.

The West-Himalayan Scaly-bellied Green Woodpecker—*Gecinus squamatus*.

Not common. Probably resident. Taken on the main range at an altitude of 8,000 feet.

The Black-naped Green Woodpecker—*Gecinus occipitalis*.

Common. A permanent resident. Frequents the main range up to about 8,000 feet. Nests at 6,000 feet.

The Western Himalayan Pied Woodpecker—*Dendrocopus himalayensis*.

Fairly common. Resident. Keeps to a higher zone than the two succeeding species. In winter descends to 6,000 feet. In summer remains between 8,000 and 10,000 feet.

The Fulvous-breasted Pied Woodpecker—*Dendrocopus macii*.

A bird of lower altitudes. Resident. Seen only in the valley and the foot-hills of the range. Not noted above 4,500 feet.

The Brown-fronted Pied Woodpecker—*Dendrocopus auriceps*.

Abundant. Resident. The representative of the pied woodpeckers at intermediate elevations of the range. Usually found between 4,000 and 9,000 feet. Also a bird of the Kangra Valley.

The Golden-backed Woodpecker—*Brachypternus aurantius*.

Resident and familiar in the Kangra Valley. Ascends the foot-hills of the main range but not higher than about 5,000 feet.

The Speckled Piculet—*Picumnus innominatus*.

A rare bird seen sometimes in the company of insectivorous flocks. Frequents low jungle and tangled brushwood where it climbs like a woodpecker about the smaller branches. Noted between 4,000 and 6,000 feet.

The Common Wryneck—*Iynx torquilla*.

Not actually seen on the range. Occurs in the valley near Kangra, so probably ascends to higher elevations.

The Great Himalayan Barbet—*Megalæma marshallorum*.

Common. Resident. In winter goes about in flocks. Keeps to moderate elevations on the snowy range. Seen from 4,000 to 7,000 feet. Stomach in winter found to contain hornets.

The Blue-throated Barbet—*Cyanops asiatica*.

Common. Resident. A very noisy bird especially in March and April. Occurs in the valley and ascends the slopes of the ranges to at least 6,000 feet. Found nesting in March and April at 4,900 feet.

The Coppersmith—*Xantholæma hæmatocephala*.

A bird of the Kangra Valley. Approaches the foot of the main range, but not seen above 4,000 feet.

The Indian Roller—*Coracias indica*.

A common resident of low altitudes. Spread over the Kangra Valley. Enters the foot-hills of the range. Not seen above 4,500 feet.

The Common Indian Bee-eater—*Merops viridis*.

A summer visitor. First arrivals noted in April. Frequents the valley and often seen about the streams in the foot-hills. Noted up to 4,500 feet.

The Himalayan Pied Kingfisher—*Ceryle lugubris*.

A pied kingfisher is sometimes seen about the streams in the foot-hills. Not identified, but most probably belongs to this species. Seen up to 4,300 feet.

The Common Kingfisher—*Alcedo ispida*.

A permanent and well-known resident of the valley. Visits the mountain streams up to a height of 5,000 feet.

The White-breasted Kingfisher—*Halcyon smyrnensis*.

A resident of the Kangra Valley. Occupies suitable places in the foot-hills of the range. Not seen above 4,500 feet.

The European Hoopoe—*Upupa epops*.

A summer visitor. Rarely seen in Dharmsala. First noted at the end of March. Not observed above 4,500 feet.

The Common Indian Swift—*Cypselus affinis*.

A common summer visitor of wide altitudinal range. Arrives early in March. Occupies the whole hill-side even to the snowline.

The Cuckoo—*Cuculus canorus*.

A summer visitor to the range. Abundant. Ascends to at least 7,000 feet. Its call is continually heard from April to June.

The Himalayan Cuckoo—*Cuculus saturatus*.

Also a summer visitor. Less common than the previous species. First heard in April. Ascends to at least 8,500 feet.

The Indian Cuckoo—*Cuculus micropterus*.

The call of this Cuckoo is a common sound in the valley. Not heard above 4,000 feet.

The Large Hawk-Cuckoo—*Hierococcyx sparveriioides*.

Heard in summer on Triund Hill at elevations between 7,000 and 10,000 feet.

The Sirkeer Cuckoo—*Taccocua leschenaulti*.

This uncommon and peculiar bird was taken in December near Dharmsala civil station at a height of about 4,500 feet. Seen only on this one occasion.

The Rose-ringed Paroquet—*Palæornis torquatus*.

Common at low altitudes. Resident. A bird of the Kangra Valley. Approaches the foot of the range, but not seen to enter the more wooded area about the civil station.

The Slaty-headed Paroquet—*Palæornis schisticeps*.

A resident on the wooded slopes of the main range. Keeps to higher altitudes than the other parrots. Ascends to at least 10,000 feet.

The Western Blossom-headed Paroquet—*Palæornis cyanocephalus*.

Resident. Abundant. This is the species which robs the gardens in the civil station of Dharmsala. Ascends the wooded slopes of the range up to an altitude of 5,000 feet.

The Brown Fish-Owl—*Ketupa zeylonensis*.

Frequents streams and marshy areas especially in the vicinity of woodland. Taken both in the valley and in the foot-hills of the range. Seen up to 4,500 feet.

The Spotted Owlet—*Athene brama*.

Uncommon. I suppose a resident. A noisy little species of diurnal habits. Found in the Kangra Valley and on the range up to 4,500 feet.

The Large Barred Owlet—*Glaucidium cuculoides*.

Abundant. Resident. The most familiar owl of Dharmsala. Very noisy. Moves about in daylight. Often mobbed by bulbuls. Frequents the valley and ascends the range to at least 6,000 feet.

The Black Vulture—*Otogyps calvus*.

Fairly common. Resident. Often seen circling over the station.

The Himalayan Griffon—*Gyps himalayensis*.

A very common species. Resident. Numbers seen any day and at all altitudes from the valley to the snow-line.

The Indian White-backed Vulture—*Pseudogyps bengalensis*.

Less common than the previous two species. Resident. Seen up to 6,000 feet.

The Large White Scavenger Vulture—*Neophron percnopterus*.

Extremely common. Resident. Always to be seen about the civil station in the vicinity of the bazar.

The Lammergeyer—*Gypaëtus barbatus*.

A handsome, common and permanent resident. Ascends to extreme altitudes. Seen circling about the snow-line at all times of the year. Found nesting in May at about 7,000 feet.

The Golden Eagle, *Aquila chrysaëtus*.

This powerful bird visits Dharmsala from time to time. Seen near the head of the Keytal nullah in March at 9,000 feet. The birds were entering and leaving a deep cleft on the side of the gorge and were probably nesting there.

The Imperial Eagle—*Aquila heliaca*.

A winter visitor. Abundant in the cold season. Often seen soaring over the station.

The Steppe Eagle—*Aquila bifasciata*.

Another very common winter visitor. Arrives in October; leaves in March.

The Indian Tawny Eagle—*Aquila vindhiana*.

Seen from time to time at the foot of the hills. Remains in the vicinity of cultivation. Not noted above 4,000 feet.

Bonelli's Eagle—*Hieraëtus fasciatus*.

I think I have seen this eagle soaring over the military station, but am not quite certain of its identity.

The Booted Eagle—*Hieraëtus pennatus*.

I think a permanent resident. Not common.

Hodgson's Hawk-Eagle—*Spizaëtus nepalensis*.

Seen occasionally soaring over the forest-clad slopes of the range between 6,000 and 10,000 feet.

The Short-toed Eagle—*Circaëtus gallicus*.

A resident species. Seen circling over the military station at about 9,000 feet.

The Crested Serpent-Eagle—*Spilornis cheela*.

A fairly common species. Sometimes seen soaring over the station. Taken on different occasions in moist wooded patches on the valley close to the foot of the range.

The Brahminy Kite—*Haliastur indus*.

Uncommon. Not noted on the wooded slope. Seen about the larger streams near the foot of the main range, but not above 5,000 feet.

The Common Kite—*Milvus govinda*.

A widespread and familiar resident. Occupies the valley and all altitudes on the range. Seen as high as 12,000 feet.

The Black-winged Kite—*Elanus caeruleus*.

Mr. C. H. Donald has told me of the occurrence of this species at Palampur. So I expect it sometimes visits Dharmsala.

The Pale Harrier—*Circus macrurus*.

A winter visitor. Uncommon. Found in the valley and on the flanks of the range. Seen up to 6,000 feet.

The Marsh-Harrier—*Circus aeruginosus*.

A winter visitor. Frequents suitable moist places in the valley and approaches the foot of the hills. Not seen above 4,500 feet.

The Long-legged Buzzard—*Buteo ferox*.

A winter visitor to the valley and the lower slopes of the hills. Common. Often seen in marshy areas and about stony places in the vicinity of streams. Birds in both phases of plumage occur. Leaves in March. Seen up to 6,000 feet.

The Common Buzzard—*Buteo desertorum*.

A pair of buzzards, that spent the summer and probably nested near Lakka at 10,000 feet, most likely belonged to this species.

The Goshawk—*Astur palumbarius*.

Uncommon. I suppose a resident. Taken in the military station. Frequently captured by the falconer.

The Sparrow-Hawk—*Accipiter nisus*.

Not a very common species. Seen occasionally in the valley and on the slopes of the range. Birds seem less numerous in summer.

The Besra Sparrow-Hawk—*Accipiter virgatus*.

A bird shot on the hill-side at 6,000 feet seemed to agree more closely with the description of this than the previous species. I am doubtful of its identity. Certain specimens seem to be intermediate links between the two species.

The Peregrine Falcon—*Falco peregrinus*.

Seen both in the valley and in the military station at 6,000 feet. Uncommon. So far as I have seen, a winter visitor only.

The Shahin Falcon—*Falco peregrinator*.

Uncommon. Resident. Seen a few times about the wooded cliffs of Dharmkote at 7,000 feet.

The Hobby—*Falco subbuteo*.

Not uncommon about the wooded slopes of the range. More frequently seen in winter. Often observed at sunset.

The Kestrel—*Tinnunculus alaudarius*.

Abundant. Resident. Frequents the range and is very common in the valley. Seen up to 9,000 feet.

The Indian Blue Rock-Pigeon—*Columba intermedia*.

A bird of the valley. Resident and common. Ascends the main range to a height of 9,800 feet where it rests in caves during the heat of the day.

The White-bellied Pigeon—*Columba leuconota*.

Resident. A bird of the snow-line. In winter gathers into restless flocks that keep incessantly on the move. Seen according to season between 5,500 and 10,000 feet.

The Eastern Wood-Pigeon—*Palumbus casiotis*.

Uncommon in this area of the range. A few were met with in February at 6,000 feet.

The Indian Turtle-Dove—*Turtur ferrago*.

A summer visitor. Very common in the season. Arrives in April. Frequents the wooded slopes. Nests on the higher ranges at about 10,000 feet.

The Spotted Dove—*Turtur suratensis*.

Very common. A resident. Abundant in the valley and the foothills. Frequents cultivated tracts and the gardens in the civil station. Not seen above 5,000 feet.

The Little Brown Dove—*Turtur cambayensis*.

This little dove occupies the valley. Resident and common. Remains at low altitudes, probably below 3,000 feet. Not seen as high as the civil station of Dharmsala.

The Bar-tailed Cuckoo-Dove—*Macropygia tusaila*.

I have not actually shot this species. But a very distinctive booming call heard frequently on the wooded hill-side between 8,500 and 10,000 feet can scarce'y belong to any other bird.

The Common Peafowl—*Pavo cristatus*.

A resident of the valley. Fairly common. It can scarcely be included amongst the birds of the range, though I have seen a bird shot almost in the foothills.

The Red Jungle-fowl—*Gallus ferrugineus*.

Common. Resident. Found in suitable places in the Kangra Valley. Also enters the foot-hills of the range. Not seen above 4,500 feet.

The Cheer Pheasant—*Catreus wallichii*.

Resident. The least common of the beautiful pheasants of the range; at least it seems to be so in the vicinity of Dharmsala. Taken in March at 7,500 feet.

The Koklas Pheasant—*Pucrasia macrolopha*.

Resident. Abundant on the wooded slopes of the main range. Occupies a somewhat narrow altitudinal zone between about 7,000 and 10,000 feet. Moves up and down the slope within these limits in accordance with the change of season.

The White-crested Kalij Pheasant—*Gennæus albicristatus*.

Abundant. Resident. Keeps mainly to the well-wooded and moist ravines. A bird of considerable altitudinal distribution. Found in the Kangra Valley and on the snowy range up to 9,000 feet.

The Monal—*Lophophorus refulgens*.

Resident. Abundant. Frequents high elevations on the main range. Often found in the high forest of oak and rhododendron where the ground is carpeted with mountain grass. Remains usually between 8,000 and 11,000 feet and moves vertically according to season within these limits.

The Western Horned Pheasant—*Tragopan melanocephalus*.

Resident. Uncommon. This handsome bird keeps close to the upper margin of the forest. Its haunts are similar to those of the Monal and both live at the same high altitude.

The Common Quail—*Coturnix communis*.

A bird of passage. Very common on migration. Large numbers pass through the Kangra Valley in April.

The Jungle Bush-Quail—*Perdicula asiatica*.

Frequently shot in the ravines and jungle along the foot-hills of the range. No record above 4,000 feet.

The Chukor—*Caccabis chucar*.

Common. Resident. Frequents the open stony places on the range that are usually covered with scrub. Haunts suitable places in the valley and the foot-hills. Seen between 4,000 and 7,500 feet.

The Black Partridge—*Francolinus vulgaris*.

Abundant. Resident. Mainly a bird of the Kangra Valley. Occurs in the foot-hills but not seen on the wooded area of the range. Not observed above 4,500 feet.

The Grey Partridge—*Francolinus pondicerianus*.

A common resident of the Kangra Valley. Some birds enter the foot-hills and ascend to 4,000 feet. Not seen on the wooded slopes.

The Himalayan Snow-Cock—*Tetraogallus himalayensis*.



Young of Himalayan Snow-Cock—*Tetraogallus himalayensis*.

Resident. Fairly common. Remains close to the snow-line, keeping to the bare places, the alpine pastures and the rocks above the limit of tree growth. Feeds largely on the soft young grass at the margin of the retreating snow. Seen between the altitudes of 9,000 and 13,000 feet within which zone the birds ascend and descend according to the change of season.

The Snow-Partridge—*Lerwa nivicola*.

Uncommon. I suppose resident. A bird of the highest elevations on the snowy range. Collects in winter into noisy whistling flocks. Keeps close to or even passes beyond the snow-line at altitudes between 10,000 and 14,000 feet. In summer probably retires to even greater heights.

The Sarus—*Grus antigone*.

Resident. Common in suitable places. A pair of these birds are frequently to be seen in the level valley not far from the civil station of Dharmsala. Not seen above 3,500 feet.

The Red-wattled Lapwing—*Sarcogrammus indicus*.

Familiar, noisy, resident in suitable places in the valley. Enters the foot-hills. Not seen above 4,000 feet.

The Lapwing—*Vanellus vulgaris*.

I think only a winter visitor. Frequents the valley. Comes to the very edge of the foot-hills, but I have not seen it within the limits of the range.

The Green Sandpiper—*Totanus ochropus*.

A bird of solitary habits. Abundant. Visits the valley in the cold season. Follows the streams into the foot-hills and ascends the range to about 5,000 feet.

The Woodcock—*Scolopax rusticola*.

Common. Resident. Frequents well-wooded streams and marshy patches on the mountain side. In winter descends to the Kangra Valley. A local

migrant. Moves up and down the range in accordance with the change of season. In winter descends to the foot of the range. In summer retires to near tree limit.

The Himalayan Solitary Snipe—*Gallinago solitaria*.

Probably a wide spread but uncommon resident of the range. I know of it having been taken in winter at two places between 4,000 and 6,000 feet. Probably a local migrant moving to high and low altitudinal zones similar to those frequented by the woodcock.

The Common Snipe—*Gallinago caelestis*.

Frequents suitable places in the valley and found up to the base of the hills at 4,000 feet.

The Jack Snipe—*Gallinago gallinula*.

A winter visitor. Common. Found in the same haunts as the ordinary snipe

The Painted Snipe—*Rostratula capensis*.

Resident. Fairly common. Occupies the main valley. Reaches at least as high as Kaniara near the foot of the main range.

The White-necked Stork—*Dissura episcopus*.

A resident of the Kangra Valley. Common. Visits the low land near lower Dharmsala at about 4,000 feet.

The Pond-Heron—*Ardeola grayi*.

Common in the Kangra Valley. Included here as it has been seen in the foot-hills at 4,000 feet.

REPORT ON A COLLECTION OF MAMMALS MADE
BY COL. J. E. B. HOTSON IN SHIRAZ, PERSIA.

By

MAJ. R. E. CHEESMAN, M.B.O.U., F.R.G.S.

The date of this collection is February 10th to August 15th, 1919.

A short notice of a subsequent Shiraz collection from Colonel Hotson, including a description of a New Vole by Mr. Oldfield Thomas, will be found at the end of this paper.

The mammals inhabiting Shiraz and the immediate neighbourhood are of exceptional interest, especially so at the present moment, as they form a link between two recently acquired collections, from the East and West, that from Baluchistan by Hotson and that from Mesopotamia by the Mesopotamian Expeditionary Force.

I have had great pleasure in working out this collection. Mr. Oldfield Thomas and Mr. R. C. Wroughton have given me every assistance in the unravelling of the various problems. The paucity of different species to be found in one place is experienced by all who have collected in Persia and Mesopotamia and even the dense forest region between the Elburz Mountains and the Caspian has proved no exception. Not only are the animals scarce, but they are difficult to trap, being usually untempted by ordinary baits.

Of the 13 species obtained, two of the bats have proved new and have been given subspecific rank: *Myotis myotis risorius* and *Rhinolophus ferrum-equinum irani*. In each case they are well marked pale desert forms, their colour resembling the dove grey of the Indian ring dove, *Turtur risorius*, after which the *Myotis* is named.

The altitude is the same for nearly all the specimens, when the elevation is not given, it is that of Shiraz, 5,200 feet.

Very little previous collection in Shiraz has been undertaken. In 1862 De Filippi obtained from the Marquis Doria a few specimens from Shiraz which he mentions in "Viaggio in Persia" although he personally travelled only in Northern Persia, around Kazvin and Teheran and the Caspian region.

In 1871 Dobson wrote a paper on a few specimens of animals which had been obtained in Shiraz.

In 1872 Dr. Blandford and Major St. John passed through Shiraz and made collections the results of which are recorded in "Eastern Persia," written by the former.

Since then our knowledge of the mammals has increased by only one small addition, made by Mr. H. F. Witherby in 1902 during an expedition which reached Shiraz, but was mainly occupied with ornithology.

Colonel A. C. Bailward, with Mr. R. B. Woosnam, in 1905, secured many specimens in adjacent country between Ahwaz and Ispahan on their journey to Armenia, but they kept well to the north of Shiraz (P. Z. S., 1905, p. 519, Thomas). A subsequent journey in 1907 was confined to the district between the South Coast of the Caspian and Teheran (A. M. N. H. 7, xx, p. 196, Thomas). As these somewhat scattered references have come under review during the writing of this paper, the various Shiraz species mentioned in them have been included, for the sake of concentration, so that this paper and Blanford's "Eastern Persia," Vol. II, should comprise the complete list up to date.

The present nomenclature is used, the original names when different are given in brackets.

DE FILIPPI, VIAGGIO IN PERSIA, 1862, p. 342.

Meriones tamaricinus, Pall. Shiraz by Marquis Doria.

Probably *Meriones persicus* or *Meriones ambrosius*.

Apodemus sylvaticus (*Mus. sylvaticus*.)

Probably : *Apodemus sylvaticus witherbyi*.

DOBSON, JOURN., AS. SOC. xl, p. 455, 1871.

Tricenops persicus, Dobson, a Bat belonging to the *Rhinolophidæ*, with a remarkable complex noseleaf, of large size, with three pointed projections on the upper edge.

Eptesicus shiraziensis, Dobson (*Vesperugo shiraziensis*), the Shiraz Serotine Bat.

Pipistrellus kuhli lepidus, Blyth (*Pipistrellus marginatus*), Kandahar Pipistrel, a subspecies of the White bordered bat.

Pipistrellus coromandra, Grey (*Pipistrellus coromandelicus*), Coromandra Pipistrel.

Myotis myotis (*Vesperugo murinus*), Mouse-Eared Bat.

Probably *Myotis myotis risorius*.

COLLECTED BY H. F. WITHERBY, 1902.

Some of these species were dealt with by Thomas in the Report "Mammals from Persia and Armenia presented to the British Museum by Col. Bailward." P. Z. S., 1905, Vol. ii, and Witherby's Field-mouse was described by Thomas in A.M.N.H. 7, X, 1902. They have not been published previously as a complete list.

Eptesicus mirza, De Filippi, (*Vesperugo*), the Mirza Serotine.

1 ♀ Basht, Shulistan, alt. 4,000'; 1 ♀ Telespid, Shulistan, 3,200'.

Witherby remarks: "shot flying about at sunset in rocky places with trees." Woosnam also obtained this bat at Mal Amir, alt. 4,300', and says "shot among oak trees on hill-side. They hang up during the day in the old trees."

Pipistrellus kuhli, Kuhl, White-bordered Bat.

1 ♀ Shiraz, Fars; 1 ? Kamarij Dashtistan.

Myotis myotis omari, Thomas, Omar's Mouse-eared Bat.

1 ♀ Telespid, Shulistan.

Rhinopoma microphyllum, Geoff, Egyptian Mouse-tail.

1 ♀ Telespid, Shulistan.

Nearly the whole of the long tail projects beyond the filament.

Length of tail 60mm. *R. kinneari*, Wroughton, a slightly larger species has been found in Sind and *R. pusillum*, Thomas, a small species has been lately described from S. E. Persia.

Vulpes persica, Blanf, Persian Desert Fox.

1, also 1 skin and 1 skull.

Blanford described the type from specimens obtained in the hills near Shiraz, alt. 6,000'.

Sciurus fulvus, Blanford. Fulvous Squirrel.

1 Kaluni, Fars, 4,200'; 1 ♂, 1 ♀ Sisakht, Fars, 6,500';
1 Chinar, 6,600'.

The type locality is oak forests round Shiraz. Witherby remarks "found in wooded valley in a species of evergreen oak; often running on ground." Probably a sub-species of *persicus*.

Apodemus sylvaticus witherbyi (*Mus.* (also *Micromys*) *sylvaticus witherbyi*), Thomas, Witherby's Field-mouse.

1 ♂ Shul, Fars, 5,200'.

Lepus lehmanni, Severz., the Turkistan Mountain Hare.

3 ♂, 1 ♀ Dasht-i-arjan, 6,400'.

Closely assimilates to specimens of *L. lehmanni* obtained by Carruthers in the Hissar Mountains, Turkistan. They are considerably larger than *L. conneri*, Rob., from the Mesopotamian Plain, though in colouring there is a certain similarity, also larger than *L. craspedotis*, the Baluch Hare.

THE FOLLOWING IS A LIST OF COL. HOTSON'S SPECIMENS:—

1. RHINOLOPHUS FERRUM-EQUINUM IRANI, Subsp.-nov.

Persian Horse-Shoe Bat.

1. ♀ (type); 8 immature.

A pale desert form of *R. ferrum-equinum*, the horse-shoe bat of Europe. Specimens from Asia Minor are identical with the European form. The present series has been compared with these and with *R. f.-e. tragatus* from North India. The Shiraz bat is paler in colour and slightly longer in the forearm than either of these forms. In the National Collection an unnamed specimen of this pale form from *Turbat-i-Haidari*, N. E. Persia, obtained by Watson, was awaiting further material for identification. This extends the known range across Persia and has suggested the name *irani*.

Size medium; hairs of the back soft and long (9mm).

General colour above pale "fawn colour", bases of the hairs pale "drab", darkening to pale fawn colour at the tip. Underparts pale drab with a washing of "vinaceous buff".

Measurements of the type: head and body (in flesh), 60mm; tail, 44; hindfoot, 12; ear, 25. Forearm, 60 mm.

Skull:—Greatest length, 23.5 mm.; basilar length, 16; greatest breadth, 12.5; least interorbital breadth, 3; breadth of braincase, 9.5; upper tooth row, including canine, 9.

Hab: Persia. Type from Shiraz, alt. 5,200'.

Type:—Adult, ♀ B. M. No. 20. 2. 9. 3. Original number 920. Collected 21st June 1919 by Col. J. E. B. Hotson and presented by the Bombay Natural History Society to the British Museum.

The eight immature specimens are a paler shade of the same general colour as the adult.

The nose-leaf from dry skin measured 12mm. by 7.5

2. PIPISTRELLUS KUHLI LEPIDUS, Blyth.

Kandahar Pipistrel.

1845. *Pipistrellus lepidus*, Blyth, J. A. S. B., xiv, p. 340.

14 ♀.

The forearm of these measures 33-34mm.

The large proportion of females to males in collections of Pipistrels is remarkable. Buxton obtained one male to sixteen females in a series of *P. kuhli* in Amara.

3. PIPISTRELLUS MIMUS GLAUCILLUS, Wroughton.

Northern Dwarf Pipistrel.

1912. *Pipistrellus mimus glaucillus*, Wroughton, J. B. N. H. S., xxi., p. 769. ♂ 12; ♀ 81; in al. 6.

Ten from Bagh Mizathahami, Shiraz, the rest from Shiraz.

The forearm of these is about 31mm.

P. mimus is generally distributed throughout India and is smaller and darker than *P. kuhli*, *P. m. glaucillus* is a paler slightly larger sub-species. The type locality is Multan, Punjab; it also occurs in Sind.

4. MYOTIS MYOTIS RISORIUS, Subsp. nov.

The Dove-grey Mouse-eared Bat.

♂ 3; ♀ 1.

Much resembles, but is paler than *Myotis m. omari*, Thomas. Also differs from *M. M. omari* in the absence of the general washing of cream buff on the back, underparts, and wing filaments, which on the back of *M. m. risorius* is replaced by a pale purplish washing. In the underparts the creamy buff tips to the hairs in *M. m. omari* are in these specimens white, giving to the belly a much whiter appearance. Forearm measurements are on an average slightly longer than those of *M. m. omari*.

Considerably paler and slightly longer in the forearm than either *M. myotis* from Europe or *M. blythi* from North India.

Size large, hairs on the back soft, and long (10mm).

General colour above "drab grey", slightly darker towards the tail, bases of hairs "slate colour", tips pale purplish. Below bases of hairs "clove brown", tips of hairs white, clove brown of bases faintly showing through the white tips. Limbs and wing filaments "drab". Line of demarcation of colour upper and underparts clearly defined.

Measurements of the type: forearm 62mm.; head and body (in flesh) 76mm. tail, 62; hindfoot, 14; ear, 26.

Skull: greatest length, 24mm; basilar length, 18.5; greatest breadth (broken) 14.5; interorbital breadth, 5.5; breadth of brain-case, 10; upper tooth row, including canine, 9.

Hab.—Persia. Type from Shiraz, alt. 5,200', three more specimens from the same locality.

Type.—Adult ♂ B. M. No. 20-2-9-18. Original number 925. Collected 22nd June 1919, by Col. J. E. B. Hotson and presented by the Bombay Natural History Society to the British Museum. The neighbouring subspecies *M. m. omari* has been obtained at Derhend, North of Isphan, alt. 6500', the type locality. Also at Resht at 400' by Woosnam and at Telespid, S. W. Persia, alt. 3,200' by Witherby.

5. HERPESTES EDWARDSI FERRUGINEUS, Blanford.

Ferruginus Indian Mongoose.

1874. *Herpestes ferrugineus*, Blanford, P. Z. S., p. 661.

♂ 1.

This is a rufous race of the Indian Mongoose, *Herpestes edwardsi*, Geoffroy. A specimen from Qasrqand, Persian Baluchistan, (Hotson) is a well marked example of this rufous form.

Shiraz is at present the Western limit of its range, the type locality is Sind.

The better known name for the Indian Mongoose, *Mungos mungo*, really belongs to a South African species of Banded Mongoose. This has been recently pointed out by Dr. J. A. Allen of New York and accepted by Mr. Oldfield Thomas. It has therefore been necessary to revive the earliest generic and specific name available for the Indian Mongoose which is *Herpestes edwardsi*.

6. CANIS AUREUS, L.

Jackal.

1756. *Canis aureus*, Linnæus, Syst. Nat. i. (10th ed.) p. 40.

♂ 1; ♂ immature 1.

The adult is in summer coat, which is much worn. Shows a marked similarity in colour shades and skull, characters and size to specimens from the Lower Tigris.

7. MERIONES PERSICUS, Blanford.

The Persian Jird or Gerbil.

Ann & Mag. Nat. Hist., xvi, 1875, p. 312.

1876. *Gerbillus persicus*, Blanford. East Persia. ii. p. 66.

♂ 1; ♀ 2.

These agree with all the specimens of *M. persicus* in the British Museum. Shiraz is also close to the type locality.

In recent collections this species has been obtained at Mal-a-Mir, N. E. of Awaz (Woosnam) and from several districts in Baluchistan (Hotson).

8. MERIONES AMBROSIUS, Thomas.

Cinnamon-buff Jird or Gerbil.

1919. *Meriones ambrosius*, Thomas, A. M. N. H., 9, iii, p. 270.

♀ 2; ♀ 2 immature.

The two adult specimens show a marked resemblance to the type of *M. ambrosius*. The two immature skins have been placed with them. The pelage is not so highly coloured as in the adult, but shows a closer affinity to *M. ambrosius* than to *M. persicus*, the only two representatives of the genus in this collection.

M. ambrosius is a very beautiful species of the larger gerbils, the bright cinnamon buff colouring readily distinguishing it from the more sombre *M. persicus* and *M. erythrorous*. Three of the Shiraz specimens have a few white hairs at the end of the tail forming a small white tip although this is apparently not a constant feature.

9. MUS BACTRIANUS, Blyth.

*The Kandahar House Mouse.*1846. *Mus bactrianus*, Blyth, J. A. S. B., xv, p. 140.

♂ 75; ♀ 74.

It is not surprising that the series of mice from Shiraz should show a very mixed breed, owing to the fact that it is situated at a point where several races meet. Stowaways on caravans have doubtless alighted to add to the confusion. To the North we have received typical examples of the dark bellied European form *M. musculus* from Buxton at Kasvin. The majority of those obtained in Mesopotamia by the Mesopotamian Expeditionary Force, were *M. m. gentilis*, with whitish belly, the bases of the hairs being slaty. To the East the white bellied *bactrianus* was taken by Hotson in Baluchistan.

The Shiraz mice have a tail averaging 10mm. longer than the Mesopotamian series, I have therefore referred those under review provisionally to *M. bactrianus* although the colour of the underparts in the specimens grades from this type to that of *M. m. musculus*.

10. CRICETULUS MIGRATORIUS, Pallas.

*The Little Grey Hamster.*1794. *Mus migratorius*, Pallas, Reis, ii, p. 703.

♂ 26; ♀ ; 24 in al. 1.

Notwithstanding this very fine series of Shiraz hamsters to work with, I have been unable to distinguish any constant differences between this and *C. migratorius*. The sizes certainly vary within considerable limits. The females are larger than the males on an average. Of the nine skins in which the head and body measurements taken in the flesh were 100mm. or over, six were females.

Many of both sexes have the ochraceous tint of colouring in contrast to the usual blue grey. One skull was sent with the two cheek pouches attached, well distended with grains of barley. This abnormal development in the hamster is used for conveying corn, from the field to the burrow where it is stored.

11. OVIS VIGNEI CYCLOCEROS, Hutton.

*The Afghan Urial.*1842. *Ovis cycloceros*, Hutton, Calc. Journ., Nat. Hist., p. 88.

♂ 1; ♀ 1; Dehnau, 12 miles S. E. of Shiraz, alt. 5,500'.

Adult male with typical horns of the *ovis vignei* group, the tip curving towards the front of the eye. Horn measurement, round the front curve 24 inches. Shoulder of male taken in the flesh, 30.5 inches. Horn of adult female measured 3.5 inches round front curve. Shoulder taken in the flesh 25.5 inches.

12. CAPRA AEGAGRUS BLYTHI, Lydekker.

*Sind Wild Goat.*1898. *Capra hircus blythi*, Lydekker., Wild Oxen, Sheep and Goats, p. 264.

♀ 1; Siakh Range, 10 miles S. of Shiraz.

This is a slightly smaller race of the Persian Wild Goat, *Capra aegagrus*, Gmelin, with slighter development of the knobs on the front edge of the horns and has a range in Sind, Baluchistan, and South Persia. *Capra aegagrus* reaches Asia Minor, the type locality is Daghestan district of the Caucasus and it appears to replace *C. æ. blythi* in the Elburz Mountains.

13. GAZELLA SUBGUTTUROSA, Guldenstadt.

Persian Gazelle.

1778. *Antelope subgutturosa*, Guldenstadt, Acta. Ac. Sci., Petrop, p. 251.
 ♀ 1; Low hills between Khan-i-Zinian and Shiraz., alt. 5,600.'

An adult female without horns, shot in June and is in the summer coat. The mask has the forehead nearly white, a broad pale chestnut stripe runs from the forehead down the centre of the face, ending in a small dark brown patch above the nose, two almost white stripes run parallel on each side of this central stripe and again two more pale chestnut stripes commence in front of the eye and terminate to the side of the nose. There is a male of this species mounted in the British Museum which has the face all white. This is at once a most interesting and valuable addition to the representatives of the Gazelle family in the National Collection, a group in which the material is sadly deficient, more particularly in the case of adult females on which many of the species of Gazelle are largely based.

The Persian Gazelle is a comparatively long coated species, with hornless females, that inhabits the higher ranges of hills and plateaux. This skull is considerably larger than any other with which comparison was made.

Hotson gives the measurement of the shoulder, taken in the flesh, as 26.5 inches, which is one inch more than the female Urial he sent from the same locality.

The type locality is given by Lydekker as Persia, at elevations of 3,000' to 7,000', and he includes Afghanistan in the range. Westward the species would meet *Gazella marica*, Thomas, which reaches the valley of the lower Karun River, a male and horned female having been obtained at Shushter by Bailey and mentioned in the report on the mammals collected by the Mesopotamian Expeditionary Force.

SUPPLEMENT.

Since the proofs of the first paper have been returned from the printer for correction, another small collection has arrived from Col. Hotson, including a new vole. There has been just time to attach the description of this vole by Mr. Oldfield Thomas and a short notice of the other species to my original paper for publication together.

Among those who contributed towards the Shiraz Collection, Col. Hotson writes that he received valued help from Lieut. J. T. Garrett, 15th Lancers, Lieut. B. L. Herdon and Major A. E. W. Lake, both of the 1/127th Q. M. O. B. L. I., Lieut.-Col. H. R. B. Gibson, I.M.S., Capt. R. Blandy, South Persian Rifles and Officers of the 36th Indian Mountain Battery. The date of this supplementary collection is August 15th to December the 16th, 1919.

THE DETAILED LIST OF THE SPECIES IS AS FOLLOWS:—

1. PIPISTRELLUS MIMUS GLAUCILLUS, Wroughton.
 ♂ 7; ♀ 11. Ten from Bagh-i-Jaffarani, Shiraz, the rest from Shiraz.
 Notes as in my paper.

2. PARAECHINUS MACRACANTHUS, Blanford.

Baluch Hedgehog.

1876. *Erinaceus macracanthus*, Blanford, East Persia, ii., p. 27.

♂ 1. Bagh-i-Rezi, Shiraz.

Type locality Dizak, Baluchistan. It was also obtained by Blanford at Karman. A plate of this Hedgehog is given in Eastern Persia, ii. Both the base and the tip of the spines, as well as the underfur, is dark brown,

almost black. The head, ears, and chest are grizzled by an admixture of white hairs. Blanford found that albinism was prevalent in the species.

3. CANIS AUREUS, L.

♂ 1. Bagh-i-Gulshan, Shiraz. Alt. 5,000'.

A typical example of *Canis aureus* in full winter coat. The general colour of the back is pale fawn, almost silvery, to which the black tips to the hairs give a grizzled appearance; the ears and hind legs are bright fawn, inclining to rufous the fore-legs are fawn coloured. Throat and belly white, chest washed with fawn. See my paper above.

4. VULPES, sp.

♂ I. Purchased.

This is a very dark specimen of a fox about the size of *V. persica*, with a large amount of purplish black on the under parts and back; the ears are entirely black outside and light fawn inside. Unfortunately it is a trade skin, without skull, and the classification cannot be carried further until more material is available. This skin was obtained from a dealer by Lieut.-Col. W. A. K. Fraser, D.S.O., M.C., South Persian Rifles.

5. TATERA PERSICA, Wroughton.

The Seistan Gerbil.

1906. *Tatera persica*, Wroughton, A. M. N. H., 7, xvii, p. 496.

♀ 1. imm., Akbarabad, near Shiraz. Alt. 4,800.

6. MERIONES AMBROSIUS, Thomas.

♂ 1, ♀ 1. One from Bagh-i-Jaffarani, Shiraz.

See my paper above.

7. MUS BACTRIANUS, Blyth.

♂ 88, ♀ 83.

The remarks on the House mice in my original paper apply equally to these except that the white-bellied specimens typical of *Mus bactrianus* are here in larger proportion.

8. CRICETULUS MIGRATORIUS, Pallas.

♂ 5, ♀ 27.

See my paper above.

9. CALOMYSCUS BAILWARDI, Thomas.

Bailward's Vesper Mouse.

1905. *Calomyscus bailwardi*, Thomas, P. Z. S., ii, p. 524.

♂ 2.

The type locality of this species is Mal Amir, 70 miles N. E. of Ahwaz. Thomas has given this descriptive paragraph which I borrow in full "A beautiful gerbil-coloured, long eared, tufted tailed mouse, of about the size of *Mus musculus*." Woosnam who collected the type says it was "trapped among barren rocks on mountain side above the Mal-i-Mir marsh." Hotson says "trapped on the hills 2 miles from Shiraz, Alt. 5,200'."

Two allied species were obtained in Baluchistan by Hotson.

10. MICROTUS IRANI, Thomas.

Shiraz Vole.

♂ 5, ♀ 1. Bagh-i-Rezi, Shiraz.

The following is Mr. Oldfield Thomas' description of this new Vole:—

“ *Microtus irani*, sp. n.

“ A rather large buffy coloured species, with a striking external resemblance to *M. (Phaiomys) afghanus*, Thos., but with normal *Microtus* dentition.

“ External appearance almost exactly as in *afghanus*. General colour above sandy buff, nearest to ‘tawny olive’, the hairs slaty at base with buffy subterminal rings and dark brown extreme tips. Sides clearer sandy. Under surface soiled whitish or creamy, the hairs slaty at base, except on the chin. Hands and feet creamy white. Tail sandy above, white on sides and below. Hindfoot pads apparently five in number and mammæ 2—2=8, but neither are absolutely clear.

“ Skull large and strongly built, twice the size of that of *M. mystacinus*, the zygomata stout and widely expanded. Palatal foramina narrow, reaching back just to the level of the front root of *m*¹. Posterior palate with well marked lateral pits. Bullæ large, though rather smaller than in *afghanus*.

“ Molar pattern as in typical *Microtus*; *m*³ with four completely closed triangles and a posterior C, there thus being four salient angles on each side. In *afghanus* there are only three. *M*² in the type with a small additional internal projection approaching that of *M. agrestis*, but this absent in other specimens. *M*¹ with six closed triangles and a well developed anterior trefoil. In *afghanus* there are only four closed triangles.

“ Dimensions of the type, as measured by the Collector:—

“ Head and body 107 mm.; tail 37; hindfoot 19; ear 13.

“ Skull:—Condylbasal length 30; condylo-incisive length 30·5; zygomatic breadth 18·2; nasals 7·5; intertemporal breadth 4; mastoid breadth 14·3; height of crown above bullæ 11; palatilar length 15·2; palatal foramina 6·1; horizontal diagonal diameter of bulke 8·7; upper molar series 6·7.

“ *Hab.*:—Bagh-i-Rezi, Shiraz. Alt. 5,200’.

“ *Type*:—Old male, B. M. No. 20. 5. 20. 9. Original No. 1328.

“ Collected 17th September 1919. Six specimens examined.

“ This striking and most distinct vole is quite unlike any described species except for its marked but purely superficial resemblance to *M. (Phaiomys) afghanus*. Geographically also it is very isolated, as its nearest neighbour is the North Persian *M. mystacinus*, Filippi, which is barely half its size. A co-type of the latter, acquired by exchange from the Turin Museum is now in the British Museum.”

11. OVIS VIGNEI CYCLOCEROS, Hutton.

♂ 1, ♀ 1.

The male from Baiza, 35 miles N. N. E. of Shiraz, shoulder measurement taken in the flesh 32 inches; horn measured round front curve 28 inches. Adult female from Kuh-i-Bamu, 8 miles N. of Shiraz. Alt. 8,000’. Height at shoulder in flesh 28·5 inches, horn 1·25 inches. See original paper above.

12. CAPRA EGAGRUS BLYTHI, Lydekker.

♀ 2. One from Kalat, 30 miles N. W. of Shiraz, alt. 6,500’, shoulder measured in flesh 29·5 inches, horn measured round front curve 8 inches; the other from hills above Kavar Valley, S. E. of Shiraz, shoulder measured in flesh 24·5 inches. See original paper above.

THE GEOLOGY OF WORLI HILL.

BY

JAYME RIBEIRO, Esq., L.C.E.

*With one plate and three text figures.**(Paper read before the Bombay Natural History Society
on 26th February 1920.)*

A glance at the map of Bombay shows the greater part of the western coast of the Island skirted by a range of hills. It starts from the northern horn of the Back Bay and after running in a northerly direction ends at the southern boundary of the Mahim Bay to re-appear beyond the limits of the city as the promontory on which stands the Chapel of Nossa Senhora de Monte. The range, however, is not a continuous one, nor of a uniform height. There is a considerable break of about 2,300 feet at Mahaluxmi. The small knoll on which stands the tomb of Haji Ali, a Mahomedan saint of considerable repute, marks practically the centre of this vanished portion of the range. The section on the south of the breach is made up of the Malabar and Cumballa Hills which at some points attain the height of about 220 feet. The northern section starts with the mound on which stands the tomb of Mama Hajiani and runs in an undulating manner, now dipping to the level plain now rising to form other hillocks till it ends at the Worli Fort. This section of the range is known as the Worli Hill. It formed by itself one of the seven islands which originally went to make up our present city.

It is interesting to watch, as one travels by the B. B. & C. I. Ry. from Grant Road to Lower Parel stations, the central portion of this range with its badly scarped sides and its top dotted with bungalows and fringed with brab palms. Just as the train leaves the Mahaluxmi station there appears, on the north of the Love Grove Sewage pumping station, a part of the hill reddish brown in its upper and ashy grey in its lower portions. This is the part of the range that is going to take up the greater and more interesting section of this paper.

Apart from the similar physical aspects of the two sections of the range there are strong geological evidences to show that these two sections are identical in their origin and that at some remote period the sea breached the range cutting it into two. It may be stated here that the description that will be given of the Worli Hill will apply in all respects to the northern end of the Cumballa Hill, the only portion of the southern section of the range that is being quarried at present, with this one difference that I have so far found no fossil remains of any kind at the latter place except bits of charcoal.

Worli Hill consists of three different strata, the topmost consisting of dark basaltic trap weathering into moorum, the middle of sedimentary beds and the lower of coarse grey trap, each of which strata I shall proceed to describe in detail. What may be the substratum on which these stand is not possible to say in the absence of deep excavations round about the place.

I. According to Dr. Carter's paper on the Geology of the Island of Bombay read before the B. B. of the Royal Asiatic Society in 1850, the upper stratum, the dark basaltic trap, is "the first of the secondary effusions which caps the main ridges in Bombay, and which, it may be presumed, was once continuous all over the island." This effusion he assigns to what he classifies as the third period of the geological formations in Bombay, and consequently is subsequent to the deposition of the sedimentary beds which are taken by him to belong



Golangi Hill, Sewri. Looking West from foot of quarry.



Golangi Hill, Sewri. Looking South from top of Lower Trap.

to the second period. Though Dr. Carter was the first of the earlier investigators to give a very painstaking, careful and elaborate description of the various geological formations of Bombay his assumptions about the sequence of the several volcanic effusions and their sub-divisions into four groups seem to be open to question, as Wynne remarks in dealing with the geology of Bombay in the *Memoirs of the Geo. Survey of India*, Vol. V, 1863. Were it a fact that this upper trap overflowed "the then plain of Bombay" and was subsequently forced up together with the sedimentary beds on which it was lying, by a fresh outbreak of lava underneath to form the existing ridge the aqueous deposits would have shown a more extensive disturbance by way of contortion, fracture and fusion than is actually the case. The upper trap itself would have undergone a good deal of fissuring beyond the very thin joints due to cooling. At Sewri the upper trap takes the contour of the lower trap and that of the thin layer of sedimentary rock and has the air tubes perfectly vertical and undisturbed. The probability is that the ridge was already formed by the forcing up of the aqueous stratum by the irruption underneath of the lower trap before the upper basaltic trap came on.

Mr. Wynne seems to doubt that the ridges in Bombay were ever the result of trap intrusions under the sedimentary beds, but the dome shaped appearance and the variations in the height of the lower trap extensively exposed at Sewri seem to favour the view that the ridges were at least partially due to that cause. Even at Worli there are indications that the sedimentary rocks have been lifted up in a dome. Dr. Buist in speaking of the Love Grove beds in the paper on the geology of Bombay read before the Bombay Geographical Society in 1851 says: "Just at the sluices the regularity of the beds has been disturbed, and they dip a little in all directions." The inference is clearly that the beds were 'raised in a dome.'



Sedimentary beds dipping south, Worli.

The physical characters of this upper trap are unlike those of the trap that caps the other ridges in Bombay. It is much darker and more crystalline and fine grained. Yet, notwithstanding the apparent difference, this basaltic trap is one and the same with the other trap. For if

we assume that the upper trap in Bombay had its origin in the mainland, since no local foci of eruption have been met with, and that it flowed in a westerly direction, the more fluid portions would travel faster and cool more rapidly, thus producing the basaltic trap of Worli. That it is merely a question of fluidity and cooling would seem to be clear from the appearance of an undivided mass of rock 105 ft. in thickness lying above the sedimentary deposit at Sewri, a rock which is probably identical with the flow of which the Worli basalt is the western outpost. Where it rests on the sedimentary bed it is ashy grey and earthy, but gradually passes into a dark crystalline rock at the top, but less so than that at Worli. That such must have been the condition of the trap at the latter place at a very remote period is proved by boulders of ashy grey and basaltic trap found embedded in the mass of moorum resulting from the disintegration of the trap. It is a very noticeable fact that the whole depth of rock on the eastern side of the hill has decomposed into moorum by concentric disintegration of the trap, leaving rounded cores of various sizes. The appearance of the more highly weathered of these cores is that of rusted iron balls. The larger and less weathered ones still show the typical trap characteristics. On the completion of the weathering process the moorum, it would appear, gets pressed into sheets and can easily be split into thin laminae. It is not possible to say what are the determining causes which lead trap to weather into balls; the probability is that the lava in cooling assumes a definite hexahedral form. The transition from this form to a ball in weathering is not distant. The moorum which is yellowish brown in its lower reaches passes gradually as it approaches the summit into the best red earth available in Bombay. The quarried face of the moorum presents remarkably clear stratifications. The western face of the hillock on which stands the tomb of Mama Hajiani is also decomposing into moorum but in a lesser degree leaving in many instances masses of solid rock poised on columns of moorum cut out by the action of the waves. It is a queer fact that the lower layers of the rock are weathering earlier and faster than the upper ones.

The unweathered rock presents an appearance unlike that of any other trap in Bombay. A freshly broken specimen shows a dark, fine grained crystalline surface with sharp edges. When struck it sounds with a clear metallic ring. In hardness and colour it ranks next to the "Lydian stone" of Antop Hill, the hardest stone in Bombay. When seen in the mass it shows on the surface a network of lines, probably occasioned by cooling, which form more or less hexagonal figures. These are best seen at Love Grove near the Sewage outfall. There it is possible to see practically perfect hexagons occasionally standing out as columns in the manner of true basalt. These lines penetrate deep into the mass of the rock as seen at Nepean Sea Road, Malabar Hill, and are filled in with quartz or zeolite veins. On both sides of these veins the rock has become greenish brown to a slight extent, a sign of incipient weathering. So far no cavities or geodes containing quartz or other minerals have been met with.

It would be interesting to investigate why this basaltic trap, which apparently is harder than the other varieties, has weathered to such an extent as to produce a bed of moorum over 100 ft. in thickness. The other hills in Bombay are covered with a comparatively thin layer of soil. Mr. Wynne, however, is of opinion that the basaltic trap is less susceptible to weathering, for, in speaking of the basaltic trap of Malabar Hill, which is identical with the Worli trap, he says: "This is an extremely hard dark variety of bedded trap; it marks glass, yields but little, and in a peculiar manner, to atmospheric action; in some places the only effect produced being a slight superficial oxidation of its combined iron, in others it is traversed by strong joints, between which large spaces have been formed, and most of the remaining angles, owing to a rudely developed concretionary structure, have been partially rounded off."

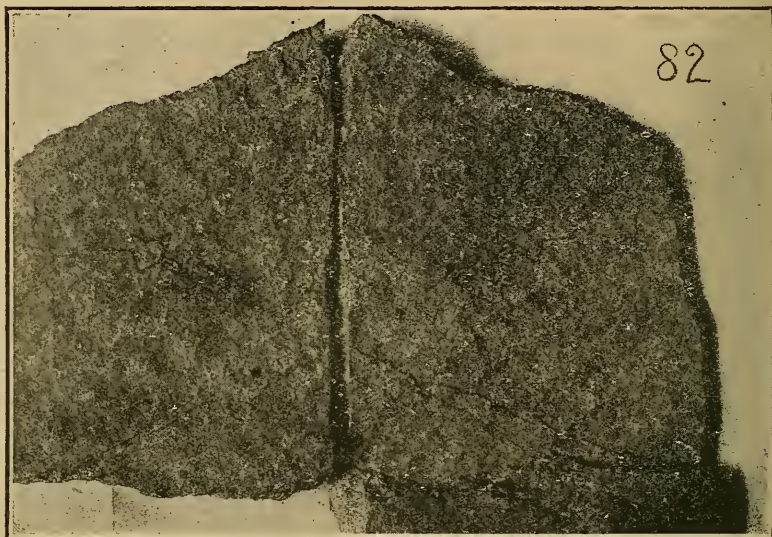
Owing to its hardness and brittleness a very restricted economic use is being made of the basaltic trap. It is being quarried to a small extent for use as rubble and metal in the foundations of buildings. For road making the metal is not quite suitable being too sharp. The face of the hill is however being extensively quarried to procure spoil for filling the adjoining low lands of the flats. The Western India Brick Factory was started at the foot of the hill to utilize the moorum for brick making, but the attempt has not so far proved successful.



Quarry Face, Worli Hill.

II. Below this thick mass of moorum and trap occur the highly interesting sedimentary deposits. From their characteristic and persistent fossil, the frog, it is evident that the beds were deposited in fresh water. Of the previous investigators Dr. Carter is the only one who has given us a full and detailed description of the beds as they appeared at the Love Grove cut of the sluices, and of the fossils found in them by himself and Dr. Leith. It may be stated here that in view of the extensive quarrying operations that have recently taken place, whereby a face of the beds about 500 ft. in length has been exposed, Dr. Carter's description is true only of the cut of the sluices. The beds now opened out are about 28 ft. above the mean level of the sea while at the Love Grove cut they are generally below it. It has not been possible to trace in the present beds the layers which according to Carter contains vertical tubes filled with crystalline quartz nor the layer said to underlie the former and which "is almost wholly composed of the casts of the shells of the little entomostracous crustacean animals called cyprides." It is probable that no description of these aqueous deposits which is true of one place would wholly apply to another place even though only a few yards away. In general the beds dip about 15° to the west. Passing under the hill they reappear on the west just under the high tide level. Looked at from a very short distance, the alternating black and light coloured bands in the quarried face are very distinct and continuous, but in the layers themselves a close scrutiny discloses an extraordinary diversity of material. The layers vary greatly in thickness

from point to point. In general the lighter material occurs in thicker layers than the darker one and is more resistant to splitting. It is very difficult to get thin slabs of it. The alternation of the layers sometimes is very rapid thereby producing very thin bands. There are large deposits of carbonaceous shale, but the remarkable fact about it is that the shale is not found in continuous layers, but occurs as pockets in the other deposits.



Fossilized Frogs from the sedimentary deposits.

The general description of the beds which are about 30 ft. thick is more or less as follows:—Immediately resting on the lower trap there is a layer about 3 or 4 inches thick of a very dark coloured shale in a good state of preservation which splits into very thin laminae. It consists of an extremely fine sediment, so fine that when held against the sunlight it gives out iridescent colours. When wetted and exposed to the sun it emits a strong smell of naphtha. This is more pronounced in a newly broken rock and the quarrymen are quite aware of it. This naphthous smell is probably the result of the large amount of organic matter incorporated in the shale. This layer is the most prolific in frog impressions. On both the faces of a small slab about $\frac{1}{2}$ inch thick there are no less than 3 clear and several faint impressions of frogs. The counterpart of this slab was welded to the lower trap and could not be detached.

Above this layer comes a deposit of a coarse grey coloured detritus about 12 inches thick. This layer does not easily split into thin laminae; but where it does, it is possible to get impressions of frog fossils. The grey deposit is followed by fine sediment similar in appearance to the first layer, but in rather a decomposing state. If split into thin layers it easily crumbles into bits. It is prolific in frog fossils and together with the previous similar deposit are the only layers in which peculiar impressions are found.

After this period the character of the deposits changes. Sediments of any one kind are in some cases heaped up several feet thick. This is especially true of the ashy grey deposit. It is peculiar in containing very thin flaky pebbles

of a dark colour which viewed sideways appear in shape like human nail parings. This can well be seen on the compound wall of the Presidency Mill on Fergusson Road where the softer matrix has weathered away leaving the flaky pebbles very prominent. These shales, as also the carbonaceous shales previously mentioned, contain large pebbles of an igneous rock of a dark colour, the largest found by me being about 9 inches in diameter and about 3 inches thick. It is very rarely that the pebbles are of a light colour. These may be merely concretions. Above the grey deposits there occurs a series of alternate dark and light shales. These bands are together about four feet thick and seen from a distance are very distinct. In general the dark layers are thinner than the others. To a greater or less extent the sedimentary deposits are charged with carbonate of lime. Iron pyrites is diffused throughout the layers, the more so in the lowest ones. The pyrites probably was the result of the sulphur evolved from the decomposing organic matter acting on the iron in the waters. The frogs seem to have survived through all these changes as their fossils occur even in the highest of the dark shales. The atmospheric influences which made the hard basaltic trap to weather so deep down do not seem to have affected the sedimentary rocks in the least as the moorum is found resting directly on aqueous beds in a good state of preservation.

The sedimentary strata are extensively cracked, the cracks generally running east to west. They do not exceed a couple of inches in thickness and are generally filled in with deposits of calcite showing a variety of crystallisations. It is very rarely that quartz occurs in these fissures but when it does occur it is found in small crystals of a peculiar brilliancy. So far no amorphous quartz has been found. Some portions of the rock have become faulted and some seem to have slid against each other with such a tremendous force as to fuse partially the rock. An evidence of this fact is found in the fairly extensive rounded and polished surfaces with clear striæ on them as if a comb had been passed over the semi-melted mass. Wherever faults occur, the layers have taken a slight bent downwards and were probably fused to some extent at the line of fracture as layers of different materials are found welded together.

The layers that existed below the lowest frog bearing band have been broken into and fused by the lower trap coming into contact with them, so that it is not easy to make out the original condition of these beds. This disturbed state of the sedimentary beds gives additional support to the theory that it was the lower trap that forced up these beds, cracking, faulting and sliding them against each other, and if we assume, as we have done, that the upper trap is of a more recent date than the lower one, then it is quite likely that this heavy weight coming over the aqueous deposits already thrown into unstable equilibrium may have helped in causing further slips in the beds. But taken all together, these cataclysmic changes were not so tremendous as in Sewri where the aqueous beds have been contorted, fused and jasperised to an extraordinary degree.

The fresh water beds are being rapidly quarried away as the material broken into metal or rubble commands a ready sale for use in the foundations of buildings. Being soft and porous it sets better in the mortar than trap metal. Many a house in Bombay will have the honour of standing on the fossil remains of the earliest known inhabitant of Bombay—the frog. At the present rate of quarrying and by the contemplated activities of the City Improvement Trust in this locality, these interesting beds will be completely wiped out at no distant date.

III. The lower trap is soft and scoriaceous like the trap underlying the sedimentary beds in the other parts of the City. In general it is ashy grey in colour and resembles very much some of the aqueous deposits. It is only the presence of crystalline texture that differentiates the former. It is quite likely that the character of this trap at least in its upper portions has

been greatly modified by intermixture with the fresh water deposits. The mass of the rock is broken up with veins and cavities filled in with calcite, quartz and zeolites. Moreover the fact that this trap was never exposed to atmospheric influences must have tended to some extent to make it different from the upper trap. Though it could not have been in a highly molten condition when it burst under the sedimentary beds as judged from its scoriaceous nature, yet it seems to have greatly affected some parts of the aqueous deposits as evidenced by the presence of some peculiar boulders in the mass of the trap. These boulders had the appearance of having been severely burnt; the outside was covered with black knobs, which scaled off at the slightest touch like carbonaceous shale, while the interior of the boulders consisted of a dark brown matrix, probably of fused silica very hard and tough to the hammer, containing a very large quantity of very fine needles of quartz embedded in all positions in the matrix. Or can it be that these boulders are specimens of rocks deeper down in the bowels of the earth carried up by the force of the trap as it made its way through them, as must have been the case with the boulders of diorite found embedded in the volcanic ash near the Koliwad station in Sewri? I throw out the suggestion for what it is worth.

It is a remarkable fact that the previous writers on the geology of Bombay have taken scant notice of the minerals found in the aqueous deposits. Carter who has taken a good deal of pains in describing the fossil remains in these beds makes only a casual reference to the occurrence of calc-spar and quartz. Speaking of the existence of small deposits of granular coal on leaves and of mineral resin, he finds "invariably calc-spar in company with both these substances." Again when he writes about the layers of cyprides he says: "It also has another peculiarity, which is, that it is almost wholly composed of silex, in the form of amorphous or crystalline quartz." Dr. Buist makes no reference to any mineral while speaking of the Love Grove beds, but in referring to those under the Malabar Hill he mentions mica and "small crystals of sulphuret of iron, supposed by the natives, when first found, to contain gold." From these stray references one is led to infer that these writers either thought this subject unworthy of much notice or that they did not come across the rich harvest of minerals now found in these beds. The latter was more probably the case considering the fact that deposits of minerals are confined to small sections of the beds. Drs. Carter and Buist have based their remarks on the beds as they appeared at the Love Grove cut of the sluices, and it is quite likely that no striking minerals were found by them at this place. The minerals occurring in the beds now exposed are a study in themselves and would well repay the labour spent in inquiring into their composition and crystallography. It is a fact very much to be deprecated that an important city like Bombay should not possess a single standard collection of minerals, and in its absence I can only describe the minerals found by me as they appear to a lay man.

I. Iron pyrites. The waters which caused these beds were evidently highly charged with iron sulphide as the mineral is found disseminated in varying quantities throughout the mass of the rock. It is more frequent in the lower than in the upper beds. It occurs as fine dust, as globules, rarely as amorphous masses resembling Chinese characters and more frequently as well formed cubic crystals of various sizes, the largest found being about $\frac{1}{8}$ inch cube. The pyrites varies in colour from brass yellow through golden yellow to copperish brown. It is also found in a dark greenish blue hue giving out iridescent colours. This peculiar colour seems to be due to the oxydising influence of the atmosphere, for some crystals, which were golden yellow when first picked up, were subsequently, after a few months, found to have taken on this dark greenish blue colour. The cubic crystals have a scaly surface. Twins are very common. The best specimens are found deposited on the crystals of

calcite in the fissures of the rock. The pyrites and the calcite seem to be æval as the crystals of pyrites are very often covered over by crystals of calcite. The pyrites does not occur in the traps, but is common in the chertified fresh water beds of Sewri in fairly big amorphous lumps. It also occurs in the aqueous deposits at Bhoiwada.

II. The most widely disseminated mineral in these sedimentary beds is undoubtedly calcite. Besides impregnating the mass of the rock it is extensively found deposited in a crystalline form in the cracks of the beds and in the cavities in the lower trap generally in association with crystalline quartz and zeolites. It is rarely intercalated with the shales. It occurs in a variety of pretty forms mixed up together on the same specimen. In colour it varies from black, dark brown through cream to pure white. In general it is translucent or opaque, but small bits can be obtained perfectly transparent. The crystals are invariably well formed and regular but rather of a small size and the aid of a magnifying glass is necessary to bring out their full beauty. Striations on the fractured surfaces or on the natural faces of the crystals are common. Sometimes the surface is dull and wavy as if the crystals had cooled out from a molten material. Smaller crystals of the same or different kind are very often partially embedded in the larger ones or are found as excretions on the exposed surfaces.

It will be noticed that most of the specimens are small in size. This is due to the fact that the deposits, though extensive, are occurring at right angles to the sedimentary layers, and any attempt to detach the mineral results in splitting the layers and with them the mineral. The following are the chief varieties in which the calcite occurs though a more careful investigation may disclose new forms or may reduce those described here to a few primitive types.

(a) Calc-spar is the commonest form of calcite. It occurs in fairly big lumps and in all shades of colour, from dark brown to milky white. Unlike the calc-spar found in trap rocks, the lumps in the sedimentary beds show a tendency to crystallise out on the surface into other forms, in fact the mass appears to be a random mixture of a variety of crystals.

(b) Next the calcite shows in independent rhombic crystals with angles sometimes approaching very near to right angles, giving to the crystals the appearance of cubes. Very often it is only a corner that projects beyond the mass of the mineral and the crystal stands out as a three-sided pyramid. The colour is sometimes waxy greenish. Twins are quite common.

(c) Calcite is also found deposited as flat oblong discs with faceted sides. The top and bottom are plain. The crystals are found lumped together and are partly transparent and partly translucent. In some cases the edges or the top layer is opaque and pearly. These crystals probably pass into the barrel shaped ones by a considerable increase in their thickness.

(d) Crystals resembling dog tooth spar occur in fine six-sided double pyramids joined at their bases. The height of the pyramid is more or less double the width of the base, but very often the ratio between the height and the base is considerably less and the crystal resembles very much a six-sided quartz crystal. Frequently only one pyramid is exposed beyond the general mass of the mineral. The colour is in general translucent white. The crystals generally end in sharp points but the top sometimes terminates in three quadrilateral faces meeting in a three-sided pyramid. Some of the faces often stop short of the apex.

(e) There is another form of calcite occurring as six-sided barrels apparently made up of regular layers of the mineral. Such barrels are generally translucent at the base but gradually become opaque towards the top taking on the glaze of white china. This latter condition in these and other allied

crystals may be due to incipient weathering. The colour is white. The tops are perfectly flat. Often fine hexagonal columns are found lying on their sides.

(f) There are also barrel shaped crystals, probably having nine sides, capped by three pentagonal faces meeting in a point at the top of the column. The appearance of the column is very peculiar. It looks as if several flat discs were piled up in a barrel shape without minute adjustment, so that the sides are rough and uneven. Sometimes the column is pinched in the middle producing the effect of two barrels placed one above the other. The colour is translucent white.

(g) There is lastly a form of calcite found in the lower trap which is very rare indeed but which also occurs in the Nowroji Hill trap. The crystals have the appearance of cubes but with slightly convex sides. The convexity is caused by the meeting of very flat crystalline faces. This is well seen in the crystals which are bright, but in those with dull surfaces, as is generally the case, the cause of the convexity seems rather puzzling.

(h) Besides the above there are some obscure forms.

III. Next is frequency, but much less in quantity is the occurrence of quartz. It fills the lines of cleavage in the upper trap as thin veins of amorphous quartz. So far no large crystals have been found either in the veins or in cavities in the trap, which at present is being quarried to a very limited extent. In the lower trap crystalline quartz is common and it occurs in well formed transparent crystals, very often cream coloured. It is generally associated with calcite and zeolites. In the sedimentary beds quartz is found, though scantily, in a crystalline form filling the cracks in the beds.

(a) The amorphous quartz of the trap veins is found in thin plates which are rather difficult to detach from the rock. The mineral invariably crumbles into powder on being detached.

(b) The crystals from the lower trap and the sedimentary beds are extremely interesting. They are of a fine transparency and peculiar lustre. Generally a rhombic face is exposed and less frequently a pyramid formed by four rhombic faces is seen protruding beyond the general mass of the mineral. It is rarely that the crystals are found as two four-sided pyramids joined by a column similarly faceted. A broken surface shows a pearly lustre. A careful study may perhaps show that this mineral is an apophyllite. It is occasionally found in a weathered condition. In association with these crystals creamy coloured quartz, crystalline and with fine striæ on the sides, is occasionally met with.

(c) Then again the mineral is found in extremely fine six-sided needles capped by a pyramid either at one or both ends. These needles are sometimes found standing out in the cavities of the lower trap but more often are mixed up with the mass of the rock. This is especially the case with the quartz crystals found in the peculiar boulders previously mentioned. Some of the crystals have their tops fused and rugged while others have their pyramids cut off in a plane which gives a pentagonal appearance to the face. They are transparent and vary in colour from smoky to pure white. The general look of the crystals is as if they have had been developed out of a fused mass.

IV. Zeolites: (a) Intercalated with the shales there occurs a dark grey zeolite. It forms extensive but thin films. Owing to its thinness it is extremely fragile. It is not also firmly attached to the rock with the result that it easily gets detached and broken.

(b) In the cavities and cracks of the lower trap there is found a fine white zeolite either by itself or in association with quartz and calcite. It occurs in sheaves and has the appearance of a stilbite. Taken altogether the mineral is rather common but it is not found in large lumps.

V. Besides the minerals described above there is met with in the sedimentary shales a waxy looking translucent mineral. It occurs in small, very thin

patches. It is very brittle and easily detachable from the rock, and owing to its brittleness it is not possible to secure it except in a powdery state, or loosely attached to the rock.

Coming to the organic deposits found in the sedimentary beds, we must acknowledge the great assiduity and not less the good fortune of Drs. Leith and Carter in securing several interesting specimens of vegetable and animal remains described in the latter's paper previously quoted. That there must have been arriving at the place a large amount of vegetable detritus is clear from the extensive deposits of carbonaceous shale and the strong naphthous smell of the freshly broken rock. It is a remarkable fact that, though extensive quarrying of the fresh water beds is at present going on, no fossil remains of the marsh tortoise, "*testudo (hyaraspis) Leithii*" or any definite impressions of stems, leaves, etc., have been met with by me. Speaking of the specimens of plants presented by Dr. Carter to the Bombay Branch of the Royal Asiatic Society, Mr. Wynne in writing on the geology of Bombay says in a footnote "Leaves, stems and seeds, all more or less, indistinct, or wood, chiefly dicotyledonous. The *corniform* and *globose* roots described and figured by Dr. Carter and of which the original specimens are preserved in the museum of the Bombay Branch Royal Asiatic Society have very much the appearance of concretions, and their organic origin must be considered extremely doubtful." Having come across a large area covered over by objects which had the appearance of the "corniform" root, the impression left on my mind is that Wynne is quite correct in his view. It is a pity that the interesting specimens of Dr. Carter's cannot now be traced in the museum, as I am informed.

I shall now proceed to describe the fossil organic remains I have come across :

Vegetable :—(1) Embedded in the coarser shales there occur small bits of charcoal. These are heavily charged with iron and carbonate of calcium.

(2) Interspersed in the mass of the rock there are found small patches of carbonised vegetable matter. They are evidently traces of leaves but they cannot be resolved into any definite shape or structure. When a piece of rock of this kind is exposed to strong sunlight a tarry liquid oozes out.

(3) Then there are larger pieces of rock showing on their surface a distinct network of nervatures formed of calcite with globules of coal spread all over. These impressions are probably of large leaves.

(4) Embedded in the upper layers of the sedimentary beds were found a few logs or planks of wood in a highly carbonised condition. These pieces of wood were lying horizontally from east to west. The coal is bright and brittle and has the appearance of anthracitic coal. It burns with a yellowish smoky flame leaving an ash about four times the size of the original piece of coal and having the appearance of coke. The ash is very brittle.

Animal :—(1) Of the animal remains found in these beds the most plentiful and at the same time the most interesting are the fossilized skeletons of frogs, *Rana pusilla* of Prof. Owen. The earlier investigators Drs. Leith and Carter, and those that based on them thought that the frog fossils were found only in the two lowest bands of the dark shale. This was due to lack of opportunity and certainly not to the want of careful inquiry as these pioneers had only the small cut at Love Grove sewage outfall to go upon. As a matter of fact the fossils are found throughout the thickness of the aqueous deposits in all kinds of shale. The only difference is that in the two lowest bands of the dark shale, which can be made to split easily into very thin layers, the frog remains occur in very large numbers. The coarser shales are more difficult to split and the fossils cannot be easily recovered in them in a clear outline. Moreover these shales must have been deposited during heavy floods when the frogs would be considerably less in numbers being carried away by the waters.

The frog fossils are from about $5\frac{1}{2}$ lines to about 11 lines in length as measured from the top of the head to the symphysis pubis and are in a very

good state of preservation. In general they must have lain undisturbed where the dead body dropped except for slight movements caused by the moving waters. This has caused them to assume various positions. There do not seem to have been any fishes or aquatic animals, at least in the shallow waters where the frogs were living, that fed on the carcasses considering the fact that the skeletons are complete. Out of hundreds of specimens examined by me there is only one where the femur is separated and is lying parallel to the tibia and another in which the foot is detached. It is true that very often what appear to be fragments of skeletons are met with but these are due to the skeleton being buried in different layers of the shale which in splitting carry only a part of the skeleton.

The fossil impressions occur in various conditions. Sometimes it is only a blurred outline that is left on the shale as if the dead batrachian had been covered over by the earthy sediment before the skeleton had been denuded of the flesh; at other times it is a clear picture as if drawn by a pencil that is left on the stone. This condition was probably brought on by the shale being subjected to very great pressure by the effusion either of the lower or the upper traps causing the mould of the fossil to flatten out. More often it is merely a mould that is left on the shale, the skeleton having been completely removed and the space left unfilled by any sediment or mineral. The hollow is some times filled by a yellowish deposit. It is only rarely that a fine casting of the bones especially of the lower extremities is obtained. This condition, however, I am inclined to believe, is more general than is usually found, the reason for its occurrence being that the skeleton is encased between two layers which do not split at the skeleton but remain adhering to one of the pieces of the shale. Thus one-half of the shale shows the fossil in relief while the other carries a corresponding depression. It may often happen that if the layers split accurately at the skeleton the core is shaken off and lost, leaving only a mould on both pieces of the split shale. In the few instances where the core is exposed, it is found to show the minutest details of the bones.

The specimens of frog fossils submitted to Prof. Owen seem to have been of a uniform size of about half an inch. As Dr. Carter's paper embodying Prof. Owen's description of the fossil is not very easily accessible, I may be allowed to repeat it here:

"The portions of the shale transmitted by Mr. Clarke contain delicate but for the most part distinct traces of the generally entire skeleton of small anourous *Batrachian*, the osseous substance is black, as if charred.

The number of the vertebræ, atlas and sacrum inclusive, is nine; the caudal vertebræ are fused into a long, slender, cylindrical style, as in most anourous *Batrachia*.

In the specimen which lies on its back, the posterior convexity of the vertebral bodies are shown.

The short sub-cylindrical, and very slightly expanded lateral or transverse processes of the sacrum, and the absence of ribs or their rudiments in the dorsal vertebræ, with the proportional expanse of the skull and length of hind legs, show the specimens to belong to the family of Frogs (*Ranidæ*).

There are seven abdominal vertebræ with long and sub-equal transverse processes, that of the second (third vertebra including the atlas) being the longest. The humerus is cylindrical, not expanded as in *Cystigranathus*. The head is little larger relatively than in *Rana temporaria*, *Rana esculenta* or *Hyla viridis* and still larger therefore in Toads and Natterjacks (*Bufo*idæ), or than in the *Pipa*. The expansion of the sacrum removes the genus *Pipa* and the *Bombinator* from that of the present fossils. The following are the measurements of the more perfect specimens:—

Length of the front part of the head to the symphysis pubis...	6 $\frac{1}{2}$	lines.
Do. of the head	2 $\frac{3}{4}$	”
Do. of the dorsal vertebral series ..	2 $\frac{3}{4}$	”
Do. of the os innominatum	2 $\frac{1}{2}$	”
Do. of femur	2 $\frac{3}{4}$	”
Do. of anchylosed tibia and fibula ..	2 $\frac{3}{4}$	”
Do. of tarsus	1 $\frac{1}{4}$	”
Do. of whole foot	4 $\frac{1}{2}$	”
Do. of whole anterior limb	4	”

All the specimens belong to individuals which had completed their metamorphosis and they are similar to one another in size and they may have belonged either to a not quite full grown brood, or to an unusually small species of *Rana*.

They conform in all respects as closely to the typical organisation of the frogs of the present day, as do the fossils discovered by Goldfuss in the tertiary lignites of the Siebengebirge and referred by him to *Rana diluviana*; but the Bombay batracholites differ not only in their smaller size, but also in their proportionally larger skulls.”

Later palæontologists, however, seem to have reasons to differ from the high authority of Prof. Owen and consider the fossils to be of an *Oxyglossus*.

It would be interesting to know if fossils of identical frogs have been found in any other shale in the world. This would perhaps show us what were the other reptiles and fishes living at the time, as also to lead us to fix the approximate time when the Worli shales were deposited.

(2) There are met with, though very rarely, the impressions of bones probably of an animal which has not been previously described. They are of a uniform shape and size and appear to be the vertebral bones of a reptile.

(3) Then again there is a piece of shale showing impressions which look like those of larvæ of some insect.

(4) Lastly there are groups of very minute shells, looking like grains of sand. They appear to be akin to oyster shells, and are quite plentiful. A careful study of these shells may lead us to determine the geological period when these sedimentary deposits took place.”

With this material before us it may not be out of place to speculate here as to what were the geological vicissitudes undergone by the site where Worli Hill now stands. During the 18th century and the first half of the 19th century this hill must have formed one of the beauty spots of Bombay as the very name of Love Grove given to a section of it would suggest, but in later years Love Grove became a misnomer owing to the location of the sewage outfall there which at present makes of it a spot of smells. The hill was dotted over with fine villas, some of which still survive, with well laid out grounds. The water was procured from deep wells which piercing through the layer of moorum tapped the sedimentary beds. It was in examining the strata in the section of one of these wells which had been laid open by quarrying operations that I was lucky to rediscover the frog beds.

In remote ages the site of the hill must have been occupied by the margin of a fresh water lake or river judging from the character of the fossils found there. How far this lake or river extended is not possible to determine. From the occurrence of fresh water beds in the volcanic breccia of Ghodbunder Dr. Carter was inclined to think that the lake,—we will for the present take it to be a lake—extended as far as that place but the probability is that there may have been several lagoons of smaller dimensions spread all over the present islands of Bombay and Salsette, but the one which gave rise to the aqueous deposits of Malabar, Cumballa and Worli Hills must have been a fairly large one. The impression of ripples left in pyrites dust on some of the shales

would indicate that Worli Hill formed at this period the shallow bank of the lake. There is no means for the present of deciding as to what was the sub-soil on which this lake stood, but the probability is that it consisted of trap. Trap must have been pre-existing for there are large pebbles of volcanic origin found embedded in these beds and the crystalline nature of the material of the shales shows the detritus to be of volcanic origin. The lakes were most probably caused by the unequal weathering and denudation of the surface of the original rock or by different lava flows crossing each other and thereby causing hollows. So far no dykes have been met with in the sedimentary beds and in their absence the second hypothesis must be considered as the less probable.

As previously stated the lowest sedimentary beds have been greatly altered by the effusion of the lower trap and it would be idle to speculate as to whether they were deposited by floods or by gentle waters. But coming to the lowest frog bearing bands it is clear that they were deposited in a very fine sediment in quiet water. The first band is about 4 inches thick and is full of frog impressions. It is a dark coloured shale and splits into very thin laminae. Soon after there seems to have occurred a period of floods which caused a layer about 9 inches thick of a coarse grained ashy grey sediment. Then recurred a further period of calm days which caused the second band of frog bearing shale which is in all respects similar to the former one but the layers are in a very much weathered state. Some soil seems to have been formed on the surface. It would appear that after this layer was deposited there was a considerable change in the level of the lake due probably to secular upheaval which caused this layer to be exposed to atmospheric influences. Then a reverse movement seems to have set in and what was dry land became a raging torrent. Heavy floods passed over it resulting into very thick deposits of coarse light coloured shales which contain not only gravel and pebbles but even bits of charcoal washed down from distant forests set on fire by thunderstorms. Even some of the pre-existing aqueous beds seem to have been broken and carried away as large angular pieces of the shale are found embedded in the grey shales. The extent and the violence of the floods seem to suggest that there occurred a breach in the banks of the lake thereby converting it into a tumultuous river.

These floods brought down large quantities of vegetable matter from the aforesaid forests judging from the fact that it arrived at Worli in a highly bruised condition. Were it not so there would have been found at least occasionally some distinguishable impressions of leaves, etc., in these highly carbonaceous shales. The vegetable detritus came to rest in the coves in the margin of the lake so that the carbonaceous shales are found in fairly thick isolated deposits practically forming pockets in the grey shales; they are never continuous. Large pebbles of igneous origin are invariably associated with these deposits. The frogs seem to have survived through these cataclysms but in very much smaller numbers; they must have been washed away to the ocean. On what these frogs were feeding is not easy to say.

Subsequent to this period there occurred floods of lesser violence which have caused alternating layers of dark and light coloured shales. Some of these layers are very thin indeed, and it is a question as to what were the determining causes of these rapidly alternating layers of such minute thickness. It may be that one grey and one dark band is the result of one flood, the grey material being heavier and settling earlier than the darker sediment. These dark bands give a very interesting appearance to the section of the quarry. Towards the close of this period some logs of wood drifted to this place and are now found as fine anthracitic coal embedded in the grey shales. There are no positive indications that there were any trees, shrubs or aquatic plants growing on the margins of this lake or river. Nor are we in a position to say definitely whether

there were any fishes; the probability is that there may have been some in the deeper waters. Very minute shell fish of one or more species was fairly plentiful.

Then came the great catastrophe of the lower trap. Bursting under the sedimentary beds it broke up some of them and lifted up the remaining into a ridge fracturing and faulting them in the process. The trap had not force enough, however, to pierce through this 30 ft. thickness of aqueous deposits, as no dykes have been met with. The heat of this volcanic matter does not seem to have been very intense, though through its mechanical effects some of the faulted strata must have become partially fused. The life of the lake as such came to an end; it was left high and dry. Carter on the contrary thinks that it was the effusion of the upper trap that put an end to this lake. He says: "It is most probable that the lake was above the level of the sea at the time this (*i.e.*, the effusion of the upper trap) occurred although the general level of its strata is now below it. One another fact connected with the fresh water formation is here worth mentioning, *viz.*, that within three inches of the igneous rock which overlies it there is a stratum three inches in thickness almost entirely composed of the casts of 'Cypridæ', not of their valves singly which they are wont to shed annually but of their entire casts, showing that some sudden alteration of the water in which they were living took place, by which they all as suddenly perished and fell to the bottom. After this occurrence no organic remains are seen, and nothing but the three inches mentioned of a kind of transitional material between the fresh water formation and the basalt." If the "Cypridæ" met their death from the waters heated by the effusion of the upper trap there would be no time for the deposition of the three inch layer of transitional material. Moreover the molten trap which must have been in a highly fluid state would have fused the material with which it came in contact and together with it the casts of the "cypridæ." The probability is that they died of other causes and further aqueous deposits took place until the lake was raised into a ridge by the irruption of the lower trap. The surface of the sedimentary beds had had no time to become extensively weathered before the flow of the upper trap occurred and covered the whole land with a dark mantle. Life came to an end and thousands of years must have elapsed before vegetable and animal life reappeared on the cooled plains.

Geological data are invariably collected from excavations made in the earth for industrial or non-scientific purposes; or from natural exposures of the rocks. No deliberate excavations are generally made for geological researches. It is quite likely that further quarrying of the Worli Hill may bring to light other interesting facts, minerals and fossils, and what is stated in this paper may have to be greatly modified or added to in view of the subsequent discoveries. This paper is intended merely as a record of the things found at and the provisional conclusions drawn from the excavations now going on between the Love Grove sewage outfall and the Western India Brick Factory.

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

No. XXV.

BY

OLDFIELD THOMAS.

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(A). ON JUNGLE-MICE FROM ASSAM.

The Collections made by Mr. Wells in Assam include a number of Jungle-mice which seem to be referable to three species, readily distinguishable by size.

The largest is one allied to the Sikkim species I described as *Mus pahari*, but which, on the conclusions given in the later paper on the grouping of Indian Mice (Results No. xix; J. B. N. H. S. xxvi., p. 417, 1919) and followed in Mr. Wroughton's Synopsis (Part v, Journ. c. p. 957, 1920) now falls into the genus *LEGGADA*. The Assam form is however smaller, less dark, and differs by at least one important cranial character.

It may be called

LEGGADA JACKSONIÆ, sp. n.

Size rather less than in *pahari*. Fur profusely mixed with spines, though perhaps rather less so than *pahari*; dorsal spines about 8mm. long by 0.2mm. broad. General colour above dark mouse grey, not so dark as in *pahari*, undersurface dull brownish white, the coloration generally not unlike that of *Mus musculus*. Ears rather large, brown. Hands and feet white. Tail about the length of the head and body, or a little shorter, brown above, dull whitish below, scales 18 to the centimeter.

Skull in its general shape very like that of *L. pahari*, with the same long muzzle, the supraorbital angles however not so strongly marked. Zygomatic plate narrow, its front edge slanting straight downwards without any trace of forward convexity; this character is equally marked in specimens of all ages, while in *pahari* the front edge always projects; masseteric knob scarcely perceptible. Palatal foramina short, not reaching to the level of the front root of m^1 .

Incisors as in *pahari*, thick and markedly opisthodont; index about 66° .

Dimensions of the type, measured in the flesh:—

Head and body, 90mm.; tail 83; hindfoot 19; ear 15.5.

Skull, greatest length 24.2; condylo-incisive length 22.2; zygomatic breadth 11.7; nasals 9.2; interorbital breadth 4.7; breadth of braincase 11.2; zygomatic plate 2; palatilar length 10; palatal foramina 4.6; post-foraminal palate 4.6; upper molar series 3.6.

Hab.—Khasi and Garo Hills, Assam. Type from Laitkynsao, Khasi Hills. Others from Tura, Garo Hills.

Type.—Adult male B. M. No. 20·11·1·48 Original number 510. Collected, 28 April 1920, by H. W. Wells. Four specimens.

The three Tura specimens are paler and more drabby than the type, but this appears to be due to their being in more or less faded pelage, as there is a similar area on the hinder back of the type, while the rest of it is in dark fresh fur.

This species is readily distinguishable from *L. pahari* by its paler colour, smaller size, and the peculiar shape of its zygomatic plate.

It is named in honour of Mrs. Jackson of Tura, to whose kindness and help Mr. Wells owes much of the success which attended his work in the Garo Hills.

The second species is one externally like *Mus homourus*, but its skull is clearly that of a *Leggada*, not a *Mus* in the narrowest sense.

LEGGADA NAGARUM, sp. n.

Size and proportions about as in *Mus homourus*. General colour above grizzled "Dresden brown", some of the hair-tips black and others dull buffy drab. Sides clearer drab. Undersurface whitish, more contrasted than is usual in these mice, the hairs slaty basally, whitish terminally; chin hairs white to their roots. Ears medium, brown. Hands and feet dull white. Tail about as long as head and body, well covered with fine hairs, scale-rings 20—22 to the centimeter; brown above, whitish below.

Skull lightly built, with long muzzle. Supraorbital edges fairly sharp. Nasals long and narrow. Zygomatic plate fairly broad, convex anteriorly, practically without masseteric knob. Palatal foramina rather long, extending to the first third of m^1 . Mesopterygoid fossa narrow, parallel-sided, commencing behind the level of the back of m^3 . Incisors slender, orthodont, with index 88° — 89° , not turned backwards as in *L. jacksoniæ*.

Dimensions of the type, measured in the flesh:—

Head and body, 76mm.; tail 77; hindfoot 17·5; ear 14.

Skull, greatest length 21·5; condylo-incisive length 20·6; zygomatic breadth 10·3; nasals 8; interorbital breadth 4; breadth of braincase 10·3; zygomatic plate 2·1; palatilar length 10; palatal foramina 4·9; upper molar series 4.

Hab.—Upper Assam. Type from Golaghat, 300'.

Type.—Adult male. B. M. No. 20·11·1·49 Original number 260. Collected, 12 February 1920, by H. W. Wells. Presented by the Bombay Natural History Society.

This mouse is readily recognisable by its long muzzle, and slender orthodont incisors, which differ markedly in set from those of *jacksoniæ*. Besides the type from Golaghat two specimens from Laitkynsao, Khasi Hills, and from Cherrapunji, may also be assigned to it, as they agree with it in all important characters, though their undersurface is less contrasted with the upper, and their teeth are a

little larger. They are both females, with the mammary formula $3-2=10$.

The third species obtained by Mr. Wells is referable provisionally to the *Leggada booduga* group, which will need further material before its various local forms can be properly sorted out.

(B) THE BRUSH-TAILED PORCUPINE OF ASSAM.

Although recorded by Sclater and Blanford as occurring in Assam, no Brush-tailed Porcupines from that region have hitherto come to the National Museum, all our specimens being from Tenasserim and the Malay Peninsula, which latter is considered the type locality of the common species, *Atherurus macrourus*.

Now in connection with his survey work Mr. Wells has sent home an excellent example from Cherrapunji, the very locality mentioned by Sclater, and I have had much interest in comparing this with Malay specimens. Although nearly allied to *Atherurus macrourus* the northern form seems to represent a distinct species, which may be called

ATHERURUS ASSAMENSIS, sp. n.

Size rather less than in *A. macrourus*. Colour above rather darker owing to there being fewer white spine-tips visible, while below the difference is more definite, the whole undersurface being pale drab brown instead of more or less whitish. Spines of low surface liberally mixed with ordinary hairs, and less robust than in *macrourus*. Tail apparently rather longer than in *macrourus*, the short-haired part about 70mm. in length, the tuft not so long, and the rice-shaped swellings on the bristles smaller; in colour the end part, within the tuft, is not so markedly whiter than the rest as it is in *macrourus*. Weight $4\frac{1}{2}$ lbs.

Skull about as long, but narrower and less bulky than in *macrourus*. It is especially narrow across the frontal region, the distance between the outer corners of the anteorbital foramina being only 33mm., as compared with 37—39mm. in *macrourus*. Nasals projecting farther back beyond the premaxillary processes. Indistinct postorbital angles present. Zygomata narrowing more evenly backwards, instead of the high anterior part abruptly altering to the comparatively low posterior portion.

Molars small, about as in *A. tionis*, therefore decidedly smaller than in *A. macrourus*.

Dimensions of the type, measured in flesh:—

Head and body 420mm.; tail 220; hindfoot 65; ear 34.

Skull, greatest length 96; condylo-incisive length 87; zygomatic breadth 44; nasals 28·5—14·5; breadth across postorbital angles 27·5; least breadth across braincase 29; height of crown from alveolus of m' 25; palatilar length 39; upper cheek tooth series 16·4; molars only 11·8.

Hab.—Assam. Type from Cherrapunji. Alt. 4,500'.

Type.—Adult male. B. M. No. 20·11·177—Original number 563·1
Collected 4 May 1920 by H. W. Wells. Presented to the National
Museum by the Bombay Natural History Society.

No. XXVI.

By

R. C. WROUGHTON.

(A). A NEW TREE-SHREW.

Among the subspecies of *Tupaia belangeri* are *siccata*, a form from the dry zone of Upper Burma, and more recent *yunalis*, from Mong-Tsze, Yunnan (A. M. N. H. 8, xiii, p. 244, 1914). Both these have white neck stripes, by which they are distinguishable from *belangeri chinensis* in which the neck stripe is yellow, but *yunalis* is at once recognisable by its excessively dark colour. In a collection made by Mr. J. P. Mills, at Mokokchung, Naga Hills (which will be reported on in due course in conjunction with the Survey collection from Upper Assam) I have found a form which bears the same likeness to *chinensis* as *yunalis* does to *siccata*, and seems to me to be worthy of subspecific distinction. I propose to call it:—

TUPAIA BELANGERI ASSAMENSIS, subsp. nov.

A *Tupaia* somewhat resembling *T. b. yunalis* at first sight but apparently slightly larger in size, with rather shorter fur and more fulvous coloration, especially on the undersurface.

Size apparently somewhat larger than in *yunalis*, judging by the skull, for no measurements were recorded by the Collector, and even the length of the hindfoot is not obtainable, the bone having been removed. The general colour above is much as in *yunalis*, the individual hairs of the back (excluding the scattered long all-black hairs) are slaty black with a tip and a sub-terminal ring (divided by a slaty ring) fulvous (each 1mm.); in *assamensis* these fulvous markings are darker, more rufous, with the result that the general aspect is duller, more sombre. The fur is shorter (8–10mm). The underside of the body is fulvous, not “grey washed with whitish”. The neck stripes are well defined and fulvous, not “inconspicuous dull whitish” as in *yunalis*.

Dimensions:—Unfortunately no measurements were recorded by Mr. Mills, but comparing the made up specimens of the two species one gets the impression that *assamensis* is somewhat the larger.

Skull:—(The measurements of the type of *yunalis* in brackets). Condyllo-basal length 47mm. (45); zygomatic breadth 25 (24); brain-case breadth 21 (19); maxillary tooth row 18 (16·5).

Hab:—Naga Hills. Type from Mokokchung, 5,000'.

Type:—Adult ♀ B. M. No. 20. 6. 6. 3. Original number 16. Collected by Mr. J. P. Mills on the 11th October 1919 and presented to the National Collection by the Bombay Natural History Society.

Eight specimens examined, all from the type locality. Though four of these are females I have been unable to verify the mammary formula.

(B). A NEW PALM-CIVET FROM ASSAM.

In a collection made by Mr. J. P. Mills at Mokokchung, 5,000' Naga Hills, is a Viverrid which is so undoubtedly distinct from any other I know that I have no hesitation in describing it under the name of:—

ARCTOGALIDIA MILLSI, sp. n.

An *Arctogalidia* of the *leucotis* type but markedly larger in size. Size (judging from the skull) about $\frac{1}{3}$ larger than *leucotis*. Fur and general colouring as in *leucotis*, except that the three dorsal stripes are black and more strongly marked than in any specimen of *leucotis* which I have ever seen. The tail coloured like the body for half its length, with indistinct dark rings about an inch apart, the remainder black with a very short bright buff tip, which however may be only an individual character; in *leucotis* at least $\frac{2}{3}$ is pale and the rest dark. The underside is a drab white, with a pure white patch on the chest, which is possibly also an individual character, for I have seen it in some specimens of *leucotis*. In that species the underside is rather buffy than drab.

Skull markedly larger than in *leucotis*, the posterior palatal tubé much more elongated than in any other species.

Dimensions of the type measured on the skin and therefore only approximate, those in brackets the corresponding measurements of a ♀ specimen of *leucotis* from Tenasserim, recorded by its collector:—Head and body 600 mm. (515); tail 700 (660); hindfoot 100 (89); ear 45 (47). Skull:—Greatest length 121 (109); basilar length 112 (98) zygomatic breadth 67·5 (58·5); interorbital breadth 17 (16·5); braincase breadth 38 (35·5); from front of canine to back of last molar 42·5 (38).

Hab:—Naga Hills. Type from Mokokchung, 5,000'.

Type:—Adult ♂ B. M. No. 20.6.6.6. Original number 4. Collected by Mr. J. P. Mills on 5th September 1919 and presented to the National Collection by the Bombay Natural History Society.

Unfortunately no body measurements were recorded by the Collector, those used are accordingly only approximate; even the length of the hindfoot is little more than a guess, the bone having been removed. There is enough, however, with the skull measurements, to show that this is a markedly larger animal than *leucotis*. Blanford gives a distribution from Sylhet to Tenasserim for *leucotis*, and Blyth

about the same, Sterndale alone adds Assam. From the measurements given Blanford's species seems to be undoubtedly *leucotis*.

Mr. Mills is to be congratulated on the discovery of this well marked new species and I have much pleasure in naming it in his honour.

(C). AN ASSAM REPRESENTATIVE OF THE *C. CASTANEOVENTRIS* GROUP OF SQUIRRELS.

Anderson in his "Anatomical and Zoological Researches" (p. 240), 1878, described a form of the *castaneiventris* group under the name of *gordoni*. This form, like the rest of the group, is characterised by a grizzled band extending from the breast to the vent, contrasting strongly with the otherwise uniform colour (ranging from orange to maroon) of the underside. He goes on to write: "There is a race in Assam.....in which the mesial grizzled line is occasionally absent.it may be indicated as the Assam variety, *S. gordoni*, and for reference stand as var. "*intermedia*". It will be noted that Anderson selects no type and that his locality is so vague as 'Assam'. In any case however the name was preoccupied by Gray more than 10 years earlier. In the Survey collection from Upper Assam is a series of squirrels numbering eleven specimens in two cases only among which can any, and that the very faintest, trace of the streak be detected. Elsewhere in Assam there may be local races which better fill Anderson's description, but for this series in which the grizzled band on the lower surface is, to all intents and purposes, obsolete a name seems to be required and I therefore propose to describe it as:—

CALLOSCIURUS CASTANEOVENTRIS AQUILU, subsp. nov.

A chestnut-bellied squirrel of the *castaneiventris* group, but differing from others by the complete absence of the grizzled line down the chest and abdomen which usually characterises this group.

Size fairly large. Fur close but rather short (15-20mm.). General colour a bright grizzle, the individual hairs slate at the base for $\frac{1}{3}$ their length, followed by two rings and a tip (each about 2mm.) 'tawny ochraceous'. The grizzling finer on the head, limbs, and flanks. Below uniform chestnut. Tail like the back but more coarsely grizzled, with a short pale tip.

Skull normal for the group.

Dimensions of the type (measured by the collector):—Head and body 23mm.; tail 210; hindfoot 45; ear 20.

Skull:—Greatest length 56mm.; basilar length 44; zygomatic breadth 34; braincase breadth 25; palatilar length 25; diastema 13; upper molar series 11.

Hab:—Sadiya, Assam. Type from the Dibong River, 600'.

Type:—Adult ♂. B. M. No. 20. 6. 7. 19. Original number 89.

Collected by H. W. Wells and presented by the Bombay Natural History Society.

THE ARABIAN OSTRICH.

BY

S. H. PRATER.

In March 1920 Col. Sir Arthur Wilson, then Acting Civil Commissioner of Mesopotamia, presented the Society with the skin of an ostrich which was given to him by a Chief of the Anaizah Tribe in Central Arabia. Though there are several records existent, the occurrence of ostriches outside African limits is not very generally known. In forwarding the skin, Col. Wilson sent us the following extract from "Burckhardt's notes on Bedouins," Vol. I, which contain several interesting points in connection with these birds.

Burckhardt writes "These (the ostriches) inhabit the great Syrian Desert, especially the plain extending from Hauran towards the Djebel Shammar and Nedjd. Some of them are found in Hauran, and a few are taken almost every year, even within two days' journey of Damascus. The Arabs call the male ostrich *Zazilhum*; the female *Reidah*. The male has black feathers, with white ends, except the tail feathers, which are wholly white. But the feathers of the female are spotted grey. This bird breeds in the middle of winter and lays from twelve to one and twenty eggs. The nest (*madhah*) is generally made at the foot of some isolated hill. The eggs are placed close together in a circle, half buried in sand, to protect them from rain, and a narrow trench is drawn round, whereby the water runs off. At ten or twelve feet from this circle, the female places two or three other eggs which she does not hatch, but leaves for the young ones to feed upon immediately after they are hatched. The parent birds sit on the eggs in turn; and while one is so employed, the other stands keeping watch on the summit of the adjacent hill, which circumstances enable the Arabs to kill them. When they descry an ostrich standing in this manner on a hill, they conclude that some eggs must be near; the nest is soon found, and the ostriches fly away. The Arab then digs a hole in the ground near the eggs and puts his loaded gun into it, having fastened to the lock a long burning match, the gun being pointed towards the eggs; he covers it with stones and retires. Towards evening the ostriches return, and not perceiving any enemy, resume their places, generally both at once upon the eggs; the gun, in due time, is discharged and the Arab finds next morning one of the ostriches, or frequently both killed upon the spot. Such is the usual method of killing these birds, for the hunting of them is not practised in the Northern Arabian Desert. It has been supposed that the sun alone hatches the ostriches' eggs; but this opinion is proved to be erroneous by the statement above given, which shows that the ostrich sits during the rainy season on its eggs, and the young ones are hatched in spring, before the sun has acquired any considerable degree of heat.

"The inhabitants of the district called Djaf eat the ostriches' flesh, which they purchase from the Sherarat Arabs. The eggs are sold for about one shilling each; the Arabs reckon them delicious food. The towns' people hang up the shells as ornaments in their rooms. Ostrich feathers are sold at Aleppo and Damascus, principally at the latter city. The people of Aleppo sometimes bring home ostriches which they had killed at the distance of two or three days' journies eastward. The Sherarat Arabs sell the whole skin with the feathers on it; such a skin in the year 1810 was sold at Damascus for about ten Spanish dollars; the skin itself is thrown away as useless. At Aleppo (in the spring of 1811) the price of ostrich feathers was from 260 to 600 piastres the rotala (about £2 10s. to £6 per pound). The finest feathers are sold singly, at from one to two shillings each."

At Col. Sir Arthur Wilson's request, the late Col. Leachman favoured us with the following information in regard to the occurrence of these birds in Arabia. Writing from Anah, on the 16th May 1920, Col. Leachman says "I have been

“requested by the Civil Commissioner to reply direct to your letter to him, dated 26th March, in which you ask for information regarding the whereabouts of the Ostrich in Northern Arabia.

“According to Arab information the ostrich is found most plentifully about fifty miles south-west of JAUF, about 300 miles East of the gulf of Akaba.

“It is found also to a certain extent North of JAUF at the heads of the wadis which drain into Mesopotamia as far North as the Damascus Baghdad direct route. I have eaten fresh ostrich egg in the desert 100 miles West of Kerbela; also 200 miles West of Basrah.”

“The ostriches are hunted by *Sulaib* (Sing. *Solubi*), a type of nomad, thought to be of non-Arabian origin. They live alone in small camps far out in the desert throughout the year and have far greater knowledge of water-holes than the Bedouins themselves. Their hunters dress in gazelle skins and can approach within touch of gazelle and ostriches before firing their rifles. Their rifles are for the most part of a very old type, the reason being that if they carried modern rifles, the Bedouin would certainly take them away from them. Otherwise the Bedouin do not molest them.”

Burton in his “Pilgrimage from Medinah” el Meccah, V. III, p. 70, writes:—
“Ostriches are found in El. Hejaz where the Bedouins shoot after coursing them. Throughout Arabia there is a belief that the ostrich throws stones at the hunter. The superstition may have arisen from the pebbles being flung up behind the bird by the bird’s large feet or it may be a foolery of Fancy”.

Canon Tristram gives the following interesting account of the methods of hunting the ostrich adopted—by Arabs in North Africa:—

“The capture of the ostrich is the greatest feat of hunting to which the Arab Sportsman aspires and in richness of booty it ranks next to the plunder of a caravan. But such prizes are not to be obtained without cost and toil and it is generally estimated that the capture of an ostrich or two must be at the sacrifice of the lives of two horses. So wary is the bird and so open are the vast plains over which it roams that no ambuscade or artifices can be employed, and the vulgar resource of dogged perseverance is the only mode of pursuit. The horses so employed undergo a long and painful training, abstinence from water and a diet of dried dates being considered the best method for strengthening their wind. The hunters set forth with small skins of water strapped under their horses bellies and a scanty allowance of food for four or five days distributed judiciously about their saddles. The ostrich generally lives in companies of from four to six individuals, which do not appear to be of the habit under ordinary circumstances of wandering more than 20 or 30 miles from their head quarters. When descried two or three hunters follow the herd at a gentle gallop, endeavouring only to keep the birds in sight without alarming them or driving them at full speed when they would soon be lost to view. The rest of the pursuers leisurely proceed in a direction at right angles to the course which the ostriches have taken, knowing by experience their habits of running in a circle. Posted on the best lookout they can find, they await for hours, the anticipated work of the game calculation upon intersecting their path. If fortunate enough to detect them the relay sets upon the now fatigued flock and frequently succeeds in running one or two down, though a horse or two falls exhausted in the pursuit. The ostrich when overtaken offers no resistance beyond kicking out sideways. A skin on the spot is worth from 40—100 Spanish dollars, but the Arabs are in the habit of judiciously thinning the feathers so that the trader can rarely obtain a specimen on which the tax has not been paid.”

The Arabian ostrich has been recently distinguished as a separate race by Lord Rothschild. In connection with the above Mr. N. B. Kinnear sent us the following notes which summarise what has hitherto been recorded of

the distribution of these birds outside African limits. Mr. Kinnear writes:—At a meeting of the British Ornithologists Club in May 1919, Lord Rothschild described as a new race two ostriches, male and female, from the Syrian desert. He gave as the distinguishing characters the “bill though not much shorter is much narrower, while the tarsus and tail are distinctly shorter. They have the same naked shield on the head as in *S. camelus*, but the horny shield as in *molybdophanes*”

The history of these two birds is as follows:—Before the war Mr. J. Aharone in Palestine obtained some ostrich eggs through Arabs from the Syrian desert. These he sent to Lord Rothschild who, seeing that though they agreed with other eggs from North Africa in being smooth and not pitted, they differed in their smaller size and higher polish, wrote at once and urged Mr. Aharone to obtain some adult skins. This Mr. Aharone was not at once able to do, but he obtained through the Arabs two live fully grown young ones which he reared up to maturity in spite of the war in Palestine, and afterwards killed and sent to Lord Rothschild after we had occupied Palestine. As Lord Rothschild pointed out “the fact that ostriches inhabit the Syrian desert and Arabia has been known for a long time—in fact there are several passages in the bible relating to the bird”. Cannon Tristram in his “Fauna and Flora of Palestine” states that the ostrich only just claims a place in the Fauna of Palestine by its occurrence in the further parts of Belka, the eastern plains of Moab. It is no doubt but a straggler from central Arabia though formerly far more abundant. Xenophon speaks of its abundance in his time in Syria (Anal; 1-5) and we have traditional accounts of its former existences in Sind. A portion of an ostrich skin captured at Belka and given to Canon Tristram is in the British Museum.

Later, Mr. Douglas Carruthers writing in the “Ibis” for 1920 mentions that he had observed an ostrich in N. W. Arabia at Wadi Hidrij, a hundred and twenty miles S. E. of the Dead Sea. He also rode up fairly close to some in the black-stone desert called by the Bedouins *Ar-des-suwan* and further S. E. he occasionally saw traces of them and on the edge of the Nafud he found broken eggs. He considers that the Mecca Railway marks the extreme western range of this bird in Arabia and does not think they go North of the 31st paralleled.

W. F. Ainsworth who took part in the Euphrates Expedition of ? notes that “ostriches have long since been exterminated in Mesopotamia” (Personal narrative of the Euphrates Expedition).

This briefly is what is known of the ostrich outside Africa in modern times, and though there are various traditions to the contrary it is unlikely that the ostrich was found beyond the desert of Upper Syria and Mesopotamia in historic times.

Before going on to remark on the extinct ostriches in Europe and Asia it may perhaps be as well to note that more than one species and race of the ostrich is found in Africa. In the North we have the typical form *Struthio camelus camelus* formerly inhabiting Egypt and Algeria, now found in Nubia, the Sudan, Sahara to Senigambia, and S. Negiria. In the North-East the Somali ostrich *S. molybdophanes* from Somaliland through Gallaland to the Tanna river; and in British East Africa, Tanganika territory to Uganda, *S. massaicus* the Masai Ostrich. Africa, south of the Zambesi, is inhabited by *S. australis* the bird from which most of the ostrich feathers are obtained. Besides being distinguishable by certain characters of the skin these ostriches can also be separated by their eggs which are all slightly different.

In the Pliocene of the Siwalik hills the fossil remains of an ostrich were discovered many years ago and named by Milne Edwards *Struthio asiaticus* and years later in 1894 Dr. Forsyth Major described a femur and a pelvis of another example from the Lower Pliocene of Mityline in the Island of Samos, calling it *S. karatheodoris*. Besides these fossil bones a number of fossil eggs have been

found from time to time, which are supposed to belong to an extinct ostrich or ostriches. The first came from the district of Cherson, S. Russia and was named by Brandt as belonging to an extinct form, which he called *S. chersonensis*. Another supposed to belong to the same form was found in 1894, 140 miles N. W. of Pekin. The remaining known egg, or rather fragments, was found by the late Mr. Archibald Carlyle, of the Archæological Survey, in a Nullah on the Kain R., Banda district, U. P., and bought by Mr. E. Bidwell at an auction sale in London. These fragments were submitted to Dr. Andrews of the British Museum, who considered them to be "parts of an egg of a species of *Struthio* and that in the distribution of the pores on the surface of the shell they are almost identical with the Somali ostrich *Struthio molybdophanes* although possibly the shell is rather thicker than of any recent ostrich egg that has been measured. When placing Dr. Andrews' examination on record in the "Ibis" for 1920 Mr. Bidwell suggested that for the sake of reference the species be called *S. indicus*."

THE BIRDS OF PREY OF THE PUNJAB.

BY

C. H. DONALD, F.Z.S., M.B.O.U.

Continued from page 300 of this volume.

PART VII.

A KEY TO THE BIRDS OF PREY ON THE WING.

In the preceding papers I have not taken very much count of colour which, as has already, often, been pointed out, is so liable to change and is at best deceptive, as anything in the way of a basis for the identification of the Birds of Prey, and when other and more reliable factors are forthcoming, there is not much lost in leaving colour alone.

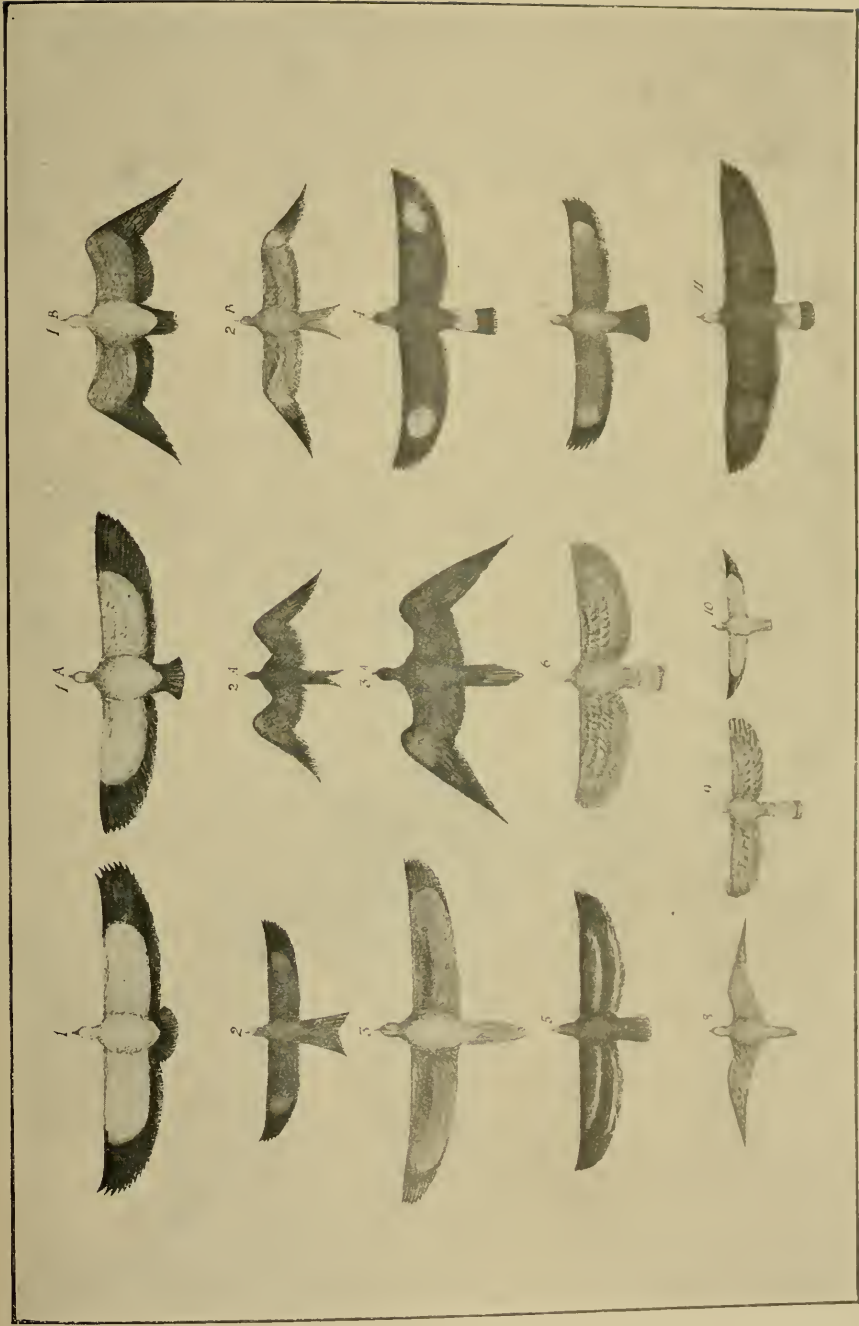
On the wing, however, with the bird anything from 30 to a 1,000 yards away, colour naturally plays the most important part, combined with size, shape, and manner of flying.

The following Key can only be accepted as a rough and ready method of identifying the birds named, and its shortcomings are many, and it is hardly to be hoped that any person, picking it up, will be successful, straight off, in recognising the various species that are to be seen, by consulting it. It only endeavours to bring into prominence the chief characteristics of the birds with which it deals, as ordinarily seen in a bird flying over-head, and with its help and a little practice, it is hoped that a great number of the species will be identified and become familiar objects even to the novice, thus enhancing his interest in the fauna around him, and, perhaps, adding to the ranks of observers, and our knowledge of our feathered friends.

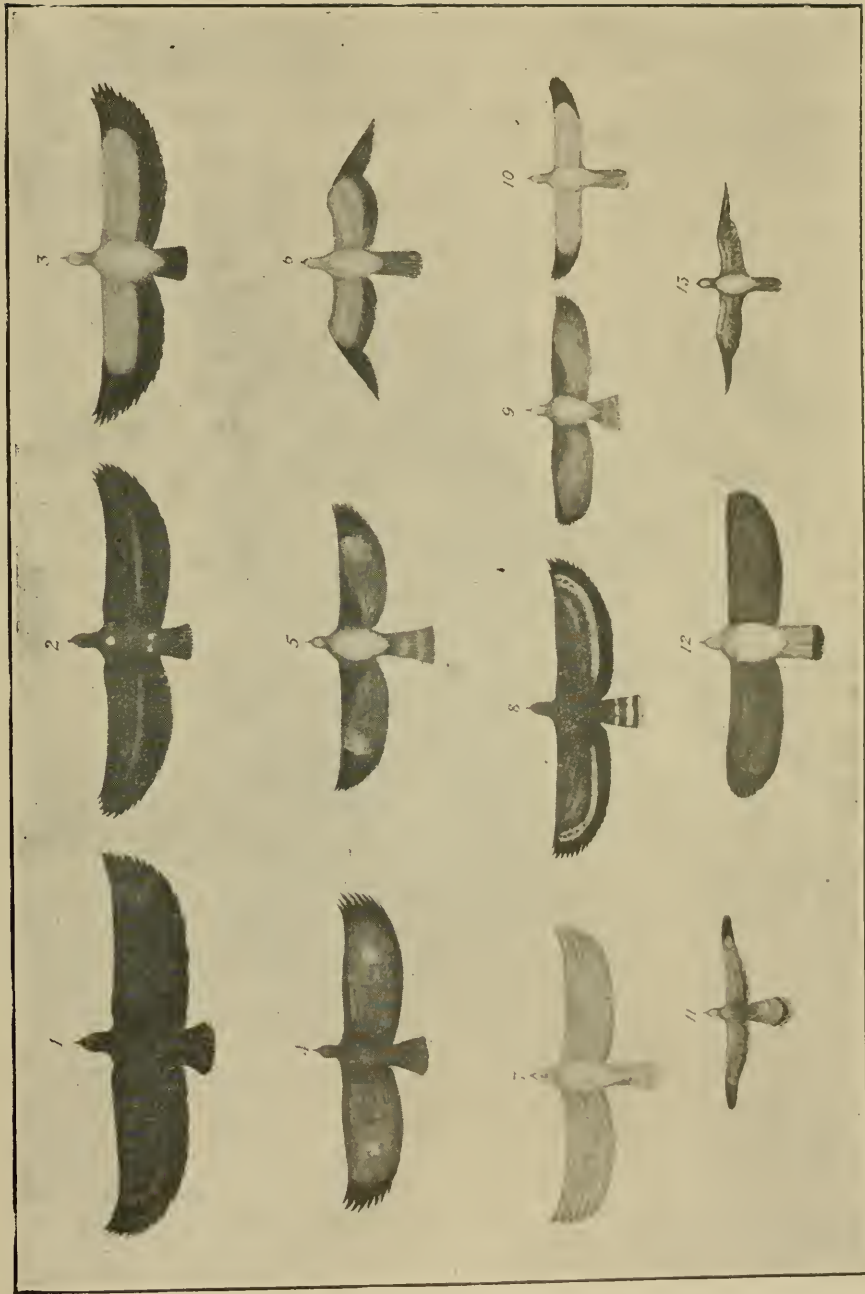
Before going further it is necessary to explain that the adjectives used with regard to wings and tail are only comparative, and must not be taken literally. "Tail long", for instance, does not mean that you must look for something in the way of a pheasant or a Paradise Flycatcher. It merely means that if regarded carefully it will be seen that in some it projects a little further from the body than in others, in which the term "medium" or "short" is used. Look at a Vulture's tail, as it flies past and then turn to a Kite, and see the difference.

I call the first "short" and the other "long" whereas many others come in between the two, as "medium". Again, I speak of "wings broad".

This only means "broad" in proportion to its size as compared with other birds of prey. Again look at a Vulture and then at a Kite, or an Eagle. A very little careful observation will suffice



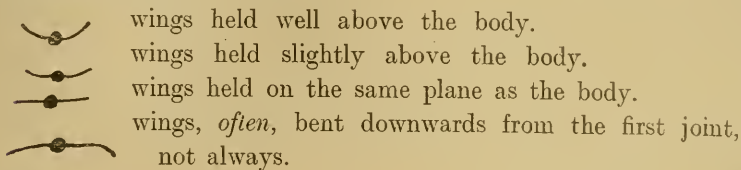
BIRDS OF PREY OF THE PUNJAB.
Illustrating impressions of overhead flight in the various species.



BIRDS OF PREY OF THE PUNJAB.
Illustrating impressions of overhead flight in various species.

to learn the difference, but it is also necessary to point out that a tail is sometimes misleading. If spread out like a fan and extending right across from wing to wing, it will appear extremely short, and in a Vulture, will hardly look like a tail at all, whereas the same bird, a few minutes later, will appear to have grown a fresh one which is very apparent, if still "short".

As colour is perhaps the first thing that strikes the eye, in a bird on the wing, I give prominence to that. The diagrams under "manner of flight" mean:—



Very often it will be seen that the tips of the primaries, in some big bird, curve well upwards, but as this probably depends on air currents or the amount of wind against a flying bird, and is not the characteristic of any individual, I take no notice of it at all. This may be very apparent at one time and hardly visible a minute later.

To save space and make the Key easily and quickly read, if suddenly required. I use the following abbreviations, which will be used throughout:—V.=very, W.=wing or wings, T.=tail, B.=broad, M.=medium, S.=short, H.=head, "M. O. F."=manner of flight, L.=long.

Thus, V. large, W. & T. black, W. B., T. M., would mean that the bird in question was very large in size, wings and tail black, wings broad, and tail medium.

Colouration, again, can only be touched on in a general way. To go into minute details, even where they are discernible, which is not often, would mean lengthy description, and thus defeat the object of the key, *i.e.*, a rapid reference.

Generally speaking, any definite marking in a bird which is also more or less conspicuous is mentioned, and where on marking or other colour to that under which the bird comes, is stated, it means that the general colour scheme is uniform. For instance, see under "A. Birds in which the colour Black predominates." No. 3, The Imperial Eagle.

Mention is made of the head which is whitish and the white band on tail and nothing else. This means that the rest of the bird, as seen, gives the impression of being uniform black throughout.

Again the Cinereous Vulture is often so deep a brown that when flying it might easily be taken for black, so a certain amount of latitude must be allowed by the observer, in picking out colours which very closely resemble each other and may be either the one or the other, at a little distance.

It is impossible to deal with every phase of every species, and many birds one may meet with, will not be identified by this Key, which only deals with the more common phases one meets with, and not with each and every phase. To give but one example, we'll take the Tawny Eagle.








Individuals of this species may sometimes be seen so dark in general appearance that they could be assigned to (A) as well as (B), and, again, it is not uncommon to meet with one in which the plumage is so bleached and ragged that one would look for it in (C), the whole being a dirty brownish white, except for the quills which are black.

The general appearance, and shape, even, of a bird may vary to a very large extent, as shown in the plate, but once the general characteristics are grasped, variations will be found to be of little account, and recognition simple, be the guise what it may, in by far the larger number of cases.













As it is only possible to deal with the more common and generally met with phases of most of the birds, in a small work of this nature, it becomes obvious that these Keys, as I have already said, are very far from being anything like complete, and their shortcomings are very numerous, but it is hoped that even as they stand they will at least help the beginner to identify, at least, some of our birds of prey, and thus make a start on a subject which might otherwise have been dropped in disgust, for the lack of a little help in the beginning.

KEY.



A.—Birds in which the colour RLACK predominates.

Name of Bird.	M.O.F.	Characteristics.
1. The Black Vulture.		V. large ; W. B. ; T. S. ; white crop and thigh patches, conspicuous.
2. Golden Eagle.		Large ; T. L. ; H. light brown, base of tail whitish ; a large white moon in the centre of wing in young birds only.
3. Imperial Eagle.		Large ; T. S. ; H. whitish, T. with white band.
4. The Black Eagle.		Large ; T. L. ; W. L. ; jet black throughout, no marking, yellow feet show at close quarters.
5. Pallas's Fishing Eagle.		Large ; T. M. ; H. white ; T. with white bar ; often noisy when soaring.
6. White-tailed Sea Eagle.		Large ; T. M. ; H. white ; T. almost entirely white.
7. The Large Spotted Eagle.		Large ; T. M. ; colour not uniform, rather streaked with whitish ; half moon of white on wing.






B.—Birds in which DEEP BROWN predominates.

- | | | |
|---------------------------|---|---|
| 1. The Cinereous Vulture. |  | V. L.; W. B.; T. S.; uniformly coloured throughout. Beat of wing very heavy and slow. |
| 2. The Griffon Vultures. |  | V. L.; W. B.; T. S.; not uniform, often patchy and streaked and lighter towards the head (Young plumage). |
| 3. The Steppe Eagle. |  | L.; T. M.; not uniformly coloured; two parallel lines of whitish running along each wing. |
| 4. The Tawny Eagle. |  | L.; T. M.; patchy, one whitish line along the wing sometimes, rather faint. |
| 5. The Lammergeyer. |  | V. L.; W. L.; T. L., and wedge-shaped, patchy appearance, head and neck black (young plumage). |
| 6. Crested Serpent Eagle. |  | L.; W. B.; T. M.; Wings lighter than body, one broad bar along whole length of wing and another narrower and less defined. A broad cross band of whitish on tail, and another near base of tail, less defined. Noisy. |
| 7. The Neophrons. |  | M.; W. rather narrow; T. S. and wedge-shaped; appearance streaked and patchy (young plumage). |
| 8. The Kites. |  | M.; T. L., and forked. |
| 9. Marsh Marrier, ♀. |  | M.; W. L.; T. L.; head whitish and often a white patch near shoulder. |
| 10. Buzzards (Buteo). |  | M.; W. rather rounded, long; T. M., silvery white along whole length of undersurface of wing and across tail (melanistic phase). |
| 11. Booted Eagle. |  | M.; W. & T. ample; flight kite-like; appearance patchy (melanistic phase). |
| 12. Saker Falcon. | }  | M. to small; W. long and pointed; T. M. (first plumage). |
| 13. Laggar Falcon. | | |

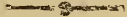





C.—Birds in which BLACK (or DARK BROWN), and WHITE are more or less equally distributed on underparts.







- | | | |
|------------------------------|---|--|
| 1. The Griffon Vultures. |  | V. L.; W. B.; T. S.; Head, body and front portion of wings dirty white; primaries and margins of secondaries, tertiaries and the whole of the tail black or blackish. (Adult plumage). |
| 2. The White-backed Vulture. |  | Back and upper parts grey brown except quills. Similar to above only smaller and the black and the white more vivid. Back dark except for white patch. |

D.—Birds in which WHITE predominates (white or whitish with black tips to wings.)






- | | | |
|----------------------------------|---|--|
| 1. The Scavenger Vultures. |  | M.; W. L., & narrow; T. short, wedge-shaped; margins of wings black throughout; Tail white (Adult). |
| 2. The Booted Eagle. |  | M.; W. & T. ample, latter not wedge-shaped and dark in colour, not white as in Neophron. Whole of underparts, white or whitish, except margins of wings which are black (light phase). |
| 3. The Pale, and Hen Harriers. ♂ |  | M.; W. & T. long; entire plumage pure white or white with a bluish tinge, except margins of wings which are black. Upper plumage bluey grey. |
| 4. Black-winged Kite. |  | S.; W. L. and pointed; T. rather short; underparts pure white, except tip of wings (<i>i. e.</i>) primaries, which are black. Back grey or black and white. |
| 5. The Tawny Eagle. |  | L.; W. long, T. M.; underparts dirty white throughout except margins of wings and tail which are black, or blackish, (not a very common phase). |

E.—Birds in which the body is WHITE or Whitish, and wings dark coloured uniform, or with markings.




- | | | |
|--------------------------|---|---|
| 1. The Lammergeyer. |  | V. L.; W. & T. long, the latter wedge-shaped; Body may vary from white to ferruginous; wings greyish or light brown, profusely streaked (Adult). |
| 2. The Bonelli's Eagle. |  | L.; W. & T. ample; body pure white or white with dark streaks., Wings dark brown with lighter patches and streaks (Adult). |
| 3. The Osprey. |  | M.; W. L.; T. M.; head, neck and body white; wings greyish to brown, patchy; Hovers over water. |
| 4. The Brahminy Kite. |  | M.; W. and T. ample, rounded; T. M.; head, neck and body white; something greyish with a reddish tinge, times patchy; upper parts bright deep chestnut. |
| 5. The Buzzards (Buteo). |  | M.; W. L. rounded; T. longish; head, neck and body whitish; wing, brown with half moon (light phases) |
| 6. The Lagger Falcon. |  | M. to small; W. L. and pointed; T. M.; body white, or white with dark streaks, wings dark brown, patchy. (Adult). |






- | | | | |
|--|---|---|--|
| 7. The Merlin. | } |  | S.; W. L. and pointed; T. M.;
body pure white or white with dark
streaks; wings silvery, speckled. |
| 8. The Turumti. | | | |
| 9. The Hobby | |  | S.; W. L. and pointed; T. M.;
breast white, darker towards abdo-
men; Wings almost black, often
patchy. |
| 10. The Large Grey-
headed Fishing
Eagle and | } |  | M.; W. broad and rounded; T.
ample; head and neck greyish;
body pure white; wings almost
black; tail (in adults) white. Found
near streams and rivers in the hills;
flight hurried. |
| 11. Hodgson's Fishing
Eagle | | | |
| 12. The Crested
Honey Buzzard. | |  | M.; W. long, rounded T. ample
body whitish, wings grey profusely
spotted with bars on wing and tail |
| 13. The Spizaeti. | |  | M.; W. short rounded; T. L.; body
white profusely or slightly spotted,
Wings grey profusely streaked and
spotted (Adult). |
| 14. All Hawks. | |  | M. to small, (smaller addition of
Spizaeti); body and wings profusely
barred and spotted, the latter a
little darker than body. (Old birds.) |

F.—Birds which appear GREY throughout, from below.



- | | | |
|-----------------------------|---|---|
| 1. The Spizaeti. |  | M; W. short and rounded; T. L.:
body sometimes darker, and some-
times lighter than the wings;
profusely barred and streaked. |
| 2. All Hawks. |  | M. to small; W. short, rounded;
T. L.; similar to above. |
| 3. Pale Harrier. |  | M.; W. long, rounded T. L.; body
and wings very much the same
colour, profusely spotted. (Young
and females.) |
| 4. Hen Harrier. | | |
| 5. Peregrine Falcon. |  | M.; W. long and pointed; T. M.;
body usually lighter than wings. the
latter profusely streaked and spotted. |
| 6. The Short-toed
Eagle. |  | L.; W. long and rounded; T. L.:
wings and body more or less uniform
apparently, profusely spotted and
streaked; hovers a great deal. |

G.—Birds in which LIGHT BROWN predominates.




- | | | |
|---------------------------|---|---|
| 1. The Imperial
Eagle. |  | L.; W. L.; T. M.; Light brown
throughout, body lighter than wings
and streaked. (Young bird.) |
| 2. The Steppe Eagle. |  | L.; W. L.; T. M.; body unstreak-
ed, two light parallel bars running
along the wings. |
| 3. The Tawny Eagle. |  | L.; W. L.; T. M.; body and wings
more or less uniform in colour, latter
patchy; usually no bar on wing but
there may be one. |

- | | | | | |
|--------------------------------|---|---|---|--|
| 4. Pallas's Fishing Eagle, and | } |  | { | L. ; W. L. ; T. M. ; body usually darker than the wings. Wings patchy, with a light coloured patch near the base of primaries, as in Buzzards. (Young plumage only.) |
| 5. The White-tail-Sea Eagle. | | | | |
| 6. White-eyed Buzzard Eagle. | |  | | S. ; W. & T. moderate, latter rather rounded ; body as a rule much darker than wings, latter appear a silvery greyish brown. |
| 7. Hawks. | |  | | M. to S. ; W. short, rounded ; T. L., often uniform brown when seen at some distance. (Young birds.) |
| 8. Buzzards. | |  | | M. ; W. L. rounded ; T. rather long ; body light brown, neck and head almost white ; wings a little darker, half moon fairly conspicuous on the wings. |
| 9. Falcons. | |  | | M. to small ; W. long, pointed ; T. M. ; at some phase or another any falcon may appear light brown in the air, either uniform throughout or mottled or barred. |

H.—Birds in which RED, in some form, predominates.

- | | | | | |
|------------------------------|--|--|--|---|
| 1. The Brahminy Kite. | |  | | M. ; W. ample and rounded ; T. M. ; body, neck and head pure white ; wings greyish with a reddish tinge ; upper parts, except head and neck, bright chestnut, or reddish. |
| 2. The Kestrel (adult male). | |  | | S. ; W. L. pointed ; T. L. ; body rusty brown, speckled ; Wings greyish ; head and tail greyish blue ; parts upper brick red with black dots. |

I.—Birds with REDDISH breasts or bodies.

- | | | | | |
|------------------------------------|--|---|--|---|
| 1. The Bonelli's Eagle. | |  | | L. ; W. & T. ample. Body brick red with dark streaks ; wings dark brown, patchy. (Young bird.) |
| 2. The Marsh Harrier (adult male). | |  | | M. ; W. and T. L. ; body a reddish brown ; wings brown and greyish, very patchy ; upper portion of wings french grey. |
| 3. The Shaheen Falcon. | |  | | M. to small ; W. long and pointed ; T. M. ; body chestnut varying to pale rufous. Wings greyish brown, spotted ; head and upper parts, often black. |
| 4. The Indian Hobby. | | | | S. ; W. L. pointed ; T. M. ; rufous in varying degrees, increasing towards the abdomen and flanks ; wings blackish. |

I.—Birds which HOVER.

- | | | | | |
|----------------|--|--|--|--|
| .1 The Osprey. | | | | Only over water ; appears about half white and half black. From below, white predominates. |
|----------------|--|--|--|--|

The Short-toed Eagle.

Over grassy plains, scrub, and barren desert. Looks light grey through out except for a black streak on edge of wing and another on chin.

3. The Black-winged Kite.

Over scrub jungle, grassy plains and cultivation. From below pure white with black tips to wings.

4. The Kestrel.

Anywhere except in heavy jungle. Light brown or reddish brown body, greyish wings,

J.—Occasional HOVERERS.

1. The Buzzards.

Now and again may be seen to stop in mid-air but not for long. Half moon on wings conspicuous.

2. The Spizaeti.

Very rarely seen to hover though I have seen one (*S. limnætus*) do so for quite a considerable time.

3. The Harriers.

Frequently stops in mid-air but never actually hovers for more than a second or two.

N.B.—Most Birds of Prey will hover momentarily over a bush or tussock of grass into which their quarry has “put in”, but this will be directly over the spot and not as in the case of the regular, or even occasional hoverers, (except Harriers), which appear to be suspended in mid-air at considerable heights.

K.—Birds which put out their Legs, as if about to settle, when still a considerable distance from the ground.

1. All Vultures.

2. The Black-winged Kite.

In the case of Vultures, it appears to be a part of the regular signal when there is a carcase, as one sees them putting out their legs, as if about to settle, when still 500 feet up in the air. I cannot think of any other reason for this curious “trait” as no other Bird of Prey does so under similar conditions. The White-backed Vulture will “drop” his legs when coming down to settle on a tree or when arriving at his nest, when still some distance from it and then it certainly does not mean it as a signal, but be the reason what it may, it is a curious characteristic of these birds.

With the Black-winged Kite, the legs suddenly “drop” and the wings are thrown back at almost right angles to the body, until they almost touch each other over its back, after a bout of hovering, when the bird sees an insect and decides to descend for it. In this case, its progress through the air is very slow until within a few feet of the ground, when the wings suddenly close into its body, and the bird covers the last few feet very rapidly.

The Short-toed Eagle occasionally does the same thing, but does not always “drop” its legs in the same way nor does it hold its wings so far back as the preceding species. It lowers itself towards the ground with half closed wings, and occasionally its legs will be gradually extended as it approaches the ground.

REFERENCE TO ILLUSTRATIONS.

N.B.—It must be clearly understood, from the first, that the illustrations of birds flying are merely intended to convey impressions, such as one ordinarily gets of a bird as he sees it pass overhead. Not being the efforts of an artist they

lay no claim to artistic effect, and are by no means accurate as to details and no effort has been made to make them so, as it is impossible to pick out details when a bird flies past, and if you do succeed with one individual, it is very possible that the very next specimen of the same species you see, lacks that particular detail. Take for instance Plate 1, Fig. 4. The conspicuous white moons are the signs of young plumage and lacking in the old bird which would resemble No. 11 in the colour of wings. However, this is so very conspicuous a feature in the young Golden Eagle that I have shown it, and again in the Buzzard.

One gets the impression of lines, or spots or half moons, etc., but the exact position in the wing is not very often obtained and may also be lacking, or further intensified in other individuals of the same species, so no reliance can be placed on them as shown in the illustrations. I may, however, be permitted to say that the general effect is fairly good and the impressions conveyed should certainly help the novice to pick out the particular species depicted, in the air, if only he will bear in mind that *these are only impressions* and too great stress must not be laid on the various markings as shown, and a little attitude allowed for variations in colour. Look at the plate from some distance.

PLATE I.

- No. 1., 1A., 1B. Griffon Vulture. 1B a young bird. Note the tail in each. (Wings broad, tail short.)
- No. 2., 2A., 2B. A Kite. Note wings and tail. (Wings ample, tail long and *forked*.)
- No. 3., 3A. The Lammergeyer (adult and young). (Wings long and rather narrow, tail long, wedge-shaped.)
- No. 4. A Golden Eagle (young plumage). (Wings long, tail long. Wings held very straight and well upwards; tertiaries meet body above root of tail and form conspicuous triangle with it.)
- No. 5. A Steppe Eagle. (Two parallel lines along wings) (Wings ample, tail medium; wings not always very straight; held in the same plane as body; tertiaries do not make a prominent triangle with tail as in No. 4.)
- No. 6. A *Spizaeti*. (Wings, short and broad; tail long. Wings held well upwards.)
- No. 7. A Buzzard. (Wings rather rounded, long; tail medium to long; half moon in wings always present; tail frequently spread.)
- No. 8. A Falcon. (Wings long and pointed; tail medium.)
- No. 9. A Hawk. (Wings short and rounded; tail long.)
- No. 10. A Black-winged Kite. (Wings long, pointed; tail medium. From below practically pure white with black tips to primaries only.)
- No. 11. Pallas's Fishing Eagle. (Wings long and often bent; tail medium, half white and half black; head whitish. Remainder of plumage practically jet black.)

PLATE II.

- No. 1. The Cinereous Vulture. (Wings very broad, tail short; colour uniform throughout.)

- No. 2. The Black Vulture.
(Wings broad, tail short ; white crop and thigh patches, faint whitish line along the wings.)
- No. 3. The White-backed Vulture.
(Wings broad, tail short ; body and front of wings whitish margins and tail black.)
- No. 4. The large Spotted Eagle.
(Wings rather broad, tail medium ; colouring black, streaked and patchy ; white patches on wing.)
- No. 5. The Bonelli's Eagle.
(Wings ample, tail long ; body white, streaked ; tail greyish brown, slightly barred ; wings dark grey with white patches.)
- No. 6. The Booted Eagle.
(Wings ample, frequently bent ; tail long, unforked ; body and front of wings dirty white, tips of wings, margins and tail dark brown to black.)
- No. 7. The Short-toed Eagle.
(Wings ample and broad, tail long. Colouring throughout, pale greyish, often silvery ; a dark streak near chin and another on or near first primary.)
- No. 8. The Crested Serpent Eagle.
(Wings broad, tail medium. Colour varies from reddish brown to deep brown. A broad wing stripe and two often visible on tail, white or whitish.)
- No. 9. The Brahminy Kite.
(Wings rather broad, tail medium. Head and body pure white, slightly streaked, wings reddish with black tips, tail reddish, upper parts bright chestnut.)
- No. 10. A (male) Hen Harrier.
(Wings long, slightly rounded, tail long. Colour white or blue white throughout except for tips of primaries, which are black)
- No. 11. A Kestrel.
(Wings long and narrow, not very pointed, tail long. Colour light brown, streaked, wings lighter than body. In males the tail is bluish with a black band near the end.)
- No. 12. Hodgson's Fishing Eagle.
(Wings broad, tail medium, neck and breast brownish, body white, tail brown mixed with white ; wings dark brown.)
- No. 13. A Hobby.
(Wings long and pointed, tail medium. Body white, wings and tail dark brownish grey, speckled with white.
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REVIEW.

SHIKAR NOTES FOR NOVICES BY HON'BLE J. W. BEST, I.F.S.

Ever since the days when Sterndale's "Seonee" and Forsyth's "Highlands of Central India" were issued from the press, the Central Provinces have probably provided the sportsmen of India with more books on shooting, and especially 'big game' shooting, than any other part of the country. All, or nearly all, these works have been written by men who had had much practical experience of the subject on which they wrote and their books have been excellent guides for the rising generations of shooting men. It might be thought that the subject might by now be getting a bit threadbare and that there cannot be much more or that is new to be added. Once more however the Central Provinces has produced an author in the Hon. J. W. Best of the Indian Forest Service, who has attempted the task of giving the benefit of his experiences to those whom he described in his sub-title as 'Novices' in a small and unpretentious volume entitled "Shikar Notes." But even if the book is small, unpretentious and within the means of everyone, it is full from cover to cover of most useful and practical advice to the young sportsman lately arrived in this country who is looking forward eagerly to taking an active part in the shooting of which he has no doubt read and heard so much. Lucky indeed will he be if he finds himself stationed in or near the Central Provinces, with which the author principally deals. His advice and information are nevertheless largely applicable to shooting in all other parts of India and we can most confidently recommend the book to all novices wherever they may be stationed. But it is not only shooting with which the book deals, for there are chapters on 'Hunting a Lobbery Pack', 'Fishing,' 'Pig Sticking' and on the Equipment and Management of a Camp which are equally full of sound, useful hints.

Generally there may not be much novel information in this useful little book, but one does not expect such in a work of this description, and the novice does not require it. In the chapter on Wild Dogs, however, there is described a method of calling them with the simple aid of a leaf, with which the cry of a fawn in distress is imitated, and which we do not remember having seen described before.

Even if the author is a practical field naturalist we fear he can have small claim to be in any way a scientific one, or he could never have passed the proofs with the glaring mis-spellings of the scientific names of many of the animals that are dealt with and we hope, whenever another addition is called for, careful attention will be given to this point. Amongst the many errors of this character we will only specifically mention one, *viz.*, the Buffalo of which the scientific designation is given as "*Babulus babulis*". Some of the others are almost as crude. Although the section dealing with the Gaur commences with the words "The Bison or Gaur" that is the only reference to the correct name of this animal, which is elsewhere misnamed the bison. In speaking of birds generally we are told that there is less necessity for observing the direction of the wind than in the case of Game animals as their sense of smell is not strongly developed, but we cannot follow the author when he proceeds to say that "a strong wind, however, effects the flight of birds in two ways, in that they cannot rise from the ground or pitch except against a strong wind and they are frequently compelled to travel down wind if the breeze is too strong for them." We regret to find a recommendation that any falcons and hawks should be shot if they come out in beats for jungle fowl. Some of the Raptors are undoubtedly destructive to small game, but their numbers are comparatively small and their depredations amongst game must surely be almost negligible in a country such as India, whereas most sportsmen must take a delight in seeing and observing the flight and methods of the many very beautiful birds of prey.

In putting forward the suggestion that if a fox or jackal goes to ground after a hard run with a bobbery pack, it should, if possible, be always dug out for the reason that in such circumstances it "frequently dies from sheer exhaustion," the author is perhaps drawing on his imagination. Such cases, we should think, are the rare exception rather than the rule. Many members of the Bombay Hunt will recall a certain jackal which repeatedly provided the hardest and best of runs some few years ago and showed no signs of suffering from exhaustion.

In the chapter on Fishing the author admits himself to be only a beginner, but we trust that if he follows up the sport he will bear in mind that sportsmanship enters as thoroughly into its pursuit as in other sports. This hint is prompted by his recommendation that when bait fishing for Rohu two large treble hooks should be placed hanging below the small baited hook, so that if the fish is not hooked in the mouth there may be the chance of foul hooking it with these trebles. We have seen these suggestions in a Bengali gentleman's book on Tank Angling, but the true angler, who fishes for sport, would certainly place the idea amongst the equipment of the poacher. On page 149 we see a reference to the capture of Rohu on a large spoon. Possibly the identification of the fish was inaccurate as we never heard of this species taking other baits than paste and such like fished on or near the bottom.

EDITORIAL.

Since our last editorial notes were written there has been considerable correspondence between various members and the Honorary Secretary on the subject of the terms on which the Society was prepared to move a large portion of its Museum collections over to the Prince of Wales Museum. From letters received it is evident that the Honorary Secretary's circular, dated 17th August 1920, asking members to say whether they agreed or not to the revised proposals, did not make it plain that whatever part of the Society's Collections was placed in the Prince of Wales' Museum, such would be the property of the Museum Trustees for so long as the Trustees were able to maintain the Natural History Section of the Museum and no longer. The Trustees' funds are, so far at least as the Natural History Section is concerned, to be obtained almost entirely from Government and since Government are unable to pledge themselves for the future as regards finance, the Committee naturally felt that they must guard themselves against the risk—however slight that risk might be—of seeing valued collections presented to the Museum by the Society, neglected and allowed to deteriorate because of want of sufficient funds. What would happen if money were not forthcoming every year for the maintenance of the Natural History Section is not pleasant to contemplate. Exhibits would have been mounted and displayed in such a way that it would be an utter impossibility to get them back into the present rooms of the Society, and even if accommodation of a suitable nature could be found—the Society could never find the money for the rent. There is however no need to labour this point. The Natural History Section of the Prince of Wales Museum will be the most popular section of the Museum and it may be regarded as certain that whatever portion of the Museum has to be closed for want of funds it will not be the Natural History Section.

Another point which wants making clear is that, until an actual Natural History Museum has been built, the reference collections of the Society will remain in their present quarters. The accommodation placed at the Society's disposal in the existing Museum building will be barely sufficient for displayed exhibits.

It is apparent that the question of finance enters very largely into the arrangements for the future. The removal of part of the Society's collection, the payment of subordinates working in the Museum, and the part payment of the Curator and Assistant Curator, will undoubtedly relieve the Society of a great deal of expense but this expense is of a nature which the Society should have incurred rather than did incur. It will not reduce the Society's expenditure on the Museum side by much, and the Society's expenses in other directions, such as Library, Clerical staff and Journal, will considerably increase. The "Times Press" have notified us that they must increase their charges for printing the Journal, and this being the case the committee and members will have to decide on one of two courses. Must the Journal be cut down in size so that the amount spent on it at the higher scale will be no more than at the lower? Or must the Society's income be increased to meet the extra cost? As regards the former the Journal is already too small for the mass of material placed at our disposal and which it is our duty in the interests of science and of our members to publish. The length of time which elapses between the receipt of MS. and the publication of MS. is a serious drawback and this is intensified in the case of serials which on account of their length have to be spread over many numbers. The strike in the "Times Press" and the disorganisation which resulted therefrom has delayed the issue of the Journal very considerably and this is greatly to be regretted. Firstly, because of the delay in issuing to members papers long waited for, secondly, because it was particularly desirable that members just at this time should receive their Journals regularly. To many members

the Society's Journal is the only thing of value obtained from membership and if that value is cut down and at the same time the member is asked to pay more, he might in these days of high prices, be inclined to resign membership. What the Committee want, and what the editors hope to do, is to bring out Journals regularly and to give members every quarter a number containing from 200 to 250 pages of valuable scientific, and interesting general notes on Natural History. As regards issues, 1920 was a very bad year. No. 4, Vol. XXVI, and Nos. 1 and 2 of Vol. XXVII being the only numbers issued and No. 2 in many cases not being in members' hands till 1921. 1921 opens better however, as we bring out in January No. 5, Vol. XXVI, and in February No. 3, Vol XXVII and have sufficient material to bring out No. 4 in April. The Index for Vol. XXVII should follow within three months of that and so a complete Volume will have been issued within a year. Mr. Stuart Baker and our friends at the British Museum will do their best to see that two parts of Vol. XXVIII are produced in 1921, but how is this to be done in the existing state of our finances? Will members be willing to give value for value and pay an increased subscription to the Society, or will they think that it is the last straw in these days of continual increases? Well one claim the Society may make. If the subscription is raised it will be the first time it has been raised since 1886. Is it not patent that our expenses in the year of grace 1921 are very different to the expenses of 55 years ago? The Committee will no doubt place matters before members in such a convincing manner that an increase in subscription will be welcomed with enthusiasm! These notes are merely to prepare members and make them think of the financial resources of the Society they belong to and of what that Society has done for the science they are interested in.

In the report of the Zoological Survey (1919-1920) Dr. Annandale, the Director of the Zoological Survey, complains bitterly of the conditions in the public galleries in the Indian Museum due to "Lack of Funds and Staff." He writes "Lack of Specialists' knowledge of Birds and Mammals, scarcity of dust-proof cases, bad lighting of the galleries and general squalor due to the paucity of the menial staff, prevent the galleries from becoming either attractive or of first class educational value." The funds of the Institution are devoted primarily to scientific research and unless more money is available the improvement of the Public Galleries cannot be considered. Dr. Annandale concludes, "I would give a great deal to see the Mammal Galleries and Bird Galleries developed on what I consider proper lines but at present it can't be done."

While the primary function of a Museum is scientific research it is to be understood that the Educational purpose of the institution must not be lost sight of, and the handicap the Indian Museum suffers in this direction through lack of adequate financial support is much to be deplored.

The purpose of a Museum would appear to be the development of the study of Natural Science with a view to placing the knowledge thereby acquired at the service of the General Public. The Researches of Darwin, Huxley and Pasteur are to-day part of the teaching of the School Room. Education, as expressed by President H. F. Osborn, in the Fifty-first Annual Report of the American Museum of Natural History, is a great deal more than the Three Rs. "It is inspiration and information, it is instruction in local history, geography, geology, in travel, in climatic laws, in simple economics, in all that concerns the health of mind and body, in all branches of Natural History and all that living nature has to tell our youth."

In the changing condition of to-day it is of primary importance that Indians, in whose hands will mainly be the power of affording educational facilities to their fellow countrymen, should awake to the knowledge that Museums and kindred institutions are ideal channels through which a large mass of the public may be

reached and instructed. In New York City the combined attendance at the Schools and Colleges during 1919 was 875,327 as compared with 10,654,881 people who attended the Museums, Public Library, Scientific Park and Aquaria. Commenting on these figures President Osborn says: "Every one who comes, learns something. Some persons learn a great deal, their thoughts, their imagination take new and better channels; thoroughly democratic these institutions are open at all times to people of all classes; they are planned on a scale commensurate with a city destined to be the leading city of the world."

The sooner it is realised that a Natural History Museum is not merely a store-house of curiosities, but is actually a fundamental part of the educational system of the country, the sooner will it be understood that the adequate support of such an institution is not a civic luxury but a paramount necessity. If the Museums in India are at all to achieve the purpose for which they are intended they must receive the ungrudging support of the administration, failure in this would by restricting their activities lessen their utility as is graphically instanced by the statement by Dr. Annandale quoted above.

The Trustees of the British Museum express their best thanks to the Society for a donation of 26 small mammals from Upper Burma, including the types of five new forms collected by Messrs. F. Kingdom Ward and P. M. Leonard, descriptions of which appears elsewhere in this number.

In addition to the above, the types of a new tortoise (*T. buxtoni*) which was obtained by Mr. P. A. Buxton on the south coast of the Caspian Sea; and a new snake (*Zamenis hotsoni*) which was collected by Col. J. E. B. Hotson in Shiraz were also presented to the National collection.

In connection with the Society's gift of large series of Mammal Skins to the British Museum, Mr. Oldfield Thomas writes, "you will, I think, understand that our ability to name and work out depends on our not only being able to see but to keep material for further work, unless we are allowed to keep quite good sets of specimens the progress of the survey will be continually hindered. The keeping of, say, 2 or 4 specimens, out of a series of 40 which has been worked out gives no opportunity for a later checking of the original paper. We want to take a number of specimens, which may appear greedy but is really only based on experience as to what is wanted for better and more detailed work in later collections."

The thanks of the Society are due to Col. J. E. B. Hotson for his many years of active help and for the valuable collections obtained by him in Mekran and Persia. Besides a large number of mammals his collections included birds' skins, insects and a large assortment of pressed plants. Throughout this period Col. Hotson bore half the expenses in connection with the collecting work, and, as stated before, the thanks of all our members are due to him for his generosity and for the valuable work he has done for the Society. Col. Hotson is now on leave in England where we wish him every enjoyment of a long delayed and hard earned rest. Members will be interested to hear that, through the instrumentality of Sir Percy Cox, arrangements are being made for one of the Society's Assistants to collect and make observations in connection with Bird Migration on the Light-house Islands of the Persian Gulf, and Sir Percy has very kindly offered to pay the salary during the period. As most of our readers must already be aware, Sir Percy is a very keen naturalist and during the war contributed, together with Major R. E. Cheesman, a large number of specimens collected in Mesopotamia, which collection will be found referred to as the Cox-Cheesman Collection in the Reports of the Fauna of Mesopotamia. Major R. E. Cheesman is back in Mesopotamia and will, we hope, be able to find time for Natural History work once more.

At a recent Committee meeting a letter from Mr. W. W. A. Phillips of Ceylon offering to collect for the Society was read. The Committee considered Mr.

Phillips' offer a very valuable one and accepted it with great gratitude. Mr. Phillips' collections will form a most useful supplement to the material obtained by Major Mayor in Ceylon before the war.

Mr. C. Primrose also offered to collect for us in the Hukong valley and unadministered Naga Territory, during the time that a Survey was being made in those parts. This offer too is a very valuable one and was accepted with pleasure, but unfortunately the Survey has had to be closed down indefinitely.

In the last Journal we published an illustration of plaster casts of some common Indian Snakes. The casts represent the Cobra, Russell's Viper, Russell's Earth Snake, John's Earth Snake and the Checkered Water Snake. We are anxious to have if possible a more or less representative collection of casts of the commoner Indian Snakes and the assistance of members is solicited in this connection. What is needed are living specimens of the common Indian Snakes. Adult examples of the following are especially needed. The Common Krait, the Banded Krait, The Phoorsa or Saw-Scaled Viper (*E. carinata*), The Royal Snake (*Z. diadema*), Bronzed-Back Tree Snake (*D. tristis*), The Kukri Snake (*O. subgriseus*) and The Banded Kukri Snake (*S. arnensis*). The snakes would travel quite safely if enclosed in a stout wooden box with a few small holes punctured in the lid, but in sending a specimen of a Krait or a Phoorsa the Museum Staff would be very thankful if notification could be given on the outside of the parcel as to the contents. Some years ago a parcel was received through the post at the Society's office—a cigar box with a brown paper wrapping—no notice as to its contents. The box on being opened disclosed a vigorous young Russell's viper!

Since the last Editorial was written we have welcomed to India Mr. Kinnear's successor, Mr. B. C. Ellison. He joins us at a time of change and has a lot of hard work before him. Plans for the best utilisation of the space placed at our disposal in the Prince of Wales' Museum have to be made, and Mr. Wroughton writes from the British Museum that the time has come for the demobilisation there of the Mammal Survey material. He estimates that the demobilisation papers will take our Curator and Assistant Curator a good six months to prepare. First the claims of the National Museum have to be considered and then the needs of the Society. Then the claim of the Indian Museum and the claims of the up-country Museums to at least a representative collection of the Mammals collected in their locality. The ordinary work of the Society keeps our staff extremely busy and with the extra work indicated above thrown on their shoulders their time for leisure will be small. Mr. Prater just before Mr. Ellison's arrival paid short visits to the Indian Museum, Madras Museum and Nagpur Museum, and we take this opportunity on behalf of the Committee of thanking all those who helped to make his trip pleasant to him and useful to the Society.

OBITUARY NOTICE.

FRANCIS MILBURN HOWLETT.

Francis Milburn Howlett, Imperial Pathological Entomologist to the Government of India, died at Masuri on 20th August 1920, after a severe operation. Born in January 1877, he was the eldest son of the late F. J. Howlett of Wymondham, Norfolk, and of Mrs. Howlett, now of Norwich. He was educated at Wymondham Grammar School and at Berkhamsted School, whence in 1896 he went to Christ's College, Cambridge, where he gained a scholarship. He left Cambridge in 1900 and was for some time on the staff of the Merchant Taylor's School. In 1905 he came out to India to Allahabad, where he was Professor of Biology at the Muir College for about two years, and in November 1907 was transferred to the Indian Agricultural Service as Second Imperial Entomologist, a title subsequently altered to that of Imperial Pathological Entomologist, and in this capacity his work dealt with all insects carrying disease to man and other animals.

From early youth Howlett had a strong taste for the study of insects, especially of Diptera, his first paper, published in the *Entomologists' Monthly Magazine* in 1907, dealing with the mating habits of *Empis borealis*. During the earlier years of his service in India he was keenly interested in the collection and classification of Indian Diptera and in 1908 he wrote the sections on Diptera and Lice for Lefroy's volume on *Indian Insect Life* (1909). But the visit to India of Mr. W. W. Froggatt, who showed that fruit-flies were attracted to the smells of certain oils, led Howlett's attention in the direction of tropic responses in insects, and he subsequently published papers on the influence of temperature on the biting of mosquitoes and on the chemical reactions of fruit-flies. He also published several short papers on sandflies. He was a good artist and several of his papers were illustrated by his own drawings. At the time of his death, he had just completed a book on the control of insect pests, but the manuscript of this has not been forthcoming amongst his papers and appears to have been mislaid.

During his earlier years in India Howlett suffered from ill-health and was absent on sick leave from 1909 to 1911 and was again absent on leave for two years from 1915 to 1917, but latterly he seemed to have recovered his health and his sudden death, at the comparatively early age of 43, was unexpected and to be regretted. His name is commemorated in that of the tick, *Hæmaphysalis howletti*, described by Warburton in 1913 from a hill pony at Rawalpindi, and in that of the Empid genus *Howlettia*, described by Brunetti.

MISCELLANEOUS NOTES.

No. I.—LEOPARD CAT (*F. BENGALENSIS*) IN CAPTIVITY.

(With a block.)



"*Felis Chaus*" and "*Felis Bengalensis*" being proverbially wild and untameable, the following account of a "*Felis Bengalensis*" kitten having been tamed may be of interest to some Members of the B. N. H. S.

She was caught by a coolie, who said that a second kitten had escaped with its mother, and sent to us by a friend, when about a month old, in August 1919; and was fed every few hours, day and night, with cow's milk diluted with water out of a tea spoon by my wife, who has a wonderful faculty for rearing and taming wild animals. The kitten soon took to the "spoon-feeding," clasping the spoon with both fore paws, and sucking vigorously, and thrived well. When old enough, she was fed on raw meat with occasionally a mouse, small bird or rat. One day when sitting on my wife's lap at breakfast, she seized a bit of cooked meat off the plate, and was allowed to eat it, but it disagreed with her little inside badly, and she nearly died; but my wife's assiduous nursing pulled her through. She used to sleep either at the foot of our bed or on top of the mosquito curtain, generally the latter, and became so tame and gentle that she was allowed full liberty about the house and garden; becoming great friends with our Airedale terrier, and it was very amusing seeing them playing together. When she was about 8 months old we went to stay at a neighbour's estate during his absence on leave, and unfortunately he had left 3 domestic cats in the house, which we hoped might make friends with our kitten, but they refused her friendly advances. And one morning "Kitty-cat" (as she was named) went out as usual, after sleeping on top of the mosquito curtain all night, and never returned for a week. Then my wife noticed that the cats had taken to sitting on the verandah outside our bedroom window, apparently on the watch: so we had them shut up at night, and at midnight of the 9th day, to our great joy, back came "Kitty-cat", very hungry and thin, but as tame as ever. In June this year my wife took her up to Kotagiri with her, sitting on her lap most of the way in the train, and the Motor Car! After they had

been there some weeks a large stray domestic cat turned up at the house and drove our pet away. If I had been there, I would have shot the brute! However, after two weeks she came back one night, and woke my wife up by showing her cold little nose against her face, and our children also woke and hurried off joyfully to get her milk and meat. But to everyone's sorrow she was driven away again after a few days by the cat, and never returned, though she was seen several times in the neighbourhood by different people. The last news of her was, that some Badaga boys in the village just below the house had found two lately born Leopard-cat kittens in the scrub between the village and the garden, and had tried to rear them, but that they had died. A great disappointment to my wife, as if they had only told her at once, for she had offered a reward to anyone who either brought the Leopard-cat or showed her its whereabouts, she would have gone to the place and watched, and probably recovered "Kittycat" and her kittens.

The 2 photographs, taken by my wife, are successful likenesses of her pet.

We still hope that she may yet come back, for she was so tame, but fear she will have become quite wild after having had kittens.

PALAGAPANDY ESTATE,
KOLLENGODE PL. O., MALABAR,
10th October 1920.

A. M. KINLOCH, F.Z.S.

No. II.—THE OCCURRENCE OF THE ERMINE IN THE PUNJAB.

On the 19th September I came across, and captured, a small male of what I took to be the Ermine or Stoat (*P. erminea*). The colouring differed somewhat to that given, for this species, in the "Fauna of British India" (Mammalia) p. 166. Blanford says:—"Colour. In summer dull chestnut (reddish brown) above, white or yellowish white below, the terminal portion of the tail black."

The colouring of the specimen in question was a dull sepia brown on the body, very slightly darker on the head which also had the faintest tinge of reddish, and the tail was somewhat lighter than the back, except the tip which was blackish. The whole of the underparts were pure white, including the tail except the extreme tip. There was not the faintest tinge of reddish or chestnut on the body at all.

According to Blanford the only authentic records of this species are of one which was obtained by Griffith in Afghanistan, and Hodgson who records it in Nepal, and one shot by Dr. Henderson in Dras, north of the Zoji-La, Kashmir.

My specimen was procured at an elevation of about 13,000 ft. on the Larka Pass, N. E. of Dharmsala, and is the first of its kind I have seen, in over a quarter of a century of wanderings in the Himalayas.

It appeared absolutely fearless of man and regarded us from a cleft in a large boulder as we passed, and allowed me to approach to within 4 or 5 ft. before disappearing into its stronghold.

I noticed that each time I retreated it came out again, so a slip-knot was made at the end of a long bit of twine and placed over the spot where it always appeared and I sat down some 10 ft. away with the other end of the twine. As soon as the head showed again I gave the twine a pull and had it safely by the neck. To ensure its not making off elsewhere, we lit a small fire on the further side of the rock and the wind being favourable all the smoke went into the cleft where the little beast had lodged, and further expedited his movement in the direction of the noose.

I had it for a couple of days and it had got the length of taking meat out of my hand, without the usual dart forward to bite, accompanied by a

short, sharp, staccato swear and I had every hope of getting the little beast perfectly tame in a few days, but unfortunately it escaped from its box in a most unaccountable manner.

I send this record of this, seemingly, very rare species as it is, I think, worthy of record, and in spite of the difference in colour above noted I think it could only be *Putorius erminea*.

The dark tip to the tail confines it to one of two species of this genus and the pure white underparts pretty well settles the rest of its identity.

DHARMSALA, PUNJAB,
23rd September 1920.

C. H. DONALD, F.Z.S., M.B.O.U.

No. III.—RECORD FEMALE INDIAN GAZELLE. (*G. BENETTI*.)

I am sending you the photo of a female Indian Gazelle, "Gazelle bennetti," ♀, I shot some years ago near "Sirsa" in the Punjab and which Rowland Ward has later mounted and measured for me. He states that it is the longest pair he has ever measured exceeding Sir Victor Brook's by one inch.

If you would care to put this into the Journal please do so.



Length of horn.	Circumference.	Tip to Tip.
7 $\frac{1}{8}$ "	2"	2 $\frac{3}{8}$ ", shot by Sir V. Brook.
8 $\frac{1}{8}$ "	1 $\frac{3}{4}$ "	3 $\frac{1}{2}$ ", shot by R. H. Heath

COULSDON, SURREY,
1st August 1920.

R. H. HEATH.

No. IV.—SOME SPLENDID BLACK BUCK HEADS.

The 'Field' of March the 27th 1920 contains a note on what is described as a magnificent Black Buck shot by Mr. F. H. Peppe in January 1915 at Jakhal, a Railway Junction on the borders of Patiala half way between Delhi and Bhatinda. The measurements are as follows:—

Length..	..	28 $\frac{7}{8}$ inches.
Girth ..	..	5 $\frac{1}{2}$ "
Tip to Tip	..	22 "

Rowland Ward's Records of Big Game give 30 $\frac{1}{2}$ " as the record Black Buck head now in the possession of Capt. J. MacRae-Gitstrap, but there is no evidence as to where the animal was shot. Second to this is a head

measuring $28\frac{3}{4}$ obtained by Capt. (subsequently General Sir Bindon Blood) in Jeypore, the measurements were recorded by A. O. Hume.

A Black Buck head measuring $30\frac{3}{4}$ inches is recorded in the 'Asian' of 1880. Writing from Mussoorie on the 11th of April 1880 a correspondent who signs himself, "Gangootri Shikari" describing the shooting of this animal says: "A party consisting of M. L. and myself who were out shooting towards the Mohun Pass on the road to Mussoorie, during the Easter week came across the owner of these enormous horns in a raid on a bag of wheat which had by some chance or the other lain neglected on the road. He was too intent to perceive us. This was at night and a shot on the head brought him to. By the strictest measurements his horns came to $30\frac{3}{4}$ inches."

It would be interesting to know whether the record head now in the possession of Capt. J. MacRae Gitstrap is the same as the one referred to by 'Gangootri Shikari' the difference of $\frac{1}{4}$ of an inch in the measurement could be easily accounted for by shrinkage.—EDITORS.

No. V.—A GOOD HEAD OF THE GOA OR TIBETAN ANTELOPE
(*PANTHALOPS HODGSONI*)
(With a block.)



In May 1919, I shot a Goa or Tibetan Gazelle beyond the Tso-Morari Lake in Rupshu, at an altitude of about 16,000 ft. The horns which have been officially taped by Rowland Ward are $14\frac{1}{8}$ " in length, and thus equal the record given in the latest edition of his "Records of Big Game."

Lydekker in his "Game Animals of India, etc.," writes of a head of $14\frac{1}{2}$ ", whilst Blanford in his Mammalia says that the longest recorded horns of this species measure $15\cdot75$ ". No details are given of this latter head. Goa horns of over 14" being so rare, I enclose a photograph of the specimen shot.

POONA,
8th November 1920.

F. LUDLOW.

No. VI.—AN OLD TIME BUFFALO HUNT.

In Volume XXVII, No. 2, of this Society's Journal we published the Sporting Diary of H. H. the Maharaja of Bikaner, in which His Highness records the shooting of a wild buffalo which was accustomed to associate with the tame buffaloes of the village.

The association of Wild Bull Buffaloes with domestic herds has often been commented on by Sportsmen. "Bhootan" writing in the *Asian* in November 1870 records a similar instance. He describes the death of a veteran Bull Buffalo who for 7 years evaded every effort to 'bag' him. He bore a charmed existence and was known to sportsmen as the Jaintee Bull. For years he made a practice of fraternising with the herds of domestic buffaloes in his neighbourhood. The herdsmen were not at all afraid of him and rather shielded him from the attention of 'shikaris', never giving 'khuber' of where he could be met with. As time went on he grew bolder and would accompany the herds home in the evening and after they had been milked would remain with them all night perfectly oblivious to the presence of the cow-herds. The policy of live and let live was maintained between the man and beast till our ancient Lothario embarked on a policy of abducting some of the cow buffaloes from amongst the herds, occasionally driving one or two of them away with him into the forest, finally he capped his misdemeanours by killing one of the herdsmen and wounding another, who died 3 days afterwards from the effects of the frightful gashes he had received. This roused the herdsmen from their apathy and they came and begged 'Bhootan' and his friends to rid them of the dread Buffalo. The party set out armed to the teeth. There were 7 guns in all, as 'Bhootan' describes it a "mixed battery which included 12 bore double-barrelled shot guns, 10 bore double-barrelled rifles and a double-barrel and a single barrel "500 express." It was half past five in the evening when they arrived, the herd was just dribbling in and so they hurriedly took up their position on and in the herdsmen's houses. All of them except one "C", who being short-sighted and having his doubts about being able to recognize the wild buffalo from the tame ones, wished to establish a coign of vantage for himself in the kitchen among the milk pails, to which the lady of the house took exception. In the midst of a heated altercation he that was expected arrived, heralding his coming with a series of grunts. Bhootan says he was "a magnificent sight as he advanced straight towards us! how he towered above the tame cows he was following."

The Buffalo crossed over to within 25 yards and at a word from 'Bhootan' received a broadside from the assembled battery, but "instead of rolling on the ground gives a slight shake of his head, wheels round and is off pursued by the hunters who tumble off the roof in their eagerness to be up and at him." He is eventually discovered standing in the tall grass some 70 yards off" and then says 'Bhootan' such an independent firing commenced as must have astonished him. The shooting appears to have been "promiscuous" and 'Bhootan', brought to a sense of his imminent danger by a bullet wizzing past his ear, puts a temporary end to the bombardment, counsels restraint and so with more caution the party proceed. Advancing about 20 yards 'Bhootan' sees a dead buffalo lying on the ground "but at the same moment 'Y' began firing in another direction saying he could see him." 'Y' is implored to desist. Quite unable to understand how two buffaloes had appeared on the scene, they creep cautiously up and to their extreme disgust find a tame buffalo stone dead with a bullet through the forehead. It was a humiliating discovery and says 'Bhootan' "others might be lying dead around near 'who could tell' ". Nothing definite is stated but one rather feels that the aforementioned short sighted 'C' was probably connected with the dead buffalo. There was only one thing to be done now, concludes 'Bhootan' we must get the bull. He climbs a small tree to see if he can sight

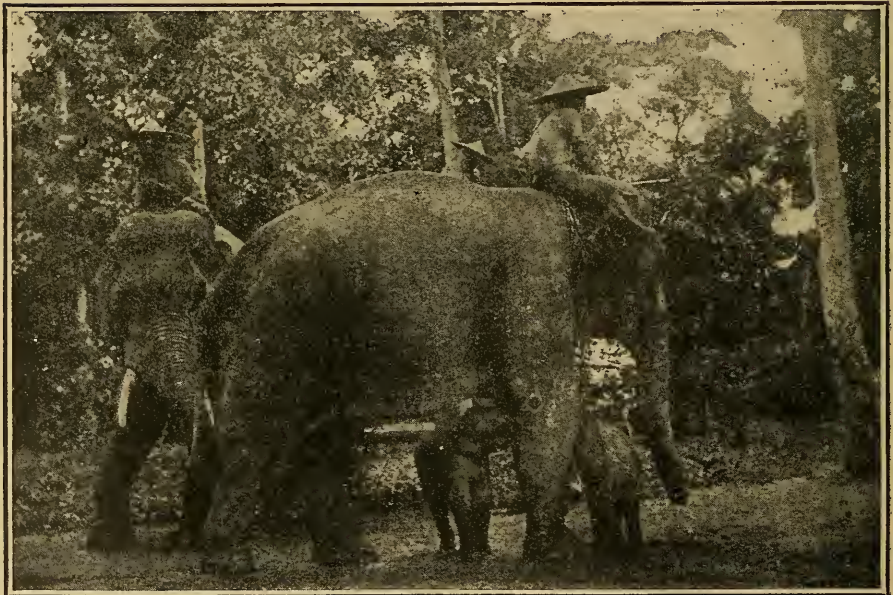
him and an ominous grunt from his vicinity causes a general retreat by the rest of the party. The alarm proves false so 'Bhootan' descends from his perch and they all proceed, this time "still more cautiously." They are brought to a stop by noises issuing from the grass in front of them which are eventually traced to a buffalo on the ground, they are non-plussed for a moment by the horrible uncertainty that this may be another tame buffalo. The position is reconnoitered with the assistance of an elephant and everybody's mind is set at rest by the welcome assurance from the Mahout that this is 'the' bull. Continues 'Bhootan' "'Y' and I now cautiously creep forward to within 12 yards of his head and fired together into his neck, the issue was unexpected;" It only resulted in bringing him to life again and he commenced to rise. This proceeding had the immediate effect of widening the distance between hunters and hunted, but one 'who was up a neighbouring tree' brought the old bull again to the ground with a well directed shot and after which "we crept close up to his head and gave him his quietus." When everything was ended, short sighted 'C' who seems to have lost himself in the confusion appeared on the scene and expressed a burning desire to put one bullet in ; so having sighted his gun with difficulty (he was within 10 yards of the carcass) he fired. Thus perished the Jaintee Buffalo.

BOMBAY NATURAL HISTORY SOCIETY,
1st October 1920.

S. H. PRATER.

No. VII.—TWIN CALF ELEPHANTS.

(With a block.)



Herewith I enclose the photograph of twin elephant calves born in Tenasserim, Lower Burma, last June. They are male and female and measured

2'-9 $\frac{1}{2}$ " at the shoulder when about three months old, so that there was probably little difference in their heights and that of a single calf at birth. Of newly born single calves measured, heights ranged between 2'-7" and 2'-11".

I have met one man only who has actually seen twin calf elephants, and but very few who have even heard of such a case. The mother is a timber working animal of Messrs. Steel Brothers & Co., Ltd.

MOULMEIN, BURMA,
12th October 1920.

GORDON HUNDLEY.

No. VIII.—“MAN-EATING MONKEYS AND POISONOUS LOCUSTS.”

May I be permitted to call your attention to two interesting natural history matters.

The writer of an article in the *Dharwar Vritt* of 13th November 1873 states that a man-eating monkey made its appearance at Dharwar. “It ate one or two and killed two or more persons in the neighbouring villages and seriously hurt a prostitute at Dharwar.”

The *Maharashtra Mitra* of 15th January 1874 states that recently locusts appeared in several villages round about the village Ankalkhop, of Taluka Tasgaum, and committed great havoc. At Ankalkhop they killed by their stings a young child which was sleeping on a raised seat in a field, and by similar means destroyed a young buffalo.

The British Government can now, I think, rest on its laurels. During the past fifty years it has practically exterminated carnivorous monkeys and the more dangerous locusts.

A. C. MILLER.

POONA, 23rd Sept. 1920.

No. IX.—MELANISM IN THE RED-VENTED BULBUL
(*MOLPASTES* sp.).

The well-marked lines, along which nature carries on its functions in its various departments, generally arrest our attention, and are taken by us as the invariable laws which govern its operations in the departments concerned. But there are other subsidiary lines that cross them at distant intervals, and along which operate the phenomena that are looked upon as exceptions. But are there no laws that govern these exceptions, which, subtle though they be, exist nevertheless, and produce their results in cycles of their own? The ordinary man may stop short by calling the exceptions as such, and may think that his enquiry has reached there its end. But the duty of the scientist stretches farther; for he should try, and may well be able to draw his induction from a large number of recorded exceptions, about which full and accurate data have been carefully collected by different inquirers; and this induction can throw the light, under which can be seen the causes that bring about the aberrations. The collection of these exceptions being a *sine qua non* of these inductions, I proceed to record details about a melanistic bulbul that I have come across, in the hope that this, with other such cases, brought to light and recorded by other inquirers, may divulge to future workers in this field the secret ways along which the exceptions are working.

In the July number of the *Agricultural Magazine* of London, I described a case of albinism in a Bulbul (*Molpastes*) with its characteristic eyes and legs. Such deviation is very rare. I have recently come across another deviation but of the opposite sort, *viz.*, melanism, in a bird of the same species—*viz.*, *Molpastes bengalensis*—about the identity of which there is not the least doubt. This

bird has almost all the general features of the Bengal Bulbul with its thick crest growing from every portion of the crown and nape, and chocolate-brown ear-coverts. The colour of the body is generally black, and not relieved by the pale edgings, while the black of the crown is not sharply defined but extends well on to the back, and continues upto the end of the tail. The chin throat and breast are deep black. The portion below the breast is black and smoky brown. The wings are distinctly brown. The bill is black.

As in all cases of complete melanism, there is, in the case under consideration, a total lack of the white colour—there being no white on the upper tail coverts or white tips to the tail-feathers, or whitish margins or edges in the wing-coverts, scapulars, lower breast or lower back. The result is to give the bird a brilliant black appearance, intensified by the absence of lighter parts in their normal settings. The absence of the bright crimson under-tail patch is the most remarkable in as much as it is the most characteristic trait of *Molpastes*. Here also the colour of the under-tail coverts is in no way different from the general body colour.

The owner of the bird lives close to my residence. He had the bird when it was a nestling of a few days and has reared it now for four years. He tells me that he found sometime ago a similar case of melanism, but there the colour of the under-tail covert changed from black into bright crimson in the course of a couple of years.

Aviculturists, I presume, have frequent experiences of deviations from the normal colouring of birds, but are not agreed as to the reasons for this divergence. Some attribute it to vigorous constitution, while others to delicate health. I showed the black bulbul under review to Mr. S. Basil-Edwardes, a member of the Bombay Natural History Society, while he was at Calcutta. Both he and myself examined the bird critically and found it to be in sound health. The feet appeared slightly injured (due, perhaps, to confinement in a small cage), and lacked the intensity of colour found in normal birds. There are various causes that bring about variations in the colour of birds. Of these the cage or aviary life and its attendant artificial rationing very often conduce to such variations in colour. A silver-eared Mesia of mine (*Mesia argentauris*) after three years of aviary life, began to show a remarkable tendency to melanism and I have had similar experiences of several birds in my aviary, all of which I found to be in full health. I do not, however, wish to fix upon one or the other of these causes as responsible for the change in colour in the bulbuls under consideration, and want only to point out that bad or good health does not exhaust the list of causes that bring about the phenomenon.

SATYA CHURN LAW.

CALCUTTA, October 1920.

No. X.—THE BREEDING OF THE EASTERN ORPHEAN WARBLER
SYLVIA JERDONI. BLYTH, IN THE N. W. FRONTIER PROVINCE.

It may be worth recording the fact that a correspondent of mine sent me a clutch of four eggs, nest, and one of the parents (unsexed, but presumably the male) of the above species.

This nest was taken at Cherat, elevation 4,500 ft. above sea-level, on 28th May 1920. The situation was 5 ft. from the ground in a "Scrubby bush" as my friend tells me.

The materials used are grass-bents (stem and blade), which were green when the nest was newly built, and very fine fibres; the whole being profusely decorated with white vegetable down. There is no attempt at lining the interior. The nest is cup-shaped.

The eggs are a broad oval, the ground colour being a very pale greenish white; the markings (chiefly at the broad end) consist of fine spots and blotches of greyish brown and greyish green.

Incubation had lasted about 4 or 5 days. My friend had watched the birds building.

A. E. JONES.

TATTERSALL HOUSE, SIMLA,

11th August 1920.

No. XI.—THE SPINE-TAILED SWIFT (*C. INDICA*) AND THE
BURMESE SWIFT (*C. PACIFICUS*) IN ASSAM.

C. indica (1078) is a fairly common bird here and occurs pretty well throughout the year, it is especially plentiful when the winged termite is about on which it feeds till gorged, judging by the tightly packed mass of these insects I've taken from the stomach of birds shot. At other times when seen in small numbers, flying either high or low, it is a sure indication of either rain or a storm to come and that usually within 48 hours, in this case the bird has been rather useful to me as by its appearance, though there has not been a cloud in the sky, it has settled my doubts as to whether I should carry on certain work in the planting line or not; there is a saying I believe "Look for the clouds and you'll never sow" but he who sees the Spine-tail in any numbers and doesn't plant is foolish.

The bird in ordinary circumstances is usually seen in the early morning or towards evening, before a change of weather at any time of the day, also it flies to a very late hour and at that time low, it's pace then must be something amazing as it passes with a bullet-like swish which is audible for some little distance though one sees nothing of the bird. As regards the shooting of this species, I will only remark hold straight, d-d straight, and if the shooter drops one out of three I should say he knows how to shoot. The bird when hawking seems to be flying slowly and fairly low but it is wonderful the misses one makes. On a good day one may account for four snipe out of every six shots fired but I'd not like to place my cartridges on record as regards the bringing down of the spine-tail. Full plumaged birds, though of quiet colour, are handsome in the decidedly scale-like markings of the plumage of the back, this seems to disappear after the bird is skinned.

Chaetura nudipes also occurs in this district, but so far I have found it very scarce compared with *C. indica* still I have hopes of sending the Society specimens. Its habits are similar to that of the former bird; its English name is misleading as there is little white about the necks of the birds shot or observed by me, ash or grey necked would perhaps be more descriptive.

Cypselus pacificus (if my identification be correct) occurs in this part of Assam as a very casual visitor but then in some numbers, its time of occurrence being from the end of August to the middle of September, few birds being seen before or after these dates; they likewise seem to prefer disturbed weather.

A. M. PRIMROSE.

GHOLAGHAT, ASSAM,

19th September 1920.

No. XII.—NOTE ON THE NIDIFICATION OF HODGSON'S STRIATED
SWALLOW (*HIRUNDO NEPALENSIS*).

On arrival in Simla on the 22nd May of this year I noticed that a pair of these birds had begun to build a nest against a beam in the roof, 10 feet high,

of the verandah of the house in which I was living. The house in question was surrounded by pine trees, and the verandah, which was in the upper storey, faced S. W.

The birds laboured intermittently, ceasing work entirely for two or three days at a time, and then making up for this by periods of exceptional industry.

The nest was of the usual retort shape and was placed almost directly above the door of one of the living rooms. When completed it was $9\frac{1}{2}$ inches in length and the size of the entrance was $1\frac{1}{4} \times 2\frac{3}{8}$ inches. As soon as its construction was sufficiently advanced the birds roosted in it regularly every night. They were remarkably fearless and frequently remained perched on a telephone wire within a foot or two of persons standing in, or passing along the verandah. Early in July it appeared that the hen had begun to sit, and on the evening of the 7th July I took the eggs, which were three in number, one addled and two moderately incubated. To do so I had to break away about 2 inches of the entrance to the nest, the egg chamber remaining intact. The birds sat on the telephone wire close by while I was so engaged, and roosted in the nest immediately afterwards. The next day they set to work rebuilding the entrance, and finished it in about a week.

Torrential rain fell on the night of the 22nd July, and on the following day the birds found it necessary to strengthen their work. On the night of the 2nd August there was another very heavy fall of rain, followed by a drizzle on the 3rd, and on the 4th the entrance was again strengthened. Meanwhile the hen had laid again, and eventually two young birds were hatched.

My opportunities for observation being limited, I did not notice food being carried to the nest until the 24th August, by which time the young birds were almost ready to fly.

From the 14th August onwards the weather had remained dry, but the continual coming and going of the parent birds necessitated more repairs to the entrance of the nest, which were carried out on the 28th August.

The early morning of the 31st August was, I believe, the first occasion on which the young birds left the nest and indulged in trial flights under the supervision of their parents. These did not last long, and the youngsters were soon back in the nest again. Between the flights the family rested on the telephone wire, the parent birds allowing one to stand quite close without showing any alarm for the safety of their progeny.

A similar programme was carried out on the mornings of the 1st and 2nd September, and on the 3rd and 4th the family was away all day, only returning in the evening to roost.

Early on the morning of the 5th September the nest gave way, presumably under the combined weight of all four birds. Its collapse was certainly not due to absorption of moisture, for the weather was then comparatively dry. It so happened that I heard the fall, and was able to examine the remains before they were removed by the sweeper. Amongst them was a broken egg, obviously addled, showing that the hen had again laid three, of which only 2 were fertile. The lining of the nest consisted of grass and fine roots below and a considerable quantity of various sized feathers above. It contained a number of what appeared to be a species of tick.

The breasts of the young birds were white without any of the striations of the adult.

H. W. WAITE,
Indian Police.

SIMLA,

15th September 1920.

No. XIII.—A NOTE ON THE HABITS OF THE COMMON PARIAH
KITE (*MILVUS GOVINDA*) AND THE ADJUTANT STORK
(*LEPTOPTILUS DUBIUS*).

It is well known that the habits, etc., of some birds have changed since the time of Oates and Blanford's Volumes in the "Fauna of British India", and a systematic glance through these books would probably reveal several statements, which though correct at that time are certainly not so now. With regard to the Common Pariah Kite (*Milvus govinda*) and the Adjutant Stork (*Leptoptilus dubius*), both of which are very familiar Indian birds, the following remarks may be of interest.

On page 377 of Vol. III Blanford quotes a passage from Jerdon about the habits of the kite, and adds that the statement is perfectly correct. He (Jerdon) says: "Mr. Blyth notices their collecting in numbers without any apparent object, especially towards evening. This I have frequently observed at all large stations, where the whole of the kites of the neighbourhood, before retiring to rest, appear to hold conclave. They are said to leave Calcutta almost entirely for three or four months during the rains." They certainly do collect in the evenings, but never in very large numbers, or within a small area, and, according to our observations and those of other naturalists we have consulted they are almost as abundant during the rains as they are in the other months.

Again, on page 106, Vol. I of "The Birds of India". Jerdon remarks: "Capt. Irby mentions having seen one hundred together, but in Calcutta and elsewhere two or three hundred may be seen at one time." Personally we have never seen them in such large numbers.

Speaking of the Adjutant Stork, Blanford makes the following statement on page 374, Vol. IV, which would be absolutely incorrect at the present day:—"In Calcutta throughout the hot season and the rains Adjutants swarm, and formerly, before the sanitary arrangements of the city were improved, numbers haunted the river ghats in the day time and perched on Government House and other conspicuous buildings at night." Adjutants were undoubtedly very common years ago but none are to be seen in Calcutta now. As far back as 1905, when Mr. Frank Finn was in the Indian Museum, the Adjutants seemed to have left the city. This is probably due to the improved sanitary arrangements and the increased population in Calcutta.

CEDRIC DOVER.

S. BASIL-EDWARDES.

INDIAN MUSEUM,
CALCUTTA, 26th August 1920.

[Since this was written I have observed that "Cheels" collect at all times of the day—unless it is very sunny—and not specially towards evening. In the rainy-season on threatening days they collect in somewhat larger numbers. On fine sunny days they often soar to such a height that they appear as small as, or even smaller than, a crow. In fact they may sometimes be mistaken for them.

Blanford (*tom cit*) quoting Jerdon says that "As remarked by Buchanan Hamilton, they are often to be seen seated on the entablatures of buildings with their breast to the wall and wings spread out, exactly as represented in Egyptian monuments." During several years' residence in Calcutta I have never seen them sitting with their wings spread, though they often sit with their breast to the wall. Of course, they may do so in other places, but seeing that resting with their wings folded must be more comfortable, I should think it would be exceptional rather than "often" as Buchanan Hamilton remarks.—C. D.]

No. XIV.—THE NIDIFICATION OF THE MASKED FINFOOT.
(*HELIOPAIS PERSONATA*)

Perhaps the most important ornithological discovery of recent years in the Indian region is the finding of absolutely authentic nests of this rare bird. The credit of actually finding the first nest is due to Mr. T. Marlow, and several more nests have since been found by him and Mr. H. C. Smith, both of whom are officers of the Forest Department. All ornithologists will heartily congratulate these two recent recruits to the science on making such an important discovery in what is practically their first year of serious field work. Before describing the nests and eggs I will give a short account of the factors which led to success. The upper reaches of the Rangoon (or Hlaing) River are known locally as the Myitmaka River, a sluggish stream flowing through the plains of the Tharrawaddy District, and in places opening out into big lagoons, the chief of which is the large lake known as the Mindu In. When the Irrawaddy rises, the flood water covers large areas of the low lying country, and backs up the Myitmaka, the result being a huge swamp, in which the depth of water varies from 5 to 15 feet, or even more. Much of the inundated area is under forest growth, consisting of trees, shrubs, and a tangled mass of creepers, and as might be expected, the Finfoot revels in country of this nature. A number of forest officers, including Messrs. Smith and Marlow, are engaged on the extraction of Government teak timber down the Myitmaka, and during the shooting season have good sport with Whistling and Cotton teal in and around the Mindu In : and in June of this year Mr. Smith mentioned to me that in the course of their sport they had shot and eaten several birds which he had identified as the Masked Finfoot ; he said the birds were quite common. On my telling him that they were on the contrary exceedingly rare birds he at once informed the other forest men, and as, fortunately, no other sportsmen visit this delectable spot the shooting of the birds has been stopped. The Forest Department employs large numbers of the local population in the extraction of timber and on river training, and I suggested to Mr. Smith that the employees should be told to keep a keen look-out for nests, as the birds would in all probability breed in the Laha area during July and August, and I described to him Mr. Stuart Baker's reputed nest. There was no difficulty at all about enlisting assistance, as the birds are by no means uncommon in this area, and are well known to the villagers by the name of YE BALON which translated means the Water Bubbler, the name being due to the bubbling noise made by the birds, which is described as being similar to that made by blowing air through a tube into water, the note being rather high pitched. Some of the men said that they frequently found nests in the rains and ate the eggs which had the flavour of duck eggs.

I will now quote verbatim Mr. Marlow's interesting account of the finding of the first nests :

" On July 26th, 1920, a hunter, whom I had employed to find me duck shooting earlier in the year, sent word that he had a nest of the YE BALON at Mindu and that the bird was sitting. The next day I visited the place at about 5-30 p.m. and saw the bird sitting tight on a nest of twigs about 15 inches in diameter placed on a horizontal branch of a " kyi-bin " (*Barringtonia*) about seven feet, above the level of the water which here was five feet deep. The nest was also supported by creepers which crossed the branch. I had approached to within about 6 feet of the bird, but except that she watched me closely she was not disturbed. As I expected Mr. H. C. Smith to arrive shortly I withdrew quietly and left the bird sitting. At about 6-30 p.m. Mr. Smith and I approached the nest carefully and found the bird still sitting very closely and with her head tucked away into the nest. She raised her head to look at us and did not fly away until Mr. Smith was only about 3 feet from her. Identification of the bird was confirmed by the legs and general coloration as she flew away. We

climbed the tree and beheld a glorious sight. In the large bowl-shaped nest of twigs and lined with a few dead leaves were seven large spheroidal glossy cream coloured eggs mottled with brown and purple. Darkness and the attentions of large red ants curtailed our gloat, and the eggs were collected. The next day was heavily overcast and it was not possible to photograph the nest. On the 30th July at Upper Tanbingon on the same river, some 20 miles down stream we heard the unmistakable 'bubble bubble' call of the bird in the flooded jungle, and found another nest with seven eggs, which like the first clutch found, were very slightly incubated. The eggs were in a similar nest similarly placed to the first but rather neater and only about three feet above the water. These eggs are with Mr. Smith.

Our next find was at Hmetkadan about a further 20 miles downstream on the same river. This was on the 2nd August. The nest had been found on the 31st of July containing two eggs and still had two eggs when we visited it. The nest was photographed "in situ" and also the nesting site. This nest was about nine feet above the water and on the higher branches of a thorny bush, not so much overhung as the first two nests. Nest and eggs were sent to Mr. J. C. Hopwood. On the 6th August, much to my annoyance and contrary to express orders, six eggs were brought to me by a villager, with the information that they were from two different nests, each of which had contained three eggs. The eggs were all fresh.

Again on the 9th August a bird, with a badly damaged nest, and five eggs were brought to me. The bird has been caught on the nest on the 8th August. I put it in my bath room at Tapun and gave it a bath-full of fresh river water with plenty of small live fish and shrimps. Also some fish and shrimps on the floor near the bath. It was tied by one leg to the handle of the bath and could get about as much as it liked. It ate fish in the water and also both fish and shrimps from the floor. In the evening I sent it to Mr. J. C. Hopwood for the Rangoon Zoological Gardens. The five eggs from this nest differ very considerably from all the eggs previously found in that they are not spheroidal but of an oval shape though of exactly the same coloration as those previously taken.

On the 11th August in company with Messrs. S. F. Hopwood, G. E. Dawkins and H. C. Smith I saw two more nests at Mindu, containing three and two eggs respectively. The last of these is only a few inches above water level and if the Laka water rises, as it certainly should, the nest will be swamped. Another nest has been found within a few hundred yards of these two, and within 200 yards of the first nest found.

We may thus conclude that the nesting haunt of the Masked Finfoot is the flooded jungle of the Irrawaddy. Dark places under thick creepers are favoured."

The nest sent to me, and referred to by Mr. Marlow above is a very thick mass of small sticks, heaped one upon the other to form a large pad. I should say it must have been nearly a foot in height. Mr. Marlow gives the average dimensions of nests as 15 inches in diameter outer measurement, whilst the egg cavity, a shallow cup, is about 8 inches in diameter; the nests are roughly circular. The eggs, of which I have seen 20 up to date, are with the exception of the elongated specimens found by Mr. Marlow, all of a spheroidal shape, some being very nearly spherical: in many eggs the two ends are more or less pointed, giving the egg a very curious appearance, which is best described by saying that a vertical cross section would approximate in shape to the ace of diamonds with the corners rounded off. They are moderately to highly glossy, of coarse texture and very hard shelled. In coloration and markings they are strongly Ralline, and could be exactly matched in colour pattern by many eggs of the Blue-breasted Banded Rail (*Hypotaenidia striata*). The ground colour is creamy, sometimes very pale, at others with a strong greenish tinge, but in any one clutch the ground colour is the same for all the eggs. The

markings are primary and secondary, the former being rusty or chestnut red the latter inky purple. The distribution and definition of the markings varies considerably, in most eggs these being most clearly defined and heavy at the large end, though a number of both primary and secondary markings are found all over the egg. Sometimes the spots are very clearly defined, in other eggs they are diffuse and cloudy and at times tend to coalesce. I have seen no other eggs that could possibly be confused with the common spheroidal form, and I doubt if even the only elongated clutch could be matched by any other eggs from India or Burma. Although Messrs. Smith and Marlow's eggs are a good deal larger and more beautifully marked than the single egg in Mr. Stuart Baker's collection (*vide* Ibis, January 1919, page 157) it is probable that his specimen is authentic. The birds swim and fly well, and ordinarily are very duck like in their habits, swimming freely but with something of the action of a swimming coot, as they progress in a rather jerky manner and the head is continually bobbed forward. When frightened or winged, the bird swims semi-submerged, only the head and neck showing above water, much as a snake-bird (*Plotus melanogaster*) swims. I may add that the specimen sent to Rangoon is thriving in the water fowl aviary and though still nervous associates with the duck and teal. On land it runs rapidly like a rail and takes to the thickest cover it can find, Messrs. Smith, Marlow and I estimate that the breeding ground discovered by them cannot be less than 500 square miles in extent, and they have heard the bubbling call for a distance of 50 linear miles. As the bird is well known to the villagers there must be many hundred pairs breeding.

The nests found so far have all been close to villages, which are not numerous as may be expected from the nature of the country, and as the villagers search for and eat the eggs in any case, and have done so for years, there is little danger of the breeding stock being reduced, as hundreds of birds must nest in the inaccessible portions of these vast swamps. Messrs. Smith and Marlow offer a reward which whilst making it worth a man's while to report the nest in preference to eating the eggs is not sufficient to induce nest hunting on an extensive scale, and ornithologists may rest assured that nothing is being done to harass the birds unduly. I append a list of measurements of the eggs taken so far; all measurements in inches.

Mr. T. Marlow, July 27th, 1920. Brought* to Mr. Marlow on August 6th, 1920.

First clutch.

1.93	×	1.72	2.05	×	1.72
1.97	×	1.70	2.05	×	1.72
1.91	×	1.74	1.94	×	1.70
1.87	×	1.73	<i>Second clutch.</i>		
1.90	×	1.67	1.95	×	1.70
1.86	×	1.72	1.98	×	1.68
1.89	×	1.72	1.97	×	1.70

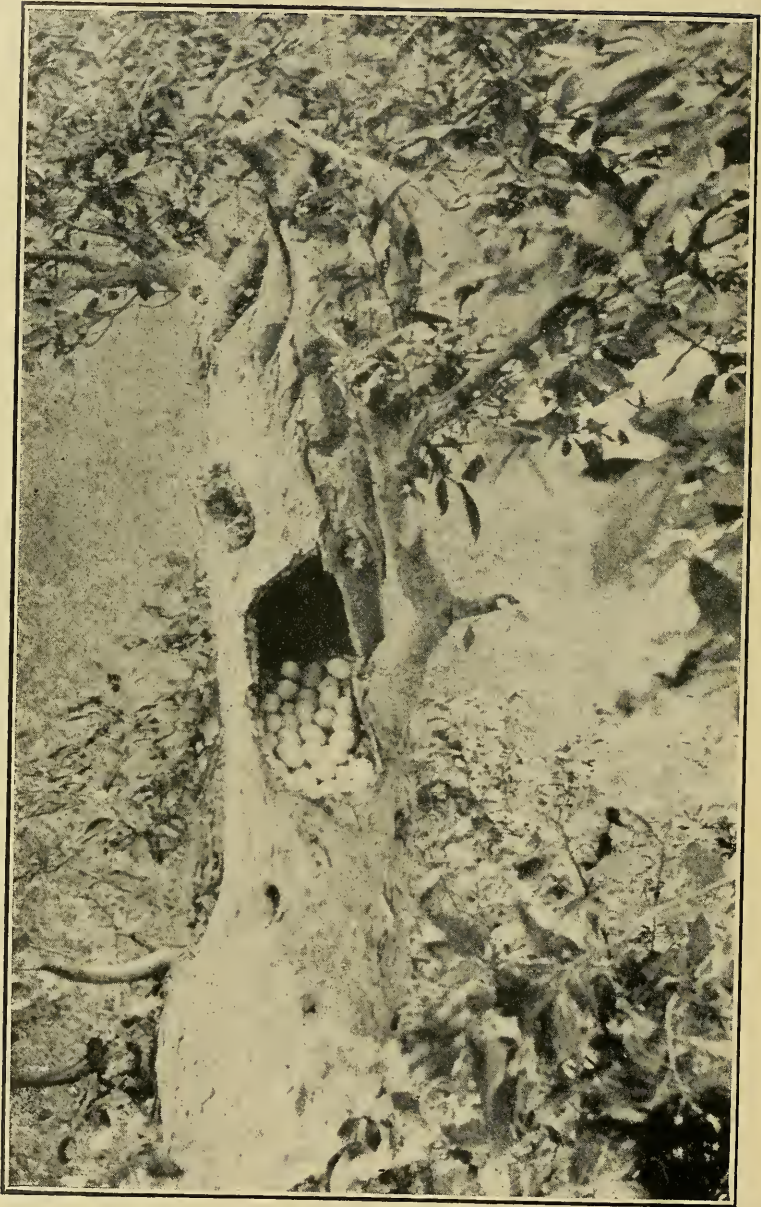
Mr. H. C. Smith, July 30th, 1920. Mr. T. Marlow, August 9th, 1920.

2.07	×	1.72	2.13	×	1.68
1.96	×	1.72	2.06	×	1.69
2.00	×	1.73	2.13	×	1.65
1.90	×	1.66	2.11	×	1.66
1.90	×	1.70	2.05	×	1.67
1.95	×	1.70			
1.99	×	1.76			

Mr. H. C. Smith, August 2nd, 1920.

1.97	×	1.69
1.96	×	1.68

Average of 27 eggs .. 1.98 × 1.70
 Average of spheroidal eggs omitting Mr. Marlow's clutch of elongated eggs. 1.95 × 1.71



NEST OF THE COMB DUCK OR NUKTA (*S. melanotos*).

In conclusion I may add that during the 18 years that I have been studying the birds of Burma, I have only met with the Finfoot on four occasions; the first was in Toungoo in 1903, the next in North Arakan in 1909, and last on two occasions at the same place near the head-waters of the Tavoy river in 1918 and 1919. In every case the bird was solitary on a jungle stream in heavily wooded country. Although I once travelled through the area where Messrs. Smith and Marlow have found the nests I did not see the bird, nor have I ever met with it on the countless swamps, marshes and lakes I have visited in pursuit of water-fowl and their nests.

CYRIL HOPWOOD, M.B.O.U.

MAYMYO,

18th August 1920.

No. XV.—NEST OF NAKTA OR COMB DUCK (*S. MELANONOTUS*).

(With a plate.)

The accompanying photograph of a Nakta's nest containing 47 (forty-seven) eggs may interest you. As the eggs were in two layers, they are not all shown in the photograph. The height of the nest from the ground was about 25 ft., the entrance to it—not shown—on the far side of the branch some 4 ft. above the eggs.

I regret to say I took the eggs as there was no point in leaving them after having laid open the nesting hole with a tomahawk before a crowd of villagers. I also wished to determine the stage of incubation and to make use of them in other ways. On placing them in a basin of water I noticed that except for about a dozen fresh ones, the remainder were all in about the same stage of incubation first standing on end at the bottom of the basin—none floating. I should say they had been sat on for 10—13 days. From this it would appear that two or three females had laid in this nesting hole, if not more. Thirteen eggs, taken at random from the incubated ones, I had placed under a hen. Of these the man entrusted with them broke four by accident, the remaining nine hatched out into strong chicks on the same day—August 26th (after 13 days' incubation). They are now (Oct. 6th) very strong and vigorous young ducks.

It may also interest you to know that within a 100 yards of this nest, on a small village tank, a single tree of moderate size contained the nests and eggs of the following six species of birds:—

White-necked Storks (one nest at the top). *Dissura episcopus*.

Open-bill Storks. *Anostomus oscitans*

Snakebirds. *Plotus melanogaster*.

White Ibis. *Ibis melanocephala*.

Great Egret. *Herodias alba*.

Lesser Egret. *Herodias intermedia*.

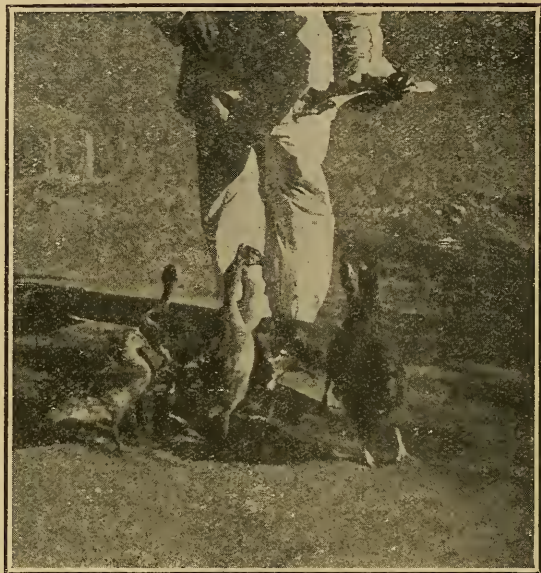
T. R. LIVESEY.

KOTAH, RAJPUTANA,

6th October 1920.

Writing again from Kotah on November 5th, Mr. T. R. Livesey says:—

As you were interested in my Nakta ducks perhaps you would care to hear again how they are. I have now 5—3 males and 2 females—the other 2 pairs having been given away to Mrs. Martin at Baroda.



I notice the females mature far quicker than the 3 males. The latter are scraggy and backward but far larger birds and exceedingly tame; they follow me about when I go out into the garden sketching up their necks and opening their beaks wide. They come up to you and peck your legs and are very curious. They cannot fly yet. The 2 females are in *better plumage* and have been able to fly now for the last week or so. They are shyer. This morning I noticed them flying about a mile away. They disappeared out of sight and after $\frac{1}{4}$ hour came back high over the polo ground and then dropped into my garden to the others. They were all sound asleep in front of my porch at the sentry's feet by 11 a.m.

This shows you how tame they get. I intend cutting the wings of the 3 males and keeping them, but now the 2 females are flying about daily I cannot bring myself to cut theirs; they shall have their freedom. I may say I have a fountain in the garden and a small irrigation stream they delight in.

I have also 7 tiny Cotton Teal with a hen and they are doing well now. They eat finely chopped raw liver and 'bajri'. These I have had now about 10 days. Only 2 died—one from cold and one from being trodden on. They are exquisite and delicate little things.

No. XVI.—LARGE FLOCK OF THE COMB-DUCK (*SARCIDIORNIS MELANONOTUS*) IN THE ALLAHABAD DISTRICT OF THE U. P.

What is the largest number of birds seen in flock of Comb-Duck (*Sarcidiornis melanonotus*)? On the railway journey from Naini Junction to Simla I passed on the 7th September 1920, at about 1-30 p.m., between the small stations of Rasulabad and Faiz-ullah-pur, a flock of Comb-Duck. In all probability I would not have noticed these birds, but I had previously seen a pair and this

made me keep a look-out for more. I had my eyes on the flock sufficiently long to be able to count the birds. I may have missed two or three, but I estimated that the flock consisted of thirty-three individuals. There were, in addition, two pairs which kept to themselves, and were quite apart from the rest. Is this not rather large number? Text-Books tell us that large flocks are rare.

The ducks were all concentrated in a field which was under water in most parts, and which did not appear to me to have had anything growing in it. The field must have measured approximately 60 yards each way and was divided about midway by a low *bund*. Most of the birds were standing on the centre bund or were paddling about in the water; a few were standing on the other *bunds*. I noticed several males but I cannot say whether this sex was in excess of the other or *vice versa*.

S. BASIL-EDWARDES.

SIMLA,

10th September 1920.

No. XVII.—INSECTS LIVING IN THE SNOW AT 14,000 FEET.

Capt. Budden's plea for articles of a less scientific and more popular nature and the favourable reception of the suggestion in your editorial (Vol. XXVII, part I (encourages me to send you some "Ornithological and Entomological Observations" made by me when crossing the Sach Pass in Chamba State between the Ravi and Upper Chenab valleys. To avoid disappointment by anyone who should read this article with the idea of improving his knowledge of birds and insects I may say right here that I know very little about insects and my knowledge of birds is almost confined to the recognition of certain species which can be shot and eaten.

After making one attempt to cross the Sach Pass on the 24th May and having to turn back as the coolies would not go on, 3 inches of snow having fallen at 10,500 ft. during the night, I made the second attempt crossing on the 2nd June. Between these dates snow had fallen almost every day and I came on to fresh snow at about 11,000 ft. lying of course on the deep accumulation of the winter. The fresh snow became steadily deeper and at the top of the pass (14,328 ft.) was at least 2 feet and may have been much more. At about 11,000 to 12,000 ft. there were a number of small birds (species and genus not noted) hopping about in the snow and occasionally making short flights. At first I thought they, like myself, were crossing the pass and were having a rest on the way but this was obviously not the case. It seemed more likely that they had come up from warmer regions and appeared to be enjoying themselves in the snow. They looked as if they were picking up things and eating them or pretending to do so though I could see nothing edible lying about. Their behaviour was to me quite unintelligible and where they put up for the night a complete mystery as there was nothing but snow for much more than a mile going straight down the hill and though there were rocks showing through they were very few and far between. Pondering over the problem I went on and soon noticed a fair quantity of insect debris—wings of moths and half eaten pieces of beetles lying about. This at first seemed to clear away my difficulties as to what the birds were doing but on a little consideration it left them unsolved. I was close enough to the birds to have seen them with a moth in their beaks and a beetle would have had to be properly carved to get rid of the elytra and other indigestible portions and I had seen no operations of this nature. Moreover the birds seemed to be finding lots to pick up whereas I could see nothing but remains of previous meals. It was a long way to the top so I continued the ascent and soon noticed what looked like *Pulex irritans* hopping about on the snow. As the Sach Pass is much

used these insects doubtless occur all along the route but they soon became so abundant that this theory became untenable. The insects gave the snow a sooty appearance and reminded me of snow I have seen about 20 miles from London blackened on the surface by a fall of soot. The insects collected in immense numbers in foot-prints in the snow.

The presence of these insects explained the birds, though as they are between 1 and 2 mm. long and rather slender they seem scarcely worth the attention of even small birds. However in the absence of proof to the contrary and with the example of the Greenland whale I am prepared to believe that the birds were feeding on the small insects. Having solved one problem to my own satisfaction I was up against another one, namely what were the insects doing and how do they make a living? Examination of the insects in the snow is not very easy and I plead this as an excuse for taking them to be beetles. Although the legs are very short they can jump well and do so as soon as a lens is brought close to them. If they cannot get away by jumping they change their tactics and burrow down into the snow. When alive they appear to be black, hard and shiny but when dead they are dull and soft and look more like Termites, except for their colour and a cusp which projects like an ovipositor from beneath the abdomen, than any other insect I know. I believe they were feeding on the minute alga which causes 'red snow' mentioned by Darwin and called *Pleurococcus nivalis*. This name has of course been changed since Darwin's time and the alga is I believe now called *Chlamydomonas nivalis*. It is however difficult to see with a small pocket lens what an animal of this size is doing, so the eating of the alga is perhaps poor speculation. It, with perhaps other similar minute forms of life, is about all there can be to eat in snow.

I collected some snow containing a large number of these insects, put it in a tube and dropped it into my pocket and then forgot about it. Two days later I remembered the tube and took it out of my waist-coat pocket where it must have reached somewhere near the body temperature. In spite of this some of the insects were still alive floating on the water in the tube. Still taking them for beetles I poured the contents on a piece of blotting paper and left it to dry. Soon after a Forest Ranger came in to my office and had occasion to take down some notes and selected the blotting paper to blot them with. Examining the blotting paper with a lens to see if anything could be saved from the ruin I was quite surprised to find the insects looking so different to beetles and to find they had all been crushed beyond recovery.

Expecting to be up at high elevations again I kept a look out for these insects but never found any at comparatively low elevations on isolated patches of snow. I expected to get them on my return to headquarters by the Chobia Pass which I crossed on the 10th August. On the Sach Pass the insects were only noticeable on the fresh snow at about 12,000 ft. becoming abundant a little higher up and on to the top. On the downward journey the snow was continuous for some 10 miles but the insects appeared to occur only near the top. On the Chobia Pass I could find none as there was no fresh snow below 17,500 feet and the top of the pass was only 16,720. I have therefore been unable to renew my acquaintance with these curious insects. Their life-history should be interesting and their powers of endurance must be remarkable. The sun on their black bodies at high elevations must heat them considerably when on the surface and even when in the snow probably melts the snow round them causing the deceptive shiny appearance. At night they cannot hope for a higher temperature than freezing point which they can get by burrowing into the snow. On the surface it freezes hard at night at 14,000 feet even early in June.

CHAMBA,

2nd October, 1920.

R. N. PARKER, I.F.S.

Writing again on the 28th October Mr. R. N. Parker sent us the following additional notes :—

"I had a few specimens left stuck on to the sides of the tube in which I collected them and I sent them to Mr. C. F. C. Beeson, Forest Zoologist, Dehra Dun, for identification. He writes to say 'The snow insect is one of the *Collembola Apetera*]; I doubt if the specimens can be identified specifically as they have shrunk out of shape.' If not too late to add this identification to my article it would doubtless add to its interest to Entomologist to do so."

No. XVIII.—SOME NOTES ON THE BUTTERFLIES OF THE PLAINS OF THE U. P.

During the last four years I have been stationed at Moradabad, Allahabad, and Agra, three typical districts of the U. P. plains. All my spare time has been spent in collecting and breeding butterflies. The following notes may be of interest to others. I have only included those that are in any way uncommon :—

Lethe europa.—Two or three were taken at Allahabad early in November after heavy rains.

Moduza procris.—Appeared in Allahabad for a few weeks only towards the end of September 1917. Not seen elsewhere or at any other time.

Junonia allites.—Taken sparingly at Moradabad during the rains.

Neptis eurynome.—I used to take this specimen commonly out in the district, but rarely in the station itself at Allahabad. Most plentiful after the rains up till January.

Cyrestis thyodamus.—I took one damaged specimen at Moradabad in September. I presume that it was a wanderer from the foot hills some 60 miles north.

Cirrochroa mithila.—I have only taken one damaged specimen at Agra during the rains and nowhere else.

Libythea myrrha.—Although this was a common insect in the extreme north of Moradabad where it borders on the Terai, I only took one specimen in the station itself. It can perhaps hardly be called a plains butterfly.

Papilio nomius.—Common at Allahabad during the rains and sparsely taken at Agra at the same season.

Papilio clytia.—I saw what I took to be a damaged specimen at Bareilly, but had no opportunity of capturing it.

Pieris canidia.—I took two very good specimens at Moradabad, both males, at the end of February. Not seen elsewhere.

Colias fieldi.—Common at Moradabad in the early months of the year before the crops were cut. It could always be taken in among the weeds at the foot of the crops.

Colotis amata, *Colotis vestalis*, *Colotis etrida*, *Colotis fausta*.—All the four have been taken at Agra and the bordering district of Etawah. They are to be found in the Chambal and Jumna ravines. The first three can be taken in the stations and are plentiful practically the whole year round, especially during the rains. *Colotis fausta* is decidedly rarer. I have only taken about a dozen specimens in all, and they were taken in the Chambal ravines of Etawah in April and May. These four species seemed to thrive on the scorching heat of the ravines, and were practically the only butterflies to be seen, except *Anaphaeis mesentina*.

Jamides bochus.—Appeared in Allahabad for about a fortnight at the end of one August. It was taken flitting round a large Hibiscus bush. Very few females were taken and those that were mostly in a poor condition.

Castalius rosimon.—Quite common during the earlier months of the year, and after the rains.

Aphnæus ictis.—Taken at Allahabad towards the end of the rains. Not very plentiful.

Rapala schistacea.—Taken sparingly at Moradabad during February and March, but by no means common.

Rapala orseis.—More plentiful than the above, but not common. Taken at the same time of year.

Arhopala amantes.—A single specimen taken, a beautiful fresh male, at Allahabad in March. This is the only one I have come across in the U. P. though it is said to be taken at Jubbulpore some 60 miles south of Allahabad.

The "skippers" I have unfortunately never been able to classify as I only possess Bingham's books, but while I was at Agra I took three kinds that I had not taken elsewhere, and which seemed to me to be rare.

G. G. FIELD,

Indian Police.

No. XIX.—THE ENEMIES OF BUTTERFLIES.

It is now over ten years since any notes appeared in the Journal dealing with the interesting question of the enemies of butterflies, so it is hoped that these observations will have some value, if only to confirm the observations of earlier writers.

That birds do eat butterflies is an established fact, as I have repeatedly seen them doing so. Moreover, most of them are absolutely indiscriminate in their choice of food. There is hardly any question of palatability, as I have noticed them eating a Danaid with the same impartiality as they would a Lycaenid. Some butterflies are undoubtedly untasteful, but when forced by hunger, a bird such as a Mynah or a Bee-eater will eat almost anything, though a bird of more specialized habits may be more discriminate. Contrary to the statements of some famous zoologists I do not believe that birds are the chief enemies of butterflies, as, according to my notes and the observations of others, the number they destroy is comparatively small. This is probably due to the fact that other insects are more tasteful and abundant. The following is a list of birds I have actually seen attacking butterflies, but it is very incomplete, as the Shrikes, Pittas, Nightjars, etc., are known to attack and eat them; the Green Magpie (*Cissa chinensis*), the Tree-pie (*Dendrocitta rufa*), the Black Drongo (*Dicrurus ater*), the Common Mynah (*Acridotheres tristis*), and the Jungle and House Crows (*Corvus macrorhynchos* & *C. splendens*). It should be noted here, that when a butterfly is seen with damaged wings, it is not always a sign of attack, as I have often seen them get damaged while trying to fly about among dense shrubbery. Monkeys are said to eat butterflies. A hungry one will probably do so in captivity if fed with them, but I doubt very much if they can be classed as an "enemy" in the natural state. While collecting in a district, where monkeys and langurs abounded, I never once saw them attacking a butterfly, but the natives informed me that they sometimes do.*

In my opinion the worst enemies of butterflies among the Vertebrates are the Lacertilia. Lizards of the genera *Calotes* and *Varanus* destroy large numbers, and I feel confident that others also feed partly on butterflies, though I have never witnessed it myself. The common house-lizard will sometimes eat a

* Since this was written Dr. Bains Prashad tells me that he has collected or lived, in districts where monkeys were plentiful, and has kept them as pets but he has never seen them eating a butterfly, and does not believe that they do so.

Lycænid if offered one, and some Microlepidoptera, but as a rule nothing larger. Of all the lizards the Bengal Monitor, *Varanus bengalensis*, is, I think, the greatest enemy of butterflies. Dr. Bains Prashad very kindly informs me that he has opened up several *Calotes* and *Varanus* and that he has often found the remains of butterflies in them, especially in the latter.*

The Tree-snakes probably feed to a large extent on the smaller Rhopalocera, such as the Lycænidæ and some Pieridæ. On a small island in the Chilka Lake which I visited through the kindness of Dr. Annandale, I twice saw *Dendrelaphis tristis* attacking and eating specimens of *Colotis calais amatus* and *Huphina nerissa evagete*, both of which are very common at certain seasons in these parts.

My experiences of the insect enemies of butterflies are limited to two occasions, once when I saw an A-ilid preying on a butterfly, and the other when I saw a dragonfly, *Pantala flavescens*, attacking one. It is more than probable, however, that many species belonging to various families of the Orthoptera, Hymenoptera, Diptera, Neuroptera† and Coleoptera either suck, or eat parts of, butterflies. But this remains to be proved by observations in the field.

While on the subject of the "Enemies of Butterflies" a few words as to the utility of "mimicry" among them may not be out of place. I will venture no definite conclusion; "mimicry" is probably very useful, but my notes tend to show that the common Indian mimetic species generally derive but little benefit from the resemblance. I have seen the "mimetic" females of *Papilio polytes* and *Hypolimnas bolina* repeatedly attacked by birds and lizards; but, for that matter I have seen the models themselves being attacked. I once fed a captive *Calotes* with three species of butterflies; *Huphina nerissa evagete*, *Danais chrysippus* and the aristolochia-like female of *Papilio polytes*, all three of which it ate in a few hours. It showed not the slightest discernment as it started with the *Papilio* and finished with the *Huphina*. If birds and lizards are, in most cases, apparently incapable of discernment, what is the use of "mimicry"?

In view of the evidence it would seem that an ordinary enemy of not very specialized habits will eat almost anything when forced by hunger, but that enemies of more specialized habits, who are particular about the nature and flavour of their food, will give untasteful butterflies, and occasionally their "mimics" a wide berth.

CEDRIC DOVER.

INDIAN MUSEUM,

Calcutta, September, 1920.

No. XX.—A NOTE ON A CASE OF A BITE BY RUSSELL'S VIPER
TREATED WITH ANTI-VENINE INTRAVENOUSLY.

Bewa Janoo, a mali, about 45 years of age, was cutting some shrubs in the garden of the Parel Convent when he was suddenly bitten by a snake on the outside of the left ankle.

The date and hour of the bite was at about 6-45 p.m. on the 20th June 1920.

The mali killed the snake with the knife he was using to cut the shrubs and took it to the Mother Superior. This lady advised him to run at once to the Bombay Bacteriological Laboratory which is about half a mile distant from the Convent. A ligature was applied to the leg below the knee before he left the Convent.

* I have since fed a common house lizard with a Pierid which it ate, and I have occasionally seen them eating a fairly large moth which is very common in Calcutta now.

† I have used the word Neuroptera in its old sense, as it includes the lower orders Odonata, etc., for convenience sake.—C. D.

Bewa Janoo arrived at my bungalow at about 7.5 p.m. bringing with him the snake. I examined the snake and found that it was a young Russell's Viper about 18 inches in length. I also examined the site of the bite, but was not able to detect the presence of fang marks, nor was there any oozing of blood. Some pain and swelling was however present and the patient complained of giddiness.

A few minutes only were necessary to secure anti-venine and a sterile syringe so that between 7.15 and 7.30 forty cubic centimeters of anti-venine were injected intravenously in the right arm. The swelling at the site of the bite had meanwhile distinctly increased; it was soft and appeared to be due to the presence of blood or serum beneath the skin.

About fifteen minutes after the injection, the patient complained of pain in the abdomen and back and as this suggested the possibility of hæmorrhage within the abdomen, forty more cubic centimeters of anti-venine were injected intravenously at 7.45 p.m.

As no further symptoms appeared the patient was allowed to go to his home at 10.30 p.m.

Next morning he presented himself at the laboratory. The swelling in the leg had extended considerably, up to but not above the knee. The pain had gone and the patient in other respects felt quite well. In three days the swelling disappeared; no suppuration or sloughing occurred. Within a week the patient had returned to his duties.

The serum used was prepared at Kasauli, Brew No. 186, V 34 A., dated 7th October 1917.

W. GLEN LISTON, M.D., D.P.H., Lt.-Col., I.M.S.,
Director, Bombay Bacteriological Laboratory

20th August 1920.

No. XXI.—NOTE ON A CASE OF RECOVERY AFTER A
BITE BY A RUSSELL'S VIPER.

On August 6th, 1920, a man was brought to the Indian Station Hospital, Sehore, stating that he had been bitten by a snake about an hour and a half previously. The man said that while carrying a bundle of freshly cut grass on his head, he felt something moving on his arm, he looked and found that the snake had reached his forearm, he hit it with his hand, the snake bit him and he killed it with a stick.

On examination two small punctures three inches apart were found on the right forearm. The man was quite calm and normal pulse 86. The punctures were scarified and rubbed with crystals of Potassium Permanganate 40 c.cs. Antivenine were injected subcutaneously. The ligature which the men with him had tied above his right elbow was removed.

The snake which the man said had bitten him was shown to Col. Luard who identified it as a Russell's Viper about a month old. The snake was 14 inches in length.

I do not think that the treatment had anything to do with the man's recovery. That was evidently due to his receiving a quantity of the poison too small to produce toxic symptoms.

Since coming under observation the man has shown no abnormal symptoms.

J. B. MOLONY, Capt., I.M.S.,
Indian Station Hospital, Sehore.

12th August 1920.

No. XXII.—A MANGO TREE (*M. INDICA*) FLOWERING IN AUGUST.

It may interest the members of this Society to know that a very large number of mango trees, especially in the grove surrounding the temple tank at Sion, flowered in August of this year. It is not unusual to see out of season a stray bunch of flowers on a mango tree but it is very rare to find mango trees in luxuriant blossom in the rains. The damp warm weather of August last seems to have had a peculiar effect in making certain trees flower out of season as, besides the mango trees, a large number of "*Pelteforum ferrugineum*" and a few specimens of "*Lagoestromia flos regina*" are also in flower at present. The usual time for flowering is March-April for the former and May for the latter.

Another unusual fact is the effect which the stormy winds of last June had on the vegetation in Bombay. The winds which herald the monsoon are generally charged with sea spray which scorches the leaves of the trees and shrubs on the western side of Bombay, but this year's wind has swept over the Island from side to side and burnt the trees to such an extent that some of them will never recover from the shock.

JAYME RIBEIRO, L.C.E.

BOMBAY,

14th September 1920.

PROCEEDINGS

OF THE MEETING HELD ON 14TH SEPTEMBER 1920.

A meeting of members of the Bombay Natural History Society and their friends took place on Tuesday, the 14th September 1920, Mr. F. Ludlow, F.E.S., presiding. The election of the following 15 members since the last meeting was announced:—

Mr. E. G. Newman, Bombay; Major T. A. Campbell, Jubbulpore, C. P.; Capt. J. B. deW. Molony, I.M.S., Sehore, C. I.; Mr. H. H. King, Soudan; Lt. G. F. Heaney, R.E., Roorkee, U. P.; Maharaj Kumer Ranjit Singh of Lunawada State; Major J. deB. T. Lucas, R.F.A., Ambala, Punjab; Mr. D. L. Stewart, Jalpaiguri; Mr. John D. Tyson, I.C.S., Calcutta; Mr. F. J. Lowman, Jalpaiguri; Major D. L. R. Lorimer, C.I.E., I.A., Loralai; Major H. D. McLaughlin, Indore; Capt. H. C. Godding, R.A.M.C., Mesopotamia; Mr. C. S. Hitchins, Draban, N. W. F. P.; Mr. E. W. Fleming, Myitinge, Upper Burma.

LIST OF CONTRIBUTIONS.

Mammals.

3 Golden-backed Squirrels (*Sciurus caniceps*), 2 Giant Squirrels (*Rotufa sp.*), 2 Black-backed Squirrels (*Sciurus atrodorsalis*), 1 Striped Squirrel (*Tamiops sp.*), 2 Little Malay Chevrotains (*Tragulus kanchil ravis*), 1 Bat. Siam—Major C. H. Stockley.

1 Assam Red-faced Monkey (*P. brahma*), 2 Wild Dogs (*C. dukhunensis*), 1 Hoary-bellied Squirrel (*T. lokroides*), 1 Grey's Civet (*P. grayi*), 1 Bengal Cat (*Felis bengalensis*), 1 Bicolored Bat (*H. bicolor*), 1 Indian Pipistrelle (*Pipistrellus mimus*), Naga Hills, Assam—J. P. Mills.

2 Voles (*Cricetulus sp.*), 1 Indian Jackal (*C. indicus*), 2 Mole Rats (*Gunomys sp.*), South Waziristan—Capt. C. M. Ingoldby.

1 Persian Hedgehog (*E. calligoni*), Baiji, Mespot.—Lt.-Col. H. D. Peile.

1 Pigmy Shrew (*C. perroteti*), Rangoon—Dr. H. Marshall.

1 Wild Boar (*S. cristatus*), 1 Four-horned Antelope (*T. quadricornis*), 1 Common Mongoose (*Mungos mungo*, var), Nepal—Lt.-Col. R. L. Kenion.

1 (*Microtus sp.*), Kashmir.

1 Door Mouse—*Dryomys pictus*, Cherat, N. W. F. P.—A. E. Jones. 1 Ground Squirrel (*F. pennanti*) Halka, N. W. Himalayas—A. E. Jones.

1 Black-naped Hare (*L. ingricollis*), Kurla, Bombay—D. A. Barretto.

2 Photographs of malformed heads of Lesser Kudhu (*S. imberbis*), E. Africa—Lt.-Col. C. E. Luard.

1 Konkan Mole Rat (*G. kok*), Coonoor, Nilgiris—The Director, Pasteur Institute.

4 Pallas' Squirrels (*C. erythrams*), 1 Hoary-bellied Squirrel (*Tomentes sp.*), 2 Fruit Bats (*Cynopterus sphinx*), 6 Yellow Bats (*S. kuhli*), 5 *Pipistrellus sp.*, Golaghat, Assam—C. M. Primrose.

Birds.

1 Grey Peacock Pheasant (*P. chinquis*), 2 Burmese Silver Pheasants (*G. lineatus*), 2 Ferruginous Wood Partridge (*C. ocolea*), 1 Pink-necked Green Pigeon, Siam—Major C. H. Stockley.

4 Burmese Albino Doves, Burma—Mrs. R. B. Kerrigan.

Eggs.

3 Eggs of Chukor Partridge (*C. chukor*), N. Persia—Capt. J. N. List.

3 Eggs of Common Myna (*A. tristis*). Bombay—D. F. Lobo.

2 Eggs of Lesser Florican (*S. aurita*), Rajkot—Kathiawar Police Agency

Snakes.

- 1 Common Blind Snake (*Typhlops brahminus*), Rangoon—Dr. H. Marshall.
 4 Khasia Blind Snakes (*T. jerdoni*), Sittong Mungpoo, 2,500 ft.—J. E. Shaw.
 1 Stoliczk's Reed Snake (*Ablabes stoliczkae*), 1 *Ambliocephalus monticola*, Sittong, Mungpoo, 2,500 ft.—J. E. Shaw.
 2 Common Blind Snakes (*Typhlops brahminus*), 2 *Typhlops exigues*, Bangalore—Lt.-Col. F. Wall.

- 1 Javelin Sand Boa (*Eryx jaculus*), Mesopotamia—Capt. H. C. Godding.
 1 Maclelland's Coral Snake (*C. maclellandi*), Shillong—Lt.-Col. G. R. Row.
 1 Grey Desert Snake (*Z. rothorachis*), Mesopotamia—Sir A. T. Wilson.
 2 Diamond-backed Rat Snakes (*Z. diadema*), Baiji, Tigris—Lt.-Col. H. D. Peile.

- 1 Striated Wolf Snake (*L. striatus*), Simla—A. E. Jones.
 1 Fasciolated Rat Snake (*Z. fasciolatus*), Bombay—Supdt., Victoria Gardens.
 1 Cobra (*N. tripudians*), Bhatinda, Punjab—S. Bhan.
 1 „ („) Palitana State, Kathiawar—Chief Med. Officer.

- 1 Common Krait (*B. caeruleus*) „ „ „
 1 Burmese Blind Snake (*Typhlops diardi*), 1 *Coluber porphyraceus*, 1 Common Green Viper (*Lachesis gramineus*), 1 Formosan Viper (*Lachesis mucrosquamatus*), 1 Common Wolf Snake (*L. aulicus*), 1 Checkered Water Snake (*Trop. piscator*), 2 Buff-striped Grass Snakes (*Trop. stollatus*), 1 Malayan Bush Snake (*Trop. subminiatus*), 1 *Ambliocephalus monticola*, 1 Mock Viper (*Psammodynastes pulverulentus*), 1 Collared Dwarf Snake (*Polyodontophis colaris*), 1 Malayan Whip Snake (*Dryophis prasinus*) Assam—H. W. Wells.

- 9 Snakes from Sinlum Kaba, U. Burma—P. M. R. Leonard.
 1 Himalayan Reed Snake (*Ablabes rypii*), 1 Black Keel-tail (*Trachischium fuscum*), Darjeeling—O. Lindgren.

- 1 Himalayan Hump-nosed Viper (*A. himalayanus*), 1 *Zamenis ladakensis*, 1 Baluch Cat-snake (*Dipsas jollyi*), 1 Speckled-bellied Racer or Dhaman (*Z. ventrimaculatus*), 2 Sind Sand Snakes (*Psammodphis leithi*), 1 Sind Krait (*Bungarus sindanus*), 2 Saw-scaled Vipers (*Echis carinata*), 2 Javelin Sand Boas (*Eryx jaculus*), 1 Banded Kukri Snake (*S. arnensis*), Kaur Bridge, Waziristan—Capt. C. M. Ingoldby.

Lizards.

- 6 *Agama isolepis*, 5 *Acanthodactylus cantoris*, 7 *Eumeces scutellatus*, 1 *Eublepharus macularius*, 2 *Hemidactylus persicus*, 4 *Agama rubrogularis*, 12 *Gymnodactylus scaber*, 2 *Eumeces schenckii*, 4 *Eremias guttulata*, 3 *Ophiops elegans*, Waziristan: 6 *Agama tuberculata*, 7 Skins, Sind Valley: 3 *Eremias velox*, 2 *Agama caucasica*, 2 *Agama sp.*, 3 *Calotes sp.*, Ladha, near Kaniguram S. Waziristan—Capt. C. M. Ingoldby.

- 8 Lizards and centipedes, spiders, etc., Kaur Bridge,—Capt. C. M. Ingoldby.
 1 Chamæleon (*C. calcaratus*), Ahmedabad—Mrs. MacCormack.

Frogs.

- 1 Frog, Murree Hills; 3 Frogs, Dal and Dular Lakes; 7 Tadpoles and immature frogs. Dras in Ladak, about 10,000 ft.—Capt. C. M. Ingoldby.

Minor contributions from Lt.-Col. C. E. Luard, A. P. Warburton, Major Campbell, H. M. Davison and Supdt., Abbottabad Jail.

Mr. Prater acknowledged a number of additions to the Society's collections received since the last meeting; among the more notable contributions were 11 mammals and 3 birds skins received from Major C. H. Stockley from Siam, these include 3 Siamese Giant Squirrels, a Grizzled Flying Squirrel, a Barking Deer, and a Siamese Chevrotain or Mouse Deer. The Mouse Deer occupies a place between the deer and the pig, it is amongst the smallest of hoofed animals. A mature specimen stands from 10-12 inches in height. The Indian form has

recently been recognised as distinct from the Malay and is easily distinguished by its spotted flanks. In India, Mouse Deer are found in the jungles of the C.P., the Ghats including Salsette Island and S. India. The birds sent in by Major Stockley include a pair of Grant's Silver Pheasants, which are new to the collection. A Peacock Pheasant and two Wood Partridges were also received from him.

Lieut.-Colonel C. M. Ingoldby continues to send the Society his contributions from S. Waziristan. Colonel Ingoldby has amassed an amount of material illustrating the Reptilian Fauna of this region, an account of which will it is hoped appear in a future issue of the journal. Since the last meeting a further contribution of 8 mammal skins and skulls was received from Mr. J.P. Mills, I.C.S.; among the skins are 2 Wild Dogs regarding which Mr. Mills writes that the Assamese hill tribes recognise two distinct types of wild dogs—one a slimmer built animal, which is said to hunt in smaller packs and more silently than the ordinary wild dog. This particular race is said to be much rarer than the ordinary Indian wild dog, which is fortunate, as they say, it is more destructive. The two recognised species of wild dogs are the Indian and the Malayan, the latter is found throughout the Malay Peninsula, Siam, Java and Sumatra, and a specimen has been obtained at Moulmein in Burma. It has never yet been recorded from within Indian limits though its occurrence in N.-E. Assam and Upper Burma is possible. Mr. Mills' contributions have been sent to England to be worked out and the results are awaited with interest. His collections from the Naga Hills form a useful supplement to the material now being obtained in Assam through the Mammal Survey, and we are pleased to announce that a new species of Civet discovered amongst Mr. Mills' collections has been named after him in recognition of his valuable services.

Two photographs illustrating a malformation in the horns of the lesser Kudu were presented to the Society by Colonel C. E. Luard. The photographs were taken from an animal shot in E. Africa and present an extraordinary abnormal development, the right horn deflected in its growth, curves downwards and penetrates the skull of the animal below the eye and emerges from the forehead. A large number of Mammal skins were presented to the Society by Colonel Kennion, the British Resident in Nepal. It is unfortunate that their value was much curtailed through want of proper labelling and making up. Colonel Kennion has, however, obtained permission for a trained skinner to visit the country and collect mammals for him and our thanks are due to H. H. the Prime Minister of Nepal for affording the Society the opportunity. Since, Brian Hodgson collected in Nepal in pre-mutiny days no scientific collections have been made there and we look forward with interest to the results of the efforts of our collector in a field which has for a long period been considered forbidden ground.

MAMMAL SURVEY.

A collection of 400 mammals was recently received from Mr. Wells, the Society's collector in Assam. The specimens exhibited were obtained between May and September in the Khasia and Jantia Hills, where our collector had to struggle under adverse conditions. The absence of roads and a lack of means of transport were not the least of his difficulties. Writing in this connection Mr. Wells informed us that he had the greatest difficulty in obtaining coolies for his kit as the men protested that they were afraid of being attacked by wild elephants who way-laid people carrying loads, for the grain of foodstuffs they might be carrying.

The collection includes a very fine series of skins of the Lesser Flying Squirrel, which inhabits the Himalayas and the hill ranges of Assam. Among the larger mammals is a skin of the Hog Badger so named from its having a resemblance to a pig, owing to the form of its snout.

Two forms of Hog Badger have been recorded from N.-E. India, a large and a small animal. The Hog Badger is said to frequent undulating stony ground on

small hills amongst jungle, living in fissures of rocks or in holes dug by itself. It is thoroughly nocturnal in its habits. Tickell relates that a specimen in captivity fed voraciously on meat, fish, reptiles and fruit. Anderson writes of a specimen kept in the Zoological garden at Calcutta "that it would pound plantains to a pulp with its snout before sucking them into its mouth."

It is proposed that Mr. Wells should accompany Mr. Milroy, a member of the Society who is shortly making an expedition to the Cachar Hills where it is hoped that, with Mr. Milroy's assistance he will be able to obtain a useful collection.

ANGLING AROUND BOMBAY.

Mr. G. D. Traylen, one of the most skilful disciples of Isaak Walton in Bombay and one who knows not only how to catch fish but where to catch them, is unselfish enough to communicate his knowledge to fellow fishermen and in his paper on "Angling around Bombay" deeply interested an appreciative audience. He divided his subject roughly into three parts:—What fish are to be taken, where to look for them, and what gear to use.

As regards fish he confined himself chiefly to Bahmin—local vernacular "Raos" and the "Begni"—local vernacular "Dungara" or "Kajura" known in Southern India as the "Nair" and gave a most entertaining account of where to go and the tackle to use if one wanted to be successful. The description of the best method of mounting the hook, and in Bahmin fishing everything depends on a good hook hold, was made very clear by means of diagrams on a black board, and good advice was given as to the best form of rod and tackle. All present hoped that Mr. Traylen would on another occasion continue his lecture and describe fishing on the inland waters of the Presidency with which he is also well acquainted.

INSECT MIMICRY.

Mr. Prater exhibited several cases which had been prepared to illustrate the various theories regarding warning colours and mimicry in insects.

The complex colour and form of many insects has aroused the attention of several observers and numerous attempts have been made to explain the meaning that underlies them.

We know that insects are preyed upon by a large number of creatures such as Birds, Lizards, etc., and it is believed the form and colouring of certain insects are devices for securing them immunity from attack. How else could we explain the wonderful likeness of the leaf insect to a bunch of leaves or the stick insect to a dried stick or the mottled colours on the wings of certain moths beetles or cicadas which so exactly resemble the bark on which they sit than as instances of the most expert camouflage which would defy the preying eyes of an ever watchful foe. Examples of these forms of cryptic colouration were illustrated.

A second type of cryptic colouring is evidenced in the changed appearance of an insect in flight and when at rest. The Oak leaf butterfly is a remarkable example of this. The brilliant uppersides of the wings exposed only in flight are in a marked contrast to the colour of the undersides seen when the insect is at rest. A similar contrast of colours is seen in the wing colours of several butterflies, grasshoppers and cicadas. The striking colours presented by these insects in flight is totally supplanted by their drab appearance when at rest and it may be believed that the change thus presented is a successful aid in evading pursuit.

Certain insects on the contrary display the most vivid colours that make them stand out in marked contrast to their surroundings. These insects are usually distasteful to birds and predaceous insects. Their striking colouration is said to be a 'warning'. A bird eating such an insect associates the bright colours with an unpleasant taste and refuses to eat similarly coloured

insects. Red Orange yellow with black are believed to be common warning colours. Now it is found that other edible insects 'copy' the markings of warning coloured insects. Examples were shown of a wasp, which is protected by its sting, exactly copied in its colour, shape and markings by a harmless fly, and a similar instance is exemplified in the close resemblance of a certain moth to a stinging bee. Then we find a number of edible insects closely copying the colouring of inedible species. An example of this is shown in the Danaid butterflies which are known to be distasteful. We find the colour and markings of these butterflies exactly copied by a whole range of different species which bear a closer resemblance to Danaid butterflies than they do to insects of their own stock. This type of mimicry is known as Batesian Mimicry. Females would appear to be cleverer mimics than males. The female purple Emperor Butterfly (*Hypolimnias missipus*) closely imitates the colouring of a Danaid while the male retains the distinctive colouring of its own species. Now the male is a quick flying insect and is able to look after itself; the female on the other hand is a slow flying creature and when egg laden may be easily captured. Another form of mimicry is known as Mullerian Mimicry from the theories advanced by Fritz Muller, namely the adoption of a general scheme of warning colours by edible as well as inedible insects occurring in one locality. Examples are shown in the similar colouring pattern in the wings of different species of Danaids and certain Papilio butterflies which fly together in South India. The Danaids are distasteful while the Papilios are edible and if the Danaids are sufficiently numerous their enemies would associate their colouring with an unpleasant taste and so avoid the Papilios as well. In advancing theories of this description it must be remembered that conclusions of this nature can only be arrived at from observation in the field. An insect mimicing a distasteful insect may not have the same distribution as its model and impressions received from a comparison of Museum specimens have led to considerable confusion.

It is not suggested that an insect deliberately changes its colour but the theories of how one insect comes to mimic another have been explained by many authors in different ways. The key to the mystery may perhaps be found in Darwin's theory of variations and the survival of the fittest. If one of the various colour forms of an edible species of butterfly closely approximated the colour of an unpleasant species it is easy to assume that this inedible species would secure immunity from an attack while the other forms without this advantage would suffer. Some of its progeny would probably have the same colouring and would in turn have the greater chance of escape and so from generation to generation the protected form would increase till it completely supplanted other forms of this species.

Lastly insects are believed to escape by startling and frightening their enemies. An example of this has been quoted in the weird resemblance in the eye-spots on the wings of a silk moth sitting among leaves, to the head of an owl, a similar parallel has been drawn in the likeness of the apex of its wings to the head of a snake.

The various theories advanced in connection with warning colours and mimicry, may in many instances be quite effective and in others be entirely misrepresented by us, but it behoves the student to approach the subject with an open mind without blinding himself to facts in exaggerating anything, but by actual notes and observations in the field to strive after a solution of the truth.

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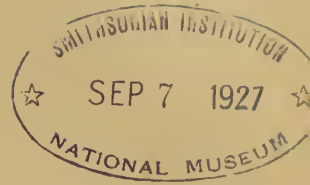


THE RUFOUS-NECKED HILL PARTRIDGE.

Arboricola rufularis rufularis.

($\frac{2}{3}$ natural size)

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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART XXX.

With a Coloured Plate.

(Continued from page 430 of this Volume.)

GENUS—*ARBORICOLA*.

GENUS *ARBORICOLA*, Hodg., 1844.

Hill Partridges.

The genus *Arboricola* contains a group of birds very typical little partridges in general appearance, but differing both in habits and in many important osteological and other characters.

The legs are longer comparatively than they are in the genera *Perdix* and *Francolinus* and have no spurs; the claws are very long and straight. The wing is short and rounded; the first primary is equal to the eighth—tenth, and the third, fourth and fifth are sub-equal and longest. There is a supra-orbital chain of bones, a feature which suffices to separate this genus not only from the true partridges, but also from the more nearly allied genera, *Tropicoperdix* and *Galoperdix*.

The tail is about half the length of the wing and consists of 14 rather soft feathers.

This genus extends from the hills and mountains of the North and North-East of India, through Burma, Yunnan, Siam and the Malay Peninsula to Sumatra, Borneo and Java, and probably to Luzon in the Philippines.

KEY TO SPECIES AND SUBSPECIES.

- A.—Feathers of flanks with chestnut borders.
- a. Breast grey.
- a¹. Crown chestnut.
- a². No chestnut on sides of neck.
- a³. Abdomen pure white *A. t. torqueola* ♂.
- b³. Abdomen rufescent white *A. t. millardi* ♂.
- b². Sides of neck more or less chestnut *A. t. batemani* ♂.
- b¹. Crown olive-brown.
- c². Chin and throat rufous with black spots.
- c³. No black band below red throat *A. r. rufogularis*.
- d³. A black band below red throat *A. r. tickelli*.
- d⁴. Chin black, foreneck rufous .. *A. r. intermedia*.
- b. Breast brownish, crown olive-brown with black spots *A. torqueola* and subspecies ♀.
- c. Breast chestnut *A. mandellii*.
- B.—No chestnut on flanks.
- d. Breast grey *A. atrogularis*.
- e. Breast pale brown, or buffy brown .. *A. brunneopecta*.

- ARBORICOLA TORQUEOLA TORQUEOLA.

The Common Hill Partridge.

- Olive Partridge*—Latham, Gen. His., viii, p. 303, (1823), (Sylhet).
- Perdix torqueola*—Valenc., Dict. Sci. Nat., xxxviii, p. 435, (1825), (Bengal).
- Perdix megapodia*—Temm., Pl. Col. v., pls. 35 and 36, (1828), (Bengal).
- Perdix olivacea*—Grey in Griff. An. King, iii, p. 54, (1829), (Sylhet).
- Perdix torquata*—Less. Traite Orn., p. 506, (1831), (Bengal).
- Arboriphila olivacea*—Hodg. Madr. Jour., 1837, p. 303, (Nepal).
- Arboricola olivacea v. torqueola*—Hodg. in Gray's Zool. Misc., p. 85, (1844).
- Arboriphila torqueola*—Gray, Cat. Hodg. Coll., p. 127, (1846); Hume, Nests and Eggs, p. 544, (1873); id, S. F. ii, p. 449, (1874).
- Arboricola torqueola*—Blyth, J. A. S. B., xviii, p. 819, (1849); id, Cat. B. M. A. S., p. 252, (1849); Adams, P. Z. S., 1858, p. 503; Irby, Ibis, 1861, p. 236, (Kumaon); Jerd., B. of In., ii, p. 577, (1864); Blyth, Ibis, 1867, p. 159; Beavan, Ibis, 1868, p. 385, (Darjeeling); Bulger, ibid, 1869, p. 170, (Tonglooloo and Tendong, Sikkim); Marshall, Ibis, 1884, p. 423, (Chamba); Ogilvie-Grant, Ibis, 1892, p. 392; id,

Cat. B. M., xxii, p. 207, (1893); id, Hand-L., Game-B., i, p. 160, (1895); Oates, Game-B., i, p. 133, (1898); Blanf., Avifauna, B. I. iv, p. 125, (1898); Stuart Baker, J. B. N. H. S., xii, p. 490, (1899), (N. Cachar); Bailey, *ibid*, xxiv, p. 77, (1915), (Tibet).

Hyloperdix torqueola—Sundevall, Tentamen, p. 116, (1872).

Arboricola torqueolus—Hume, S. F., viii, p. 111, (1879); Scully, *ibid*, p. 349, (1879), (Nepal); Hume and Marsh, Game-B., ii, p. 69, (1879).

Vernacular Names—Peunra, Ban-titir, (*N. Kumaon*); Kohumbut, (*Lepcha*); Sipung Lulu, (*Tibetan*); Pao-er, (*Chulikatta Mishmi*); Peora, (*Nepalese*); Dao-bui, (*Cachari*); Inrui-Whip, (*Kacha Naga*).

Description—*Adult Male*.—Crown to nape bright chestnut, the latter more or less spotted with black; narrow line across forehead, lores, cheeks and bold supercilia black, the last mixed with white next the crown and nape; ear-coverts golden-rufous; a line under the black supercilia chestnut spotted with black; upper parts golden olive-brown, each feather margined with black and with two or three narrow crescentic bars of the same, rump and upper tail-coverts similar olive-brown with bold black centres and very narrow black margins; central tail feathers olive-brown, mottled with black, outer feathers brown with chestnut-buff margins.

Scapulars, wing-coverts and innermost secondaries light golden-brown, with large spots and narrow margins of black and broad splashes of deep bright chestnut; primaries and remaining secondaries dark brown, the former with narrow rufous margins and the latter with mottled borders of rufous and brown.

Chin, throat, foreneck and sides of neck black, the neck with streaks of white; a moustachial streak of white, sometimes more or less marked with black; a white band dividing foreneck from breast; breast grey, varying considerably from dark pearly grey to almost slate grey; centre of abdomen white; flanks and sides of abdomen grey with a few white drops or streaks in the centres of the feathers, and the greater part of the inner webs deep chestnut; greater part of vent rufous-white with black bars; under tail-coverts black and white.

Colours of Soft Parts.—Bill black; irides brown or red-brown, in rare cases almost a crimson-brown; legs dull fleshy, fleshy-grey, sometimes grey or livid grey, but seldom without some tinge of flesh colour which becomes more pronounced in the breeding season; orbital skin crimson-red, brighter and deeper in the breeding season than at other times.

Measurements.—Wing 148 to 161 mm., average of 30 birds 153; tarsus 44 to 45 mm., bill at front about 20 mm., and from gape about 25 mm. In length the live bird is about 250 to 270 mm. (10-12 inches) and Hume gives the weight as "8 ozs. in a small female to 13.6 ozs. in a large fat male."

Jerdon describes the leg as red, a colour they never are in this species; Scully, on the other hand, calls it brownish-olive, which does sometimes properly describe those of the female.

Adult Female.—Generally similar to the male, but crown brown, more or less streaked with black; upper parts more heavily marked with black; supercilia rufous instead of black and white; chin, throat and neck rufous, spotted with black, and the white band on the chest replaced by chestnut. Below the general tone is duller, and there is more rufous on the breast; from below the breast to the vent there are numerous white spots, sometimes practically absent in very old females.

Colours of the Soft Parts.—Bill black, or black with brown on commissure and gonys and, according to Hume, sometimes brown also on the culmen; legs like those of the male, but duller, and even sometimes with no trace of red at all; irides brown; orbital skin livid red, or dull purple-pink.

Measurements.—Decidedly smaller than the males, the wings running from 140 to 151 mm., and averaging only 144·7 mm. One tiny female has a wing of only 136 mm., but this, though mature, seems to be an abnormally small bird, and is not included in the average.

Young Male.—Like the adult, but with the supercilia obsolete or entirely wanting; there is no chestnut on the flanks and but little on scapulars and coverts; the whole of the lower surface is covered with white drops from breast to vent.

A Still Younger Male.—Is like the female, but very pale below, and without chestnut on eitherwings or flanks, whilst the whole lower surface is covered with white drops as in the previously described stage.

Distribution.—The typical form of this little Partridge extends from Garhwal and Kumaon through Nepal, Sikkim, Tibet, the whole of the Hill Ranges, North of Assam as far East as the Chulikatta Mishmi Country. South of the Brahmapootra it is found in the higher ranges of the Naga Hills and in the Barail Range of N. Cachar, and probably in these same ranges all through Northern Manipur, and thence East as far as the Hills South-East of Lakhimpur, but it does not seem to enter the Chin Hills, where its place is taken by Bateman's Partridge.

Nidification.—The breeding season of the Common Hill Partridge commences in the lower elevations in the end of April, and goes on until the early part of June, whilst in the highest of its haunts, it breeds about a month later than this. It is, however, rather an erratic bird in its laying, and I have taken eggs in March, and once had its eggs brought me together with the parent bird in the middle of August, it having been trapped about the 12th of that month. It lays its eggs in a merely grass-filled scratching in the earth, or it may make a somewhat more pretentious nest, and will, on rare occasions make a really well-built one of grass, leaves and weeds, matting them well together, and raising the sides so that the whole affair becomes a very deep cup. I have never, however, known them make a domed nest, such as is sometimes made by *rufogularis* and often by the Black-throated Hill Partridge. This is probably because, as far as I know, it

never breeds in grass-land, but always in forest and generally in such forest as is a good deal broken up, and has heavy undergrowth. The nest itself is nearly always placed under the shelter of a bush, or sometimes at the foot of a rhododendron or some other tree. There appear to be no records of its breeding in Ringal or other bamboo jungle, though it often frequents these when feeding.

I have taken very few of their eggs myself, but have good series taken by Messrs. Primrose, Müller, Mackintosh, Masson and others in Sikkim, some taken by Mr. S. L. Whymper in Garwal, and have seen a few others from Nepal, and the hills North of the Brahmapootra.

The number of eggs laid varied from 4 to 8, but 4 or 5 seems the most common number. In colour they are a very pure china white, with quite a respectable amount of gloss, sometimes rather highly developed. The surface is very fine and smooth, though the texture is close and strong, nearly as stout as are the eggs of the English Partridge. In shape they are ovato-pyriform, not varying much, but occasionally running to true oval or to true pyriform, but with rounded, not flattened, big end.

Like all the Hill Partridges, this species lays eggs which vary very greatly in size, though perhaps not quite to the same extent as those of the Rufous-necked Hill Partridge.

A hundred eggs average 38·4 by 29·5 mm., and the extremes in length and breadth are : maxima 42·2 by 31·4 and 42·1 by 33·3 mm.; minima 35·6 by 28·7 mm. and 35·8 by 27·4 mm.

General Habits.—The Common Hill Partridge is found principally between 5,000 and 9,000 feet, but it both ascends higher and descends lower. Stoliczka reported it as being most common between 10,000 and 14,000 feet, but, as Hume points out, this is undoubtedly incorrect; though it may wander up to 14,000 feet or so, it is rare at such heights, or, indeed, anywhere over 10,000 feet, or, at the outside, 12,000 feet. Below 5,000 feet it is not common, I found it occasionally at 4,000 feet in N. Cachar, and the same in the Naga Hills. In the Darjiling District it may wander down below 5,000 feet, but is most common between 7,000 and 9,000 feet; in Garhwal it appears also to be most common at these heights, but in Nepal 6,000 feet is possibly its favourite altitude. It is essentially a bird of heavy forest country, and prefers such as is broken up by ravines, rocks and hill torrents. It likes lots of undergrowth such as bracken, ferns, daphne, and the multitudes of plant and bushes which grow in these beautiful forests and, throughout the more Western portion of its range, it is said to keep much to such. In the Hills South of the Brahmapootra, however, I found them often frequenting more open places. The forests themselves were, as in the West, very dark, the sun just glinting in patches through the leafy roof, but underfoot were little glades of moss and scattered rocks and stones with here and there a tiny stream, its banks almost bare except for a few ferns and perhaps an odd jasmine

bush or bramble of raspberries or blackberries. In such places I several times was fortunate enough to be able to watch the fascinating habits of these little Partridges. They were nearly always in small coveys of from 5 to 10 birds, almost certainly just a pair of old birds with their last family.

They are quick, yet deliberate in their movements, and scratch about here and there, turning over the leaves, picking up a seed or two, and then darting away a few paces to a more tempting patch. Perhaps some of the party will then settle down for a siesta, and for this they love a tiny patch of sunshine, where they can bask with wing outstretched, first on one side and then on the other ; but unless it is getting late in the morning, within a few minutes they are once more on the move, and busy with the important occupation of feeding.

They look like little balls of feathers as they sedately walk about, very neat, yet very soft, their little tails, tucked in tightly, held pointing almost straight to the ground, their wings held not too close to their bodies, and often quivering as they run, but never extended.

Flight seems never to be indulged in as an ordinary means of locomotion, though they are quite good flyers when forced to take to wing, flying much in the same manner as the true partridges, but not so quickly or strongly, and with a much softer whirr of the wings.

They are very conversational birds, and keep up a constant succession of soft low whistling notes intermixed with notes which may be best described as like very soft coos of a dove. Their call note during the breeding season is quite different, a loud, though melodious double whistle which carries a very great way even in dense forest. This note is only used during the breeding season, and then only in the mornings and evenings, and generally, I think, from some elevated position, preferably a branch about 20 feet up in a biggish tree.

I have found its diet to be both insects and seeds, but Wilson says that it " feeds on leaves, roots, maggots, seeds and berries ; in confinement it will eat grain ; in a large cage or enclosure its motions are very lively, and it runs about with great sprightliness from one part to another. It occasionally mounts into the trees, but not so often as a forest bird might be expected to do." Hodgson, however, says " they constantly perch. At the top of Pulhook I flushed a covey of 8 or 10, which flew widely scattered, all alighting in the highest trees."

This certainly agrees with what I have seen of this bird. Possibly it is not so constant a tree percher as the Black-Throated Hill Partridge, and does not roost on trees during the day time so much as that bird does, but whenever I have disturbed them, they have always taken to trees at the end of their flight, and at night they always roost well up in them.

Hume does not recommend them for the table, he says " They are very good eating when you can get nothing better ; but when you can . . . they do not repay separate cooking, they are too

dry." We used to consider them *very* good eating. They are dry, but they are very tender and sweet, and basted with a little fat or butter, make a quite first-class dish.

ARBORICOLA TORQUEOLA BATEMANI.

Ogilvie-Grant's Hill Partridge.

Arboricola batemani—Ogilvie-Grant, Bull. B. O. C., xvi, p. 68, (1906), (Chin Hills); Editor's, B. N. H. S. J., xvii, p. 812, (1907), (Chin Hills, Falam).

Vernacular Names.—Wo-gam or Gam-toung (*Kachin*).

Description—*Adult Male.*—Like the Common Hill Partridge, but has the sides of the neck much mixed with chestnut or wholly of this colour. The chin, throat and neck appear to be more profusely marked with white, but as nearly all the specimens in the British Museum collection have the necks very much drawn out, the extra amount of white may be due to this. The chestnut of the scapulars and inner secondaries is darker, duller and more extensive.

Colours of Soft Parts.—As in *A. t. torqueola*.

Measurements.—This bird is possibly slightly smaller than is the Common Hill Partridge, though a larger series may well disprove this. In wing measurement six birds vary from 144 to 154 mm., and average only 148.6 mm. against 153 mm. in the common form. The tarsus runs from 44 to 46 mm., and the bill at front 18 to 19 mm.

Adult Female—Is difficult to distinguish from that of the last bird, but is generally more rufous in tone above.

Measurements.—The wings of six birds range from 140 to 149 mm., and average 143.6 mm.

Distribution.—So far as is known at present, this bird is confined to the Chin and Kachin Hills, but may wander down into the higher of the Northern Arrakan Yomas and must somewhere in the North-East extend until it meets and blends into the Yunnan and Annam forms.

Nidification.—As far as I can ascertain, there is nothing on record about the nesting of this Partridge, but I have two clutches of its eggs sent to me from the Chin Hills, taken at Haka by Col. Harrington's collectors. Both of these clutches, which consisted each of 4 eggs, were taken at Haka in the Chin Hills in dense evergreen forest. The eggs were quite fresh, and were said to have been taken from hollow scratched in the ground and lined with fallen leaves and rubbish.

These eggs are the usual pure white, and of course indistinguishable from those of the Common Hill Partridge, though, as individual specimens, they are rather broader, shorter eggs than usual; the biggest egg each way measures 41.5 by 30.5 mm., and the shortest, which is also the most narrow, measures 37.5 by 29.2 mm.

They were laid on the 24th of April, and 22nd May 1910, respectively.

It is probable that the breeding season lasts from late February to the end of May, and that the usual elevation is between 8,000 feet and 10,000 feet, as at this time and height Col. Harington reports that they were heard whistling loudly.

General Habits.—In his articles on Burmese Game-Birds, Harington, writing of these and other Hill Partridges, comments as follows:—

“The habits of all seem to be the same. Those I have met with are always in pairs or small family parties, and were found frequenting shady evergreen forest, and seemed to be very partial to the banks of damp shady streams running through thick jungle. They have soft purring notes, and, when scattered, call to one another in low whistling calls. In the evenings they may occasionally be heard indulging in a regular whistling solo in which they run up the scales in double notes.

“Hill Partridges afford very little sport, as they are great runners, always dodging into the thickest cover, and only flying when hardly pressed. The best way of getting them was taught me by Major Nisbett, and is very simple, namely, to walk quietly along a jungle path with a man a short distance behind one, halt every now and then to listen, as both Partridges and pheasants make a good deal of noise running about and scratching among the dead leaves. Whenever any suspicious noise is heard, point in the direction, and the man, who should be well instructed beforehand, must then move very quietly and slowly round in the jungle, forcing the birds out in such a way that they cross the path in front of one. No talking must be allowed, and a pair of tennis shoes is recommended as foot wear on these occasions. By careful listening, one can generally tell the direction they are taking, and so be able to prepare to fire at them. The great thing is not to frighten or press the birds, but gently to drive them in the desired direction. The Kachins say the nests are very hard to find, as they are generally placed in long grass at the foot of a tree, and always have a covered way leading to them through the fallen grass.”

ARBORICOLA TORQUEOLA MILLARDI.

The Simla Hill Partridge.

Arboricola torqueola millardi—Stuart Baker, Bull. B. O. C., xli, p. 101, (1921), (Koteghur).

Arboricola torqueola—Blyth J. A. S. B., xxiv, p. 276, (1857), (Simla, etc.); v. Pelzeln, Ibis, 1868, p. 321, (Koteghur); Marsh, Ibis, 1884, p. 423, (Chamba); Ogilvie-Grant, Cat. B. M., xxii, p. 207, (1893), (part); id, Hand-L., Game-B., i, p. 160, (1895), (part); Oates, Game-B., i, p. 133, (1898), (part); Blanf., Avifauna, B. I., iv, p. 125, (1898), (part); Whistler, G. B. N. H. S., xxvi, p. 849, (1919), (Simla).

Vernacular Names.—Roli, Ram Chukru, (*Chamba*) ; Peora, Bantitur, (*Hindu*).

Description.—*Adult Male.*—Differs from *A. t. torqueola* in the following particulars. The chestnut of the head is darker and not so bright ; the breast is neither so dark nor so pure a grey, but is more tinged with ashy ; the abdomen is not so pure a white, being nearly always strongly suffused with rufescent.

Colours of Soft Parts.—As in the other forms.

Measurements.—These are much the same as in the Common Hill Partridges, but a bigger series of measurements are required. The wings of these in the British Museum collection run from 150 to 161 mm., and average (13 birds) 154·6 mm.

Adult Female.—Differs from the adult female of *A. t. torqueola* in much the same respects as does the male from the male of that bird. The chestnut of the throat is much paler, the breast a paler grey, and the abdomen is more suffused with rufescent.

Measurements.—Much the same as in the Common Hill Partridge. The wings of these I have been able to measure run from 144 to 150 mm. and average 148·2 mm.

Distribution.—Simla Hills, extending North and West into Chamba, Kullu and also Kangra.

Nidification.—The only information recorded about the breeding of this bird is that by Mr. Whistler in the Bombay Natural History Society's Journal. He thus writes :—

“ A nest was recently obtained for me about 8,500 feet near Mahasoo, Simla.

“ It was first found on 25th April through the flushing of the parent birds, but although they had betrayed the approximate whereabouts of the nest, it was discovered only after a careful search ; there were then 7 eggs and on the 27th there were still only 7 eggs, but 8 were found the next morning. When the place was again visited on the 2nd May it was found that another and last egg had been laid, making in all a clutch of nine. On each of these subsequent visits neither parent was seen and the eggs were invariably cold, yet from the placing of grass over the entrance hole there was no doubt that the nest had not been deserted.

“ Endeavours were made to snare a bird at the nest but a first attempt with horse-hair nooses was unsuccessful ; so on the 7th May a gut-noose was set and the nest was visited a second time in the evening. There had been a hail storm and hail-stones then lying thickly around ; my correspondent on arriving at the nest was astonished to find it completely covered over with grass and while he was looking at this and wondering at the reason the bird suddenly bounced out and as it passed he made a lucky grab and caught it in mid-air in his hand ; the broken gut-snare was then round its neck. He kept the bird and set a fresh noose in the

entrance and this had been disturbed next morning though the second bird was not caught. The eggs were then taken for me.

“The nest is described as being built in a carefully scraped out and rounded hole in a bank; this hole measured $8\frac{1}{2}$ inches in diameter after the removal of the nest which was built carefully of, and domed with grass with an internal diameter of $6\frac{1}{2}$ inches. The actual site of the nest was fairly open, but only a few yards away started undergrowth of the type usually frequented by the Peora. Particular emphasis is laid on the fact that whenever the nest was visited the eggs were quite cold, and on the fact of concealing the entrance of the nest with grass whether the bird was sitting or absent.

“The eggs when blown were found to be all slightly incubated to an equal extent. They are in shape a very pointed oval, verging almost on the pyriform, of a very fine texture, faintly pitted, and with a rather pronounced gloss. The colour is an almost pure white with no marking. The nine eggs measure from 42.5 to 46.0 mm. in length and 32.5 to 34 mm. in width; the average comes to 44.0 by 33.2 mm.”

General Habits.—Similar to those of the two preceding races, but nothing has been written so far on this one except in conjunction with them. It occurs on the Simla Hills up to 9,000 feet and 10,000 feet in summer, but also ranges down as low as 5,000 feet, so that probably in the winter may be found at lower elevations than these.

ARBORICOLA RUFUGULARIS RUFUGULARIS.

Blyth's or the Rufous-throated Hill Partridge.

Arboricola rufogularis—Blyth, J. A. S. B., xviii, p. 819, (1849), (Sikkim); id, Cat., p. 253, (1849); id, J. A. S. B., xxiv, p. 276, (1855); Jerdon, B. of In., ii, p. 578, (1864); Blyth, Ibis, 1867, p. 159; Beavan, ibid, (1868) p. 385; Hume, S. F., v, p. 114, (1877); id, ibid, viii, p. 3, (1879); Hume and Marsh. Game-B., ii, p. 75, (1879); Scully, S. F., viii, p. 349, (1879), (Nepal); Oates, B. of B. B., ii, p. 328, (1883); Ogilvie-Grant, Ibis, 1892, p. 393; id, Cat, B. M., xxii, p. 212, (1893); id, Hand-L., Game-B., i., p. 165, (1895).

Perdix rufogularis—Gray, List Gall., p. 58, (1867).

Arborophila rufogularis—Hume, S. F., ii, p. 450, (1874), (Kumaon).

Arboricola rufogularis—Blyth and Wald., Mam. and B. of B., p. 150, (1875); Oates, in Hume's N. and E., iii, p. 439, (1890); Blanf., Avifauna of B. I., iv., p. 126, (1898); Oates, Game-B., i, p. 137, (1898); Stuart Baker, J. B. N. H. S., x, p. 490, (1899); Oates, Eggs, B. M., i, p. 43, (1901); Inglis, J. B. N. H. S., xxvii, p. 154, (1920), (Buxa).

Arboricola rufogularis rufogularis—Stevens, J. B. N. H. S., xxiii, p. 724, (1915), (Dafra and Abor Hills).

Vernacular Names—Pewra (Kumaon); Kohumbut, (*Lepcha*); Pokhu, (*Dafra*).

Description—Adult Male.—Crown olive-brown, the tips of the feathers darker, sometimes forming blackish spots, forehead more grey and unspotted; lores and broad supercilia greyish white streaked with black; sides of head the same, becoming rufous-brown on the posterior ear-coverts; a pure white streak from lower mandible to under ear-coverts; nape olive-brown with more or less rufous markings, especially at the sides, with bold black drops and with a few smaller ones of white or rufous-white; upper parts glossy olive-brown, the rump and upper tail-coverts with black centre to the feathers, showing in varying degrees in different individuals; scapulars and wing-coverts chestnut with a large grey and a smaller black drop on each feather; primaries rufous-brown; secondaries brown, mottled with rufous, this colour increasing in extent inwards, the innermost secondaries being like the scapulars, but with less grey.

Below from chin to end of foreneck bright rufous with numerous black spots on chin and throat, and with white bases to the feathers, which generally show through a good deal; below the rufous there is a narrow but well-defined black band; breast and flanks slaty grey, paler on the abdomen, the flanks more or less marked with deep chestnut and with white central spots or streaks to most of the feathers; posterior flanks and vent pale rufous-brown, mottled with black and white; under tail-coverts rufous with broad black bars and white tips.

Colours of Soft Parts.—“Bill black; irides red-brown; orbits dull lake-red; legs red,” (Jerdon).

“Tarsus salmon-red, claws horny,” (Stevens).

The orbital skin and skin of throat is red or salmon-red, deeper and brighter in the breeding season.

Measurements.—Wing from 131 to 142 mm., average 137 mm., tarsus from 40 to 44 mm., bill at front 18 to 19 mm., and from gape about 19 to 20 mm.; tail 50 to 56 mm.

Hume gives the “length 10·0 to 11·0 inches, expanse 16·0 to 17·5 inches; weight 7 to 10·5 ozs.”

Adult Female.—Like the adult male, but often has fewer black spots on the chin and throat, and more white drops on the breast and abdomen.

Colours of Soft Parts.—As in the male, but legs, orbital skin and skin of throat a duller paler red.

Measurements.—There are but few sexed females in the British Museum series, but the wings of these run from 130 to 140 mm., the average being 137 mm., the same as the male. In the other races the females average a good deal smaller than the males, and a larger series of properly sexed specimens would probably give the same result with this bird.

Young Male.—Throat immaculate rufous-brown, much paler than in the adult. Under-parts smoky slate with numerous white drops all over breast, abdomen and flanks.

Distribution.—From Kumaon and Garhwal throughout the Himalayas to the extreme East of Assam, North of the Brahmapootra, from the level of the broken ground up to an elevation of about 8,000 feet.

The boundary between East and West would appear to be the Brahmapootra or the Dibong; birds obtained for me by Mr. Needham, east of the former river, though perhaps rather indeterminate, were nearer to *intermedia* than to true *rufogularis*, and birds obtained by Dr. H. W. Coltart and myself from the hills east and south of the Brahmapootra in Lakhimpur were certainly *intermedia*.

Nidification.—The Rufous-throated Hill Partridge breeds throughout its range at all heights from the foot of the plains up to 8,000 feet, at which height Mr. W. P. Masson found it nesting on the Singlo Range beyond Darjiling. In the Dapla Hills and the Western Abor Country it ranges up to some 5,000 feet commonly, but wanders up at least 2,000 feet higher than this from time to time in the hottest weather.

It breeds in all kinds of forests and jungle. Its eggs have been taken by Mr. H. Stevens in evergreen forest in rocky broken ground, with an undergrowth of moss, ferns and bracken; Mr. W. P. Masson found it on similar ground round about Darjiling; Mr. A. M. Primrose found its nest near Kurseong in tea cultivation and in scrub jungle as well as forest. Its eggs have also been found both in grassland and bamboo jungle, but at present we have hardly sufficient data to enable us to decide as to what is really its favourite form of cover during this season. In the lower parts of its range it begins to breed in the middle or early part of April, and continues well on into June, but in the higher ranges few eggs will be found until early May and more often in the middle and end of that month, whilst a few may be found as late as July.

The nest itself varies very greatly, but I have had very few detailed descriptions of it. Most of my correspondents describe the nest as a mere depression in the ground well filled with grass, sometimes this is just loosely placed in it, at other times it is worked into quite a matted pad some inches thick. Mr. Masson, however, found near Darjiling a well-made nest of grass, partly domed and densely lined with soft grass. In this case the nest was placed in coarse grass about a couple of feet high just outside the forest in dense scrub. His other nests were quite simple pads of grass in hollows amongst bracken and ferns.

The eggs are, I think, most often four or five in number but as many as eight have been recorded and I have known three hard set.

They are, as indeed are those of all the Hill Partridges, an extremely pure china white, often with a fair amount of gloss though this is seldom very highly developed.

The texture is stout, close and fine, the surface being very smooth. In shape they are modified pyriform or oval with the smaller end well

defined and often considerably pointed, true ovals are unusual, but very broad eggs are not uncommon.

In size they vary a good deal but I have only had a small series pass through my hands and the extremes of measurement are not so wide apart as in the better known eggs of *A. r. intermedia*. My longest and broadest eggs are 41·6 by 30·7 and 40·2 by 31·8 mm. respectively, and the shortest and most narrow are 37·2 by 30·0 and 38·4 by 26·9 mm.

General Habits.—The Rufous-throated Hill Partridge is a bird of lower elevation than the Common Hill Partridge, though the habitat of the two overlap, and they may even be found breeding together over all heights between 4,000 and 6,000 feet; but whereas *torqueola* will seldom be found below 5,000 feet *rufogularis* may often be shot during the cold weather well below 2,000 feet and indeed sometimes almost into the Plains. Even in the summer it may be taken breeding between 2,000 and 2,500 feet, though this is below the normal elevation they frequent.

They are distinctly birds of heavy jungle, and, I think, prefer tree and evergreen forest with a fairly thick undergrowth to any other kind of country, but they may be shot out of bamboo jungle, scrub, the heavy secondary growth on deserted cultivation, and rarely in long grass and bracken on the outskirts of forest.

They fly well, but from the very nature of their haunts, are hard to put up without dogs and *with* dogs they very often take refuge in the nearest big tree instead of taking to flight. They are not wild, and can be easily approached. According to Beavan—

“About Darjiling it is found generally in coveys, and numbers are captured by the Lepchas by calling them within shot, and taken into the station of Darjiling for sale. These birds inhabit such dense cover that shooting them in any other way is almost out of the question.”

Their call is a beautiful loud double whistle, a sound like *Wheea-whu* repeated constantly and slightly ascending in scale with each repetition. It is a very loud ringing cry, and can be heard at a very long distance even in very heavy jungle where sound carries so short a way. It is uttered principally during the breeding season in the early mornings and evenings, and once heard can never be forgotten.

The coveys, which consist of the old birds and family, sometimes two families joining forces, may number anything from 6 to a dozen. They keep together until February or March, after which the young clear off to see to their own family arrangements.

In the Daffa Hills Col. Godwin Austen says :—

“It was very common at 4,000 feet and upwards at our camp under Toroputu Peak, and the Daffa guides snared several. The Daffas, like the other Hill Tribes, are clever at this art, and the mode of capturing pheasants and partridges is simple and worth

describing. As it is the habit of these birds to get down low at night into the warmer ravines, and feed upwards along the crests of the spurs, they stop the progress of the covey by a zigzag barrier about two or three feet high, made up of twigs and short pieces of bamboo struck in the ground, which is rapidly formed and extended a short distance down the hill on either side. A narrow opening is left here and there, generally at the re-entering angles, and in this the noose is set, just above two cross sticks, and in the same plane, at exactly the height of the bird's breast. The noose is made of a thin strip peeled off the outside of a bamboo, and tied to the end of a pliant stick, drawn down like a spring, and hitched into a saw-nick in a bamboo peg, into which the flat form of the spring forming the noose fits closely and accurately. All the materials grow on the spot, and in a few hours hundreds of barriers and snares can be made and set. The birds are often caught alive by the legs."

(To be continued).

THE SYNONYMIES, CHARACTERS AND DISTRIBUTION OF
THE MACAQUES INCLUDED UNDER THE NAMES *RHESUS*
AND *ASSAMENSIS* IN BLANFORD'S MAMMALS.

BY

M. A. C. HINTON AND THE LATE R. C. WROUGHTON.

In examining the synonymy, &c., of *M. rhesus* and *M. assamensis*, as listed in the Mammalia, we have found so much to upset all preconceived notions that we are of opinion that the results are of sufficient interest and importance to require a more detailed record than could be conceded to them in a "revision."

It will, we think, make an understanding of the mistakes and confusion which have crept into the use of these two names more easy if, before recording the results in detail of our enquiry, we give in outline the conclusions to which we have been led. A detailed summary of these results will be found at the end of this paper.

Firstly then, in 1771, Pennant described a monkey, seen by him in a menagerie, so well and adequately that there can be no doubt that the animal was the Rhesus. Owing to a strong personal prejudice against giving latin names to animals, Pennant did not name it otherwise than as the "Tawny Monkey". This omission was first rectified by Zimmermann in 1780, when he gave it the name of *mulatta*, thus antedating the name *rhesus* given by Audebert in 1798, by nearly 20 years. There is no burking this fact and in future *M. mulatta* must replace *M. rhesus*.

Secondly the name *rhesus* remained in general and undivided use till 1839 when McClelland named a species, from Assam, which he called *assamensis*. From this point confusion crept in, owing to some extent to the loss of McClelland's type specimen. The result of our enquiry shows that *assamensis* is a totally different animal from *mulatta* ("rhesus"), with a comparatively restricted range in the Himalayas and Assam.

The following are the details of the synonymy which prove the antedating of *rhesus* by *mulatta*.

Pennant (Syn. Quadr. p. 120, No. 86), 1771, describes the "Tawny Monkey" as follows:—"Monkey with a face a little produced; that and the ears flesh-coloured: nose flattish: long canine teeth in the lower jaw: hair on the upper side of the body pale tawny, cinereous at the roots: hind part of the back orange: legs cinereous: belly white: size of a cat: tail shorter than the body. Inhabits India. From one in Mr. Brook's exhibition, very ill-natured." Pennant gives a plate which could not possibly be accepted as that of *rhesus*, but explains elsewhere in the volume (xxiii A.) that this figure is not that of the "tawny monkey" but of another specimen which he considered to be a variety of it. With the figure thus removed outside the discussion, there can remain no doubt that Pennant's description, is that of the animal we now know as the Rhesus.

Six years later Erxleben (Mamm. p. 43), 1777, notices Pennant's description and gives a translation into Latin, even to the concluding "malignus." Erxleben however, never having seen it, places it under a heading "Species obscure" and gives it no name.

Zimmermann (Geogr. Gesch. des Menschens, ii, p. 195) 1780, under the heading "der braugelbe Affe," gives the following diagnosis "Cercopithecus (Mulatta) fusco-luteus, caninis inferioribus magnis." The form of this diagnosis might give room for a doubt whether the word *mulatta* is really used as a specific name. But throughout the book Zimmermann almost universally encloses specific names in brackets, and in an appendix (Zool. Weltcharte. p. 25) published in 1783 the name is clearly given "Sim. 35 = *Cercop. mulatta*, *Zimm.* Tawny Monkey, *Penn.* Der braugelbe Affe."

Kerr (Anim. Kingd., p. 73), 1792, basing, on Pennant's Tawny Monkey, gives the name *Simia (Cercopithecus) fulvus* and paraphrases Pennant's description. Thus further destroying the seniority of the specific name *rhesus*.

Audebert (Hist. Nat. Singes. 2. Fam., p. 5), 1789, described *Simia rhesus*, basing it upon Buffon's "Macaque a queue courte" (Hist. Nat. Supp., vii, p. 56, pl. xiii) 1798. Neither Buffon nor Audebert gave any information as to the true provenance of the species but Audebert's fine plate removes all uncertainty, for it cannot for anything but what we have up to now known as *rhesus*.

Shaw (Gen. Zool., i. p. 33), 1800, citing "Schreber Suppl." as his authority, applies the name *Simia erythræa* to Buffon's 'Macaque à queue courte'; but this actually was the first publication of the name *erythræa*. Schreber's Taf. viii, c, with the descriptive letter-press, representing this species was not published until 1841. In the same work (p. 57) Shaw uses *Simia fulva* for Pennant's Tawny Monkey; but as we have seen already, the name *fulvus* originated with Kerr (1792).

For many years after the publication of the first descriptions, no one seems to have suspected that the 'Macaque à queue courte' was identical with the Tawny Monkey. Thus Shaw speaking of the latter says "Mr. Pennant seems to be the describer of this animal." Desmarest (Mamm. p. 65), 1820, although he describes *M. rhesus* accurately ("croupe d'un jaune doré; extremities grises") and cites the name *Simia erythræa* (from Schreber be it noted), makes no mention of the Tawny Monkey, or of the names *mulatta* and *fulva*. He gives the habitat as "Les Indes orientales," les forêts du bord Gange."

J. B. Fisher (Syn. Mamm., p. 29), 1829, seems to have been the first to express doubt as to the distinctness of the Rhesus from the Tawny Monkey. Thus after dealing with "38 *S. rhesus*, Audeb. he followed with "**S. mulatta*" (using in order to express the doubt about the status, an asterisk instead of a numeral) and concludes his diagnosis and synonymy with the observation "Vix a præcedente diversa."

Hodgson (J.A.S.B., ix, p. 1212), 1840, described his *Macacus (Pithecus) oinops*, from the Nepal Tarai, giving *Macacus nipalensis*, cited from his M. S. Catalogue, as a synonym, with the remark "name dropt." An examination of Hodgson's material in the British Museum shows *oinops* to be a synonym of *mulatta*.

Other names referring, more recently, to *mulatta* are:—1870. var. *M. (Pithecus) petops*, Gray Cat. Monk. &c. B. M. p. 31 (where "*petops*" is a *lapsus calami* for *oinops*).

1915. *Macaca assamensis*, Wroughton (nec McClelland) J. B. N. H. S., xxiii, p. 464 and in subsequent reports and Summary (xxv, p. 554, 555).

So far we have had to deal with a *single* species, the problem being to identify its oldest specific name *mulatta*, from among a number of others, given subsequently and independently, to the same species. With the erection of a new species, in 1839, by McClelland, under the name *assamensis* and its prompt confusion with the original species *mulatta* (under the name *rhesus*) a new problem is created, *i.e.*, to fix the true identities of each of the two species *mulatta* and *assamensis*.

Horsfield (P. Z. S., p. 148), 1839, published a paper in which he included the description by McClelland of a new species under the name *assamensis*. The description is as follows:—"Bluish grey, with dark brownish on the shoulders; beneath light grey: face flesh-coloured, but interspersed with a few black hairs: length two and a half feet: proportions strong: canine long, and deeply grooved in front; the last of the cheek teeth in the upper jaw blunt." The type specimen was lodged in the H. E. I. C. Museum, in London, but most unfortunately was subsequently lost. Before this happened however it was seen by Anderson, who recorded (West. Yunn. p. 64) 1879, a very full description of it, as follows:—"The type of *M. assamensis* in the Indian Museum, London, is an adult male. It is a stuffed specimen, but the skull has been removed from the skin and is not in the Museum. This monkey differs from all animals of the common monkey of the plains of India, which have come under my observation, in the anterior half wanting the ashy tint which is so characteristic of the adults, and in the hinder portion of the body being in no way rufous. The fur, too, is almost completely devoid of annulations, and the hair round the face

and on the chin is longer than in animals from the plains. This general colour of this old specimen may be described as brown, washed on the outer side of the fore-limbs, and more especially between the shoulders, and on the back of the neck with yellowish, which appears in certain lights as pale golden, passing on the upper surface of the head into a pale yellowish brown. The general brownish tint is darkest on the flanks, where it has a fuliginous tinge, and down the front margin of the fore-limbs, over the outer surface of the thighs the dorsi of the feet and on the tail. The inside of limbs and under surface generally are much paler than the upper parts, and have a yellowish tint, inclining to grey. Behind the angle of the mouth, and below and behind the ears and on the chin, the hair is rather longer and nearly of the same colour as the under surface, but slightly tipped with blackish. There is a moderately dense line of rather long supraorbital hairs, with a pencil of similar hairs extending backwards from the external orbital angle of the frontals. The hair generally is wavy, and on the shoulders and between them above, and on the sides of the chest it is much longer than on the hind part of the body, with the exception of the dark hairs on the lower part of the flanks, which are also rather long. The hair on the vertex radiates from a point of about one inch above the level of the supra-orbital ridge, and a few of the front hairs are directed forwards, but the mass outwards and slightly backwards, which is also the direction of the hairs to the radiating point. There are a few black superciliary hairs, also others on the upper lip and chin. The callosities are closely surrounded by the fur. Length along curve of head and back 26.75 inches, tail 9 $\frac{1}{4}$ ". Blyth also examined this type, and whilst he was disposed to regard it as merely an individual variety of the common animal of Bengal he noted that "the hind part of the body is not as usual strongly tinged bright ferruginous or tawny, being uniformly coloured with the rest." These full descriptions enable us to accept, with confidence, the specimens collected by Mr. J. P. Mills, in the Garo Hills, as being practically topotypes of *assamensis*, with which those collected by Mr. Crump in Sikkin are undoubtedly conspecific.

Hodgson (J. A. S. B., ix, p. 1213), 1840, described *M. pelops*. The description given is as follows:—"Structure and aspect similar to the last (*i.e.*, *oinops*). Colours more sordid and purpurescent, slaty partially merged in rusty; buttocks posteriorly (except the callosities) clad; face nude and dusky, flatter than in the last. From the northern range of hills exclusively. Fur fuller and more wavy than in *oinops*." The Hodgson material in the British Museum includes the type of *pelops*. An examination of this and comparison with the descriptions of the two species given above make it quite certain that *pelops* is conspecific with *assamensis* and therefore a synonym of it.

Other names given to *assamensis* are as follows:—

1870. *Macacus problematicus*, Gray, Cat. Monk. &c., B. M., p. 123; described from Dhalinkot, Bhutan.

1872. *Macacus rheso-similis*, Selater, P. Z. S. p. 495; described from a living specimen in the Zoo.

The types of both these nominal species are in the British Museum and after careful examination, we have no hesitation in relegating both to the synonymy of *assamensis*.

1870. *Macacus oinops*, Anderson, nec Hodgson, West. Yunn., p. 62, in legend below figures 5 and 6; Anderson's figure represents a fine mule skull of "*pelops*," *i.e.*, of *assamensis*, collected by Hodgson in Nepal, now in the British Museum Collection (No. 45, 1.8.4) and the legend "*type of oinops*" is erroneous. This error has had far-reaching consequences.

1881. *Macacus rhesus*, Anderson (in part), nec Audebert, Cat. Ind. Mus. p. 68 (No. 41e).

The most serious effect of Anderson's erroneous legend has now to be noticed. In 1872 (P. Z. S. p. 529) he published an excellent account of two remarkable specimens, collected in the Sunderbuns 'about 50 miles east of Calcutta.' These

were obtained with many examples of the true Rhesus. Anderson's description of both the external and the cranial characters is so clear and detailed and is accompanied by such good figures of the skull, that it is not possible to doubt that the Macaque in question is conspecific with *assamensis* even if subspecifically distinct from the latter. Anderson himself seems to have been fully convinced that these two specimens were specifically distinct from "rhesus," though he refrained from applying any technical name to them. Selater immediately recognised, in Anderson's description, the form to which he had himself given the name *rheso-similis*, which we know from inspection of the type to be a synonym of *assamensis*. When, however, in 1881, Anderson prepared his Catalogue of the Mammals in the Indian Museum, Calcutta, he completely changed his mind as to the affinities of the Sunderbun Macaque. Apparently he was misled by the erroneous legend to his own figures referred to above; these figures (representing 'pelops') were, as we have seen, labelled "type of *oinops*" and since Anderson, like most other writers regarded *oinops* as a synonym of 'rhesus,' he was led to attribute to the latter species a wholly unnatural degree of variation, firstly in the characters of the skull, and secondly, (as a necessary consequence) in those of the pelage. On comparing the skull, 41e, of the Indian Museum Collection, from the Sunderbuns, with the figure in Western Yunnan cited, Anderson, of course, found the closest agreement and rightly concluded that both skull and figures represent one and the same species. Unfortunately, too, he used the skull of a large species of Macaque, which he had collected at Bhamo, as being representative of *assamensis*; this skull belonged to a young individual, with m^1 still in germ, and is quite possibly not referable to *assamensis* at all. Anderson as a result referred all the Sunderbun specimens to 'rhesus.' Anderson's error, in due course, crept into Blanford's Mammalia, for the figures 3 and 4, at page 12 labelled "*M. rhesus*," are copied from those in Anderson's Western Yunnan. They therefore do not represent 'rhesus' but *assamensis*.

This concludes the enumeration of the essential references in the synonymy of *M. assamensis*. From the foregoing recital it is apparent that we owe the possibility of identifying McClelland's species almost wholly to Anderson's careful description of the now lost type. On the other hand the synonymies of *mulatta* and *assamensis* have been in a state of inextricable confusion since 1881, and that confusion has to a large extent arisen from a chance blunder. It would be wholly unprofitable to attempt to disentangle all the references to the two species in question which have been published since the date named and we have contented ourselves with putting those of the fundamental publications in their true places, as follows:—

MACACA MULATTA, Zimm. *The Rhesus.*

1771. "Tawny Monkey," Pennant, Syn. Quadr., p. 120, No. 86; India.
 1780. *Cercopithecus mulatta*, Zimmermann, Geogr. Gesch. Mensch., ii, p. 195; (based on Pennant's "Tawny Monkey")
 1789. "Macaque à queue courte", Buffon, Hist. Nat. Supp., vii, p. 56, pl. xiii; (no locality).
 1792. *Simia (Cercopithecus) fulvus*, Kerr, Amin. Kingd. p. 73; (based on Pennant's "Tawny Monkey").
 1798. *Simia rhesus*, Audebert, Hist. Nat. Singes. 2ieme Famille. p. 5; (based on Buffon's "Macaque à queue courte").
 1800. *Simia erythraea*, Shaw, Gen. Zool, i. p. 33; (name cited from Schreber's Supplement but not published in latter until 1841; (based on Buffon's "Macaque à queue courte").
 1840. *Macacus (Pithex) oinops*, Hodgson, J. A. S. B. ix, p. 1212; (described from the Nepal Tarai).
 1843. *Macacus (Pithex) pelops*, Gray, (nec Hodgson), List of species of Mammals in B. M. p. 8. (See Gray, Cat. Hodg. Coll., 1846, p. 2); and again by *lapsus calami* in Cat. Monk. etc., B. M., p. 1870.
 1915. *Macacus assamensis*, Wroughton (nec McClelland), J. B. N. H. S., xxiii, p. 464; and in subsequent reports and in Summary (xxv, pp. 554,555).

MACACA ASSAMENSIS, McCl.

1839. *Macacus assamensis*, McClelland, in Horsfield, P. Z. S. p. 148; described from Assam. Blanford (in part).
 1840. *Macacus (Pithecia) pelops*, Hodgson, J. A. S. B., ix, p. 1213; described from the Nepal Kachar. Wroughton Summary.
 1843. *Macacus oinops*, Gray (nec Hodgson), List of species of Mamm. in B. M. p. 8; Gray, Cat. Hodgson Collection, p. 2, 1846.
 1870. *Macacus problematicus*, Gray, Cat. Monk. &c., B. M. p. 128; (described from Dhalimkot, Bhutan).
 1872. *Macacus rheso-similis*, Selater, P. Z. S., p. 495; (no definite locality).
 1879. *Macacus oinops*, Anderson (nec Hodgson), West. Yunn., p. 62 in legend below figs. 5 and 6.
 1881. *Macacus rhesus*, Anderson (nec Audebert), Cat. Mamm. Ind. Mus. Calc., p. 68.
 1888. *Macacus rhesus*, Blanford (nec Audebert), Mammalia, p. 12 in legend below figs. 3 and 4.

These two synonymies dispose of our first problem, *i.e.*, the true technical name of the Rhesus and of the Assam Macaque. The solution of the second we believe we can best present by the following statement of the outstanding characters, distinguishing *M. mulatta* from *M. assamensis*, in parallel columns.

MACACA MULATTA, Zimm.

SIZE—A large male measures head and body 540-560mm., tail 225-250mm. Proportionally more slightly built. Weight up to 23-24 lbs.

FUR—Usually of moderate length, straight, not wavy or woolly; sometimes (Central Provinces) it seems to grow much longer, giving a shaggy look; hairs directed backwards from the forehead over the crown, without any trace of a median parting.

COLOUR—General colour greenish brown; sides of the head and forelimbs pale ashy; lower back, especially loins and thighs tinged (often strongly) with rufous or ferruginous.

SKULL:—Moderate in size, short and broad, braincase large and facial portion relatively short; occipital crest and temporal ridges weakly developed, the latter never fusing to form a sagittal crest; supraorbital ridges little developed; mandible short, wide between the condyles and toothrows.

DENTITION—Canines of males not exceptionally large; cheek-teeth rather large and heavy in relation to size of skull.

MACACA ASSAMENSIS, McClel.

Head and body up to 575mm. More stoutly built. Weight up to 28 lbs.

Fairly long, wavy; a point on the vertex, joined to the forehead by an obscure median parting, from which the hair falls away laterally, right and left, before turning backwards.

General colour dark brown, with a tinge of yellowish, especially between the shoulders and on the nape. No ashy colouring of the fore-limbs, nor rufous tinge on lower back.

Size large, massive; braincase short, narrow; muzzle prominent: occipital crest and temporal ridges strongly developed, the latter fusing to form a distinct (and in old age a lofty) sagittal crest; supraorbital ridges noticeably thickened; mandible relatively longer, and narrower between the condyles and toothrows.

Canines much larger, those of the upper jaw deeply grooved anteriorly; cheek-teeth relatively weaker.

We append a short table of skull measurements, taken in the course of our enquiry, for ready reference. Some measure of the skull differences just enumerated may be obtained therefrom.

TABLE OF SKULL

SKULL MEASUREMENTS OF ADULT MALES (in Millimetres)	ABSOLUTE										
	MULATTA.										
	Kumaon						C.P.		Nepal.		
	4280	4323	7 4.	14 10 7	14 10 7	14 10 2.	1320	45 1 8 222.	45 1 8 225.	45 1 8 223	58 6 24 144.
1 Condyllo-basilar length ..	88	91.4	92.1	96.6	99.4	89.2	82.5	82.7	86.9	81.5	
2 Occipito-basilar length ..	114.2	116.6	121.2	126.4	124.6	115.8	109.6	107.4	114.7	108.2	
3 Zygomatic breadth ..	87.7	86	91.4	90.7	86.5	88	80+	74.9	79+	76.7	
4 Length of brain-case ..	85.2	87.4	88	90.6	89.1	87.1	83.8	81.2	86.1	82.6	
5 Cranial width ..	64.2	65	64.7	67.7	66	64	61.9	60	59.2	62.2	
6 Cranial height ..	53.5	53.7	53.2	54.7	54.3	55	51.6	50.5	51	54.3	
7 Post-orbital constriction ..	45.8	44.9	46.8	45.2	46	43.7	43.3	42	45.4	44.3	
8 Greatest breadth across orbits.	69.7	68.8	69.7	71.8	70.9	68.3	66.4	63.9	68.5+	61	
9 Inter-orbital septum ..	7.3	7.7	5.3	7.8	6.4	7.5	6	5.7	5.4	6.6	
10 Condyle to m3 ..	45.4	47.2	47.6	50.5	56.2	47.1	46	41.1	43.3	37.3	
11 Palatilar length ..	43.1	45.9	47	50	50.7	43	39.4	41.5	41.6	38.2	
12 Width across bases of upper canines ..	34.5	32.6	32.9	33.7	34.6	31.8	29.4	27.9	30.5	28	
13 Width across bases of m2—m2	37	39.2	39	37.9	41.3	37.6	37.8	38.5	39.2	36.2	
14 Canine—m3 ..	39.5	40.2	42.2	42.2	40.6	36.4	37.6	40.5	41.6	39.5	
15 m1—m3 ..	22	22.7	24.2	24.5	22.8	21.7	22.8	24.2	24.8	28+	
16 Upper canine antero-posterior basal diameter ..	8	8	8.2	8.8	8.6	7.8	7.4	7	8.7	7	

MEASUREMENTS.

MEASUREMENTS.													Percentages.	
ASSAMENSIS.														
Sikkim	Chindwin.			Shan States.	Naga Hills.	Sikkim.						Nepal.	Mulatta.	Assamensis
1587	15 5 3.	10 10 5.	19	3101	1920 342	15 9 2.	15 9 4.	6253	6414	15 9 3.	296	45 1 8 4.		
90.1	83.1	90.9	84.3	112	107.1	113.5	106.7	110	111.6	102.8	102	100	100	
116.5	109.2	116.4	113.2	140.4	138.2	140.2	136	139	140.3	133.9	128.3	126-133	124-130	
84.3	80.8	85.3	79.5	91.6	97	91	95	96.2	92	94.8	92.2	87-101	80.3-92.2	
81.4	79.4	85.6	89.5	98.5	98.4	92.5	95.5	99.4	95.4	97.8	88.7	89.8-101.5	81.4-95.2	
61.4	59.5	65.6	63.3	67.8	61.5	64.9	66	66.5	62.7	66.7	61.7	66.5-76.3	56.1-65	
47.6	..	53.9	51.5	54.3	51.5	55.4	54	55.3	54.5	55.8	55.3	53-66.9	48-54.3	
43	43	46	45.2	47	44.1	44.5	44.9	44.6	42.2	44.8	44.3	46.4-56.5	37.8-43.6	
63.5	63.4	69.4	68.4	74.6	73.5	72	77	80.5	72.8	73±	77	70.6-79.8	63.4-75.5	
7.2	5.8	7.3	5.1	7	7	7	6.8	8.2	7.3	6.5	6.2	5.75-8.45	6.1-7.5	
44.4	43.7	49.7	46.3	63.1	58.4	65	59	63	63	55.6	56.5	45.9-56.7	54-57.3	
46	41.8	43.1	42.1	56.1	53.8	59.7	53.9	57.9	55.8	52.9	50.6	46.8-52.5	49.6-52.7	
32	30.3	31.4	28.4	38	28.2	35.5	40.2	38.4	36.6	37.6	34.1	33.8-39.2	31.2-37.7	
33.5	36.2	33.7	36.5	41.7	42.2	40.4	42	45.3	41.7	41.7	38.6	39.2-46.6	35.5-41.3	
43.7	38.2	40.2	38.1	46.8	47.4	45.6	46.4	45	42.7	40.3	43	40.8-48.6	38.3-44.2	
24.8	22	23.6	22.5	25.5	25.7	24.8	24.1	23.5	24.2	23.5	22.8	23-29.3	21.4-24	
9.4	8.4	7.8	8	10.5	11.5	11	12.8	13	11	7.8	10			
Length of brain case.												100	100	
Occipito-basilar length.												130-143	140-15	

Before closing this paper there are some points, connected with the geographical distribution of these two very distinct species, about which we wish to add a few words and to make an appeal for help. Of *M. mulatta* we have, thanks to the Survey, a certain amount of material representing that species in the Kumaon and Sikkim Tarais, Assam, Chindwin to Mt. Popa in Burma, eastwards to the Shan States and southwards to Prome. But though *mulatta* is the common monkey of India, north of the Madras Presidency, we have altogether only two Survey specimens from the Central Provinces and very little information even as to its occurrence in Central India and Bengal to guide us.

Anderson writes "I obtained on the right bank of the Irawadi, about 20-25 miles below Bhamo, a female monkey which closely agrees with the type of *assamensis*." He also obtained a monkey from the Sunderbuns which, as we have seen, is undoubtedly a form of *assamensis*. Anderson also notices a monkey "resembling *rhesus*," which occurs in Kashmir and is sometimes found at an elevation of 10,000 feet. This is probably the monkey named "*M. rhesus villosus*" by True, and possibly the same species as a specimen collected in Lower Chitral by Capt. H. F. D. Stirling and sent to this Museum by the B. N. H. S., but whether it is the same as the form noted by Blanford at Murree, by Dodsworth in the Simla Hill States (J. B. N. H. S. xxii, p. 730, 1914) and by Maj. Bailey and others at high elevations in the Himalayas elsewhere, we have no material on which to judge. We appeal to members, who are in a position to do so, to furnish us with good adult specimens (skin and skull) which would be invaluable at this time, and to all, for all can help in this way, to furnish information about their local monkey. We should also like to hear as a fact the names of districts from which the Rhesus is absent.

INDIAN DRAGONFLIES

BY

MAJOR F. C. FRASER, I.M.S.

(With 5 Text-figures.)

(Continued from page 498 of this Volume.)

PART X.

Family—LIBELLULIDÆ.

Subfamily II.—CORDULINÆ.

Compared with the Libellulinae, the Cordulinae are a comparatively small subfamily, represented within Indian limits by five genera and eleven species.

The subfamily is split up into two groups—*Cordulia* and *Macromia*, and these again into genera, of which the first group contains only one genus—*Hemicordulia*, and the second group four genera—*Macromia*, *Epophthalmia*, *Phyllomacromia* and *Idionyx*.

They are usually insects of large size with robust or slim bodies with more or less metallic colouring. The eyes are more or less contiguous, the thorax bulky and the abdomen long and cylindrical. They may be mistaken for Libellulinae or even for *Æschninae*, the general facies being a combination of the characters of the two subfamilies. From the former they may be recognised by the following characters:—

1. A small, sinuous projection on the middle of the hinder border of the eyes.
2. A tuft of hairs or spines at the distal end of the anterior femora and a keel on the tibiæ.
3. The anal border of the hindwings in the males deeply notched (except in *Hemicordulia*).
4. A general metallic colouring of the head and thorax.

From the *Æschninae*, they may be recognised by the triangular arrangement of the ocelli around the vesicle, and by the very marked inequality of the trigones of the fore and hind wings.

Among the Indian *Libellulinae*, the only one likely to be confused with the *Cordulines* is *Zygonyx iris*, but in this the hindwing is not notched, the tibiæ are not keeled and there is no postocular projection.

The same may be said for other metallic species, such as—*Cratilla metallica*, *Brachydilar sobrina* and *farinosa* and some species of *Rhyothemis*.

Tillyard divides up the subfamily into five tribes and two of these again into series, but as only three of these tribes are represented within Indian limits, it is more convenient to adopt a modification of Martin's classification.

GROUPS OF CORDULINES.

- A. Trigone of the hindwing in line with or slightly proximal to the arc. . . . *Cordulia*.
- B. Trigone of the hindwing distal to the arc . . . *Macromia*.

DICHOTOMOUS KEY TO THE GENERA AND SPECIES OF THE SUBFAMILY CORDULINÆ.

- | | | | | | |
|---|---|---|----|--------------------------------|--------|
| 1 | { | Genus <i>Hemicordulia</i> . Trigone of the hindwing in line with or slightly proximal to the arc. | .. | <i>Hemicordulia asiatica</i> , | |
| | | Only one species within Indian limits | .. | | Selys. |
| | { | Trigone of the hindwing distal to the arc | .. | | 2 |

2	{	Genus <i>Epophthalmia</i> . Trigone and subtrigone of the forewing always, and trigone of the hindwing nearly always traversed	3
		Trigone and subtrigone of fore and hindwing always free	6
3	{	Costal nervure black : Upper surface of front and vertex steely metallic blue	<i>Epophthalmia cyanocephala</i> , Hagen.
		Costal nervure yellow	
4	{	Four largish spots of yellow on the face and two at base of labrum : yellow annules on the abdomen very broad	<i>Epophthalmia frontalis</i> , Selys.
		Only three yellow spots on face : yellow annules on the abdomen much narrower ..	
5	{	Upper surface of front steely black	<i>E. vittata</i> , Burm.
		Upper surface of front metallic blue	<i>E. vittigera</i> , Ramb.
6	{	Genus <i>Macromia</i> . Discoidal field commencing with 2 or more rows of cells : anal loop short and rounded and at least 3 cells wide, Discoidal field commencing with only 1 row of cells : anal loop narrow and elongate and not more than 2 cells in width	7
			10
7	{	Front of thorax metallic blue, with a yellow, humeral band : costa outwardly yellow ..	8
		Lower part of front of thorax reddish brown, green metallic above : no humeral, yellow band	9
8	{	Comparatively small species with hindwing <i>ca.</i> 37-39 mm, abdomen <i>ca.</i> 44 mm. : face bright yellow spotted with deep black : yellow markings on abdomen bright and sharply defined	<i>Macromia cingulata</i> , Ramb.
		Larger species with hindwing <i>ca.</i> 41-44 mm., abdomen <i>ca.</i> 47-51 mm. : face yellowish brown : yellow markings on abdomen more sombre and diffuse .. .. .		Macromia flavicincta, Selys.
9	{	Superior appendages of male brown with an external spine at the middle : inferior appendages reddish : 10th abdominal segment bearing a bituberculated eminence on the dorsal carina	<i>Macromia moorei</i> , Selys.
		Superior appendages of male black with an external spine situated nearer the apex than the base : inferior appendages black, of the same length as superior ; 10th abdominal segment bearing a trituberculated eminence on the dorsal carina .. .. .		Macromia trituberculata, Fraser.

- | | | | | |
|----|---|--|--|---------------------------------|
| 10 | { | Genus <i>Phyllomacromia</i> . 8th abdominal segment of female dilated at the sides: arc between the 2nd and 3rd antenodal nervures: only 1 species within Indian limits .. | <i>Phyllomacromia nilgiriensis</i> , Fraser. | |
| | | Genus <i>Idionyx</i> . 8th abdominal segment of female not dilated at the sides: arc between the 1st and 2nd antenodal nervures .. | | |
| 11 | { | Vesicle not markedly prominent | | 11 |
| | | Vesicle conspicuously prominent | | 12 |
| 12 | { | Pyramidal elevation on dorsum of 10th segment with its point turned back in the direction of base of abdomen | <i>Idionyx yolanda</i> , Selys. | 13 |
| | | Pyramidal elevation on dorsum of 10th abdominal segment with its point inclining towards the end of abdomen | | <i>Idionyx optata</i> , Selys. |
| 13 | { | Vesicle prominent, conical, eminence. Antehumeral, oval spots well defined .. | <i>Idionyx ornata</i> , Fraser. | |
| | | Vesicle prominent, acute, spine-shaped like the horn of a rhinoceros. Antehumeral spots very obscure | | <i>Idionyx corona</i> , Fraser. |
| | | | | |

GROUP 1.

Genus—HEMICORDULIA, Selys.

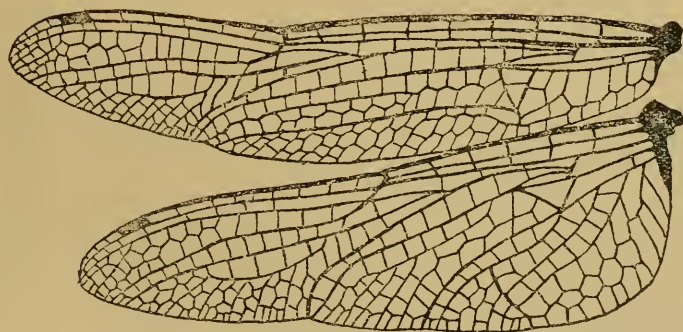


Fig. 1.—Wings of *Hemicordulia asiatica*, Selys. (x 2.5).

Head moderately large and globular: eyes moderately contiguous: vesicle high and slightly notched: forehead with a marked foreborder: suture shallow. Prothorax with a small posterior lobe.

Thorax moderately robust, somewhat cubical and almost naked.

Legs robust and long.

Abdomen clavate in the male, cylindrical and slightly dilated at the anal end in the female. Auricles absent in both sexes.

Anal appendages: the superior in the male long and sinuous when seen from above, strongly arched seen from the side in profile, the inferior fused as in the *Libellulinae*, triangular, curving strongly upward to meet the superior. In the female, the superior smaller and straighter and smaller than in the male, conical and pointed.

Genitalia : male on 2nd abdominal segment—lamina depressed, hamules well developed, lobes small ; female : 8th abdominal segment not dilated but the whole of the terminal segments slightly broadened so that the end of the abdomen is somewhat clubbed at the end : vulvar scale very small, cleft into two small triangular, leaf-like processes separated by a deep fissure.

Wings moderately broad and long : line of trigone in the hindwing slightly proximal to the line of the trigone in the fore : trigone in forewing broad, the costal side about equal to the proximal, the distal much longer, its long axis in the breadth of the wing, traversed once : trigone in the hindwing with distal and costal sides a little subequal and the proximal much shorter, its long axis in the length of the wing, entire, situated a little proximal to the arc : arc between the 1st and 2nd antenodal nervures : antenodal nervures 7, the final complete : sectors of the arc separated in both wings, springing from the arc a little below its middle : all hypertrigones entire : only rarely and irregularly, supplementary nervures to the bridge : only 1 cubital nervure to all wings : 4th nervure irregularly undulated : 5a (Rspl) very short but well developed : only 1 row of cells between 5 and 5a (Rs and Rspl) : 7a (Mspl) well developed, very long, extending almost to the termen : discoidal field strongly contracted at the termen where it is only 2 small cells wide, commencing with 2 or 3 cells and then continued for a short distance as 2 rows of cells : termen strongly indented at the 6th nervure : subtrigone formed of 3 cells, its basal nervure not meeting the trigone but separated from it by a short stalk : loop long and narrow and with a very small toe, split cells at the outer angle only : anal area formed of 2 or 3 rows of cells, large and running obliquely : anal border in both sexes rounded. Stigma short and comparatively broad. Membrane small.

Only one species found within Indian limits.

1. *Hemicordulia aslatica*, Selys.

Selys, Bull. Acad. Belg. (2) Mar. 1878.

Martin, Coll. Selys, 1906.

Id. Gen. Insectorum, 1912.

Laidlaw. Rec. Ind. Mus, 1914.

Fraser, Bom. Nat. Hist. Journ, 1919.

Male. Hindwing 32 mm., abdomen 33 mm.

Female. Hindwing 35 mm., abdomen 37 mm.

Male : head ; eyes deep bottle green : vesicle, frons and upper part of epistome brilliant metallic green : lower part of epistome, labrum and labium bright yellow.

Prothorax blackish brown, with a large, dorsal, yellow spot.

Thorax bright metallic green on the dorsum and humeral regions, the sides posterior to this being bright yellow, traversed by a broad, metallic green stripe which runs obliquely down and forward from the root of the hindwing. Legs black, the coxæ and greater part of the femora yellow.

Wings hyaline, faintly smoked. The anal border of the hindwing in the male rounded, not excavate as in other Cordulines. (This feature is associated with an absence of the auricles, the small, ear-like processes found on the sides of the 2nd abdominal segment of most Cordulines and many *Æschnines* and *Gomphines*. Apparently there is some correlation between the two, the wings being notched at the base to clear these appendages, or it may be that the auricles fill in the gap left by the notched wing, probably the former is the correct explanation. The wings of females are never notched in any of the insects quoted and this is always associated with very tiny, rudimentary auricles.)

Abdomen clavate, the first two segments dilated a little dorso-ventrally and laterally, the 3rd and 4th constricted, the remaining segments gradually dilating as far as the 7th and then tapering to the end. The terminal 6 or 7 segments depressed. Black, marked with metallic green and yellow as follows :—a narrow metallic green stripe running from the 1st to the 4th segment dorsally, the sides

of the first 3 segments bright, uninterrupted yellow, the 4th to 8th segments with wedge-shaped, yellow spots on either side, extending to the lateral border and base of each segment.

Anal appendages black, rather longer than the 2 last segments of the abdomen, the superior rather sinuous and this as seen from above, curving, strongly downwards, the inferior shorter, triangular, curving up to meet the superior.

Female very similar to the male, rather larger in size and the abdomen shaped differently. The markings on the abdomen not nearly so extensive as in the male. The 1st and 2nd segments dilated dorso-ventrally, the remaining segments strongly depressed and parallel-sided as far as the 7th, where the abdomen dilates laterally so as to be slightly club-shaped.

Hab. An apparently rather rare or at least local insect which until Mr. Bainbridge Fletcher of Pusa rediscovered it in 1918 at Shillong, was only known by 2 male specimens.

I found a pair amongst a small collection sent to me from Pusa which had been taken in Assam and the female of this pair constitutes the female type specimen and is still in the Pusa collection. The type male is in the Selys collection, from the Khasia Hills, Assam, the other male was taken by Mr. Stevens at Dejoo, N. Lakhimpur, Upper Assam.

Mr. Fletcher took his specimens along the banks of a tank, "settled on grass at edge of lake" or "hovering about 3 ft. over the water, near edge of tank" He remarks that they have a rapid flight and are not easy to catch and that when hovering, facing the observer, the eyes glow with a gorgeous green. August to October are the months in which most of the specimens were taken. Its habits are very similar to the British species *Cordulia genei*, Linn.

Genus—EPOPTHALMIA.

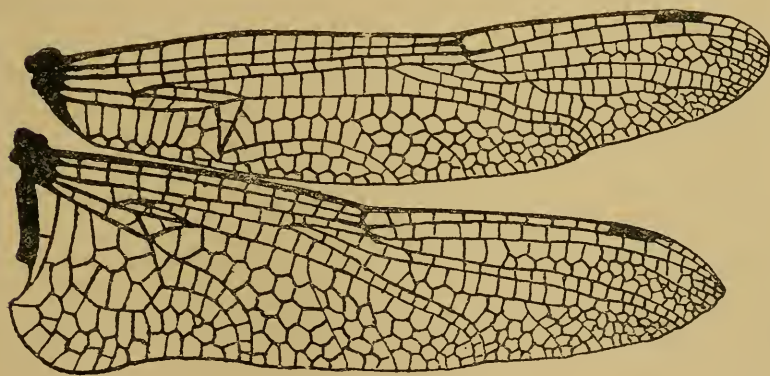


Fig. 2. Wings of *Epophthalmia vittata*, Burm.

Head large and globular: eyes very large and broadly contiguous: vesicle large and high, surmounted by two small papillæ: forehead with a rounded eminence in front and a small pointed eminence outwardly: foreborder not well-marked: a band of stiff bristles at the lower part of forehead and another row of similar bristles resembling a hogged moustache at the middle of epistome: suture deep: occipital triangle very small: basal joints of antennæ tumid.

Prothorax very small and completely hidden by the large head, posterior lobe small.

Thorax very bulky, humeral region square, tergum large and flat.

Legs long and robust : all femora finely papillated on the flexor surfaces, the hind with 4 or 5 fine spines at the extreme distal end, mid femora with a row of gradually lengthening, fine spines : tibial spines robust, widely set and moderately numerous; claw hooks indistinguishable from the claws, which thus appear bifid at the ends, the claws and hooks being about the same size.

Abdomen long and cylindrical, the base and distal end tumid, the intervening segments slim and cylindrical. Abdomen of female long and cylindrical but rather compressed laterally and of a more even width than in the male.

Anal appendages : superior robust and angulated, with a small spine at the sides : inferior of about the same length, fused, triangular and curving up more or less to meet the superior.

In the female the appendages are very short, straight and conical.

Wings long and tapering rapidly towards the apex, the hind very broad at the base in the males and with the tornus produced and strongly angulated ; in the female, the tornus rounded ; trigone in the forewing distal to the line of that of hind, narrow, its long axis in the breadth of the wing, the distal and proximal sides a little subequal, traversed at least once ; trigone in the hindwing well distal to the line of arc, its long axis in the length of the wing, its costal and distal sides nearly equal, usually traversed ; hypertrigone in the forewing traversed, usually several times and that of the hind more often than not traversed ; arc between the 1st and 2nd antenodal nervures, its sectors fused for a considerable distance ; multiple cubital nervures in both wings ; supplementary nervures to the bridge in both wings ; antenodal nervures numerous, up to 17 or more in most species, the final complete ; 4th nervure very flat and long, only slightly undulated ; 5th nervure often with an angular bend directed backwards just proximal to the inner end of stigma ; 5a well developed, usually only 1 row of cells between it and 5 ; 6th and 7th nervures undulated and turning sharply towards the termen near their terminations ; 7a not present ; discoidal field commencing with 2 or 3 rows of cells and then continued for a variable distance as 2 rows of cells, enormously dilated at the termen ; 8th nervure very short and convex, arising in the hindwing from the anal angle of trigone ; 6th nervure strongly angulated a short distance posterior to the trigone and appearing as if forked, the inner branch of the fork being the outer border of the end of the loop ; loop short and broad with no toe ; anal area in the male, broad and expanding into the tornus ; the base of wing strongly indented ; tornus and base of wing rounded in the female. Membrane large. Stigma narrow and long.

Genitalia : male, 2nd segment projecting markedly from the ventral surface ; lamina foliate and depressed ; tentaculæ long, foliate processes ending in a fine, slightly curved hook ; lobe quadrate, not as high as the hamules. Female ; 8th abdominal segment not dilated, but the 7th, 8th and 9th segments broadened dorso-ventrally ; 8th ventral plate prolonged into a long, foliate, vulvar scale which is cleft by a deep fissure into two leaf-like processes which overlap the 9th ventral plate, on the latter and between the two processes mentioned previously, is a tuft of short, stiff hairs ; the 10th ventral plate large and fissured mesially and overlapped slightly by the 9th. Three or possibly 4 species found within Indian limits. The specific distinctions are based, at present mainly on colour differences which are not always satisfactory, and it is more than probable all are merely local races of *E. frontalis*, Selys.

2. *Eppophthalmia cyanocephala*, Hagen, Verh. Zool. bot. Ges.

Wien, XVII. 1867.

Selys, Bulletin Acad. Belg. (2) XXXI, 1871.

Martin, Coll. Selys. Cordulines, 1906.

Male. Abdomen ca. 52 mm., hindwing 50 mm.

Wings hyaline, without any vestige of a basal brown marking, the apices slightly suffused with brown and a yellow tinting at the anal angle; 17 antenodal nervures, 7-9 postnodals, hypertrigone traversed 2 to 3 times, cubital nervures numerous, usually about 5; stigma black, about 2 cells in length, 3mm. long; membrane white or greyish. Reticulation black as well as the costa.

Head large; labium, labrum and face dark brown with a coppery sheen, marked with yellow as follows:—a transverse, basal, interrupted spot at the middle of labrum, a basal stripe, two small, triangular spots in the middle and a lateral on the nasus and a lateral spot near the eyes.

Thorax steely black with a brilliant, greenish blue, metallic reflection. The antearlar sinus a light brown, an antehumeral, straight narrow, dark yellow stripe and a broadish oblique stripe on the sides of the same colour.

Abdomen cylindrical, tumid at the base and a little thickened from segments 6 to 10, steely black in colour marked with yellow as follows:—a median, oblique annule on the 2nd segment, a similar on the 3rd but interrupted by the dorsal carina, a subdorsal spot on each side of the dorsal carina on the 4th, an annule on the 7th occupying about the basal 4th and slightly broken by the dorsal crest, a basal vestige of the same on the 8th. The 10th segment dark brown on the dorsum, with no markings and a small tubercle at its base.

Legs black, the extreme base of femora brown.

Anal appendages black, the superior as long as the 10th segment, the apical half curved slightly and an angular spine on the outer side at about its middle.

Female unknown.

Hab. Ceylon.

3. *Epophthalmia vittata*, Burm. Handbk, Ent. 1839.

Selys, loc. cit.

Martin, loc. cit.

Male, abdomen 50 mm., hindwing 48 mm.; female abdomen 58 mm., hindwing 52 mm.

Male: wings hyaline with a diffuse, yellow tinting at the anal angle; membrane pale grey, darker at the anal border; stigma 3 mm., pale brown, not quite covering $1\frac{1}{2}$ cells; 15 to 17 antenodal nervures, 7 postnodals; hypertrigone traversed 3 to 4 times; 5 to 6 cubital nervures; the discoidal field commencing with a single row of 3 cells and then continued as 2 rows of cells; reticulation black, the costa finely yellow.

General colouring ochreous brown, marked with yellow.

Labium, labrum and face reddish brown with 2 basal, yellow spots to the labrum, a sinuous transverse band on the nose, a small, subtriangular spot between this and the eyes. No markings on the upper part of frons which is steely black with a coppery reflection.

Black or ochreous brown according to age, the front being metallic with the antearlar sinus and a slightly curved antehumeral band on each side which nearly meets the antearlar sinus yellow. Laterally a large, medium, yellow band which is continued over the tergum between the roots of the wings, meeting its fellow from the other side.

Abdomen cylindrical, tumid at the base, thickened from segments 6 to 10, black or deep brown, marked with yellow as follows:—complete rings on segments 2 and 3 before the base and similar ones on 4 to 7 but broader and occupying nearly the apical half of each segment, on segments 8 and 9 the annules still broader, occupying nearly the whole of the dorsum, but badly defined and diffuse. 10th yellow.

Legs blackish brown, the femora rather paler.

A small tubercle at the base of the 10th segment. The superior anal appendages yellow, rather longer than the 10th segment.

Female very similar, the abdomen being stouter and more flattened laterally and the yellow rings rather broader.

At the base of the hindwing, between the costa and the submedian nervure, a brownish ray, extending as far out as the 1st antenodal nervure. The outer fifth of the wings is usually clouded with a dirty yellow or pale brown.

The 3 last abdominal segments black, the 8th with a small transverse, basal spot of yellow on each side of the dorsal carina.

“Burmeister’s type is from Madras and is of rather larger dimensions than those given above. The thorax is described as having 6 yellow bands but he may have supposed that 2 had faded from postmortem decomposition, as Hagen describes it as having only 4 bands—*Selys*.”

In my specimens from Poona, there are certainly only the 2 antehumeral and the 2 lateral bands and as these are fresh specimens, *Selys* was certainly correct in his conjecture. In the male, the upper part of the front of thorax and the brown part of the sides less so, are a fine, metallic green. The costa is finely yellow on the superior surface only, and as far out as the stigma, which is deep brown, almost black. The upper part of frons and the vesicle are metallic green, with a bright yellow spot just in front of the vesicle. The neuration of the wings is similar to *E. vittigera*, Ramb., from Java and Borneo and doubtfully, Assam. The yellow annules on the abdomen differ somewhat as follows:—that on the 3rd occupies its middle third, on the 4th, 5th and 6th nearly as much as the basal half but the apical border of the rings is much clearer cut than the basal, which is diffuse, the annule on the 7th occupies the basal third and on the 8th and 9th, obscurely, the greater part of dorsum.

Female similar but the facial markings more obscure and the rings on the abdomen much broader of which the ground colour is pale ochreous brown. In old specimens the greater part of the wings is suffused with a dirty yellow, rather patchy in its distribution.

“*Selys*: *E. vittata*, *vittigera*, *frontalis*, *cynocephala* and *australis* are all closely allied and may perhaps all be local races of a common species.”

4. *Epopthalmia vittigera*, Ramb., Neuropt., 1842.

Selys. loc. cit.

Martin, loc. cit.

Macromia vittigera, Ramb., 1842.

Abd., male 50-53 mm., female 57-60. Hindwing, male 48-51 mm., female 51-54 mm.

Wings hyaline (in the male, a pale yellow tinting at the anal angle of forewing, but occupying in the hindwing, the entire space between the costa and medium as far out as the 1st antenodal nervure. In the female, the brown marking more distinct in the forewing and extending outwards as far as the 5th antenodal nervure in the hindwing. The apical fifth of the wings suffused with a dirty yellow or ochreous).

Membrane grey, darker against the anal border; stigma brownish black, covering $1\frac{1}{2}$ -2 cells, length 3 mm.; in the forewing, 15-20 antenodal nervures, 7-8 postnodals, hypertrigone traversed 3 or 4 times, 5-7 cubital nervures, discoidal field commencing with a single row of 3 cells and then continued as 2 rows of cells. Reticulation black; costa yellow as far out as node.

Body colouring brownish black varied with yellow markings as follows:—Labium, labrum and face a russet brown with a transverse, sinuous, yellow basal line interrupted in the middle on the epistome and a lateral spot on the nose. Upper part of frons steely metallic blue (in the general female, a median, basal yellow spot in front of vesicle as in *vittata* from Poona, and on each side, against the eyes, a pale yellow spot).

Thorax brownish black with a bluish, metallic reflection. The antealar sinus in front, a narrow, antehumeral stripe on each side and a narrow, median stripe on the sides which goes over the tergum, as in *vittata*, yellow.

Abdomen cylindrical, tumid at the base, a little thickened from the 6th to the 10th segments, black, marked with yellow as follows:—narrow, submedian annules on the 2nd to 6th segments, nearly broken by the dorsal carina except on the 2nd, the rings on 7 and 8 are nearer the base and on the latter not interrupted.

Legs black, femora brown.

In the male, the 10th segment has a small tubercle at the base. Anal appendages brownish black, the superior a little longer than the 10th, curving convergently, a little, thick, the outer border curved from its middle rather abruptly where it bears a sharp spine, the end blunt. Inferior appendages rather longer than the superior, curving upwards a little, the end somewhat truncate.

Female. The stripes and rings rather broader. Appendages black, conical, pointed, shorter than the 10th segment, which is as long as the 9th. Vulvar scale cleft into two small, leaf-like processes, closely parallel and as long as the 9th segment.

General specimens have a vestige of 2 pale yellow marks at the base of the labrum: the yellow rings on the abdomen are broader on the 4th to the 7th segments. The male has no basal brown marking to wings and the 10th segment and anal appendages are brownish yellow.

Hab. Java. Martin mentions Assam, Borneo.

E. vittata and *vittigera* are evidently very closely related, or are perhaps merely varieties of one species.

5. *Epophthalmia frontalis*, Selys., loc. cit., 1871.

Martin, loc. cit.

Type male, in Selys's coll. Female unknown.

This species which is closely related to the foregoing, and much resembles them, is distinguished by the much broader yellow annules on the abdomen and by 4 rather large yellow spots on the front, 2 at the base of the labrum and a yellow band on the nasus. The costa is yellow.

The abdominal rings are not a very reliable guide as they vary greatly in breadth in *vittata* and are broad in *vittigera*. The spots on the front are the only specific differences and it is more than probable that *frontalis* is merely a local variety of the two species mentioned. The anal appendages of the three species do not present any marked differentiation.

Genus—MACROMIA.

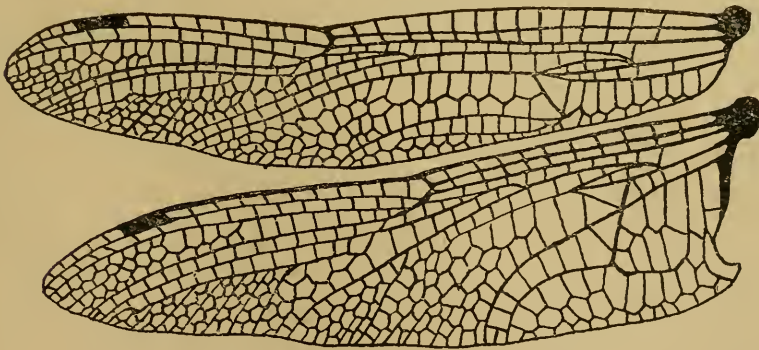


Fig. (3) Wings of *Macromia moorei*, male (x2).

Head large and globular; eyes contiguous for a long distance; occipital triangle small; frons with a rounded foreborder, pointed rather sharply at the outer angles, the whole coated with dense, short bristles; a similar row of bristles, on the lower part of the epistome as seen in *Epophthalmia*; suture very deep. Prothorax small.

Thorax small, cubical, coated with long hairs on the front and dorsal surface. Legs long and slim, hind femora with 2 rows of short, closely set spines on the flexor surface, each ending in a single, long, distal spine, and a row of moderately long, fine hairs on each side of the distal end of the limb; mid femora with a row of short, closely-set spines extending the whole length of the limb, fine spines on the outer, extensor surfaces; tibial spines long and numerous and an additional row on the flexor surface of the two anterior tibiae; claws bifid at the extremities, the hooks being as long as the claws.

Abdomen very similar in shape to that of *Epophthalmia*, tumid at the base, with auricles on the sides of the 2nd segment, 3rd to 6th segments well constricted in the male, segments 7 to 10 dilated laterally and dorso-ventrally, the 10th segment usually flexed strongly on the 9th and bearing a strong dorsal spine with, in some cases, 2 small, lateral spines. In the female the abdomen is of more even width and markedly compressed laterally from the 3rd to the 10th segments, the base of the abdomen is tumid and there is a strong carina to the dorsum which is not well marked in the male.

Anal appendages: superior short, diverging, pointed and bearing an external spine on the outer border; inferior triangular, very slightly bifid at the extremity, curving up to meet the superior. Superior appendages in the female very short, conical and tapering.

Genitalia: male organs on the 2nd abdominal segment large and projecting markedly from the ventral surface; lamina usually depressed, elongated and bifid at the free border; hamules long, tapering, foliate processes, prolonged into a long straight hook which is closely applied to the lobe; lobe straight and tapering to a point.

Female: 8th abdominal segment not dilated; 8th ventral plate prolonged into two oval or leaf-shaped processes which overlap the 9th ventral plate, the latter being convex at its free border and not overlapping the 10th. 10th very short.

Wings long and moderately narrow; trigone of the forewing in line with that of the hind, broad, its costal and proximal sides subequal, the distal side being the longest, its long axis in the breadth of the wing, entire; trigone of the hindwing with its long axis in the length of the wing, entire, situated well distal to the arc, its costal and distal sides subequal, the proximal much shorter than either; hypertrigone of the forewing usually traversed 3 times, that of the hind only twice; subtrigone in the forewing entire, its posterior angle projecting a little posterior to the trigone; arc between the 1st and 2nd antenodals, which number 13 to 16, the final being complete; 4th nervure with a single convex curve; multiple supplementary nervures to the bridge; supplementary cubital nervures to both wings, 4 or 5 in number; 5a (Rspl) well formed, very long, running in some cases as far as the termen; only 1 row of cells between 5 and 5a (Rs. and Rspl.); 7a (Mspl.) obsolete; 8th nervure in the forewing short and strongly convex; discoidal field widely dilated, 2 rows of cells as far as or beyond the inner end of the bridge; 8th nervure in the hindwing from the anal angle of the trigone; 9th nervure in the hindwing strongly angulated at about 2 or 3 cells posterior to the trigone and giving off a branch which forms the outer border of the loop; loop broad and short, usually 3 but sometimes 4 cells wide usually made up of more cells in the female than in the male; 3 rows of cells between the loop and the membrane in the female, only 1 or 2 rows in the male; tornus markedly angulated in the male, rounded in the female; basal border of wing markedly indented in the male, rounded or straight in the female. Membrane large; stigma of moderate dimensions, rather short.

6. *Macromia cingulata*, Ramb., Neurop., 1842.

Selys, Bull. Acad. Belg. (2), XXXI, 1871 and XXXVII, 1874.

Martin, loc. cit. 1906.

Macromia whitei, Selys. (male) Bull. Acad. Belg. (2), XXXI, 1871.

Abdomen: ♂ 44 mm., ♀ 44 mm.; hindwing: ♂ 37, ♀ 39 mm.

Wings hyaline or slightly washed with dirty yellow especially in the female reticulation black; costa yellow along its anterior border; stigma short, black ($2\frac{1}{2}$ mm.), covers about $1\frac{1}{2}$ cells; membrane grey; in the forewing 13 to 14 antenodal nervures, 6 postnodals and 2 rows of discoidal cells. In the teneral female the wings are faintly saffronated in their basal half and along the costal border, the extreme base is deeply saffronated as far as the 1st antenodal nervure; the stigma is brown and the membrane white.

In some specimens of males, the wings are a bright saffron for about three-fourths of their extent but whether this is a teneral condition or not is doubtful.

(In one specimen which I have before me, the apices of the forewings are bright saffron as far as the node and for the whole length of the subcostal space. In the hindwings, the saffronation is a little deeper and extends as far as 2 postnodals from the node but the margin extends obliquely to the termen, which it reaches at the 8th (Cui) nervure. The extreme base is also deeply saffronated in the subcostal and cubital spaces. This specimen was undoubtedly a teneral one.)

General colour, deep glossy black, variegated with yellow.

Head: labium and labrum yellow, the middle and lateral lobes of former and the edge of labrum bordered with black; face and frons yellow, the front of latter black, which colour is connected with a black spot lying in the suture above the front so as to form a large T-shaped mark. Vertex, occiput and back of eyes black, the latter a beautiful emerald green.

Thorax metallic blue marked with yellow as follows:—the antealar sinus, an antehumeral band not extending as far up as the sinus and laterally, a broad, median stripe which ascends between the bases of the wings to traverse the tergum and connect up with its fellow from the other side.

Abdomen black, ringed with bright, sharply defined yellow rings. On the 2nd segment, the ring very broad and occupying nearly the basal half, on the 3rd a semi-annule above and a broadish spot laterally, on the 4th to 6th the rings occupy one-fourth of the segments, being complete and nearer the base than the middle of each segment, finally on 7 and 8 the rings occupy the basal half.

In the male the abdomen is cylindrical, a little tumid at the base and somewhat dilated from 7 to 9: on the dorsum of the 10th segment is situated a median, short, pointed, stout spine, which appears right-angled in profile.

In the female the abdomen is stouter, not dilated at the end and markedly compressed laterally.

Legs slender, brownish black or black, the anterior pair yellow on the basal half of their flexor surface.

Anal appendages of male black, the superior longer than the 10th abdominal segment, a little subcylindrical, the inner border straight, the outer furnished at its middle with a robust spine. The terminal half tapered and ending acutely.

The inferior appendages of equal length, triangular, a little curved up and blunted at the end. In the female, the appendages are rather longer than the 10th segment, conical, pointed and black. The vulvar scale slightly cleft.

Hab. Bengal, the Deccan. Moderately common at Poona. A male taken at Mahableshwar near Bombay. In Poona it is met with, either following the course of shallow swift streams, hovering closely over the surface of the water, or else hawking up and down lanes or openings in the jungle and very occasionally settling low down on twigs.

Closely allied to *cincta* but smaller, the markings much brighter and better defined and labrum bordered with black.

7. *Macromia moorei*, Selys, loc. cit, 1874 and 1878.

Martin, loc. cit., 1906.

Abdomen: ♂, ♀ 49 mm.; hindwing: ♂ 55 mm., ♀ 57 mm.

Male : wings hyaline, stigma brownish yellow or yellow, rather more than 1 mm. in length ; in the forewing, 14-16 antenodal nervures, 8-9 postnodals, the hypertrigone traversed 3 to 4 times but the trigone entire ; membrane white.

Labrum ochreous, labium reddish yellow, narrowly bordered with brown. The border of labrum sometimes bordered also with brown. Epistome and frons olivaceous, the latter with a steely reflection in front.

Thorax rich mahogany red on the lower part of its front, metallic green above and at the sides. The antealear sinus yellow as is also a broadish lateral stripe which passes up between the bases of the wings to traverse the tergum and connect up with its fellow from the other side.

No humeral band.

Abdomen dark, brownish black, marked with yellow as follows :—narrow, median rings on segments 2 to 7, broadest on the latter and occupying about its basal half. Small vestiges or points of yellow on the sides of the 8th and 9th segments.

Anal appendages slightly longer than the 10th segment of abdomen, black, subcylindrical, with an external spine situated about its middle ; inferior appendages a little longer than the superior, reddish, curving up a little at the end.

The 10th abdominal segment usually strongly flexed on the 9th, strongly keeled above, this keel commencing with a small, right-angled eminence, slightly notched at its summit.

Female : wings smoked or often saffronated as far as the arc : reticulation black, including the costa : stigma brownish black, rather longer than in the male : antenodal and postnodal nervures usually slightly more numerous than in the male : membrane moderately large, white.

Head and thorax as for male. Abdomen black, ringed with yellow : broad median rings on segments 2 to 5, narrower on the 6th, broader on the 7th, occupying its basal half, a terminal vestige on the 8th and on borders of 9th. Vulvar scale short, cleft.

Anal appendages black, cylindrical, pointed, as long as the 10th abdominal segment.

Hab. Khasia Hills, Assam, Deccan. Sometimes taken in company with *flavicincta*, its habits being similar. Breeds in running water and is usually found in jungle ridings or open spaces in jungle or more rarely following the course of brooks.

Differs from *flavicincta* by the shorter stigma and by the black costa.

8. *Macromia flavicincta*. Selys, loc. cit.

Martin, loc. cit.

Abdomen : ♂ 47 mm. ♀ 50-51 mm. ; hindwing : ♂ 41 mm., ♀ 44 mm.

Wings hyaline in the male, dirty or tinted with yellow in the female (in some specimens, the wings are largely bright saffron but I am not certain if this is a general condition although the colouration of the bodies of such specimens is always fully developed) ; reticulation black, costa yellow along its anterior border ; stigma moderately large (3 mm.), and covering ca. 2 cells ; membrane a greyish white ; in the forewing 15-17 antenodal nervures, 7 postnodals, 2-4 hypertrigonals, 3-5 cubital nervures and 2 rows of discoidal cells.

General colouring steely black with a metallic reflection variegated with yellow.

Head : labium and labrum yellow, the latter bordered broadly with black ; epistome and front yellow, the latter black in front and in the suture above, the mark thus forming a thick, black "T" ; vesicle and occiput dark brown or black ; eyes a beautiful, opalescent blue somewhat of the quality of a moonstone, black behind with an oval, yellow spot below.

Thorax metallic blue marked with yellow as follows :—the antealear sinus, a humeral stripe not extending upwards as far as the sinus, a median, lateral stripe extending up between the wings to traverse the tergum and connect up with its

fellow from the other side, finally a posterior stripe on the hinder border of the metepimeron.

Abdomen black ringed with yellow as follows :—a basal ring on the 2nd segment occupying about its half, rings on segments 3 to 6 extending basalwards from the median transverse ridge of segments but are separated from the base of segments by black, which colour dorsally, extends apically into the yellow, nearly cutting the rings in twain on the dorsal crest, on 7 and 8 the rings occupy the basal half and on 9 there is a transverse, lateral mark.

In the male, the abdomen is cylindrical, a little tumid at the base and dilated in the terminal segments; 10th segment with a strong dorsal keel beginning with a pointed tubercle which is strongly angled when seen in profile.

In the female, the abdomen is more robust, not dilated at the end but strongly compressed laterally.

Anal appendages of the male dark yellow, the superior longer than the 10th segment, subcylindrical, with a strong spine at about its middle, the terminal half tapered and bevelled. Inferior appendages a little longer, triangular, curving strongly upwards at the end, which is tapered.

In the female, the appendages conical, pointed, yellow, rather longer than the 10th segment; vulvar scale cleft into two oval, leaf-like processes which are contiguous and extend as far as the 9th segment.

In specimens taken at Poona (which I think are a local race of this insect or which may be a distinct species), the basal ring on the 7th segment is also encroached upon by the basal black, and the ring on the 8th is prolonged in an apical point on the dorsal crest and also laterally.

The forewings have 14 antenodals and 7 postnodals, the hindwings 10 antenodals and 9 postnodals. In the female, the wings are more or less smoky and there are dark, brown rays in the subcostal and median (cubital) spaces extending nearly to the trigone (as in *M. gerstaeckeri*). The yellow annules on the abdomen of the female are much broader than in the male and not encroached upon by the basal black. The abdomen is markedly flattened laterally.

Legs slender, long, brownish black; coxæ and trochanters yellow.

Ova fusiform, pointed at each end and flattened laterally.

Deposited by the female whilst hovering and dipping the end of abdomen in water.

Hab. Madras, Poona, Deccan, Mahableshwar near Bombay, Darjeeling. Generally in wooded districts. Has a habit of hawking up and down glades in the jungle or in lanes and ridings; at midday it takes a short siesta at which time they settle low down on bare twigs or bushes. They may often be seen collecting in numbers on such situations and I have seen as many as a dozen, some paired, hanging together on one small bush. May and June are the best months during which this insect may be found, but it is seen more sparingly from March till September. It was very plentiful at Poona in the year 1917 but was scarce from then until 1920. Possibly it may take three years to breed out as the imago.

Closely related to *cingulata*, but differs as follows :—

1. The labium is not bordered with black.
2. The back of eyes and vertex marked with yellow.
3. The rings on abdomen broader.
4. The anterior pair of femora are not bordered with yellow.
5. The stigma is longer.
6. The anal border of the hindwings is much more deeply notched.
(nearly straight in *cingulata*).
7. The shape of the vulvar scale.
8. The size is considerably larger.

9. *Macromia trituberculata*, sp. nov.

Abdomen: ♂ and ♀ 49 mm.; hindwing: ♂ 42 mm., ♀ 45 mm.

Head: labium and labrum yellow, both broadly brown at the base; epistome and frons pale brownish yellow, the latter with a little metallic green above;

vesicle metallic green above; occiput small, brown; eyes emerald green, black behind.

Prothorax brown.

Thorax rich mahogany red on lower part of the front, metallic green above and at the sides, no humeral stripe but a moderately broad, oblique, bright canary yellow stripe on the middle of the sides, passing up between the bases of the wings to traverse the tergum and connect up with its fellow from the other side. The antealar sinus and a spot behind it, yellow.

Wings slightly smoky and palely suffused with saffron in the basal half, posterior to the trigone and for the basal half of the hindwings posterior to the 8th nervure (Cui); costa black anteriorly, 13 to 14 antenodal nervures, and 11 post-nodals to the forewings.

Abdomen matt black, marked with yellow as follows:—a dorsal spot on the 2nd segment, shaped like a mushroom with the stalk directed apically, narrow annule on 3 to 5, a little notched basally with black, a broad, basal annule on segment 7 pointed apically on the dorsal crest, remaining segments unmarked.

Anal appendages short, black, longer than the 10th segment, the superior with a robust spine on its outer side, situated a little beyond the middle, the apex turning out a little; the inferior of the same length, slightly notched at the apex. A strong keel on the dorsum of the 10th abdominal segment commencing basally with an angulated eminence, on either side of which is a small, conical tubercle.

Seen from behind, these appear as three small tubercles.

Legs long, slender, black.

Female differing but little from the male. The yellow markings on abdomen broader, the abdomen compressed laterally, the anal appendages black, conical, pointed, rather longer than the 10th abdominal segment; wings slightly smoky; vulvar scale cleft.

Hab. Shillong, Assam. Taken by Mr. T. Bainbrigg Fletcher hawking over pebbly streams. Several males and females were taken or seen from the 5th to the 30th September. Oviposition was accomplished as in the Libellulinae, by hovering and dipping the end of abdomen in water.

Closely allied to *M. moorei* from which it may be distinguished by the stigma being black instead of yellow, the appendages of equal length instead of subequal, no yellow markings on the 8th and 9th segments and by the character of the tubercles on the 10th segment. From *borneensis*, which it resembles closely in colouring, it may be distinguished by the black costa and by the 10th segment. From *flavicincta* and *cingulata* by the non-possession of a humeral stripe.

Genus—PHYLLOMACROMIA, Selys.

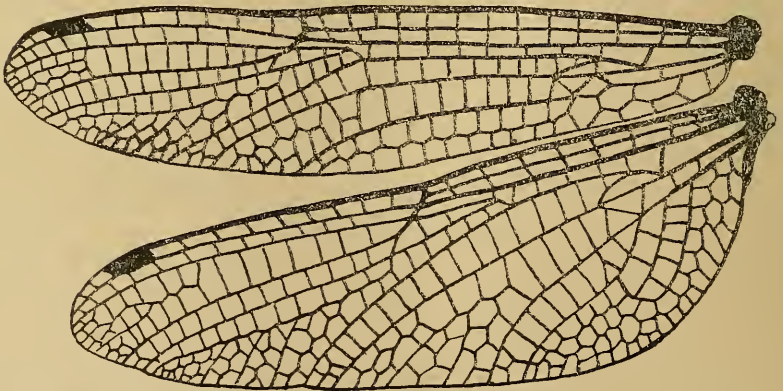


Fig. 4. Wings of *Phyllomacromia nilgiriensis*. ♀ (x 3).

Head broad, eyes very large, broadly contiguous; occiput small, fringed with short stiff hairs; vesicle very prominent, broadly and shallowly notched.

Prothorax comparatively bulky, posterior lobe small and entire.

Thorax narrow and comparatively small. Legs long and slim; the first pair of femora with a tuft of hairs at the distal ends, the hind femora with a row of sparse fine spines, gradually lengthening towards the distal end, mid femora with more numerous and stouter spines than those of the hind; anterior tibiae keeled, the spines long and numerous, claw-hooks well developed, situated at the extreme end of claws and of equal length, so that the latter appear reduplicated.

Wings rounded at the apex, the fore narrow, the hind very broad (the anal border notched in the male, rounded in the female); in the forewing, 12-13 antenodal nervures, the final complete, 6 postnodals; arc between the 2nd and 3rd antenodal nervures; trigone in the hindwing well distal of arc; both trigones subequilateral, the hind larger than that of fore, both entire; sectors of arc in both wings fused for a long distance; 1 cubital nervure in the forewing, 2 in the hind; subtrigone in the forewing 4-sided; hypertrigone of forewing traversed once, that of hind entire; 1 or 2 supplementary nervures to the bridge; 4th, (nodal sector) and 5th (subnodal sector) nervures strongly curved opposite the stigma; 5a (Rspl) of great length, almost reaching the termen; 7a (Mspl) obsolete; 1 row of cells between it and the 5th nervure; discoidal field narrow, of 1 row of cells to its inner two thirds, dilated at the termen; anal loop small of about 9 cells, stunted, its outer end a little distad of the outer line of trigone; 8th (Cui.) nervure from the anal angle of the trigone; membrane moderately large; stigma small (2 mm), lozenge-shaped.

Abdomen moderately long and slender, tumid at the base, 3rd to 6th attenuated and cylindrical, (much compressed laterally in the female) 7th to 9th segments (in the female only) markedly dilated and depressed.

Anal appendages small, as long as the combined length of abdominal segments 9 and 10, subcylindrical, tapering.

Vulvar scale conspicuous, acuminate, ridged and traversed with striations at its distal end.

The genus is an African one, represented by a single species only within Indian limits.

10. *Phyllomacromia nilgiriensis*, Fraser, Bom., Nat., Hist., Jour., Vol. XXV, No. 3, Jan., 1918.

Female. Abd.: 30 mm.; hindwing: 32 mm. Male unknown.

Head; eyes rich olive green above, bottle green beneath, labium and labrum pale yellow, the former bordered with brown, the face lemon yellow, vesicle and upper part of frons brilliant metallic green.

Prothorax brown.

Thorax brilliant metallic green with a bright lemon yellow stripe on the sides and another on the hinder border of the metepimeron, both continued under the abdomen to meet their fellows from the other side.

Legs black, the anterior four femora marked with yellow, more extensively in the anterior pair.

Wings hyaline, faintly enfumed at the apices and saffronated at the base as far out as the trigones; stigma blackish brown; membrane white.

Abdomen black with a lemon yellow, skull-like marking on the dorsum of the 2nd segment. Anal appendages black, small.

Hab. Nilgiri Hills, South India. Described from a single female specimen taken above Kalar, 2000 feet, June 1917. This specimen was depositing eggs in a marsh, in mud covered with a thin film of water and amidst the dense shade cast by a forest of gigantic colladiums.

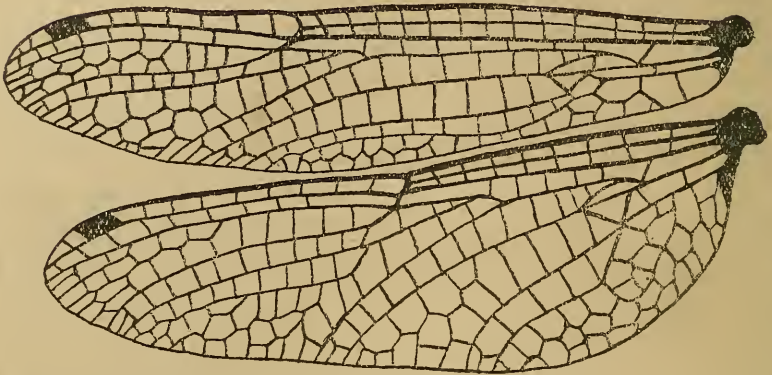
Genus—*IDIONYX*, Selys.

Fig. 5. Wings of *Idionyx optata*, female. (x 3).

Head large, globular; eyes broadly contiguous; occiput small; vesicle prominent.

Prothorax small, posterior lobe small, entire.

Thorax small, narrow, finely hairy.

Abdomen moderately long and slender, laterally compressed, the base a little tumid, the terminal segments dilated (but not so in the female). Oreillets present on the sides of the 2nd abdominal segment, with equal divisions.

Wings: the fore narrow, the hind very broad, notched at the base in the male, rounded in the female; all trigones entire, subequilateral, that of hindwing, distad of arc, which is situated in the forewing between the 1st and 2nd antenodal nervures; sectors of arc fused for a long distance; antenodal nervures in the forewing 11 to 14, postnodals 5 to 7; hypertrigone in the forewing traversed once, that of hind entire; subtrigone of forewing one-celled and 4 sided; 1 cubital nervure in the forewing, 2 in the hind; 2-3 supplementary nervures to the bridge in both wings; only 1 row of discoidal cells for nearly as far as the termen (considerably longer than in *Phyllomacromia*); 4th (nodal sector) nervure moderately convex beneath the stigma; 5a (Rspl) strongly developed in the hindwing, 7a (Mspl) obsolete; 1 row of cells between 5 (subnodal sector) and 5a; anal loop short and stunted, its outer limit in line with the outer end of the trigone, composed of 7-8 cells; anal border broadly rounded in the female, notched in the male; stigma small, sublozenge-shaped; membrane small.

This genus is closely related to *Phyllomacromia* by the form of the trigones and the single row of discoidal cells but in *Phyllomacromia* the abdomen of the female is dilated and the wings present a few different characters, viz., the arc is situated between the 2nd and 3rd antenodal nervures (instead of between the 1st and 2nd as in *Idionyx*), and the single row of discoidal cells runs for a much shorter distance than in *Idionyx*.

11. *Idionyx optata*, Selys, Buul. Acad. Belg. XLV, 1878.

Id. Ann. Mus. Genov, 1891.

Martin, loc. cit. 1906.

Abd.: ♂ 32-33 mm., ♀ 32 mm.: hindwing: ♂ 32-33 mm., ♀ 32 mm.

Male: head; labium and labrum yellow, the latter bordered with greyish brown, epistome and clypeus olivaceous, upper part of front and the vesicle metallic green; occiput and back of eyes glossy black, the latter presumably, some shade of emerald or bottle green during life.

Prothorax dark olivaceous.

Thorax dark metallic green marked with yellow as follows :—a short, antehumeral, cuneiform spot not extending upwards for half the height of the front of thorax, 2 lateral bands, one under each wing, the first passing up between the bases of the wings to traverse the tergum and connect up with its fellow from the opposite side, the second on the metepimeron and bordered behind with black. Beneath black, the middle of chest, longitudinally yellow.

Wings slightly rounded, hyaline, reticulation black, slightly tinted with saffron at the extreme bases of hindwings, which are very broad; stigma small, black (2 mm.) ; in the forewing 11-13 antenodal nervures and 6-7 postnodals ; membrane rather long, black.

Abdomen cylindrical, a little tumid at the base, the borders of 7-9 a little dilated, glossy black marked with yellow.

A dorsal, yellow band on the 1st segment and the sides of 1 to 3, the apical end of the 8th also yellow. 10th segment very short, flexed on the 9th so that the articulation gapes widely above, pale brown in colour. On the dorsum of this segment, is seen a pyramidal tubercle inclining towards the apical end of abdomen.

Anal appendages black, as long as the 9th and 10th segments taken together, the superior subcylindrical, tapering and ending in a downward directed point just before which is a robust, pointed spine ; inferior one-fourth longer than the superior, with a blunt, straight point at the end and with a triangular spine at about its middle.

Legs slender, femora black, tibiæ and tarsi pale yellow.

Female similar to the male but the wings are more tinted with saffron at the base where they are broadly rounded. The small, “ , ”-like, antehumeral spots are oblong, not cuneiform. The abdomen is more slender, a little compressed laterally and not dilated at the end, black with a longitudinal yellow band on the dorsum of the 2nd segment, a basal annule and the dorsal carina of the 3rd yellow.

Legs dark brown, the anterior pair of femora and the tibiæ and tarsi yellow.

Anal appendages short, separated by a rounded protuberance, coated with yellow hairs.

Hab. Khasia Hills, Assam. Type male collected by Mr. Atkinson. Closely resembles the following species, *yolanda*, but the male has a spine on the superior appendages and the inferior are longer and also furnished with a submedian spine, finally, the dorsal, pyramidal tubercle on the 10th abdominal segment is directed towards the apical end of abdomen.

The females of the two species are almost impossible to distinguish with exactitude.

12. *Idionyx yolanda*, Selys, Bull. Acad. Belg. (2), XXXI, 1871.

Id. Ann. Mus. Genov., 1891.

Martin, loc. cit.

Abd. : ♂ 31 mm., ♀ 27 mm. ; hindwing : ♂ 30 mm., ♀ 29 mm.

Male : head : labium and labrum citron yellow, the latter finally bordered with black ; rest of face glossy black changing to dark metallic green on frons and vesicle, except for a yellow mark on the centre of the rhinarium. Back of eyes glossy black ; eyes presumably some shade of green in the living state.

Prothorax dark olivaceous.

Thorax dark metallic green or blue, marked with bright yellow as follows :—an isolated, antehumeral spot, shaped like a “ , ”, not extending upwards for half the height of the thorax, 2 lateral bands, one under each wing, the posterior of which is bordered below and behind with black. Black beneath, the centre of chest longitudinally yellow.

Wings slightly rounded, notched at the base, a little tinted with saffron at the extreme base of the hindwings which are a little narrower than in *optata*, reticulation black; stigma small, black (2 mm); in the forewing, 13-14 antenodal nervures and 5-6 postnodals ; membrane moderately large, black.

Abdomen cylindrical, a little tumid at the base, the border of 7 to 9 a little dilated. Glossy black with a dorsal spot of yellow on the 1st segment, a longitudinal, tapered spot on the dorsum of 2nd, continued very finely on the 3rd, the sides of 1 to 3 are also yellow, as is also, finely, that of the 7th 10th segment very short, flexed on the 9th, with its articulation gaping widely above and a pale brown in colour. On its dorsum, is a similar pyramidal protuberance to that seen in *optata*, but its point is turned slightly back in the direction of the base of abdomen.

Anal appendages black, as long as the 9th and 10th abdominal segments taken together, superior subcylindrical, thickened at the base, very tapered afterward, ending in a blunt point, abruptly bent downward. The inferior nearly as long, seen in profile, it resembles the superior, slightly curved throughout its length but more strongly so, apically, coated with short, yellow hairs. From above, the base is broad, tapering afterwards to a point, which has a short, rounded bosse just before it.

Legs slender, femora black, trochanters, tibiae and spots on the tarsi yellow.

Female closely resembles the male but the wings are a little enfumed and more saffronated at the base. The labrum is not bordered with black; the yellow, antehumeral marking is absent but in this part of thorax, the area is pale brown as far out as the humeral suture.

Abdomen slenderer, compressed laterally, black. (In the Singapore type specimen, the dorsal line on the first two segments is absent), the lateral borders of segments 1 to 8 are finely yellow but broader on the first 2. The 8th and 9th segments very short. Vulvar scale black, very short, rounded, projecting and spout-like.

Anal appendages small, subcylindrical, thick, separated by a small, rounded protuberance which terminates the abdomen.

Legs black, femora pale blackish brown.

Hab. Karen Mts., Upper Burma. Female type from Singapore, collected by Mr. Alfred Wallace; male type collected by Mr. Fea 19th June and a paratype female on the 19th April, now in the Selysian collection.

13. *Idionyx corona*, sp. nov. M.S., Memoirs of Pusa.

A single female from the Babaruddin Hills, Mysore, 4,700', 1-6-1915, coll. Ramakrishna.

Abd. 22 mm. Hindwing 38 mm. (The last 5 segments of the abdomen are missing, the probable length of the whole would be about 40 mm.).

Head: eyes large and globular, probably deep sea blue in life, now reddish brown, moderately fused. Occiput small, black with a tuft of stiff, black hairs in the middle line and fringed behind with long, yellow hairs, this fringe being continuous round the posterior margin of the eyes. Vesicle remarkably developed into a long, elevated spine shaped like the double crown of ancient Upper and Lower Egypt and 2.75 mm. in length, bluish black. Frons with a deep fissure, bronzed green or bluish green above and in front; epistome black; labium yellowish at the base, broadly blackish brown along the border as is also the labrum.

Thorax bronzed green marked by a narrow, bright yellow, lateral stripe which traverses the spiracle. The posterior border of the metepimeron bright yellow. Above blackish brown, unmarked.

Wings enfumed diffusely around the areolar network, the centres of the cells being clear. A diffuse saffronation along the costa as far as the stigma and most markedly at the base. Membrane white tinged with brown posteriorly. Stigma black, unbraced, not quite 3 mm.

A single row of discoidal cells nearly as far as the node. Hypertrigone traversed once in the forewing, entire in the hind. Arc at the 2nd antenodal nervure. Loop 11 cells. Only 2 rows of cells posterior to *Cui*.

Nodal index :— $\frac{8.13}{9.9} \frac{12.7}{9.9}$ *Cui* angulated at its origin in the hindwing and rather lost in the general net-work in the right wing.

Abdomen black or bronzed black, unmarked save for a fine, mid-dorsal, apical, yellow line on the 2nd segment.

Legs black, coxæ yellow, tibiæ yellowish or pale brown on the extensor surfaces. Moderately long and slim. Hind femora with a row of closely-set, long, evenly sized, fine spines. Tarsal claws bifid.

14. *Idionyx ornata*, sp. nov. M.S., Memoirs of Pusa.

A single female from Shillong, 2-6-1920, coll. T. B. Fletcher.

Taken in dense jungle and difficult to see in flight.

Abd. 38 mm. Hindwing 36 mm.

Head relatively large; face brownish yellow, the upper part of frons a deeper colour and slightly metallic; labium reddish brown, dark; vesicle dark yellow highly developed and projecting as a blunt spine but not to the same extent as in the former species. Eyes probably deep blue during life but now reddish brown; occiput small, black.

Thorax small, metallic green, marked with bright yellow as follows:—

Antechumeral, oval spots not extending beyond halfway to the alar sinus, well defined and pointed below; alar sinus yellow; a lateral, broad stripe and the posterior border of the metepimeron more or less broadly yellow. Above blackish but crossed by a yellow stripe which connects up laterally with the yellow stripes.

Legs slim, coxæ yellow, femora and tarsi black; tibiæ bright yellow with black spines.

Abdomen long, laterally compressed, broadening towards the anal end, shiny black, the ventral borders of segments, 2, 3 and 8 marked with bright yellow. The dorsum of the 2nd broadly, and that of the 3rd and basal half of the 4th finely marked with pale yellow. Anal appendages short, pointed, black.

Wings hyaline, saffronated at the bases only as far as the 2nd antenodal nervure. Membrane white; stigma black, covers $2\frac{1}{2}$ cells.

Nodal index :— $\frac{9.13}{10.9} \frac{13.8}{9.11}$. One row of discoidal cells nearly as far as the node in the right forewing, beyond the node in the left forewing; hypertrigones traversed twice in the forewings, once in the hindwings; 3 rows of cells posterior to *Cui* in the forewing; 13 to 16 cells in the loop.

(To be continued.)

HAND-LIST OF THE "BIRDS OF INDIA."

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

PART III.

Family LANIIDÆ.

628. (469) **Lanius excubitor lahtora.** *The Indian Grey Shrike.*
Collurio lahtora *Skyes, P.Z.S., 1832, p. 86 (Deccan).*
Breeding tropical India.
629. (470) **Lanius excubitor pallidirostris.** *The Allied Grey Shrike.*
L. pallidirostris Cassin., P. Acad. Phil. v., p. 244 (1852),
(East Africa).
Breeding N. Baluchistan, Turkestan.
630. (471) **Lanius excubitor aucheri.** *Bonaparte's Grey Shrike.*
L. aucheri Bonpte. Rev. Zool., 1853, p. 294 (Persia).
Breeding Palestine to Persia.
631. (472) **Lanius excubitor przewalskii.** *Bogdanow's Grey Shrike.*
L. przewalskii Bogd. Wur. der Russ. Faun., p. 147 (1881),
(Tashkent).
Breeding E. Turkestan, Tian Schan, etc.
632. (473) **Lanius vittatus.** *The Bay-backed Shrike.*
Valenc. Diet., Sci. Nat. xi., p. 227 (1826), (Pondicherry).
633. (474) **Lanius colluroides.** *The Burmese Shrike.*
Less. Voy., Belang, p. 250 (1834), (Pegu).
634. (475) **Lanius nigriceps nigriceps.** *The Indian Black-headed Shrike.*
Collurio nigriceps Frank, P.Z.S., 1831, p. 117 (Ganges,
Calcutta-Benares).
Breeding N. E. India and Burma.
635. (476) **Lanius nigriceps longicaudatus.** *The Siam Black-headed Shrike.*
L. longicaudatus O-Grant, Nov. Zoo. ix., p. 480 (1902),
(Siam), (Bangkok).
Siam and Peninsular Burma.
636. (476) **Lanius schach erythronotus.** *The Rufous-backed Shrike.*
Collurio erythronotus Vigors, P.Z.S., 1831, p. 42 (Hima-
layas), (Lucknow).
N.-W. India to Eastern Bengal.

637. (476) **Lanius schach caniceps.** *The Southern Rufous-backed Shrike.*
L. caniceps Blyth, *J.A.S.B.*, xv., p. 302 (1846), (*South India*).
 Southern India and Ceylon.
638. (477) **Lanius schach tephronotus.** *The Grey-backed Shrike.*
Collurio tephronotus Vigors, *P.Z.S.*, 1831, p. 43 (*Himalayas*), (*Gyantse*).
 Breeding Garhwal to E. Tibet and W. China.
639. (478) **Lanius collurio.** *The Red-backed Shrike.*
Linn. S.N., p. 94 (1758), (*Europe, Sweden*).
 Straggler into India.
640. **Lanius senator niloticus.** *The Eastern Woodchat Shrike.*
Enneoctonus niloticus Bonpte. *Rev. Zool.*, 1853, p. 439 (*The White Nile*).
 Breeding Palestine to Persia.
641. (482) **Lanius cristatus cristatus.** *The Brown Shrike.*
L. cristatus Linn., *S.N.*, p. 93 (1758) (*Bengal*).
 Breeding Siberia, L. Baikal to Amur, Assam Hills.
642. (479) **Lanius cristatus isabellinus.** *The Pale Brown Shrike.*
L. isabellinus Hemp. & Ehr., *Symb. Phys. Aves.*, fol. e., note, (1828), (*Kumfuda, Arabia*).
 Breeding E. Turkestan, Mongolia, etc.
643. (480) **Lanius cristatus phœnicuroides.** *The Rufous Shrike.*
L. phœnicuroides Severtz., *Jour. fur Orn.*, 1873, p. 347 (*Tschimkent*).
 Breeding Transcaspia to Baluchistan, Quetta.
644. (481) **Lanius cristatus lucionensis.** *The Philippines Shrike.*
L. lucionensis Linn., *S.N.*, p. 135 (1766), (*Luzon*).
 Breeding N. China to Korea. Straggler into Burma, etc.
645. (483) **Lanius tigrinus.** *The Thick-billed Shrike.*
 Drapiez, *Dict. Class. Hist. Nat.* xii., p. 523 (1828), (*Java*).
646. (484) **Hemipus picatus picatus.** *The Black-backed Pied Shrike.*
Muscicapa picata Sykes. *P.Z.S.*, 1832, p. 85 (*Deccan*), *India*.
 S. of the Himalayas and S. Burma.
647. (485) **Hemipus picatus capitalis.** *The Brown-backed Pied Shrike.*
Muscicapa capitalis McClelland *P.Z.S.*, 1839, p. 157 (*Assam*).
 Himalayas, Garhwal to Assam, N. Burma and Shan States.

648. **Hemipus hirundinaceus.** *The Malay Pied Shrike.*
Muscicapa hirundinacea Temm. Pl. Col. iii., p. 51 (1824),
(Java).
 Straggler, Siam and Burma and once M. Cacher.
649. (486) **Tephrodornis pelvicus pelvicus.** *The Nepal Wood*
Shrike.
Tenthea pelvica Hodg. Ind. Rev. I., p. 477 (1837), (Nepal).
 Himalayas, Nepal to Assam and Burma.
650. (487) **Tephrodornis pelvicus sylvicola.** *The Malabar*
Wood Shrike.
T. sylvicola Jerd. Madr. Jour. L. S. x., p. 236 (1830),
(Malabar Coast).
 S. W. India, Belgaum to Travancore.
651. (488) **Tephrodornis pondicerianus.** *The Common Wood*
Shrike.
Muscicapa pondiceriana Gmel. S. N., i., p. 939 (1789),
(Pondicherry).
652. (489) **Platylophus ardesiacus.** *The Jay Shrike.*
Lophositta ardesiaca Cabanis, Mus. Hein i., p. 219 (1850),
(Sumatra).
653. (490) **Pericrocotus speciosus speciosus.** *The Indian*
Scarlet Minivet.
Turdus speciosus Lath. Ind. Orn. i., p. 363 (1790), (India),
(Darjiling).
 Northern India to East Assam, North of Brahmapootra.
654. (491) **Pericrocotus speciosus fraterculus.** *The Burmese*
Scarlet Minivet.
P. fraterculus Swinh., Ibis., 1870, p. 244 (Hainan).
 Assam, South of Brahmapootra, Burma, W. Siam, S. China
 to Hainan.
655. (492) **Pericrocotus speciosus andamanensis.** *The Anda-*
manese Scarlet Minivet.
P. andamanensis Tytler, Beavan, Ibis, 1867, p. 322 (Anda-
mans).
 Andamans only.
656. (493) **Pericrocotus speciosus flammifer.** *Davison's*
Scarlet Minivet.
P. flammifer Hume, Str. Feath. iii., p. 321 (1875),
(Pakchan, S. Burma).
 Nwalabo, Tennasserim, Southwards.
657. (494) **Pericrocotus speciosus flammeus.** *The Orange*
Minivet.
Muscicapa flammea Forster, Ind. Zool., p. 25 (1781), (Tra-
vancore).
 Western Ghats of South India.

- * 658. (495) **Pericrocotus brevirostris brevirostris.** *The Short-billed Minivet.*
Muscipeta brevirostris Vigors, P.Z.S., 1831, p. 43 (Mussoorie).
 Chitral to Central Nepal.
659. (495) **Pericrocotus brevirostris affinis.** *The Assam Short-billed Minivet.*
Pericrocotus affinis McClelland, P.Z.S., p. 156. (1839), (Assam).
 E. Nepal to Shan States.
660. (496) **Pericrocotus brevirostris neglectus.** *Hume's Minivet.*
Pericrocotus neglectus Hume, Str. Feath. v., p. 171 (1877), (Tennasserim).
 Tennasserim.
661. (497) **Pericrocotus igneus.** *The Fiery Minivet.*
 Blyth, *J.A.S.B. xv., p. 309 (1846), (Malacca).*
 Tennasserim and Southwards.
662. (498) **Pericrocotus solaris.** *The Yellow-Throated Minivet.*
 Blyth, *J.A.S.B., xv., p. 310, (1846), Nepal to Tennasserim.*
663. (499) **Pericrocotus roseus roseus.** *The Rosy Minivet.*
Muscicapa rosea Vieill., Nouv. Dict. d'Hist. Nat. xxi., p. 486 (1818), (Bengal).
 Himalayas and Burma to Tennasserim.
664. (500) **Pericrocotus peregrinus peregrinus.** *The Small Minivet.*
Parus peregrinus Linn., S.N. i., p. 342 (1766), (no locality), (Umbala).
 N.-W., W. and Central India to Bengal, Oudh and Behar.
664. (500) **Pericrocotus peregrinus vividus.** *The Burmese Small Minivet.*
 Stuart Baker, *Bull. B.O.C. xl., p. 114 (1920), (Uttaran River, Burma).*
 Assam and E. Bengal, Burma, Siam and Cochin China.
665. (500) **Pericrocotus peregrinus malabaricus.** *The Malabar Small Minivet.*
Parus malabaricus Gmel. Syst. Nat. i, p. 1012 (1789), (Malabar).
 South India and Ceylon.

* Bangs and Phillips (Ball. Mus. Comp. Zool. lviii., p. 283, 1914,) have made the type locality of *P. brevirostris* "The Eastern Himalayas," but this cannot be correct. This Minivet was described by Vigors as one of a collection of birds received from the Himalayas and in this collection are specimens of such purely Western forms as *Carduelis spinoides* and *Picus auriceps*. McClelland fully appreciated this when he very properly described the Assam bird and his name of *affinis* must stand whilst the type locality for *brevirostris* must be somewhere in the Western Himalayas for which reason I designate *Mussoorie*.

666. (500) **Pericrocotus peregrinus pallidus.** *The Sind Small Minivet.*
Stuart Baker, *Bull. B.O.C. xl.*, p. 115 (1920), (*Larkhana, Sind*).
Sind and extreme N.-W. India and (?) Mt. Abu.
667. (501) **Pericrocotus erythropygus.** *The White-bellied Minivet.*
Muscicapa erythropygia Jerd., Madr. Jour., L. S. xi., p. 17 (1840).
Central India, S. to Nilgiris, E. to Tirhut and W. to Sind.
668. (502) **Pericrocotus albifrons.** *Jerdon's Minivet.*
Jerdon, *Ibis*, 1862, p. 20 (*Upper Burma*), (*Thayetmyo*).
Upper Burma to Tounghoo.
669. (503) **Pericrocotus cinereus.** *The Ashy Minivet.*
Lafresn. Rev. Zool. viii., p. 94 (1845), (*Luzon, Phillippines*).
Winter Visitor to Burma.
670. (504) **Pericrocotus cantonensis.** *Swinhoe's Minivet.*
Swinhoe, *Ibis*, 1861, p. 42 (*Canton, China*).
Rare winter migrant to S. Burma.
671. (505) **Campophaga melanoschista melanoschista.** *The Dark Grey Cuckoo-Shrike.*
Volvocivora melanoschistus Hodg., Ind. Rev. i., p. 328 (1837), (*Nepal*).
N. India, Muree to Eastern Assam.
672. (506) **Campophaga melanoschista melanoptera.** *The Pale Grey Cuckoo-Shrike.*
Ceblypyris melanoptera Rupp., Mus. Senckenb. iii., p. 25 (1846), (*Bengal*).
The greater part of Burma, Shan States and (?) N. Siam.
673. **Campophaga melanoschista intermedia.** *The Siam Cuckoo-Shrike.*
Volvocivora intermedia Hume, Str. Feath. v., p. 205 (1877), (*Tennasserim*).
Tennasserim, Siam and Malay States.
674. (507) **Campophaga timbriata neglecta.** *The Small Cuckoo-Shrike.*
Volvocivora neglecta Hume, Str. Feath. v., p. 203 (1877), (*S. Tennasserim*).
675. (508) **Campophaga sykesii.** *The Black-headed Cuckoo-Shrike.*
Lalage Skyesii Strickl., A.M.N.H. (L.) xiii., p. 36 (1844) (*Calcutta*).

There remains a considerable amount of work to be done in regard to the Minivets, their geographical distribution and variation.

66. (509) **Campophaga terat.** *The Pied Cuckoo-Shrike.*
Turdus terat Bodd., *Tabl. Pl. Enl.*, p. 17 (1783), (Camorta),
Nicobars.
677. (510) **Graucalus macei macei.** *The Large Cuckoo-Shrike.*
G. macei, *Less., Traite*, p. 349 (1831), (Bengal).
 Continental India, S. of Himalayas, Nepal to W. Assam.
678. (510) **Graucalus macei nipalensis.** *The Himalayan Large Cuckoo-Shrike.*
G. nipalensis *Hodg., Ind. Rev.*, p. 327 (1837), (Nepal).
 Nepal to W. Assam, N. Behar and N.-E. Bengal.
679. (510) **Graucalus macei layardi.** *The Ceylon Large Cuckoo-Shrike.*
G. layardi *Blyth, Ibis*, 1866, p. 368 (Ceylon).
 Ceylon.
680. (510) **Graucalus macei siamensis.** *The Siamese Large Cuckoo-Shrike.*
 Stuart Baker, *Bull. B.O.C. xxxviii.*, p. 69 (1918), (Mi-Nam-Kabren).
 Burma, Siam, Chin and Kachin Hills, E. Assam.
681. (511) **Graucalus dobsoni.** *Dobson's Cuckoo-Shrike.*
Ball, J.A.S.B. xli., Pt. ii., p. 281 (1872), (Andamans).

Sub-family ARTAMINÆ.

682. (512) **Artamus fuscus.** *The Ashy Swallow-Shrike.*
Vieill, Nouv. Dict. d'His. xvii., p. 297 (1817), (Bengal).
683. (513) **Artamus leucorhynchus humei.**
Hume's White-rumped Swallow-Shrike.
Stresemann, Nov. Zool. xx., p. 291 (1913), (S. Andamans).

Family ORIOLIDÆ.

684. (514) **Oriolus indicus indicus.** *The Black-naped Oriole.*
O. indicus *Jerd. Ill. Ind. Orn. Pl. 15* (Continental India).
 Breeding, China and (?) N.-E. Himalayas.
685. (515) **Oriolus indicus tenuirostris.** *The Burmese Black-naped Oriole.*
O. tenuirostris *Blyth, J.A.S.B. xv.*, p. 48 (1846), (Central India).
 Breeding, China, Siam, N.-E. India and Central India.
686. (516) **Oriolus indicus macrorus.** *The Nicobar Black-naped Oriole.*
O. macrorus *Blyth, J.A.S.B. xv.*, p. 46, p. 370 (1846), (Nicobars).

687. (517) **Oriolus indicus andamanensis.** *The Andaman Black-headed Oriole.*
O. andamanensis *Tytler, Beavan, Ibis, 1867, p. 326 (S. Andamans).*
 Andamans.
688. (519) **Oriolus oriolus oriolus.** *The European Oriole.*
Coracias oriolus *Linn., S. N. ed. i., p. 107 (1758), (Sweden).*
 A straggler into N.-W. India.
689. (518) **Oriolus oriolus kundoo.** *The Indian Oriole.*
O. kundoo *Sykes, P.Z.S., 1832, p. 27 (Deccan).*
 India and Burma.
690. (520) **Oriolus xanthonotus.** *The Malay Black-headed Oriole.*
Horsf., Trans. Linn. Soc. xiii., p. 152 (1821), (Java).
691. (521) **Oriolus luteolus luteolus.** *The Indian Black-headed Oriole.*
Sturnus luteolus *Linn., S. N., x. ed. i, p. 167 (1758) (Bengal).*
 India, Northern Burma and Siam.
- * 692. (521) **Oriolus luteolus thaiaeous.** *The Siamese Black-headed Oriole.*
Hartert, Bull. B.O.C., No. ccxxxviii., p. 63 (1918), (Koh Lak Siam).
 South Siam and E. Tennasserim.
693. (522) **Oriolus trailii** *The Maroon Oriole.*
Pastor trailii *Vigors, P.Z.S., 1831, p. 175 (Himalayas) (Darjiling).*

Family EULABETIDÆ.

694. (523) **Eulabes religiosa.** *The Southern Grackle.*
Gracula religiosa *Linn., S. N. i., p. 154 (1766), (Asia), (Travancore).*
695. (524) **Eulabes intermedia intermedia.** *The Indian Grackle.*
Gracula intermedia *A. Hay, Madr. Jour. L. S. xiii., Pt. ii., p. 157 (1844), (Cachar).*
 Himalayas, Kumaon to Assam, Burma and Siam.
696. (524) **Eulabes intermedia andamanensis.** *The Andaman Grackle.*
Eulabes andamanensis *Tytler, Beavan, Ibis, 1867, p. 331 (Andamans).*
 Andamans and Nicobars.

* This is a rather doubtful sub-species, as individual variation is very great.

697. (525) **Eulabes intermedia javana.** *The Malay Grackle.*
Eulabes javanus Cuvier, *Regne Anim. i.*, p. 377 (1829),
 (Java).
 Extreme South of Siam and Burma to Java, etc.
698. (526) **Eulabes ptilogenys.** *The Ceylon Grackle.*
Gracula ptilogenys Blyth, *J.A.S.B. xv.*, p. 285 (1846),
 (Ceylon).
699. (527) **Calornis chalybeius.** *The Glossy Calornis.*
Turdus chalybeius Horsf., *Trans. Linn. Soc. xiii.*, p. 148.
 (1821), (Java), (Sikkim).
700. (261) **Psaraglossa spiloptera.** *The Spotted-winged Stare.*
Lamprotornis spilopterus Vigors, *P.Z.S.*, 1831, p. 35 (Hima-
 layas).

Family STURNIDÆ.

701. (528) **Pastor roseus.** *The Rose-coloured Starling.*
Turdus roseus Linn., *Sys. Nat., ed. x., i.*, p. 170 (1758)
 (Lapland).
702. *(529) **Sturnus vulgaris humii.** *The Himalayan Starling.*
Sturnus humii Brooks, *Str. Feath. viii.*, p. 207 (1873),
 (Larkhana).
 Breeds Kashmir to Nepal and Garhwal.
703. (530) **Sturaus vulgaris porphyronotus.** *The Central
 Asian Starling.*
S. porphyronotus Sharpe, *Ibis*, 1888, p. 438 (Yarkand).
 Breeds Turkestan, Tianschan.
704. (531) **Sturnus vulgaris minor.** *The Small Indian Starling.*
Sturnus minor Hume, *Str. Feath., viii.*, p. 207 (1873),
 (Sind).
 Resident Sind.
705. (532) { **Sturnus vulgaris poltaratzskii.** *Finsch's Starling.*
 (533) } *S. poltaratzskii* Finsch, *P.Z.S.*, 1878, p. 713 (Lake Marka-
 Kul, Altai).
 ? Breeds Krasnyarik to L. Baikal.
706. (534) **Sturnus vulgaris nobilior.** *Hume's Starling.*
S. nobilior Hume, *Str. Feath.*, 1879, p. 175 (Kandahar).
 Breeds E. Persia and Afghanistan.
707. (534a) **Sturnus vulgaris dresseri.** *Dresser's Starling.*
S. purpurescens dresseri Buturlin, *Orn. Jahrb.*, 1904, 208
 (Askabad).
 Samarkand. Straggler into India.

* See Hartert, *Novitates Zoologicæ* xxv., p. 327 (1918).

708. (534b) **Sturnus vulgaris dzungaricus.** *Buturlin's Starling.*
S. dzungaricus *Buturlin, Orn. Jahrb.*, 1904, p. 208 (*Dzungaria*).
? Breeds Dzungaria.
709. (535) **Spodiopsar cineraceus.** *The Grey Starling.*
Sturnus cineraceus *Temm., Pl. Col.*, 556 (1832), (*Japan*).
- *710. (536) **Sturnia turdiformis.** *The Chinese Myna.*
Pastor turdiformis *Wagler, Syst. Av. Pastor, sp.* 15 (1827),
(*China*).
711. (538) **Sturnia malabarica malabarica.** *The Grey-headed Myna.*
Turdus malabaricus *Gmel. Syst. Nat. i.*, p. 816 (1789), (*Malabar*).
Breeding N. and E. of Mount Abu.
712. (537) **Sturnia malabarica blythii.** *Blyth's Myna.*
Pastor blythii *Jerd., Madr. Jour. L.S. xiii.*, p. 133 (1844),
(*Malabar*).
Breeding S. and W. of Mount Abu.
713. (539) **Sturnia malabarica nemoricola.** *The White-winged Myna.*
S. nemoricola *Jerd., Ibis*, 1862, p. 22 (*Thayetmyo, U. Burma*).
Breeding Siam, Pegu and Malay Peninsula.
714. (540) **Sturnia malabarica andamanensis** *The Andaman Myna.*
Temenuchus andamanensis *Tytler, Beavan, Ibis*, 1867, p. 329 (*Andamans*).
Andamans and Nicobars.
715. (541) **Sturnia malabarica erythropygia.** *The Nicobar Myna.*
S. erythropygia *Blyth, J.A.S.B. xv.*, p. 34 (1846), (*Car-Nicobars*).
Car-Nicobars.
716. (541) **Sturnia malabarica katchalensis.** *Richmond's Myna.*
S. erythropygia katchalensis *Richmond, Pro. U.S. Nat. Mus xv.*, p. 293 (1902), (*Katchal*).
Katchal Island.
717. (542) **Agropsar sturnina.** *The Daurian Myna.*
Gracula sturnina *Pall. Reise Russ. Reich. iii.*, p. 695 (1776),
(*Dauria*).
718. (543) **Ampeliceps coronatus.** *The Gold-crested Myna.*
Blyth, *J.A.S.B. xi.*, p. 194 (1842), (*Tennasserim*).

* *Oriolus sinensis*, Gmelin is preoccupied by *Lin. Syst. Nat.* 1766, p. 160.

719. (544) **Temenuchus pagodarum.** *The Black-headed Myna.*
Turdus pagodarum Gmel., Syst. Nat. i., p. 816 (1789),
(Malabar).
720. (545) **Sturnornis senex.** *The White-headed Myna.*
Heterornis senex Temm. Bonap., Consp., Av. i., p. 419
(1851), (Bengal).
721. (546) **Grauculipica nigricollis.** *The Black-necked Myna.*
Gracula nigricollis Payk., Stockholm Acad. Hand-L.
xxviii., p. 291 (1807), (China).
722. (547) **Grauculipica burmanica burmanica.** *Jerdon's*
Myna.
Sturnia burmanica Jerd., Ibis, 1862, p. 21 (Thayetmyo,
U. Burma).
 Western and South Burma.
- 723.* (547) **Grauculipica burmanica fuscogularis.** *Salvadori's*
Myna.
Poliopsar fuscogularis Salvadori, Ann. Mus. Civ. Gen. (2)
vii., p. 364 (1889), (Karennee).
 East Burma and Siam.
724. (548) **Grauculipica leucocephala leucocephala.** *Hume's*
Myna.
Acridotheres leucocephalus Gigl. & Salv., Atti. R. Acc. v.,
p. 273 (1870), p. 185 (Siam).
 Cochin China, Siam and S. Shan States.
725. (548) **Grauculipica leucocephala annamensis.** *Well's*
Myna.
Wells Bull. B.O.C. xxxix., p. 78 (1919), (Nhatrang, Annam)
 Annam and N. Shan States.
726. (548) **Grauculipica leucocephala incognita.** *Hume's*
Myna.
Sturnia incognita Hume, Str. Feath. viii., p. 396 (1879),
(Tennasserim).
 Tennasserim and South Burma.
727. (549) **Acridotheres tristis tristis.** *The Common Myna.*
Paradisea tristis Linn., Syst. Nat. i., p. 167 (1766), (?
Phillippines).
 India and Burma.
728. (550) **Acridotheres tristis melanosternus.** *The Com-*
mon Ceylon Myna.
A. melanosternus Legge, A.M.N.H. (5) iii., p. 168 (1879),
(Ceylon).
 Ceylon.

* This appears to be a good sub-species, though not hitherto generally admitted.

729. (551) **Acridotheres ginginianus.** *The Bank Myna.*
Turdus ginginianus Lath., *Ind. Orn. i.*, p. 362 (1790)
 (India), (Nadia).
730. (552) **Æthiopsar fuscus fuscus.** *The Indian Jungle Myna.*
Pastor fuscus Wagl., *Syst. Av. Pastor, Sp.* 6 (1827), (India),
 (E. Bengal).
 India generally, not Assam.
731. (553) **Æthiopsar fuscus grandis.** *The Burmese Jungle Myna.*
Acridotheres grandis Moore, *Horsf. & M. Cat. ii.*, p. 537
 (1856-8), (Sumatra), (Tennasserim).
 South Burma and Malay Peninsula and Siam.
732. (553) **Æthiopsar fuscus infuscatus.** *The Assam Jungle Myna.*
 Stuart Baker *Bull. B.O.C. xxxviii.*, p. 70 (1918), (L. Chindwin).
 Assam, Manipur, Cachar, N. Burma.
733. (554) **Æthiopsar albocinctus.** *The Collared Myna.*
Acridotheres albocinctus Godw.-Aus. *Wald. Ibis*, 1875,
 p. 251 (Manipur).
 Manipur and Burma.
734. (555) **Sturnopastor contra contra.** *The Pied Myna.*
Sturnus contra Linn., *Syst. Nat. i.*, p. 290 (1766), (India),
 (Calcutta).
 India and N. Assam.
735. (556) **Sturnopastor contra superciliaris.** *The Burmese Pied Myna.*
S. superciliaris Blyth, *J.A.S.B. xxxii.*, p. 77 (1863),
 (Burma), (Rangoon).
 S. Assam and Burma.
736. (556) **Sturnopastor contra floweri.** *The Siamese Pied Myna.*
S. floweri Bull. *B.O.C. vii.*, p. 17 (1897), (Siam), (Bangkok, Siam).
Siam and E. Tennasserim.
- Family MUSCIPIDÆ.
737. (557) **Muscicapa striata neumanni.** *The Eastern Spotted Fly-Catcher.*
 Poche, *Orn. Monats.*, 1904, p. 26 (Turkestan).
738. 558) **Hemichelidon sibirica cacabata.** *The Himalayan Sooty Fly-Catcher.*
Muscicapa sibirica cacabata Penard, *Pro. N.E. Zool. Club*
vii., p. 21 (1919).

739. (559) **Hemichelidon cinereiceps.** *The Ferruginous Fly-Catcher.*
Hodg., *P.Z.S.*, 1845, p. 32 (*Nepal*).
740. (560) **Siphia strophciata.** *The Orange-gorgeted Fly-Catcher.*
Hodg., *Ind. Rev. i.*, p. 651 (1837), (*Nepal*).
741. (561) **Siphia parva parva.** *The European Red-breasted Fly-Catcher.*
Muscicapa parva Bechst., *Getrue Abbild. heft* (2), p. 26 (1793), (*East Holland*).
Breeding N. Europe and W. Siberia, N. Tibet and Ladak.
742. (562) **Siphia parva albicilla.** *The Eastern Red-breasted Fly-Catcher.*
Muscicapa albicilla Pall., *Zoogr. Rosso-Asiat. i.*, p. 462 (1827), (*Dauria*).
Breeding Eastern Siberia.
743. (563) **Siphia parva hyperythra.** *The Indian Red-breasted Fly-Catcher.*
S. hyperythra Cab. *J.F.O.*, 1866, p. 391 (*Ceylon*).
Breeding Himalayas.
744. (564) **Cyornis cyaneus.** *The White-tailed Blue Fly-Catcher.*
Muscitrea cyanea Hume, *Str. Feath. v.*, p. 101 (1877), (*Muleyit Mt.*)
Tennasserim and Malay Peninsula.
745. (565) **Cyornis erythacus hodgsonii.** *The Rusty-breasted Blue Fly-Catcher.*
Siphia hodgsonii Verr. *Nouv. Arch. Nus. Par. vi.*, *Bull.*, p. 34 (1870), (*Moupin*).
Assam, S. of Brahmapootra, N. Burma and S. in winter.
746. (566) **Cyornis hyperythrus.** *The Rufous-breasted Blue Fly-Catcher.*
Muscicapa hyperythra Blyth, *J.A.S.B. xi.*, p. 885 (1842), (*India*).
747. (567) **Cyornis leucomelanurus leucomelanurus.** *The Slaty Blue Fly-Catcher.*
Digenea leucomelanura Hodg., *P.Z.S.*, 1845, p. 26 (*Nepal*),
Himalayas, Kashmir to E. Assam, N. of Brahmapootra.
748. (567) **Cyornis leucomelanurus cerviniventris.** *The Tibet Slaty Blue Fly-Catcher.*
Digenea cerviniventris Sharpe, *Cat. B.M. iv.*, p. 460 (1879), (*Khasia Hills*).
Hills, South of the Brahmapootra.
749. (568) **Cyornis superciliaris.** *The White-browed Blue Fly-Catcher.*
Muscicapa superciliaris Jerd., *Madr. Jour. L. S. xi.*, p. 16 (1840), (*N. Indian Ghauts*).

750. (569) **Cyornis melanoleucus melanoleucus.** *The Little Pied Fly-Catcher.*
Muscicapula melanoleuca Hodg., *Blyth, J.A.S.B. xii.*, p. 940 (1843), (*Nepal*).
 Nepal to E. Assam, N. of the Brahmapootra.
751. (569) **Cyornis melanoleucus westermanni.** *The Malay Pied Fly-Catcher.*
Muscicapula westermanni Sharpe, *P.Z.S.*, 1888, p. 270 (*Mount of Perak*).
 Hills, S. of Brahmapootra, Burma, etc.
752. (570) **Cyornis astigma.** *The Little Blue and White Fly-Catcher.*
Muscicapa astigma Hodg. in *Gray's Zool. Misc.*, p. 84 (1844), (*Nepal*).
753. (571) **Cyornis sapphira.** *The Sapphire-headed Fly-Catcher.*
Muscicapula sapphira Tickell, *Blyth, J.A.S.B. xii.*, p. 939 (1843), (*Darjiling*).
754. (572) **Cyornis oatesi.** *The Rufous-bellied Blue Fly-Catcher.*
Niltava oatesi Salvadori, *Ann. Mus. Civ. Gen.* (2) v., p. 514 (1887), (*Muleyit*).
 Manipur and Hills of Tennasserim. This is probably only a race of *vivida*.
755. (573) **Cyornis pallipes pallipes.** *The White-bellied Blue Fly-Catcher.*
Muscicapa pallipes Jerd., *Madr. Jour. L. S. xi.*, p. 15 (1840), (*Coonor Ghaut*).
 South India.
756. **Cyornis palipes hainana.** *Grant's Blue Fly-Catcher.*
Siphia hainana Grant, *Bull. B.O.C. x.*, p. 36 (1900), (*Hainan*).
 Hainam, Siam and (?) Tennasserim.
757. (574) **Cyornis unicolor unicolor.** *The Pale Blue Fly-Catcher.*
C. unicolor Blyth, *J.A.S.B. xii.*, p. 1007 (1843), (*Darjiling*).
 Himalayas from Sikkim to E. Assam, S. to Chin Hills.
758. (574) **Cyornis unicolor infuscata.** *Blyth's Pale Blue Fly-Catcher.*
Muscicapa infuscata Blyth, *Ibis*, 1870, p. 165 (*Java*).
 Java, Peninsular Siam and (?) Tennasserim.
- *759. (575) **Cyornis rubeculoides.** *The Blue-throated Fly-Catcher.*
Phœnicura rubeculoides Vigors, *P.Z.S.*, 1831, p. 35.

*The genus *Cyornis* has never been fully worked out, many of the species are separable into sub-species, and there is still considerable confusion in the nomenclature.

760. **Cyornis dialilæma.** *Salvadori's Blue-throated Fly-Catcher.*
 Salvadori, *Ann. Mus. Civ. Geno.* xxviii., 1889, p. 387 (*Tahu Karennee*).
 Siam, Eastern and Southern Burma.
761. (576) **Cyornis banyumas tickelliæ.** *Tickell's Blue Fly-Catcher.*
Cyornis tickelliæ Blyth, *J.A.S.B.* xii., p. 941 (1843), (*Central India*).
 Peninsula India and Ceylon and (?) Manipur and N. Burma.
762. (577) **Cyornis magnirostris.** *The Large-billed Blue Fly-Catcher.*
Blyth, J.A.S.B. xviii., p. 814 (1849).
 Himalayas, Sikkim to E. and Assam and the greater part of Burma.
763. (578) **Nitidula hodgsoni.** *The Pigmy Blue Fly-Catcher.*
Nemura hodgsoni Moore, *P.Z.S.*, 1854, p. 76 (*Nepal*).
764. (579) **Stoparola melanops melanops.** *The Verditer Fly-Catcher.*
Muscicapa melanops Vigors, *P.Z.S.*, 1831, p. 171 (*Himalayas*).
 India, N. of the Nilgiris and Northern Burma.
765. (579) **Stoparola melanops thallasoides.** *The Malayan Verditer Fly-Catcher.*
Glaucomyias thallasoides Cab. *Mus. Hein.* i., p. 53 (1850), (*Sumatra*).
 Peninsular Burma to Sumatra.
766. (580) **Stoparola melanops sordida.** *The Dusky Blue Fly-Catcher.*
Glaucomyias sordida Wald. *Ann. M. N. H.* (4), v., p. 218 (1870), (*Ceylon*).
 Ceylon only.
767. (581) **Stoparola melanops albicaudata.** *The Nilgiri Blue Fly-Catcher.*
Muscicapa albicaudata Jerd., *Madr. J.L.S.* xi., p. 16 (1840), (*Nilgiris*).
 Nilgiri and Plain Hills, and Hills of Travancore.
768. (582) **Muscitrea grisola.** *The Grey Fly-Catcher.*
Tephrodornis grisola Blyth, *J.A.S.B.* xii., p. 180 (1843), (*Malay Peninsula*).
769. (583) **Anthipes monileger monileger.** *Hodgson's White-gorgeted Fly-Catcher.*
Dimorpha monileger Hodg., *P.Z.S.*, 1845, p. 26 (*Sikkim*).
 Sikkim, Butan and (?) Hills, N. of Brahmapootra.

770. (584) **Anthipes monileger leucops.** *Sharpe's White-gorgeted Fly-Catcher.*
Digenea leucops Sharpe, P.Z.S., 1888, p. 246 (Shillong Hills, S. of Brahmapootra, Karennie).
771. (585) **Anthipes monileger submoniliger.** *Hume's White-gorgeted Fly-Catcher.*
A. submoniliger Hume, Str. Feath. v., p. 105 (1877).
(Muleyit Mount).
Tennasserim.
772. (586) **Anthipes poliogenys.** *Brook's Fly-Catcher.*
Cyornis poliogenys Brooks, Str. Feath. viii., p. 469 (1879).
(Salbaree, Sikkim Terai).
Sikkim to E. Assam, N. and S. of the Brahmapootra.
773. (587) **Anthipes olivaceus.** *Hume's Fly-Catcher.*
Cyornis olivacea Hume, Str. Feath. v., p. 338 (1877).
(Extreme S. Tennasserim).
South of Tennasserim, Malay Peninsula, etc.
477. (588) **Alseonax latirostris.** *The Brown Fly-Catcher.*
Muscicapa latirostris Raffl. Trans. Lin. Soc. xiii., p. 312
(1821), (Sumatra).
All Burma and India except extreme N.-W.
775. (589) **Alseonax ruficaudus.** *The Rufous-tailed Fly-Catcher.*
Muscicapa ruficauda Swin. Nat. Lib. x., p. 251 (1838).
(India), (Kashmir).
776. (590) **Alseonax muttui.** *Layard's Fly-Catcher.*
Butalis muttui Layard, A.M.N.H. (2) xiii., p. 127 (1854).
(Ceylon).
777. (591) **Ochromela nigrorufa.** *The Black and Orange Fly-Catcher.*
Saxicola nigrorufa Jerd., Madr. Jour., L. S. x., p. 266
(1839), (Nilgiris).
778. (592) **Culcicapa ceylonensis.** *The Grey-headed Fly-Catcher.*
Platyrhynchus ceylonensis Swain's Zool. iii., ser. 1, i.,
(1820-1).
779. (593) **Niltava grandis.** *The Large Niltava.*
Chaitaris grandis Blyth. J.A.S.B. xi., p. 189 (1842).
(Darjiling).
780. (594) **Niltava sundara.** *The Rufous-bellied Niltava.*
Hodg., Ind. Rev. i., p. 650 (1837) (Nepal).
781. (595) **Niltava macgrigoriae.** *The Small Niltava.*
Phoenicura macgrigoriae Burton, P.Z.S., 1835, p. 152
(Himalayas).

782. (596) **Philentoma velatum.** *The Maroon-breasted Fly-Catcher.*
Drymophila velata Temm. *Pl. Col. No. 334* (1823), (*Timor, Java*).
783. (597) **Philentoma pyrrhopterum.** *The Chestnut-winged Fly-Catcher.*
Muscicapa pyrrhoptera Temm. *Pl. Col. No. 596* (1823), (*Borneo and Sumatra*).
784. (598) **Terpsephone paradisi paradisi.** *The Indian Paradise Fly-Catcher.*
Muscicapa paradisi Linn., *Syst. Nat. i.*, p. 324 (1766), (*Ceylon*).
 All India to W. Assam, N. of Brahmapoetra.
785. (599) **Terpsephone paradisi affinis.** *The Burmese Paradise Fly-Catcher.*
Tchitreia affinis Hay, *Blyth, J.A.S.B. xv.*, p. 292 (1846), (*Malay Pen. and Tennasserim*).
 Assam, Burma.
786. (600) **Terpsephone paradisi nicobarica.** *The Nicobar Paradise Fly-Catcher.*
T. nicobarica Oates, *Fauna B. I. ii.*, p. 48 (1890), (*Nicobars*).
 Andamans and Nicobars.
- *787. (601) **Hypothymis azurea sykesi.** *The Madras Black-naped Fly-Catcher.*
 Stuart Baker *Bull. B.O.C. xl.*, p. 1 (1920), (*Deccan*).
 South India, Deccan and Madras.
788. (601) **Hypothymis azurea styani.** *The Indian Black-naped Fly-Catcher.*
Siphia styani Hartl. *Abh. Nat. Ver. Brom. xvi.*, 2, p. 248 (1898), (*Hoihow, Hainan*).
 N. India, Assam, Burma, China, Hainan, etc.
789. (601) **Hypothymis azurea ceylonensis.** *The Ceylon Black-naped Fly-Catcher.*
H. ceylonensis Sharpe, *Cat. B.M. iv.*, p. 277 (1879), (*Ceylon*).
 Ceylon.
790. (601) **Hypothymis azurea forrestia.** *The Malay Black-naped Fly-Catcher.*
 Oberholser, *Pro. U.S. Nat. Mus. xxxix.*, p. 601 (1911), (*Mergui*).
 Mergui Archipelago.

* *Muscicapa ceruleocephala* of Skyes (1832) is pre-occupied by *Scopoli*, *Del. Flor-et Faun.* 1786, p. 95.

791. (602) **Hypothymis azurea tytleri.** *The Andaman Black-naped Fly-Catcher.*
Myiagra tytleri *Beavan, Ibis, 1867, p. 324 (Andamans).*
 Andamans, Great and Little Cocos.
792. (602) **Hypothymis azurea idiochroa.** *Car-Nicobar Black-naped Fly-Catcher.*
Oberholser, Pro. U. S. Nat. Mus., xxix., p. 596 (1911).
(Car-Nicobars).
 Car-Nicobars.
793. (602) **Hypothymis azurea nicobarica.** *The Nicobar Black-naped Fly-Catcher.*
Bianchi, Ann. Mus. Zool. Acad. St. Petersb. xii., (I), p. 76, (1907), (Nicobars).
 Nicobars.
794. (603) **Chelidorhynch hypoxanthum.** *The Yellow-bellied Fly-Catcher.*
Rhipidura hypoxantha Blyth, J.A.S.B., xii., p. 935 (1843)
(Darjiling).
 Himalayas, Simla to Burma and Burma Hills to Pegu.
795. (604) **Rhipidura aureola aureola.** *The White-browed-Fantail Fly-Catcher.*
R. aureola Less. Traite. p. 390 (1830 or Jan. 1831), (Bengal),
 The whole of India and extreme N. Burma.
796. *(604) **Rhipidura aureola burmanica.** *The Burmese White-browed Fantail Fly-Catcher.*
Leucocerca burmanica Hume, Str. Feath. ix, p. 175 (1881).
(Tkoungyeen).
 Burma, Siam.
797. (604) **Rhipidura aureola compressirostris.** *The Ceylon, White-browed Fantail Fly-Catcher.*
Leucocerca compressirostris Blyth, J.A.S.B. xviii., p. 815 (1849), (Ceylon).
 Ceylon.
798. (605) **Rhipidura albicollis albicollis.** *The White-throated Fantail Fly-Catcher.*
Platyrynchus albicollis Vieill, Nouv. Dict. d'Hist. Nat. xxvii., p. 13 (1818), (Bengal).
 Bengal, South Assam and Arrakan.
799. (605) **Rhipidura albicollis stanleyi.** *Baker's White-throated Fantail Fly-Catcher.*
Stuart Baker, Bull. B.O.C. xxxvi., p. 81 (1916), (Abor Hills).
 Himalayas, N. of Assam into N. Burmese Hills.

* The name *aureola* is some months earlier than *albonotata*, and must, therefore, be used for this Fly-Catcher.

800. (606) **Rhipidura javanica.** *The Javan Fantail Fly-Catcher.*
Muscicapa javanica Sparrm. *Mus. Carl. iii.*, Pl. 75 (1788),
(Java).
801. (607) **Rhipidura pectoralis.** *The White-spotted Fantail Fly-Catcher.*
Leucocerca pectoralis Jerd. *iii.*, *In. Orn. Text to Pl. ii.*
 (1847), (*Nilgiris*).

Family TURDIDÆ.

Sub-family Saxicolinæ.

802. *(608) **Saxicola caprata rossorum.** *The Common Pied Bush-Chat.*
Pratincola caprata rossorum Hartert, *Jour. f. Orn.* 1910,
 p. 180 (*Transcaspia*).
 N.-W. India and Kashmir.
803. (608) **Saxicola caprata bicolor.** *The Northern Indian Pied Bush-Chat.*
S. bicolor Sykes, *P.Z.S.* 1832, p. 92 (*Deccan*).
 N. India from the Deccan to the Himalayas.
804. (609) **Saxicola caprata atrata.** *The Southern Indian Pied Bush-Chat.*
Pratincola atrata Kelaart, *Blyth, J.A.S.B. xx.*, p. 177
 (1851), (*Ceylon*).
 Ceylon and S. India.
805. (610) **Saxicola torquata indica.** *The Indian Bush-Chat.*
Pratincola indica Blyth, *J.A.S.B. xvi.*, p. 169 (1847)
 (*India*), (*Kashmir*).
 Breeding Kashmir and N.-W. Himalayas.
806. (610) **Saxicola torquata stejneri.** *The Japanese Bush-Chat.*
Pratincola rubicola stejneri Parrot, *Verh. Orn. Ges. Bay*
xiii., p. 124 (1908), (*Yesso, Japan*).
 Breeding E. Siberia and Japan.
807. (610) **Saxicola torquata przewalskii.** *The Turkestan Bush-Chat.*
Pratincola maura var. *prezvalskii*, *Pleske, Weiss. Res. P.*
Reis. i., p. 46 (1889), (*Kansu*).
 Breeding Turkestan and Tibet.
808. (611) **Saxicola leucura.** *The White-tailed Bush-Chat.*
Pratincola leucura Blyth, *J.A.S.B. xvi.*, p. 474 (1847),
 (*Upper Sind*).

* The correct generic name for this bird and its congeners is *Saxicola*, and *Cyanthe* is the correct generic name for the birds hitherto known as *Saxicola*.

809. (612) **Saxicola macrorhyncha**. *Stoliczka's Bush-Chat*.
Pratincola macrorhyncha *Stol.*, *J.A.S.B.* xli., 2, p. 238
(1872), (*Sind*).
810. (613) **Saxicola insignis**. *Hodgson's Bush-Chat*.
Pratincola insignis *Blyth*, *J.A.S.B.* xvi., p. 129 (1847),
(*India*), (*Cawnpore*).
811. (614) **Oreicola jerdoni**. *Jerdon's Bush-Chat*.
Blyth, *Ibis*, 1867, p. 14 (*Dibrugarh*).
812. (615) **Oreicola ferrea ferrea**. *The Dark Grey Bush-Chat*.
Saxicola ferrea *Grey*, *Cat. M. and B., Nepal*, p. 71 (1846),
(*Nepal*).
India.
813. (615) **Oreicola ferrea haringtoni**. *The Burmese Dark
Grey Bush-Chat*.
Hartert, *Vog. Pal. i.*, p. 710 (1909), (*Moupin*).
Burma and China.
814. (616) **Œnanthe monacha**. *The Hooded Chat*.
Saxicola monacha *Temm.*, *Pl. Col.* 359 (1825), (*Nubia*).
Baluchistan and Sind to N. E. Africa.
815. (617) **Œnanthe alboniger**. *Hume's Chat*.
Saxicola alboniger *Hume*, *Str. Feath. i.*, p. 2 (1873), (*Sind*).
Sind to Gilgit.
816. { ^{*}(618)
(619) } **Œnanthe picata**. *The Pied Chat*.
Saxicola picata *Blyth*, *J.A.S.B.* xvi., p. 131 (1847), (*Sind*).
817. (620) **Œnanthe opistholeuca** *Strickland's Chat*.
Saxicola opistholeuca *Strick.*, *Jard. Con. Orn.*, 1849, p. 60
(*N. India*).
818. { †(621)
(623) } **Œnanthe leucomela leucomela**. *The Pied Chat*.
Saxicola leucomela *Pall. Nov. Comm. Petrop. xiv.*, Pt. i.,
p. 584 (1770), (*Samara, Russia*).
South Russia to Tibet.
819. (622) **Œnanthe melanoleuca melanoleuca**. *Barnes' Chat*.
Muscicapa melanoleuca *Gülden.*, *Nov. Comm. Petr. xix.*,
p. 468 (1775), (*Georgia*).
Transcaspia, Persia to Baluchistan.
820. (624) **Œnanthe œnanthe œnanthe**. *The Wheatear*.
Motacilla œnanthe *Linn.*, *Syst. Nat.*, i., p. 186 (1758),
(*Sweden*).
? Straggler, N.-W. India.

* It is now generally accepted that *picata* and *capistrata* are dimorphic forms of the same bird.

† *vittata* appears to be merely an aberration.

821. (624) **Ænanthe ænanthe argentea.** *The Eastern Wheatear.*
Saxicola ænanthe argentea Linn., *Arch. f. Zool. v.* (9), p. 22 (1909), (*Baikal*).
 Siberia, Gilgit.
822. (625) **Ænanthe isabellina.** *The Isabelline Chat.*
Saxicola isabellina Cretz. *Atlas zu Rüp. Reix. Vog.*, p. 52 (1826), (*Nubia*).
 South Russia to Tibet.
823. {*(626) } **Ænanthe deserti atrogularis.** *The Gould's Desert*
 (627) { *Chat.*
Saxicola atrogularis Blyth, *J.A.S.B.*, 1847, p. 131 (*Upper Provinces, India*).
 Breeding Himalayas.
824. (628) **Ænanthe xanthopyrma chrysopygia.** *The Red-tailed Chat.*
Dromolaea chrysopygia De Fil. *Arch. Zool. Gen. ii.*, p. 381 (1863), (*Demavend Persia*).
 Breeding Transcaspia to Baluchistan.
825. (629) **Cercomela fusca.** *The Brown Rock-Chat.*
Saxicola fusca Blyth, *J.A.S.B.*, xx., p. 523 (1851), (*Muttra*).
- Sub-family PHÆNICURINÆ.
826. (630) **Enicurus maculatus maculatus.** *The Western Spotted Forktail.*
Enicurus maculatus Vigors, *P.Z.S.*, i., p. 9 (1831), (*Himalayas*), (*Simla*).
 Western Himalayas to Garhwal.
827. (631) **Enicurus maculatus guttatus.** *The Eastern Spotted Forktail.*
Henicurus guttatus Gould., *Blyth, Ibis*, 1867, p. 29 (1865), (? *Sikkim*), (*Darjiling*).
 Eastern Himalayas, Nepal to E. Assam.
828. (632) **Enicurus schistaceus.** *The Slaty-backed Forktail.*
Hodg., As. Res. vix., p. 189 (1836), (*Nepal*).
829. (633) **Enicurus immaculatus.** *The Black-backed Forktail.*
Hodg., As. Res. vix., p. 190 (1836).
830. (634) **Enicurus leschenaulti indicus.** *The Assam Forktail.*
Hartert, Vog. Pal. i., p. 760 (1910), (*Margherita, E. Assam*).
 Sikkim to E. Assam through Burma to Tennasserim.
831. (635) **Hydrocichla frontalis.** *The White-crowned Forktail.*
Enicurus frontalis Blyth, *J.A.S.B. xvi.*, p. 156 (1847), (*Sumatra*).

* *montana* cannot be divided from Blyth's *atrogularis*, the Indian form of *deserti*.

832. (636) **Hydrocichla ruficapilla.** *The Chestnut-headed Forktail.*
Enicurus ruficapillus Temm. *Pl. Col. iii.*, pl. 534 (1832),
 (Sumatra).
833. (637) **Microcichla scouleri scouleri.** *The Little Forktail.*
Enicurus scouleri Vigors., *P.Z.S. i.*, p. 174 (1832), (*Himalayas*).
 Himalayas, N. Burma and China.
834. (638) **Chaimarrornis leucocephala.** *The White-capped Redstart.*
Phœnicura leucocephala Vigors, *P.Z.S. i.*, p. 35 (1831)
 (*Himalayas*).
835. *(639) **Phœnicurus frontalis.** *The Blue-fronted Redstart.*
 Vigors, *P.Z.S.*, 1832, p. 172 (*Himalayas*).
836. (640) **Phœnicurus schisticeps.** *The White-throated Redstart.*
Ruticilla schisticeps Hodg., *Cat. Mam. and B. Nep.*, p. 69
 (1846), (*Nepal*).
837. (641) **Phœnicurus aureus leucopterus.** *The Daurian Redstart.*
P. leucoptera Blyth, *J.A.S.B. xxii.*, p. 962 (1843), (*Malacca*).
 Breeding W. Central China.
838. (642) **Phœnicurus erythronotus.** *Eversmann's Redstart.*
Sylvia erythronota Eversm., *Add. Pall. Zoogr. Ros.-As. fasc. ii.*, p. 11 (1841), (*Altai*).
839. (643) **Phœnicurus hodgsoni.** *Hodgson's Redstart.*
Ruticilla hodgsoni Moore, *P.Z.S.*, 1854, p. 26 (*Nepal*).
840. (644) **Phœnicurus ochrurus rufiventris.** *The Indian Redstart.*
Cœnanthe rufiventris Vieill. *Nouv. Dict. d'Hist. Nat. xxi.*,
 p. 431 (1818), (*India*), (*Gyantse, Tibet*).
 Himalayas from Sikkim E. to China.
841. (644) **Phœnicurus ochrurus phœnicuroides.** *The Western Indian Redstart.*
Ruticilla phœnicuroides Moore, *P.Z.S.*, 1855, p. 25
 (*N. India*), (*Srinagar, Kashmir*).
 Himalayas, Afghanistan to Nepal and Persia.
842. (645) **Phœnicurus erythrogastrus grandis.** *Gulzenstadt's Afghan Redstart.*
Ruticilla grandis Gould, *P.Z.S.*, 1849, p. 112 (*Afghanistan*).
 Kashmir, E. Himalayas to Tibet.

* The generic name for the Redstarts is *Phœnicurus*, Forster (1817), and not *Ruticilla*, Brehm. (1828).

843. (646) **Rhyacornis fuliginosa.** *The Plumbeous Redstart.*
Phenicura fuliginosa Vigors, P.Z.S., 1831, p. 35 (Himalayas).
 Himalayas, Chitral to E. Assam.
844. *(647) **Cyanosylvia suecica suecica.** *The Red-spotted Blue Throat.*
Motacilla suecica Linn., Syst. Nat. i., p. 187 (1858), (Sweden).
 N. Europe and W. Siberia.
845. (647) **Cyanosylvia suecica pallidogularis.** *The Eastern Red-spotted Blue Throat.*
Cyanecula suecica pallidogularis Sarud., Mat. z. Ken. Russ. Reich. iii, p. 171 (1897), (Orenburg).
 Turkestan, Ladak, Tibet.
846. (648) **Cyanosylvia cyanecula abbotti.** *The Eastern White-spotted Blue Throat.*
Cyanecula abbotti Richmond, Smith, In. 1896, p. 484 (Nubra Valley, Ladak).
847. (649) **Lucinia megarhyncha golzii.** *The Eastern Nightingale.*
Lusciola golzii Cab. Jour. f. Orn., 1873, p. 79 (Turkestan).
848. (650) **Calliope calliope.** *The Common Ruby Throat.*
Motacilla calliope Pall. Reise. Russ. Reichs. iii., p. 697 (1776), (Yenesei).
849. (651) **Calliope pectoralis pectoralis.** *The Himalayan Ruby Throat.*
C. pectoralis Gould., Icones Av. Pt. i, pl. iv (1837), (West Himalaya).
 Breeding W. Himalayas to Nepal.
850. (651) **Calliope pectoralis confusa.** *The Eastern Ruby Throat.*
Luscinia pectoralis confusa Hartert, Vog. Pal. i., p. 740 (1910), (Sikkim).
 Eastern Himalayas to Sadiya.
851. +(652) **Calliope pectoralis tschebaiewi.** *The Tibet Ruby Throat.*
Calliope tschebaiewi Przew., Mongol. i., Stran. Tang. ii., p. 44 (1876), (Kansu).
 Breeding Tibet to Kansu.
852. (653) **Tarsiger chrysæus.** *The Golden Bush-Robin.*
Hodg., P.Z.S. 1845, p. 28 (Nepal).

* *Cyanosylvia*, Brehm. antedates *Cyanecula* as Brehm. uses it first in his book (1828). Ludlow has recently obtained the White and Red-spotted birds breeding in the same area in Tibet, so they should be considered species.

† Hartert includes *Cyanosylvia*, *Daulias* and *Calliope* all with *Lucinia*, also the Shortwings, *Larrivora*.

853. (654). **Ianthia rufilata.** *The Red-flanked Bush-Robin.*
Nemura rufilatus Hodg., *P.Z.S.*, 1845, p. 27 (1845), (*Nepal*).
854. (655) **Ianthia indica indica.** *The White-browed Bush-Robin.*
Sylvia indica Vieill. *Nouv. Dict. d'Hist. Nat.* xi., p. 267 (1817), (*India*), (*Darjiling*).
855. **Ianthia cyanura.** *The Japanese Bush-Robin.*
Motacilla cyanurus Pall., *Reise. Russ. Reichs.* ii., p. 709 (1773), (*Yenesei*).
 Once occurred in N. Cachar (Vog. Pal. I., p. 713).
856. (656) **Ianthia hyperythra.** *The Rufous-bellied Bush-Robin.*
 Blyth, *J.A.S.B.*, xvi., i. 132 (1847), (*Darjiling*).
857. (657) **Adelura cæruleocephala.** *The Blue-headed Robin.*
Phœnicura cæruleocephala Vigors, *P.Z.S.*, 1830, p. 35 (*Himalayas*).
858. *(658) **Grandala cœlicolor.** *Hodgson's Grandala.*
 Hodg., *J.A.S.B.* xii., p. 447 (1843), (*Nepal*).
859. (659) **Notodela leucura.** *The White-tailed Blue Robin.*
Muscisylvia leucura Hodg., *P.Z.S.*, 1845, p. 27 (*Nepal*).
860. (660) **Callene frontalis.** *The Blue-fronted Callene.*
Cinclidium frontale Blyth, *J.A.S.B.* xi., p. 181 (1842), (*Sikkim*).
861. (662) **Thamnobia fulicata fulicata.** *The Black-backed Indian Robin.*
Motacilla fulicata Linn., *Syst. Nat.* i., p. 336 (1766), (*Philippines*), (*Ceylon*).
 Ceylon and India, S. of the Godavari and Ahmednagar.
862. (661) **Thamnobia fulicata combaiensis.** *The Brown-backed Indian Robin.*
Sylvia combaiensis Lath. *Ind. Orn.* ii., p. 554 (1790), (*Guzerat*).
 India N. of the Godavari and Ahmednagar.
863. (663) **Copsychus saularis saularis.** *The Indian Magpie-Robin.*
Gracula saularis Linn., *Syst. Nat.* i., p. 165 (1766), (*Bengal*).
 India, Burma and Siam.
864. (663) **Copsychus saularis musicus.** *The Malay Magpie-Robin.*
Lanius musicus Raffl. *Tran. L. Soc.* xiii. (1820), p. 147 (*Sumatra*).
 Penin. Siam and Burma Southwards.

* This bird may have to be placed nearer the true Thrushes.

865. (663) **Copsychus saularis ceylonensis.** *The Ceylon-Magpie Robin.*
C. ceylonensis *Slater, P.Z.S., 1861, p. 186 (Ceylon).*
Ceylon and Travancore.
866. (664) **Kittocinclla macroura macroura.** *The Malay Shama.*
Turdus macrourus Gm., Syst. Nat. i., p. 820 (1789), (Pulo Condore).
Penin. Siam and Burma Southwards.
867. (664) **Kittocinclla macroura tricolor.** *The Indian Shama*
Turdus tricolor Vieill., Nouv. Dict. d'Hist. Nat. xx., p. 291 (1818), (India).
India, Ceylon and Burma, etc.
868. (665) **Kittocinclla albiventris.** *The Andaman Shama.*
Blyth, J.A.S.B. xxvii., p. 269 (1858), (Andamans).
Sub-family BRACHYPTERYGINÆ.*
869. (190) **Larvivora cyane cyane.** *The Siberian Blue Chat.*
Motacilla cyane, Pall., Reise. Russ. Reich. iii., p. 697 (1776), Dauria.
E. Siberia to Japan. Winter Burma and E. India.
870. (191) **Larvivora cyane brunnea.** *The Himalayan Blue Chat.*
L. brunnea, Hodg., J.A.S.B. vi., p. 102 (1837), (Nepal).
Himalayas N.-W. to Nepal and Sikkim.
871. **Larvivora wickhami.** *The Burmese Blue Chat.*
Stuart Baker, Nov. Zool. xviii., p. 298 (1916), (Chin Hills).
Chin Hills, Burma.
872. (193) **Brachypteryx albiventris.** *The White-bellied Shortwing.*
Callene albiventris, Fairbank, Blanf., P.Z.S., 1867, p. 833 (Pani Hills).
873. (194) **Brachypteryx rufiventris.** *The Rufous-bellied Shortwing.*
Callene rufiventris, Blyth, Jerd., B. of I. i., p. 496 (Neilgherries).
874. †(195) **Heteroxenicus stellatus.** *Gould's Shortwing.*
Brachypteryx stellatus, Gould., P.Z.S., 1868, p. 218 (Sikkim)
875. (196) **Heteroxenicus hyperythrus.** *The Rusty-bellied Shortwing.*
Brachypteryx hyperythra Jerd. and Blyth, P.Z.S., 1861, p. 201 (Sikkim).

* This sub-family of Shortwinged Chats appears to come here before the true Thrushes.

† *Drymochares* is preoccupied for a family of *Coleoptera* so *Heteroxenicus*, Sharpe must be used.

876. (198) **Heteroxenicus nepalensis.** *The Nepal Shortwing.*
Brachypteryx nepalensis Hodg., Moore, *P.Z.S.*, 1854, p. 74
 (Nepal).
877. (197) **Heteroxenicus cruralis.** *The White-browed Shortwing.*
Calliope cruralis Blyth, *J.A.S.B.* xii., p. 933 (1843)
 (Darjiling).
878. (197) **Heteroxenicus sinensis.** *The Chinese Shortwing.*
Dryomochares sinensis Rickett, *Bull. B.O.C.* vi., p. 1 (1897),
 (N.-W. Fokkien).
 China to N.-E. Assam.
879. (199) **Hodgsonius phœnicuroides.** *Hodgson's Shortwing.*
Sylvania phœnicuroides Blyth, *J.A.S.B.* xvi., p. 136
 (1847), (Nepal).

Sub-family TURDINÆ.

- *880. (666) **Planesticus maximus.** *The Central Asian Blackbird.*
Merula maxima Seebohm, *Cat. B. M.* v., p. 405 (1881),
 (Kashmir).
881. **Planesticus kessleri.** *Przewalski's Thrush.*
Turdus kessleri Przew., *Mong. Stran. Tangut.*, p. 62 (1876),
 (Kansu).
 East Tibet into China.
882. (667) **Planesticus simillimus simillimus.** *The Nilgiri Blackbird.*
Turdus simillimus Jerd., *Madr. Jour. L. S.* x., p. 253
 (1839), (Nilgiris).
883. (668) **Planesticus simillima kinnisii.** *The Ceylon Blackbird.*
Merula kinnisii Blyth, *J.A.S.B.* xx., p. 177 (1851), (Ceylon).
 Ceylon.
884. (669) **Planesticus simillima bourdilloni.** *Bourdillon's Blackbird.*
Merula bourdilloni Seebohm, *Cat. B.M.* v., p. 251 (1881),
 (Travancore).
 Travancore and Palni Hills.
885. (670) **Planesticus kinnisii erythrotis.** *Davison's Blackbird.*
Merula erythrotis Davison, *Ibis*, 1886, p. 205 (? Palghat Hills).
 Not known, but probably Palghat Hills, Travancore.

* *Merula* is unfortunately preoccupied and cannot, therefore, be used for the Thrushes, and its place must be taken by *Planesticus*, Bonap. Comp. Renda xxxviii., p. 3 (1854). Type *Turdus jamaicensis*.

886. *(671) **Planesticus nigropileus.** *The Black-capped Black-bird.*
Turdus nigropileus Lafres., Deless, Voy. de l'Inde, Pt. ii., p. 27 (1843), (India).
 Nilgiris, Mysore Hills and Aravalli Hills.
887. (672) **Planesticus albocinctus.** *The White-collared Ouzel.*
Turdus albocinctus Royle., Ill. Him. Bot., p. lxxvii. (1839), (Himalayas).
888. (673) **Planesticus castaneus castaneus.** *The Grey-headed Ouzel.*
M. castanea, Gould P.Z.S., 1835, p. 185 (Sikkim).
 Himalayas, Kashmir to Assam.
889. (673) **Planesticus castanea gouldi.** *Gould's Grey-headed Ouzel.*
Merula gouldi Verr. Nouv. Arch. Mus. d'Hist. Nat. vi., p. 34 (1871), (W. Setschuan).
 Eastern Assam to W. China.
890. (674) **Planesticus eunomus.** *The Dusky Ouzel.*
Turdus eunomus Temm. Pl. Col. ii., pl. 514 (1831), (Japan).
991. **Planesticus pallidus.** *The Pale Ouzel.*
Turdus pallidus Gmel., Syst. Nat. i., p. 815 (1789), (Lake Baikal).
892. †(675) **Planesticus ruficollis ruficollis.** *The Red-throated Ouzel.*
Turdus ruficollis Pall., Reise. Russ. Reichs. iii., p. 694 (1776), (Dauria).
 Breeding East Siberia, etc.
893. (677) **Planesticus ruficollis atrogularis.** *The Black-throated Ouzel.*
Turdus atrogularis Temm., Man. d'Orn. i., p. 169 (1820), (Austria).
 Breeding W. Siberia and N.-W. Himalayas.
894. (676) **Planesticus boulboul.** *The Grey-winged Blackbird.*
Lanius boulboul Lath., Ind. Orn. i., p. 80 (1790), (India).
895. (678) **Planesticus unicolor.** *Tickell's Ouzel.*
Turdus unicolor Tick., J.A.S.B. ii., p. 577 (1833), (Borabhum).
896. (679) **Planesticus protomelus.** *The Black-busted Ouzel.*
Turdus protomelas Cab. Jour. f. Orn., 1867, p. 286 (Himalayas).
 Hills S. of Brahmapootra, Chin Hills.

* It is possible that Nos. 667-671 should all be treated as sub-species of *P. merula*.

† It is very doubtful whether *atrogularis* can be considered a sub-species of *ruficollis*. I cannot find any connecting link between the two which are always separable. [See also Kollibay Bemer. Turk. Vogel. (1917, p. 450).]

897. (680) **Planesticus obscurus obscurus.** *The Dark Ouzel.*
Turdus obscurus Gmel., Syst. Nat. i., p. 816 (1789), (Lake Baikal).
 Breeding Siberia, Yenesei to Kamschatka.
898. (681) **Planesticus obscurus subobscurus.** *Salvadori's Ouzel.*
Merula subobscura Salv., Ann. Mus. Civ., Gen. (2), i., p. 413 (1889), (Karen Hills).
 ? Hills, E. of Burma.
899. (682) **Planesticus feæ.** *Fea's Ouzel.*
Salv. Ann. Mus. Civ. Gen. (2), v, p. 514 (1887), (Muleyit Mour).
 Hills S. of Brahmapootra and Burmese Hills.
900. (683) **Geocichla wardi.** *The Pied Ground-Thrush.*
Turdus wardi Jerd., J.A.S.B., xi., p. 882 (1842), (Mysore).
 Breeding W. Himalayas to Assam.
901. (684) **Geocichla sibirica sibirica.** *The Siberian Ground-Thrush.*
Turdus sibiricus Pall., Reise. Russ. Reichs. iii., p. 694 (1776), (Dauria).
 Breeding Central Siberia.
902. (684) **Geocichla sibirica davisoni.** *Davison's Ground-Thrush.*
Turdus davisoni Hume, Str. Feath. v., p. 63 (1877), (Muleyit Mount).
 Breeding Japan.
903. (686) **Geocichla citrina citrina.** *The Orange-headed Ground-Thrush.*
Turdus citrinus Lath., Ind. Orn. i., p. 350 (1799), (India), (Cachar).
 N. India, N. Burma and Siam.
904. (685) **Geocichla citrina cyanotis.** *The White-throated Ground-Thrush.*
Turdus cyanotis Jard. and Sel., Ill. Orbn., i., p. xlvi. (1828), (India), (Nilghirris).
 Southern half of India.
905. (687) **Geocichla citrina innotata.** *The Malay Ground-Thrush.*
G. innotata Blyth, J.A.S.B. xv., p. 370 (1846), Malayan Peninsula).
 Extreme S. of Siam and Burma Southwards.
906. (688) **Geocichla citrina albogularis.** *The Nicobar Ground-Thrush.*
G. albogularis Blyth, J.A.S.B. xvi., p. 146 (1847), (Nicobars).
 Nicobars.

907. *(689) **Geocichla citrina andamanensis.** *The Andaman Ground-Thrush.*
G. andamanensis Wald., *A.M.N.H.* (4), *xiv.*, p. 156 (1874),
 (Andamans).
 Andamans.
908. (690) **Petrophila erythrogaster.** *The Chestnut-bellied Rock-Thrush.*
Turdus erythrogaster Vigors, *P.Z.S.*, 1831, p. 171 (*Himalayas*).
 Himalayas from Chamba to China.
909. (691) **Petrophila cinclorhyncha.** *The Blue-headed Rock-Thrush.*
Petrocincla cinclorhyncha Vigors, *P.Z.S.*, 1831, p. 172 (*Himalayas*), (*Simla*).
 Himalayas, Afghanistan to Bhutan.
910. (692) **Petrophila solitaria solitaria.** *The Western Blue Rock-Thrush.*
Turdus solitarius Linn., *Syst. Nat.* (X.), p. 170 (1758), (*Italy*).
 Breeding Europe to Persia.
911. (692) **Petrophila solitaria transcaspica.** *Hartert's Blue Rock-Thrush.*
Monticola cyanus transcaspicus Hart., *Bull. B.O.C.* *xiii.*,
 p. 43 (1909), (*Tedschen*).
 Breeding Transcaspiä.
912. (693) **Petrophila solitaria pandoo.** *The Eastern Blue Rock-Thrush.*
Petrocincla pandoo Sykes, *P.Z.S.*, 1832, p. 87 (*Southern Ghats*).
 Breeding Himalayas, Kashmir Eastwards.
913. (693) **Petrophila solitaria philippensis.** *The Japanese Rock-Thrush.*
Turdus philippensis Müller, *Natur. Anhang.*, p. 142 (1776),
 (*Japan*).
 Breeding E. Siberia to Japan. Straggler, Siam and
 Tennasserim.
914. (694) **Monticola saxatilis.** *The Rock-Thrush.*
Turdus saxatilis Linn., *Syst. Nat.* (XII), p. 294 (1766),
 (*Greece*).
915. † **Monticola gularis gularis.** *Swinhoe's Rock-Thrush.*
Orocetes gularis Swinh., *P.Z.S.*, 1862, p. 318 (*Pekin*).
 Breeding E. Siberia, straggler Burma.

* Hartert unites *Merula*, *Geocichla*, and *Oreocinchla* with *Turdus*

† Hartert, possibly rightly, unites *Petrophila* with *Monticola*.

916. (695) **Turdus viscivorus bonapartei.** *The Himalayan Mistle-Thrush.*
Turdus bonapartei Cab. Jour. f. Orn. 1860, p. 183 (*Himalayas*).
 Breeding Central Asia to Kashmir.
917. (696) **Turdus pilaris.** *The Fieldfare.*
Linn., Syst. Nat. (X), p. 168 (1758), (*Sweden*).
918. (697) **Turdus musicus.** *The Redwing.*
Linn., Syst. Nat. (x), p. 169 (1758), (*Sweden*).
919. (698) **Oreocincla dauma dauma.** *The Small-billed Mountain-Thrush.*
Turdus dauma Lath., Ind., Orn. i., p. 362 (1790), (*India*),
 (*Kashmir*).
 Himalayas, Hazara to Assam.
920. (699) **Oreocincla dauma nilgiriensis.** *The Nilgiri Thrush.*
O. nilgiriensis Blyth, J.A.S.B. xvi., p. 141 (1847), (*Nilgiris*).
 Hills of Southern India.
921. (698a) **Oreocincla dauma aurea.** *White's Thrush.*
Turdus aureus Holandre, F. de M. Ann. de la Moselle, 1825.
 p. 60 (*Metz*).
 East Siberia to Japan. Straggler into Burma.
922. (700) **Oreocincla dauma imbricata.** *The Ceylon Thrush.*
Zoothera imbricata Layard, A.M.N.H. (2), xviii., p. 212
 (1854), (*Ceylon*).
 Ceylon.
923. { (701) } **Oreocincla mollissima mollissima.** *The Plain-*
 { (702) } *backed Mountain Thrush.*
Turdus molissimus Blyth, J.A.S.B. xi., p. 188 (1842), (*Dar-*
jiling).
 Himalayas, Chamba to Mishmi Hills. Breeding Forests.
924. **Oreocincla mollissima whiteheadi.** *Whitehead's Mountain Thrush.*
 Stuart Baker, *Bull. B.O.C. xxvi.,* p. 71 (1913), (*Khagan Valley*).
 Extreme N.-W. Frontier. Breeding above forest line.
925. (703) **Oreocincla spiloptera.** *The Spotted-winged Thrush.*
Blyth, J.A.S.B. xvi., p. 142 (1847), (*Ceylon*).
 Ceylon.
926. (189) **Myiophonus horsfieldi horsfieldi.** *The Malabar Whistling-Thrush.*
M. horsfieldi Vigors, P.Z.S., 1831, p. 35 (*Malabar*).
 South-Western India.
927. (187) **Myiophonus horsfieldi temminckii.** *The Himalayan Whistling-Thrush.*
M. temminckii Vigors, P.Z.S., 1831, p. 171 (*Himalayas*).
 Himalayas, Afghanistan to N. and Central Burma.

928. (188) **Myiophoneus horsfieldi eugenei.** *The Burmese Whistling-Thrush.*
M. eugenei Hume, *Str. Feath. i.*, p. 475 (1873), (*Pegu*).
Southern Burma and Siam.
929. (192) **Arrenga blighi.** *The Ceylon Arrenga.*
Holdsworth, *P.Z.S.*, 1872, p. 444 (*Ceylon*).
930. (704) **Zoothera monticola.** *The Large Brown Thrush.*
Vigors, *P. Z. S.*, 1831, p. 172 (*Himalayas*), (*Sikkim*).
931. (705) **Zoothera marginata.** *The Lesser Brown Thrush.*
Blyth, *J.A.S.B. xvi.*, p. 141 (1847), (*Arrakan*).
932. (706) **Cochoa purpurea.** *The Purple Thrush.*
Hodg., *J.A.S.B. v.*, p. 359 (1836), (*Nepal*).
933. (707) **Cochoa viridis.** *The Green Thrush.*
Hodg., *J.A.S.B. v.*, p. 359 (1836), (*Nepal*).

Sub-family CINCLINÆ*.

934. { (708) } **Cinclus cinclus kashmiriensis.** *The White-breasted*
{ (711) } *Asiatic Dipper.*
C. kashmiriensis Gould, *P. Z. S.*, 1859, p. 494 (*Kashmir*).
Himalayas, Kashmir to Tibet.
935. †(709) **Cinclus pallasii tenuirostris.** *The Brown Dipper.*
C. tenuirostris Bonap., *Consp. Av. i.*, p. 252 (1850), (*Central Asia*).
Breeding Turkestan and Himalayas.
936. (710) **Cinclus pallasii souliei.** *Pallas' Dipper.*
Cinclus pallasii var souliei Oust., *Ann., Sc. Nat. Zool. (7), xii.*
p. 299 (1892), (*Ta-tsién-lu*).
Breeding E. Tibet to China.

Sub-family PRUNELLIDÆ‡.

937. (712) **Laiscopus collaris nipalensis.** *The Eastern Alpin Hedge-Sparrow.*
Accentor nipalensis Blyth, *J.A.S.B. xii.*, p. 958 (1843),
(*Nepal*).
Eastern Himalayas, beyond first ranges.

* Hartert unites the Dippers and Wrens in the *Troglodytidae* in which he includes *Tesia*, but not the *Certhiidae*. I prefer *Turdidae*, *Cinclidae*, *Troglodytidae* and *Certhiidae* which appear to be a natural sequence.

† In this, as in so many other cases, Hodgson's name *asiaticus* is a *nomen nudum*, and therefore cannot be maintained.

‡ The name *Accentor* cannot be used for the Hedge-Sparrow, and therefore *Laiscopus*, Gloger Hand. in Hilfsb. p. 267 (1841) must be used in its place; *Prunella*, Vieill; Analyse nouv. Ornith. p. 43, 1816, antedates *Tharrhaleus*, Kaup, 1829.

938. (712) **Laiscopus collaris rufilatus.** *The Turkestan Hedge-Sparrow.*
Accentor rufilatus Severtz., Sapiski d. Turk., p. 45 (1879),
(Turkestan).
 Turkestan, Ladak and Chitral.
939. (712) **Laiscopus collaris whymperi.** *Whymper's Hedge-Sparrow.*
Laiscopus collaris whymperi Sturat Baker, Bull. B.O.C.
xxv., p. 60 (1915), (Garhwal).
 Garhwal and W. Nepal.
940. (712) **Laiscopus collaris tibetanus.** *The Tibet Hedge-Sparrow.*
Accentor collaris tibetanus Bianchi, Ann. Mus. Zool. Acad.
Petersb. ix., p. 128 (1904), E. (Tibet).
 Tibet to Koku-Nor.
941. (712) **Laiscopus collaris ripponi.** *Rippon's Hedge-Sparrow.*
Prunella collaris ripponi Hartert, Vog., Pal. i., p. 766 (1913),
(Gyi-dzu-Shan).
 Shan States, above 10,000 feet.
942. (713) **Laiscopus himalayanus.** *The Altai Hedge-Sparrow.*
Accentor himalayanus Blyth, J.A.S.B. xi., p. 187 (1842),
(Himalaya).
943. (714) **Prunella immaculatus.** *The Maroon-backed Hedge-Sparrow.*
Accentor immaculatus Hodg., P.Z.S., 1845, p. 34 (Nepal).
944. (715) **Prunella rubeculoides.** *The Robin Hedge-Sparrow.*
Accentor rubeculoides Moore, P.Z.S., 1854, p. 118 (Nepal).
945. (716) **Prunella atrogularis.** *The Black-throated Hedge-Sparrow.*
Accentor atrogularis Brandt., Bull. Acad. Petersb., p. 140
(1844), (Semi-Palatine).
946. (717) **Prunella fulvescens fulvescens.** *The Brown Hedge-Sparrow.*
Accentor fulvescens Severtz., Turk. Jevotn., p. 66 (1873),
(Turkestan).
947. (718) **Prunella strophiatu strophiatu.** *The Rufous-breasted Hedge-Sparrow.*
Accentor strophiatu Blyth, J.A.S.B. xvii., p. 959 (1843),
(Nepal).
 Eastern Himalayas to Kumaon.
948. (719) **Prunella strophiatu jerdoni.** *Jerdon's Hedge-Sparrow.*
Accentor jerdoni Brooks, J.A.S.B. xli., Pt. 2, p. 327 (1872),
(Kashmir).
 Western Himalayas to Kashmir.

Family IRENIDÆ*.

949. (254) **Irena puella puella.** *The Fairy Blue-Bird.*
Coracias puella Lath., Ind. Orn. i., p. 171 (1790), (India)
(Travancore).
 India, N. and Central Burma.
950. (254) **Irena puella cyanea.** *The Malay Fairy Blue-Bird.*
Irena cyanea Beqbie, Malayan Penin., p. 516, date (Malay
Pen).
 Extreme S. of Tennasserim and Siam.

Family PLOCEINÆ.

Sub-family *Ploceinæ.*

951. (720) **Ploceus philippinus philippinus.** *The Baya.*
Loxia philippina Linn., Syst. Nat. (XII), p. 305 (1766).
(Ceylon).
 Ceylon and the greater part of India.
952. (721) **Ploceus philippinus megarhynchus.** *Finn's Baya.*
P. megarhynchus Hume, Str. Feath. iii., p. 406 (1875),
(Kaladoongi, Nainital).
 Himalayas about Nainital. ? Extent of range.
953. (721) **Ploceus philippinus passerinus.** *The Eastern Baya*
P. passerinus Reichenow, Zool. Jahrb. i., 1886, p. 156, (Nepal)
 Eastern Sub-Himalayas, Bengal, Assam, N. Burma and
 Siam.
954. (721) **Ploceus philippinus infortunatus.** *The Malay*
Baya.
Ploceus passerinus infortunatus Hartert, Nov. Zool. ix.,
p. 577 (1902), (Sungei Lebeh).
 South Siam, Tennasserim and Malay Peninsula.
955. (722) **Ploceus benghalensis.** *The Black-throated Weaver-*
Bird.
Loxia benghalensis Linn., Syst. Nat. p. 305 (1766), (Bengal).
 N. India, Assam, Manipur and Chin Hills.
956. (723) **Ploceus manyar manyar.** *The Striated Weaver-Bird.*
Fringilla manyar Hors., Trans. Lin. Soc. xiii., p. 160
(1820), (Java).
 Java, Bali, Malay Pen. to S. Tennasserim.

* Oberholser has recently (Oct. 1917) created this family for the two genera *Irena* and *Glauconympha* (Jour. Wash. Acad. Sc. VII., No. 17) which he seems to think should be placed near the Bulbuls. Whilst agreeing that *Irena* cannot be placed in any known family, I think it may eventually find a place nearer the *Cochoa* group of Thrushes. I cannot separate *Irena* and *Glauconympha*.

957. (723) **Ploceus manyar flaviceps.** *The Indian Striated Weaver-Bird.*

P. flaviceps Less., *Trait. d'Orn.*, 1831, p. 435 (Pondicherry).
Ceylon, India, Burma and Siam.

*958. (724) **Ploceëla chrysæa.** *The Golden Weaver-Bird.*

Ploceus chrysaëus Hume. *Str. Feath.* vi. p. 399, footnote,
(1878), (*Tennasserim.*)

Sub-family VIDUINÆ.

959. (725) **Munia malacca.** *The Black-headed Munia.*

Loxia malacca Linn. *Syst. Nat.*, i, p. 302 (1766), (*China, Java, Malacca.*)

960. (726) **Munia atricapilla atricapilla.** *The Chestnut-headed Munia.*

Loxia atricapilla Vieill. *Ois. Chant.*, p. 84 (1805), (*Peninsula India.*)

Southern India.

961. (726) **Munia atricapilla rubroniger.** *The Northern Chestnut-headed Munia.*

M. rubroniger Hodg., *As. Res.* xix., p. 153 (1836), (*Nepal.*)
Northern India.

962. (727) **Uroloncha acuticauda acuticauda.** *Hodgson's Munia.*

Munia acuticauda Hodg., *As. Res.* xix., p. 153 (1836),
(*Nepal.*)

The whole of India and Burma.

963. (727) **Uroloncha acuticauda squamicollis.** *The Chinese Pin-Tailed Munia.*

U. squamicollis Sharpe, *Cat. B. M.*, xiii, p. 359 (1890),
(*Hainan.*)

Shan States to Hainan.

964. (728) **Uroloncha striata striata.** *The White-backed Munia.*

Loxia striata Linn., *Sys. Nat.* i, p. 306 (1766), (*I. of Bourbon.*)
Ceylon and South India.

965. (729) **Uroloncha striata semistriata.** *The Nicobar White-backed Munia.*

Munia semistriata Hume, *Str. Feath.* vi., p. 257 (1874),
(*Nicobars.*)

Nicobars.

966. (730) **Uroloncha striata fumigata.** *The Andaman White-backed Munia.*

Munia fumigata Wald., *A.M.N.H.* (4), xii, p. 488 (1873),
(*Andamans.*)

Andamans.

* *Loxia javanensis* of Less (1831) is preoccupied by *L. javanensis*, Sparrm (1789).

967. (731) **Uroloncha leucogastra.** *The White-bellied Munia.*
Amadina leucogastra Blyth, *J.A.S.B.* xv., p. 286 (1846),
 (*Malay Pen.*).
968. (732) **Uroloncha pectoralis.** *The Rufous-bellied Munia.*
Munia pectoralis Jerd., *B. of I.* ii, p. 355 (1863), (*Wynaad*).
969. (733) **Uroloncha kelaarti.** *The Ceylon Munia.*
Munia kelaarti Blyth, *Jerd.*, *B. of I.* ii., p. 356 (1863), (*Ceylon*).
970. (734) **Uroloncha malabarica.** *The White-throated Munia.*
Loxia malabarica Linn., *Syst. Nat.* i, p. 305 (1766), (*India*),
 (*Malabar*).
971. (735) **Uroloncha punctulata punctulata.** *The Spotted Munia.*
Loxia punctulata Linn., *Syst. Nat.* i., p. 302 (1766), (*Asia*).
 (*Calcutta*).
 India and Ceylon N. to W. Assam.
972. (735) **Uroloncha punctulata topela.** *The Chinese Spotted Munia.*
Munia topela Swinh., *Ibis*, 1863, p. 380 (*China and Formosa*),
 (*Formosa*).
 S. Assam, Burma and China.
973. (736) **Erythura prasina.** *The Long-tailed Munia.*
Loxia prasina Sparrm., *Mus. Carls.*, pls. 72-73(1788), (*Java*).
974. (737) **Stictospiza formosa.** *The Green Munia.*
Fringilla formosa Lath., *Ind. Orn.* i., p. 441 (1790), (*India*).
- *975. (738) **Amandava amandava amandava.** *The Indian Red Munia.*
Fringilla amandava Linn., *Syst. Nat.* i., p. 319 (1766), (*India orientalis*), (*Calcutta*).
 India and N. Burma.
976. (739) **Amandava amandava flaviventris.** *The Burmese Red Munia.*
Estrela flaviventris Wallace, *P.Z.S.*, 1863, p. 480 (*Timor and Flores*).
 Central and S. Burma, etc.
- Family FRINGILLIDÆ.
- Sub-family Coccothraustinae.
977. (740) † **Coccothraustes coccothraustes humii.** *Hume's Hawfinch.*
C. humii Sharpe, *P.Z.S.*, 1886, p. 97 (*N.-W. Punjab*).
 Turkestan, Afghanistan and N.-W. Himalayas to (?) N.-W. Japan.

* The correct name for this genus is not *Sporæginthus* but *Amandava* (Reich. Sing. Vogel, p. 15, 1853).

† I have received typical Hawfinches' eggs from Tibet, probably of this race.

978. (741) ***Perrisospiza icteroides icteroides.** *The Black and Yellow Grosbeak.*
Coccothraustes icteroides Vigors, P.Z.S., 1830, p. 8 (Himalayas).
 Himalayas West to Nepal.
979. (742) **Perrisospiza icteroides affinis.** *The Allied Grosbeak.*
Hesperiphona affinis Blyth, J.A.S.B. xxiv., p. 179 (1855), (Alpine Punjab).
 Nepal, Sikkim to W. China.
980. (743) **Perrisospiza carnipes carnipes.** *The White-winged Grosbeak.*
Coccothraustes carnipes Hodg., As. Res. xix., p. 151 (1836), (Nepal).
 Himalayas, Afghanistan to Chambi, Tibet.
981. (744) **Mycerobas melanoxanthus.** *The Spotted-winged Grosbeak.*
Coccothraustes melanoxanthus Hodg., As. Res. xix., p. 150 (1836), (Nepal).
 Himalayas, Hazara to Extreme S.-E. Assam, Manipur.
- Sub-family FRINGILLINÆ.
982. (745) **Pyrrhula aurantiaca.** *The Orange Bull-Finch.*
Gould, P.Z.S., 1857, p. 222 (Kashmir).
983. (746) **Pyrrhula erythrocephala.** *The Red-headed Bull-Finch*
Vigors, P.Z.S., 1831, p. 174 (Himalayas).
984. (747) **Pyrrhula erythaca erythaca.** *Beavan's Bull-Finch.*
P. erythaca Blyth, Ibis, 1862, p. 389 (Sikkim).
 Eastern Himalayas to E. Assam and (?) W. China.
985. (747) **Pyrrhula erythaca altera.** *Rippon's Bull-Finch.*
P. altera Rippon, Bull. B.O.C. xix, p. 19, 1906 (W. Yunnan).
 Yunnan and (?) N. Shan States and W. China.
986. (748) **Pyrrhula nipalensis nipalensis.** *The Brown Bull-Finch.*
P. nipalensis Hodg., As. Res. xix, p. 155 (1836), (Nepal).
 Himalayas, Garhwal to Bhutan and Chambi Valley, Tibet.
987. (748) **Pyrrhula nepalensis victoriæ.** *The Mount Victoria Bull-Finch.*
Pyrrhula victoriæ Rippon, Bull. B.O.C. xvi., p. 47 (1906), (Mount Victoria).
 Chin Hills.

* Oberholser Pro. U. S. Nat. Mus. XXII., p. 227.

988. (749) **Pyrrhoplectes epauletta.** *The Gold-headed Black-Finch.*
Pyrrhula epauletta Hodg., *As. Res. xix.*, p. 156 (1836),
 (Nepal).
989. (750) **Loxia curvirostra himalayana.** *The Himalayan Crossbill.*
L. himalayana Blyth, *J.A.S.B. xiii.*, p. 952 (1844), (Nepal).
990. (751) **Hæmatospiza indica.** *The Scarlet Finch.*
Loxia indica Gmelin, *Syst. Nat. i.*, p. 847 (1789), (India),
 (Khasia Hills).
991. (752) **Propyrrhula subhimalchus.** *The Red-headed Rose-Finch.*
Corythus subhimalchus Hodg., *As. Res. xix.*, p. 152 (1836),
 (Nepal).
992. (753) **Pyrrhospiza punicea punicea.** *The Red-breasted Rose-Finch.*
P. punicea Hodg., *J.A.S.B. xiii.*, p. 953 (1844), (Nepal).
 Nepal, Sikkim and Chambī Valley, Tibet.
993. (753) **Pyrrhospiza punicea humii.** *The Western Red-breasted Rose-Finch.*
P. humii Sharpe, *Cat. B. N. xii.*, p. 433 (1888), (N.-W. Himalaya).
 Chitral, Gilgit to Garhwal.
994. (754) ***Propasser thurus thurus.** *The White-browed Rose-Finch.*
Carpodacus thura Bon. & Schle., *Mon. Loxiens.*, p. 21 (1850),
 (Himalaya), (Sikkim).
 Garhwal, Nepal and Sikkim to Chambī Valley.
995. (754) **Propasser thurus blythi.** *The Kashmir White-browed Rose-Finch.*
P. blythi Biddulph, *Ibis*, 1882, p. 283 (Gilgit).
 Gilgit and N. Kashmir.
996. (754) **Propasser thurus dubius.** *The Kansu White-browed Rose-Finch.*
Carpodacus dubius Przew., *Mong. Stran Tangut ii.*, p. 92
 (1876), (Alaschan).
 Alaschan and Kansu, Setschuan and E. Tibet.
997. (754) **Propasser thurus minimus.** *The Yunnan White-browed Rose-Finch.*
P. minima Rip., *Bull. B.O.C. xix.*, p. 32 (1906), (W. Yunnan).
 Yunnan.

* Hartert unites *Carpodacus* and *Propasser*, I think rightly as the differences hardly seem of generic value

998. (755) **Propasser pulcherrimus pulcherrimus.** *The Beautiful Rose-Finch.*
P. pulcherrimus Moore, *P.Z.S.*, p. 85 (1844), (*Nepal*).
 N. W. Himalayas to Sikkim.
- 999.* (755) **Propasser pulcherrimus waltoni.** *Walton's Rose-Finch.*
Propasser waltoni Sharpe, *Bull. B.O.C.* xv., p. 95 (1905),
 (Gyantse, *Tibet*).
 Tibet.
- 1000.† (756) **Propasser pulcherrimus ambiguus.** *Hume's Rose-Finch.*
P. ambiguus Hume. *Str. Feath.* ii., p. 326 (1874), (*Garhwal*).
 Garhwal.
1001. (757) **Propasser rhodoclamys grandis.** *The Red-mantled Rose-Finch.*
Carpodacus grandis Blyth, *J.A.S.B.* xviii., p. 810 (1849),
 (*Above Simla*).
1002. (758) **Propasser rhodochrous.** *The Pink-browed Rose-Finch.*
Fringilla rhodochroa Vigors, *P.Z.S.*, 1831, p. 23 (*Himalaya*).
1003. (759) **Propasser rhodopeplus rhodopeplus.** *The Spotted-winged Rose-Finch.*
Fringilla rhodopepla Vigors, *P.Z.S.*, 1831, p. 23 (*Himalaya*).
 Himalayas, Garhwal to Sikkim.
1004. **Propasser rhodopeplus ripponi.** *Sharpe's Rose-Finch.*
Carpodacus ripponi Sharpe, *Bull. B.O.C.* xiii., p. 10 (1902),
 (*W. Yunnan*).
 Shan States and Yunnan.
1005. (760) **Propasser edwardsii.** *Edwards' Rose-Finch.*
Carpodacus edwardsii Verr., *Nouv. Arch. Mus.* vi., *Bull.*, p. 39 (1870), (*Chinese Tibet*).
1006. **Propasser vinaceus.** *The Vinaceous Rose-Finch.*
Carpodacus vinaceus Verr. *Nouv. Arch. Mus.* vi., *Bull.*, p. 39 (1870), (*Chinese Tibet*).
 Straggler, Kachin Hills.
1007. (761) **Carpodacus erythrinus erythrinus.** *The Common Rose-Finch.*
Loxia erythrina Pall. *Nov. Com. Petrop.* xix., p. 587 (1770)
 (*South Russia*).
 A doubtful straggler N.-W. India.

* A very poor sub-species.

Whymper, who took the eggs of this bird in Garhwal, tells me he cannot distinguish it from *P. p. pulcherrimus*.

1008. (761) **Carpodacus erythrinus roseatus.** *Hodgson's Rose-Finch.*
Pyrrhulinita roseata *Hodg., P.Z.S., 1845, p. 36 (Nepal).*
 Breeding Himalayas to Tibet.
1009. (762) **Carpodacus rubicilla severtzovi.** *Severtzov's Rose-Finch.*
C. severtzovi *Sharpe, P.Z.S., 1886, p. 354 (Turkestan).*
1010. (763) **Erythrospiza githaginea crassirostris.** *The Eastern Desert-Finch.*
Carpodacus crassirostris *Blyth, J.A.S.B. xvi., p. 476 (1847),*
(Afghanistan).
 Palestine, Persia to Baluchistan and N.-W. India.
1011. (764) **Erythrospiza mongolica.** *The Mongolian Desert-Finch.*
Carpodacus mongolicus *Swinh., P.Z.S., 1870, p. 447 (Nankow Pass).*
1012. **Rhodopechys sanguinea.** *The Crimson-winged Finch.*
Fringilla sanguinea *Gould, P.Z.S., 1837, p. 127 (Erzerum).*
 Erzerum, Persia to Afghanistan and N.-W. India.
1013. **Rhodospiza obsoleta.** *Lichenstein's Desert-Finch.*
Fringilla obsoleta *Lich., Eversm., Reise., Anhang, p. 132 (1826),*
(Bochara).
 Palestine to Afghanistan and Baluchistan.
1014. (765) **Procarduelis nipalensis.** *The Dark Rose-Finch.*
Carduelis nipalensis *Hodg., As. Res. xix., p. 157 (1836),*
(Nepal).
1015. (766) **Procarduelis rubescens.** *Blanford's Rose-Finch.*
Blanf., P.Z.S., 1871, p. 694 (Sikkim).
1016. (767) **Carduelis caniceps caniceps.** *The Himalayan Gold-Finch.*
C. caniceps *Vigors, P.Z.S., 1831, p. 23 (Himalayas).*
 Breeding W. Himalayas to Kumaon.
1017. (767) **Carduelis caniceps subulata.** *The Eastern Gold-Finch.*
Fringilla subulata *Gloger, Abandem Vogel, p. 153 (ex Gloger MS.),*
(133), (Genesee).
 Lake Baikal to E. Persia, Afghanistan and Baluchistan.
1018. **Carduelis carduelis major.** *The Turkestan Gold-Finch.*
C. major *Tacz., P.Z.S., 1879, p. 672 (Turkestan).*
 West Siberia, Turkestan, Persia, Baluchistan.
1019. (768) **Callacanthus burtoni.** *The Red-browed Finch.*
Carduelis burtoni *Gould P.Z.S., 1837, p. 90 (Himalayas),*
(Srinagar, Kashmir).

- 1020.* (769) **Acanthis cannabina fringillirostris.** *The Eastern Linnet.*
Linota fringillirostris Bp. & Schleg. *Monog. Lox.*, p. 45 (1850),
 (Kashmir).
 Breeding Caucasus to N. Kashmir.
1021. (770) **Acanthis flavirostris brevirostris.** *The Eastern Twite.*
Linota brevirostris Moore, *P.Z.S.*, 1855, p. 216 (Erzerum).
 Breeding Turkestan to N. Tibet. Winter, Sind.
1022. **Acanthis flavirostris stoliczkæ.** *Stoliczkas' Twite.*
Acanthis flavirostris stoliczkæ Hartert, *Vog. Pal. i.*, p. 77
 (1903), (Gilgit).
 Breeding Kashmir.
1023. **Acanthis flavirostris rufostriata.** *The Tibetan Twite.*
Linota rufostriata Walton, *Bull. B.O.C. xv.*, p. 93 (1905),
 (Gyantse, Tibet).
 Breeding S. and E. Tibet.
1024. (771) **Metaponia pusillia.** *The Gold-fronted Finch.*
Passer pusillus Pall., *Zoogr. Russ.-Asiat. ii.*, p. 28 (1811),
 (Caucasus).
1025. (772) **Hypacanthis spinoides.** *The Himalayan Green-Finch.*
Carduelis spinoides Vigors, *P.Z.S.*, 1831, p. 44 (Himalayas),
 (Simla).
1026. (773) **Chrysomitris thibetana thibetana.** *The Sikkim Siskin.*
C. thibetana Hume, *Ibis*, 1872, p. 107 (Sikkim).
 Breeding Sikkim and Tibet.
1027. **Chrysomitris thibetana ambigua.** *The Yunnan Siskin.*
Serinus ambiguus Oust., *Bull. Mus. Paris*, 1896, p. 186
 (Yunnan).
 Breeding Shan States, Kachin Hills to Yunnan.
1028. (774) **Fringilla montifringilla.** *The Brambling.*
 Linn, *Syst. Nat.*, p. 179 (1758), (Sweden).
1029. **Fringilla cœlebs cœlebs.** *The Chaffinch.*
F. cœlebs Linn., *Syst. Nat.* p. 179 (1758), (Sweden).
1030. †(775) **Gymnoris xanthosterna xanthosterna.** *The Yellow-throated Sparrow.*
Fringilla xanthosterna Bonap. *Com. Av. i.*, p. 512 (1850),
 (Bengal).
 Lower Himalayas to Travancore.

* The name *Fringilla subulata* of Gloger, 1833, antedates *F. orientalis* of Eversmann (1841).

† *Fringilla flavicollis* of Franklin, *P.Z.S.*, 1831, p. 120, is preoccupeid by Gmelin. *Syst. Nat.*, p. 926, 1789.

1031. (775) *Gymnoris xanthosterna transfuga*. *The Sind Yellow-throated Sparrow*.
Gymnoris flavicollis transfuga Hartert, *Vog. Pal. i.*, p. 145 (1903), (*Baluchistan*).
 Persia to Sind and Afghanistan.
1032. (776) *Passer domesticus indicus*. *The Indian House-Sparrow*.
P. indicus *Jard. & Sel., Ill. Orn. iii.*, p. 118 (1835-1848), (*India*).
 India and Burma.
- 1033.* (777) *Passer domesticus pyrrhonotus*. *The Rufous-backed Sparrow*.
P. pyrrhonotus *Blyth, J.A.S.B. xviii.*, p. 946 (1844), (*Sind*).
 Sind.
1034. (778) *Passer hispaniolensis transcaspicus*. *The Eastern Spanish-Sparrow*.
Tschusi, Orn. Jahrb., 1903, p. 10 (*Transcaspia*).
 Transcaspia to Punjab.
1035. (779) *Passer montanus saturatus*. *The Indian Tree-Sparrow*.
Passer saturatus *Stejn., Pro. Nat. Mus. U.S. viii.*, p. 19 (1885), (*Lu Kiu Is*)
 All India, N. and C. Burma and Siam.
1036. †(779) *Passer montanus malaccensis*. *The Malay Tree-Sparrow*.
Passer malaccensis *Dubois, Faune Ill. Vert. Belge, Ois. i.*, p. 572 (1885), (*Malacca*).
 Extreme S. Burma and Siam to Malay Peninsula.
1037. (779) *Passer montanus dilutus*. *The Afghan Tree-Sparrow*.
Richm., Proc. U.S. Nat. Mus. xviii., p. 577, (1895), (*Kashgar*).
 Common resident Baluchistan.
1038. (780) *Passer rutilans cinnamomeus*. *The Cinnamon Tree-Sparrow*.
Pyrgita cinnamomea *Gould P.Z.S.*, 1835, p. 185, (*Bhutan*).
 Breeding E. Himalayas to Yunnan.
1039. (780) *Passer rutilans debilis*. *The Kashmir Cinnamon Tree-Sparrow*.
 Hartert, *Vog. Pal.*, p. 163 (1910), (*Sind-Tal, Kashmir*).
 Western Himalayas.

* I am rather doubtful as to whether this bird should not be given full specific rank.

† The form found in Siam and S. Burma is intermediate between *saturatus* and *malaccensis*.

1040. (781) **Passer flaveolus**. *The Pegu House-Sparrow*.
Blyth, *J.A.S.B.* xiii., p. 946 (1844), (Pegu).
1041. (782) **Petronia petronia intermedia**. *The Eastern Rock-Sparrow*.
Hartert, *Nov. Zool.*, 1901, p. 324 (Gilgit, Kashmir).
- * 1042. (783) **Chionospire blanfordi**. *Blanford's Mountain-Finch*.
Montifringilla blanfordi Hume, *Str. Feath.*, 1876, p. 147, (Tibet).
1043. (784) **Chionospire ruficollis**. *The Red-necked Mountain-Finch*.
Blanf., *Pro. A.S.B.*, 1871, p. 227 (Kangra Lama Pass, N. Sikkim).
1044. (785) **Chionospire nivalis adamsi**. *Adam's Mountain-Finch*.
Montifringilla adamsi, Adams, *P.Z.S.*, 1858, p. 482 (Ladakh).
Breeding W. Himalayas to Tibet.
1045. (785) **Chionospire nivalis alpicola**. *Pallas' Mountain-Finch*.
Passer alpicola, Pall. *Zoogr. Rosso-Asiat.* ii., p. 20, (1831), (Caucasia).
Breeding Caucasus to Baluchistan.
1046. **Chionospire mandelli**. *Mandelli's Mountain-Finch*.
Montifringilla mandellii Hume, *Str. Feath.*, 1876 p. 488, (Tibet-Sikkim borders).
1047. (786) **Fringilauda nemoricola nemoricola**. *Hodgson's Mountain-Finch*.
Fringilauda nemoricola Hodg., *As. Res.* xix., p. 158 (1836), (Nepal).
Breeding E. Himalayas, Nepal to Tibet.
1048. (787) **Fringilauda nemoricola altaica**. *Stoliczka's Mountain-Finch*.
Fringilla altaica Eversm., *Bull. Soc.*, I. *Nat. Mosc.* xvi., p. 223 (1848), (Altai).
Western Himalayas, Kumaon, etc.
1049. (788) **Fringilauda brandti hæmatopyga**. *Brandt's Mountain-Finch*.
Leucosticte brandti Bonap., *Consp. Av.* i., p. 537 (1850), (Turkestan).
Gilgit to Sikkim.

* The name hitherto used for this genus *Montifringilla* is a *nomen nudum*, and must therefore be discarded. The next oldest name is *Chionospire*, Kaup 1829.

Family AMPELIDÆ.

1050. **Bombycilla garrulus centralasiæ.** *The Asian Wax-Wing.*
Poljakov *Mess. Ornith. iv.*, p. 137 (1915).

Family EMBERIZINÆ.

1051. (789) **Emberiza schœniclus schœniclus.** *The Reed Bunting.*
Fringilla schoeniclus Linn., *S.N. i.*, p. 182 (1758), (Sweden).
1052. (790) **Emberiza fucata fucata.** *The Grey-headed Bunting.*
E. fucata Pall. *Reise. Russ. Reichs. iii.*, p. 698 (1776), (*Mona and Ingoda*).
Breeding Siberia, Japan and N. China.
1053. (790) **Emberiza fucata arcuata.** *The Indian Grey-headed Bunting.*
E. arcuata Sharpe, *Cat. B. M. xii.*, p. 494 (1888), (*Himalayas*).
Breeding Himalayas.
1054. (791) **Emberiza pusilla.** *The Little Bunting.*
Pall. *Reise. Russ. Reichs. iii.*, p. 697, (1776), (*Daurian Alps*).
1055. (792) **Emberiza leucocephala** *The Pine Bunting.*
Gmel. *Nov., Comm. Acad. Sci. Imp. Petrop. xv.*, p. 480 (1771), (*Astrakan*).
1056. (793) **Emberiza stewarti.** *The White-capped Bunting.*
Blyth, *J.A.S.B. xiii.*, p. 215 (1854), (*Himalayas*).
1057. (794) **Emberiza cia stracheyi.** *The Eastern Meadow-Bunting.*
E. stracheyi Moore, *P.Z.S.*, 1855, p. 215, (*Kumaon*).
Breeding Himalayas to Kumaon.
1058. (794) **Emberiza cia godlewskii.** *The Chinese Meadow-Bunting.*
E. godlewskii Tacz., *Jour. f. Orn.*, 1874, p. 330 (*E. Siberia*),
Breeding N. China and E. Siberia.
1059. (794) **Emberiza cia per.** *The Transcaspian Meadow-Bunting.*
Hartert, *Vog. Pal., i.*, p. 184 (1910), (*Gudan, Transcaspia*).
Breeding Transcaspia to Chitral.
1060. (794) **Emberiza cia yunnanensis.** *The Yunnan Meadow-Bunting.*
E. yunnanensis Sharpe, *Bull. B.O.C. viii.*, p. 12 (1902); (*W. Yunnan*).
Western Yunnan.
1061. (795) **Emberiza buchanani.** *The Grey-necked Bunting.*
Blyth, *J.A.S.B. xiii.*, p. 957 (1844), (*India*).

1062. (796) *Emberiza hortulana*. *The Oortolan Bunting*.
Linn., *S.N. i.*, p. 177 (1758), (Sweden).
1063. (797) *Emberiza aureola*. *The Yellow-breasted Bunting*.
Pall., *Reise. Russo. Reichs. ii.*, p. 711 (1773), (*Populetis*).
1064. (798) *Emberiza spodocephala spodocephala*. *The Black-faced Bunting*.
E. spodocephala Pall., *Reise. Russo Reichs iii.*, p. 698 (1776), (*Daurian Alps*).
Breeding E. Siberia to Korea.
1065. (798) *Emberiza spodocephala melanops*. *The Mupin Black-faced Bunting*.
E. melanops Blyth, *J.A.S.B. xiv.*, p. 554 (1845), (*Tippera*).
Breeding Yangtse-Kiang.
1066. (799) *Emberiza melanocephala*. *The Black-headed Bunting*.
Scop. Annus i. His. Nat., p. 142 (1769), (*Karnten*).
1067. (800) *Emberiza luteola*. *The Red-Headed Bunting*.
Sparr. *Mus. Carlsonian. fasc. 4* (1789), (*S. India*).
1068. (801) *Emberiza rutila*. *The Chestnut Bunting*.
Pall., *Reisc. Russ. Reichs. iii.*, p. 698 (1876), (*Mongolia*).
1069. (802) *Emberiza striolata striolata*. *The Striolated Bunting*.
Fringilla striolata Licht. *Vers. Doubl. Mus. Berlin*, p. 24 (1823), (*Nubia*).
1070. *Emberiza calandra calandra*. *The Corn Bunting*.
E. calandra Linn., *S.N. i.*, p. 176 (1758), (Sweden).
1071. *Emberiza citrinella erythrogenys*. *The Eastern Yellow-Hammer*.
E. erythrogenys Brehm, *Vogelfang*, p. 414 (1855), (*Sarepta*).
1072. (803) *Melophus melanicterus*. *The Crested Bunting*.
Fringilla melanicterus Gmel., *Syst. Nat. i.*, p. 910 (1789), (*Macao*).

Family HIRUNDINIDÆ.

1073. (804) *Delichon urbica urbica*. *The House Martin*.
Hirundo urbica Linn., *X. ed.*, p. 192 (1758), (Sweden).
In North-West India in winter.
1074. (805) *Delichon urbica cashmeriensis*. *The Kashmir Martin*.
Chelidon kashmeriensis Gould, *P.Z.S.*, p. 356 (1858), (*Kashmir*).
Himalayas from Kashmir to Western China.

1075. (806) **Delichon urbica whiteleyi.** *The Siberian House Martin.*
Chelidon whiteleyi Swinh., P.Z.S., 1862, p. 320 (Pekin).
 Breeding East Siberia; straggler into Burma in winter.
1076. (807) **Delichon nepalensis.** *Hodgson's Martin.*
Hodg., Moore, P.Z.S., 1854, p. 104 (Nepal).
 Himalayas, Nainital to Assam, N. of Brahmapootra and Cachar Hills.
1077. (808) **Riparia riparia riparia.** *The Sand-Martin.*
Hirundo riparia Linn., Syst. Nat., X. ed., p. 192 (1758), (Sweden).
 N.-W. India and N. India (?) to Assam.
1078. (809) **Riparia riparia diluta.** *The Pale Sand-Martin.*
Cotile diluta Sharpe and Wyatt, Mon. Hir. i., p. 63 (1893),
(Tashkent).
 Breeding N.-W. India.
1079. (809) **Riparia brevicaudata.** *The Indian Sand-Martin.*
Hirundo brevicaudata McClell. P.Z.S. 1839, p. 156 (Assam).
 India, Burma, S. China, etc.
1080. (810) **Ptynoprogne rupestris.** *The Crag-Martin.*
Hirundo rupestris Scop. Ann. I. His. Nat., p. 167 (1769)
(Tyrol).
1081. (811) **Ptynoprogne concolor.** *The Dusky Crag-Martin.*
Hirundo concolor Sykes P.Z.S., 1833, p. 83 (Deccan).
1082. (812) **Ptynoprogne obsoleta obsoleta.** *The Pale Crag-Martin.*
Cotile obsoleta Cab. Mus. Hein. i., p. 50 (1850), (N.-E. Africa).
1083. (813) **Hirundo rustica rustica.** *The Common Swallow.*
Hirundo rustica Linn., Syst. Nat., x., ed., p. 191 (1758),
(Sweden).
 Extreme N.-W. India.
1084. (814) **Hirundo rustica gutturalis.** *The Eastern Swallow.*
Hirundo gutturalis Scop. Del. Flor. et Faun. Insubr. ii., p. 96
(1786), (New Guinea).
 Breeding throughout Himalayas and Mts. of Burma.
1085. { (815) } **Hirundo rustica tytleri.** *Tytler's Swallow.*
 { (816) } *Hirundo tytleri Jerd., B. of I. iii., p. 870 (1864), (India).*
 N.-W. Siberia, winter in India, etc.
1086. (817) **Hirundo rustica javanica.** *The Nilgiri House Swallow.*
Hirundo javanica Sparrm., Mus. Carls. iv., pl. 100 (1789),
(Java).
 India, S. of Nilgiris, Ceylon, Malay Peninsular, etc.
1087. (818) **Hirundo smithii.** *The Wire-tailed Swallow.*
Leach, App. to Tuckey's Voy. Congo, p. 407 (1818), (Congo
River).

1088. (819) *Hirundo fluvicola*. *The Indian Cliff Swallow*.
Jerd., *Blyth, J. A. S. B. xxiv.*, p. 470 (1855), (*Bandelkhund*).
1089. (820) *Hirundo daurica daurica*. *The Daurian Striated Swallow*.
Hirundo daurica Linn., *Man. Plan.*, p. 582 (1771), (*Siberia*).
East Siberia, winter Assam. (?) Breeding E. Himalayas.
1090. (821) *Hirundo daurica striolata*. *The Japanese Striated Swallow*.
Hirundo striolata Temm. & Sch., *Faun. Jap. Aves*, p. 33 (1847), (*Java*).
A Southern form, breeding hills, Central China to Assam.
1091. (822) *Hirundo daurica nepalensis*. *Hodgson's Striated Swallow*.
Hirundo nepalensis Hodg., *J.A.S.B. v.*, 1836, p. 780 (*Central Nepal*).
Himalayas to Japan.
1092. (823) *Hirundo daurica erythroptgia*. *Syke's Striated Swallow*.
Hirundo erythroptgia Sykes, *P.Z.S.*, 1832, p. 83 (*Poona*).
Resident, India N. of the Nilgiris.
1093. (824) **Hirundo daurica rufula*. *The European Striated Swallow*.
Hirundo rufula Temm., *Man. d'Orn. 2nd ed. iii.*, p. 298 (1835), *Egypt*.
Wanderer into extreme N.-W. India, breeding Himalayas.
1094. (825) *Hirundo daurica hyperythra*. *The Ceylon Swallow*.
Hirundo hyperythra Layard, *Blyth, J.A.S.B. xviii.*, p. 814 (1849), (*Ceylon*).
Ceylon only.

Family MOTACILLIDÆ.

1095. (826) *Motacilla alba dukhunensis*. *The Indian White Wagtail*.
M. dukhunensis Sykes, *P.Z.S.*, 1832, p. 91 (*Deccan*).
Breeding W. Siberia to Yenisei, Turkestan, etc.
1096. (827) *Motacilla alba leucopsis*. *The White-faced Wagtail*.
M. leucopsis Gould, *P.Z.S.*, 1837, p. 78 (*India*).
Breeding E. Siberia, Tibet, N. China.
1097. (828) *Motacilla alba ocularis*. *The Streak-eyed Wagtail*.
M. ocularis Swinh., *Ibis*, 1860, p. 55 (*Amoy*).
Breeding N.-E. Siberia into N.-W. America.
1098. (829) *Motacilla alba personata*. *The Masked Wagtail*.
M. personata Gould, *B. Asia vi.*, pl. 63 (1861), (*India*).
Breeding Transcaspia to Baikal, S. to E. Persia and Kashmir.

* *Hirundo daurica scullii*, Seebh. *Ibis*, 1883, p. 168 (Gilgit) does not seem to me to be a recognisable race.

1099. (830) **Motacilla alba hodgsoni.** *Hodgson's Pied Wagtail.*
M. hodgsoni Gray, *Blyth, Ibis*, 1865, p. 49 (Nepal).
 Breeding Himalayas to S. Tibet.
1100. (831) **Motacilla alba maderaspatensis.** *The Large Pied Wagtail.*
M. maderaspatensis Gmel., *Syst. Nat. i.*, p. 961 (1789), (India).
 Breeding Continental India.
1101. (832) **Motacilla cinerea melanope.** *The Grey Wagtail.*
M. melanope Pall., *Reis. Russ. Reich. iii.*, p. 396 (1776).
 (Dauria).
 Breeding from the Urals to Kamschatka, Himalayas.
1102. (833) **Motacilla flava thunbergi.** *The Grey-headed Wagtail.*
M. thunbergi Billberg, *Syn. Faun. Scan.*, p. 50 (1828), (Lapland.)
 Breeding N. Europe and N.-W. Asia.
1103. (834) **Motacilla flava melanogriseus.** *The Blue-headed Wagtail.*
Budytes melanogriseus Homeyer, *Jour. f. Orn.*, p. 128 (1878)
 (India).
 Breeding Turkestan.
1104. (835) **Motacilla flava beema.** *The Indian Blue-headed Wagtail.*
M. beema Sykes, *P.Z.S.*, 1832, p. 90 (Deccan).
 Breeding W. Siberia to Yenisei.
1105. (836) **Motacilla flava feldegg.** *The Black-headed Wagtail.*
M. feldegg Michahelles, *Isis*, 1830, p. 812 (Dalmatia).
 Breeding S.-E. Europe and Asia Minor.
1106. **Motacilla flava leucocephala.** *The White-headed Wagtail.*
Budytes leucocephala Przew. *Zap. Imp. Acc. St. Peters*, p. 85
 (1887), (Dzungaria).
 Dzungaria, Altai, Turkestan.
1107. **Motacilla flava taivana.** *The Chinese Blue-headed Wagtail.*
Budytes taivanus Swinh., *P.Z.S.*, 1863, p. 334 (Formosa),
 Breeding Trans Baikal to Saghalin.
1108. (837) **Motacilla citreola citreola.** *The Yellow-headed Wagtail.*
M. citreola Pall., *Reis. Russ. Reichs. iii.*, p. 696 (1776),
 (Siberia).
 Breeding N.-E. Russia to Turkestan.

1109. (838) **Motacilla citreola citreoloides.** *Hodgson's Yellow-headed Wagtail.*
Budytes citreoloides Gould, *B. of Asia iv.*, pl. 64 (1865),
 (N. India).
 Breeding Altai, Himalayas to E. Tibet.
1110. (839) **Dendronothus indicus.** *The Forest Wagtail.*
Motacilla indica Gmel., *Syst. Nat. i.*, p. 962 (1789), (India).
1111. (840) **Anthus trivialis trivialis.** *The Tree Pipit.*
Alauda trivialis Linn., *X. ed.*, *Syst. Nat.*, p. 166 (1758),
 (Switzerland).
 Straggler into N.-W. India in winter.
1112. (840) **Anthus trivialis haringtoni.** *Witherby's Tree Pipit.*
 Witherby, *Bull. B.O.C. xxxvii.*, p. 43^o (1917), (Kaghan
 Valley, N.-W. India).
 Breeding N.-W. Frontier and Kashmir.
- * 1113. (841) **Anthus maculatus.** *The Indian Tree Pipit.*
A. maculatus Jerd., *B. In. iii.*, p. 873 (1864), (India),
 (Kashmir).
 Breeding Siberia, Himalayas to China.
1114. (842) **Anthus nilghiriensis.** *The Nilgiri Pipit.*
A. nilghiriensis Sharpe, *Cat. B.M. x.*, p. 550 (1885), (Nil-
 giris).
 Nilgiri and Palni Hills.
1115. (843) **Anthus leucophrys cockburniæ.** *The Rufous Rock Pipit.*
A. cockburniæ Blanf., *B. of In. ii.*, p. 305 (1890), (Nilgiris),
 South India, Breeding Hills at high elevations.
1116. (844) **Anthus leucophrys jerdoni.** *The Brown Rock Pipit.*
Agrodroma jerdoni Finsch, *Trans. Z.S. vii.*, p. 241 (1870),
 (Kotegarh).
 Breeding Himalayas.
1117. (844) **Anthus leucophrys captus.** *Hartert's Rock Pipit.*
 Hartert, *Vog. Pal. i.*, p. 269 (1903), (Palestine).
 Palestine to Afghanistan and Baluchistan.
1118. (845) **Anthus richardi richardi.** *Richard's Pipit.*
A. richardi Vieill., *Now. Dict. d'Hist. Nat. xxvi.*, p. 491
 (1818), (France).
 Breeding Siberia, migrant India and Burma.
1119. (846) **Anthus richardi striolatus.** *Blyth's Pipit.*
A. striolatus Blyth, *J.A.S.B. xvi.*, p. 435 (1847), (Darjiling).
 Breeding Central Asia, Khasia Hills, Shan Hills.

* *Anthus maculatus* is preoccupied by Vieill., 1818.

1120. (847) **Anthus richardi rufulus.** *The Indian Pipit.*
A. rufulus Vieill., Nouv. Dict. d'Hist. Nat. xxvi., p. 494,
 (1818), (*Bengal*).
 Breeding Plains and Lower Hills of India and Burma.
1121. (847) **Anthus richardi malayensis.** *The Malay Pipit.*
A. malayensis Eyton, P.Z.S., 1839, p. 104 (Malacca).
 Southern Burma, Siam and Malay Peninsular.
1122. (848) **Anthus campestris campestris.** *The Tawny Pipit.*
Alauda campestris Linn., Syst. Nat. X. ed., p. 166 (1758),
 (*Sweden*).
 Breeding N. Europe to Persia.
1123. (848) **Anthus campestris minor.** *The Tawny Pipit.*
Agrodroma campestris minor Blasius, Natur. Vog. Mittl.
E. iii, p. 74 (1900), (N.-W. India).
 Breeding ? Afghanistan, Baluchistan, etc.
1124. (819) **Anthus cervinus.** *The Red-throated Pipit.*
Motacilla cervina, Pall., Zoogr. Rosso-As. i., p. 511 (1827)
 (*Siberia*).
1125. (850) **Anthus roseatus.** *The Rosy Pipit, or Hodgson's*
Pipit.
 Hodg., *Blyth, J.A.S.B. xvi., p. 437 (1847), (Nepal).*
1126. (851) **Anthus spinoletta coutelli.** *The Egyptian Water*
Pipit.
A. coutelli Savigny, Descr. Egypt xxxiii., p. 360 (1828),
 (*Egypt*).
 Straggler to Quetta. Breeding Mts. of Persia.
1127. (850) **Anthus spinoletta blakistoni.** *The Altai Water*
Pipit.
A. blakistoni Swinh., P.Z.S., 1863, p. 90 (Yangtse, 140 m.
inland).
 Breeding Central Asia, winter India, &c.
1128. (852) **Anthus spinoletta japonica.** *The Japanese Water*
Pipit.
Anthus pratensis japonicus Temm. and S. Fauna. Jap., p. 59
 (1847), (*Japan*).
 Breeding N.-E. Siberia. Migrant Burma and E. India.
1129. (853) **Oreocorys sylvanus.** *The Upland Pipit.*
Heterura sylvana, Hodg., Blyth, J.A.S.B. xiv., p. 556 (1845)
 (*Nepal*).

Family ALAUDIDÆ.

1130. (854) **Alaemon alaudipes pallida.** *The Persian Desert Lark.*
Saxicola (?) pallida Blyth, J.A.S.B. xvi., p. 130 (1847),
 (*Sind*).
 Breeding Persia to Sind.

1131. (855) *Otocorys alpestris penicillata*. *Gould's Horned Lark*.
Alauda penicillata Gould, *P.Z.S.*, 1837, p. 126 (*Erzoun*).
 Breeding Caucasus to Central Asia.
1132. (856) *Otocorys alpestris longirostris*. *The Long-billed Horned Lark*.
O. longirostris Moore, *P.Z.S.*, 1855, p. 215 (*Kulu*).
 Breeding Kashmir, Kumaon and N.-W. Himalayas.
1133. (857) *Otocorys alpestris elwesi*. *Elwes' Horned Lark*.
Otocorys elwesi Blanf. *J.A.S.B.* xli., Pt. ii., p. 62 (1870),
 (*Kangra-Lama Pass.*)
 Breeding E. Himalayas Ladak to Tibet.
1134. (857) *Otocorys alpestris przewalskii*. *Bianchi's Horned Lark*.
Otocorys brandti przewalskii Bianchi, *Ibis*, 1904, p. 371
 (*Zaidam*).
 Breeding N. Tibet.
1135. (857) *Otocorys alpestris khamensis*. *The Tibet Horned Lark*.
Otocorys elwesi khamensis Bianchi, *Ibis*, 1904, p. 372 (*Kham, S.-E. Tibet*).
 Breeding S.-E. Tibet.
1136. (858) *Melanocorypha maxima*. *The Long-billed Calandra Lark*.
Gould B. of Asia iv., pl. 72 (1867), (*Sikkim*).
1137. (859) *Melanocorypha bimaculata*. *The Eastern Calandra Lark*.
Alauda bimaculata Menetries, *Cat., Rais.* (1832), (*Mountains of Talych*).
1138. (880) *Alauda arvensis cinerascens*. *The Eastern Skylark*.
A. cinerascens Ehmcke, *Jour. f. Orn.*, 1904, p. 313 (*Barnou in Siberia*).
 Breeding Siberia S. to Palestine and Persia.
1139. (860) *Alauda arvensis intermedia*. *The Chinese Skylark*.
A. intermedia Swinh., *P.Z.S.*, 1863 p. 169 (*Shanghai*).
 Chinese Hills and Kashmir.*
1140. (860) *Alauda arvensis japonica*. *The Japanese Skylark*.
A. japonica Temm. & Sch. *Faun. Japon.*, p. 87 (1848), (*Japan*).
 Straggler in winter into Burma.

* See Richmond *Pro. Nat. Mus. U. S.* xviii, p. 467 (1895).

1141. (860) ***Alauda arvensis leiopus***. *The Tibet Skylark*.
A. leiopus Hume, *Str. Feath. i.*, p. 40 (1873), (*Himalayan Plateaus*).
 Breeding Tibet and (?) Sikkim.
1142. (861) ***Alauda gulgula gulgula***. *The Small India Skylark*.
A. gulgula Franklin, *P.Z.S.*, 1831, p. 119 (*Ganges, Benares, Calcutta*).
 Breeding N. Tropical India.
1143. (861) ***Alauda gulgula guttata***. *The Small Kashmir Skylark*.
A. guttata Brooks, *J.A.S.B. xli.*, p. 84 (1872), (*Kashmir*).
 Breeding Himalayas.
1144. (861) ***Alauda gulgula australis***. *The Small Nilgiri Skylark*.
A. australis Brooks, *Str. Feath. i.*, p. 486 (1873), (*Ootacamund*).
 Breeding South India and Ceylon.
1145. (861) ***Alauda gulgula cœlivox***. *Swinh., Zoologist*, 1859, p. 672† (*Amoy*).
 South China. (?) Breeding Kachin Hills, etc.
1146. (861) ***Alauda gulgula sala***. *The Hainan Skylark*.
A. sala Swinh., *Ibis*, 1870, p. 355 (*Hainan*).
 Straggler into Tennasserim, Breeding Siam.
1147. (861) ***Alauda gulgula inconspicua***. *The Small Turkestan Skylark*.
A. inconspicua Severz., *Turk. Jevot.*, p. 142 (1873), (*Turkestan*).
 Breeding Turkestan and Transcaspica. Occurred in Quetta.
1148. (862) * ***Calandrella brachydactyla brachydactyla***. *The Short-toed Lark*.
Alauda brachydactyla Leisler, *Ann. du Wetter. Ges. iii.* p. 357 (1814), (*S. France*).
 Breeding Europe and Asia to Baluchistan.
1149. (862) ***Calandrella brachydactyla longipennis***. *The Yarkand Short-toed Lark*.
Alauda longipennis Evers., *Bull. Soc. Imp. Mosc. xxi.*, p. 219 (1848), (*Songarai*).
 Breeding Transcaspia to Tibet.
1150. (863) ***Calandrella brachydactyla dukhunensis***. *The Rufous Short-toed Lark*.
Alauda dukhunensis Sykes, *P.Z.S.*, 1832, p. 93 (*Deccan*).
 (?) Breeding. Winter in India, etc.

* See Hartert, *Nov. Zool. xxv.*, p. 91, 1918.

1151. (865) *Calandrella acutirostris acutirostris*. *Hume's Short-toed Lark*.
C. acutirostris Hume, *Lah. to Yarcand*, p. 265 (1873), (*Karakorum*).
 Breeding N. Kashmir, Pamirs, Tianshan, etc.
1152. (864) *Calandrella acutirostris tibetana*. *Brooks' Short-toed Lark*.
C. tibetana Brooks, *Str. Feath.* viii., p. 488 (1880), (*Tibet*).
 Breeding Tibet.
1153. (866) *Alaudula raytal raytal*. *The Ganges Sand-Lark*.
Alauda raytal Blyth, *J.A.S.B.* xiii., p. 962 (1844), (*Lucknow*).
 Breeding greater part of India except W. and N.-W.
1154. (867) *Alaudula raytal adamsi*. *The Indus Sand-Lark*.
Alauda adamsi Hume, *Ibis*, 1871, p. 405 (*Agrore Valley*).
 Breeding Sind and extreme N.-W.
1155. (868) *Alaudula minor persica*. *Sharpe's Sand-Lark*.
A. persica Sharpe, *Cat. B. M.* xiii., pl. 590 (1890), (*Niris in Persia*).
 Breeding S. E. Persia to Afghanistan.
1156. (868) *Alaudula minor seebohmi*. *Seebohm's Sand-Lark*.
A. seebohmi Sharpe, *Cat., B. M.* xiii., p. 590 (1890), (*Turkestan*).
 Breeding East Turkestan.
1157. (869) *Mirafra cantillans cantillans*. *The Singing Bush-Lark*.
M. cantillans Jerd., Blyth, *J.A.S.B.* xiii., p. 960, (1844), (*Bengal*).
 Breeding India.
1158. (869) *Mirafra cantillans williamsoni*. *The Siam Singing Bush-Lark*.
 Stuart Baker *Bull. B.O.C.* xxxvi., p. 9 (1915), (*Bangkok*).
 Breeding Siam and (?) Tennasserim.
1159. (870) *Mirafra assamica assamica*. *The Bengal Bush-Lark*.
M. assamica McClell., *P. Z. S.* 1839, p. 162 (*Assam*).
 Breeding N.-E. India and Assam.
1160. (872) *Mirafra assamica affinis*. *The Madras Bush-Lark*.
M. affinis Jerd., *Madr. Jour. L. S.* xiii., Pt. 2, p. 136 (1844),
 Breeding Ceylon and S. India.
1161. (873) *Mirafra assamica microptera*. *The Burmese Bush-Lark*.
M. microptera Hume, *Str. Feath.* i., p. 483 (1873), (*Thayetmyo*).
 Breeding South and Central Burma.

1162. **Mirafra assamica marionæ.** *The Siamese Bush-Lark.*
Stuart Baker Bull. B.O.C. xxvi., p. 34 (1915), (Ayuthia Central Siam).
 Siam and (?) Tennasserim.
1163. (871) **Mirafra erythroptera.** *The Red-winged Bush-Lark.*
Jerd., Madr Jour. L. S. xviii., Pt. 2, p. 136 (1844), Northern portion of Peninsula of India).
1164. (874) **Galerida cristata magna.** *Hume's Crested Lark.*
G. magna Hume, Ibis., 1871, p. 407 (Yarkand).
 Breeding Central Asia, Baluchistan, etc.
1165. (874) **Galerida cristata chendoola.** *Franklin's Crested Lark.*
Alauda chendoola Franklin, P.Z.S., 1831, p. 119 (Ganges and Nerbudda).
 Breeding N.-W. India.
1166. (874) **Galerida cristata leautungensis.** *The Tibet Crested Lark.*
Alauda leautungensis Swinh., Ibis., 1861, p. 256 (Liautung W. China).
 Breeding Tibet and Mts. of W. China.
1167. (875) **Galerida deva.** *Sykes' Crested Lark.*
Alauda deva Sykes, P.Z.S., 1832, p. 92 (Deccan).
1168. (876) **Galerida malabarica.** *The Malabar Crested Lark.*
Alauda malabarica Scop. del Flor. et Faun. Insubr., p. 94 (1786), (Malabar).
1169. (877) **Ammomanes phœnicura phœnicura.** *The Rufous-tailed Finch-Lark.*
Mirafra phœnicura Franklin, P.Z.S., 1831, p. 119 (Ganges, Calcutta-Benares).
 Breeding India.
1170. (877) **Ammomanes phœnicura zarudnyi.** *Hartert's Rufous-tailed Finch-Lark.*
A. cinctura zarudnyi Hartert, Bull. B. O. C. xii., p. 43 (1902), (E. Persia).
 Breeding Persia to Baluchistan.
1171. (878) **Ammomanes deserti phœnicuroides.** *The Indian Desert Lark.*
Mirafra phœnicuroides Blyth, J.A.S.B. xii., p. 583 (1853), (Kashmir).
 N.-W. India, Kashmir, etc.

1172. (879) *Pyrrhulauda grisea grisea*. *The Ashy-Crowned Finch-Lark*.

Alauda grisea Scop., *del Flor. et Faun. Insubr. ii.*, p. 95 (1786), (*No locality*).

Breeding all India except Sind, Rajputana and extreme N.-W.

1173. (880) *Pyrrhulauda grisea melanolauchen*. *The Black-Crowned Finch-Lark*.

Coraphites melanolauchen Cab. *Mus. Hein. i.*, p. 124 (1850), (*Africa*).

Breeding Sind, W. Rajputana and N.-W. India and Arabia.

(*To be continued.*)

THE LIFE HISTORY OF RARE AND LITTLE KNOWN
SPHINGIDÆ (HAWK MOTHS) OF THE ORIENTAL
REGION.

By

C. E. FELLOWES-MANSON.

Sub-family.—AMBULICINÆ.

Ambulicine, Butler, Trans. Zool. Soc., Lond., IX, pp. 514, 579 (1877);
Rothschild, Nov. Zool., IX, (Suppl.), p. 166 (1903).

Genus.—OXYAMBULYX. Type: *substrigilis*.

Ambulyx, Walker, List, Lep. Ins. B. M., VIII., p. 120 (1856).

Oxyambulyx, Rothsch. l.c. p. 192 (1903).

Range.—Indo-Australian Region, as far north as Japan, eastwards to the
Solomon Islands (Roths.)

Sixteen species of which nine are Indian.

OXYAMBULYX SUBSTRIGILIS (Westwood).

Sphinx (Ambulyx) substrigilis, Westwood, Cab. Or. Eut., p. 61, t. 30, f. 2
(♂), (1848). (Silhet;—Mus. Brit.).

Oxyambulyx substrigilis, Rothsch., l.c. pp. 201, 838, n. 164, t. VIII, f. 1. 2
(♂) (1903).

Distribution.—North India and Burma to the Andamans, Philippines and
Java. (Roths.)

Five sub-species of which one is Indian and one Ceylonese.

b. O. SUBSTRIGILIS SUBSTRIGILIS.

Sphinx (Ambulyx) substrigilis, Westwood, l.c. (1848).

Ambulyx substrigilis, Hampson in Blanf., Fauna Brit. Ind. Moths, I., p. 77, n.
103 (1892); Rothsch., l. c. p. 87 (1894); Dudgeon, Journ. Bombay Nat. Hist.
Soc., XI, p. 408, n. 102 (1898).

Oxyambulyx substrigilis substrigilis, Rothsch. l. c. p. 202, n. 164, b. t. VIII,
f. 2. (♂) 1903.

Habitat.—North India; Burma and Andaman Islands.

Sikkim; Assam; Burma and Andaman Islands;

Localities.—Paungbyin, Upper Chindwin District, Northern Burma.

Elevation.—(Vertical range) up to 3,500 feet.

Time of appearance.—July.

Occurrence.—Fairly common in localities where the food-plant is plentiful.

Expanse.—♂, 100 mm. ♀

The larva is very rough being covered with whitish tubercles; it is a bright
green with white dorsal and lateral longitudinal stripes from the head to the
horn; seven oblique white side stripes adjoining the white lateral stripes from
the 4th to the 12th segments bordered on their upper edges with darker green.
Spiracles emerald green, head dull green, the extremity of the anal flap bluish-
green bordered with white and blue and pinkish brown below. Horn bright
pink and very rough being covered with tubercles. Claspers pinkish brown,
legs reddish brown with pale centres and black bases.

Length.—100 mm.

Time of appearance.—May and June.

Food-plants.—*Dipterocarpus tubercula'us*

Pupa glossy, of a wine red colour on the thorax, head and wing cases; a darker shade of reddish brown on the abdomen, the segments of which are pinkish, cremaster wedge shaped, stout and with a bristle at the extreme tip. In shape it is compact and more or less cylindrical.

Length.—♂ ♀, 56 mm.

Time of pupation.—June.

Situation.—Subterranean at or near roots of food-plant.

Genus.—CLANIS. Type: phalaris.

Clanis, Hübner, Verz. bek. Schm., p. 138 (1822); Rothschild, Nov. Zool., IX, (Suppl.) p. 212, LV, (1903).

Ambulyx, Hampson, (non-Walker, 1856), in Blanf., Fauna Brit. Ind. Moths, I, p. 77 (1892).

Range. Japan to Ceylon, eastwards to Timor; not yet found on the larger Sunda Islands, the Philippines, or Malacca. (Roths.)

Seven species, (Roths) *Clanis titan* (Rothschild.), six of which are Asiatic.

Clanis titan, spec. nov., Rothschild, Nov. Zool. IX. (Suppl.), p. 218, n. 180, (1903).

Ambulyx phalaris, Hampson, in Blanf., Fauna Brit. Ind. Moths, I, p. 79, n. 109, (1892); Dudgeon, Journ., Bombay Nat. Hist. Soc., XI, p. 408, n. 109 (1898).

Habitat.—North India and Burma.

Localities.—Sikkim; Khasia Hills, Assam; Insein District, Lower Burma.

Elevation.—(Vertical range.).

Time of appearance.—June and July.

Occurrence.—Very scarce.

Expanse.—♂, 146-160 mm. ♀, 150 to 176 mm.

The larva has recently been discovered by a friend of mine feeding on the leaves of a tree named *Millettia atropurpurea* (Bth.), but I am unable to describe it as it was not seen by me.

Length.—

Time of appearance.—May and June.

Food-plants.—*Millettia atropurpurea* (Bth.).

Pupa.—Not described.

Length.—

Time of pupation.—July.

Situation.—Probably subterranean.

Genus.—LEUCOPHLEBIA. Type. lineata.

Leucophlebia, Westwood, Cab. Or. Ent., p. 46 (1848), (type: lineata); Rothschild, Nov. Zool., IX (Suppl.), p. 229, No. LIX, and p. 842, No. LX, (1903), (typus lineata).

Range.—Indo-Malayan and Æthiopian Regions. Four species of which two are Oriental.

LEUCOPHLEBIA EMITTENS. (Walker).

Leucophlebia emittens, Walker, List Lep. Ins. B. M., XXXV, p. 1858 (1866); Hampson, in Blanf. Fauna Brit. Ind. Moths, I, p. 75, n. 101 (1892); Dudgeon, Journ., Bombay Nat. Hist. Soc., XI, p. 407, n. 101 (1898); Rothschild, Nov. Zool., IX (Suppl.), p. 231, n. 192, and p. 842, n. 194 (1903).

Habitat.—N. W. Himalayas southwards to Bombay and eastwards to Burma (Roths.).

Localities.—N. W. Himalayas; Sikkim; Bombay; Central India; Insein District, Lower Burma.

Elevation.—(Vertical range) up to 7,000 feet.

Time of appearance.—June and July.

Occurrence.—Very rare.

Expanse.—♂, 55 mm. ♀, 65 mm.

Larva pink on the dorsal surface, a sub-dorsal cream coloured stripe and a yellow lateral stripe from the head to the horn, pinkish underneath. There are three dark lateral lines from the head to the horn which is bright yellow. Head pink on top with a green and white streak on gulæ. Anal segment greenish. Legs and claspers pink with dark brown tips. Spiracles pink bordered with brown.

Very slothful in its movements.

Length.—60 mm.

Time of appearance.—September and October.

Food-plants.—Bamboo.

Pupa.—not seen.

Length.—

Time of pupation.—October.

Situation.—Probably subterranean.

Genus.—CYPA. Type: decolor. (Walker).

Smerinthus, Walker (non-Latreille, 1802). List. Lep. Ins. B. M., VIII, p. 255 (1856).

Cypa, id., l. c. XXXI, p. 41 (1864), Rothschild, Nov. Zool., IX (Suppl.), p. 297, n. LXXV and p. 850, n. LXXVI (1903).

Range.—North India to Ceylon and Burma, Siam and New Guinea.

CYPA DECOLOR (Walker).

Smerinthus decolor, Walker, l. c. VIII, p. 255, n. 19 (1856).

Cypa decolor, Rothschild, Nov. Zool., IX (Suppl.), p. 298, n. 253, and p. 850, n. 257 (1903).

Distribution.—North India to Ceylon and Tenasserim; New Guinea.

Three sub-species (Roths.).

a. CYPA DECOLOR DECOLOR.

Cypa decolor, Hamps, in Blauf., Fauna Brit. Ind. Moths, I, p. 71, n. 94, f. 43, (♂). (1892); Dudgeon, Journ., Bombay Nat. Hist. Soc., XI, p. 407, no. 94 (1898); Rothschild, l. c. (1903); (*a* (*f*), *decolor*).

Habitat.—North India to Shan States, thence to South Burma; apparently confined to mountainous districts.

Localities.—Sikkim; Shan States, Paungbyin, Upper Chindwin District. Tavoy, Burma.

Elevation.—(Vertical range) up to 4,500 feet.

Time of appearance.—May to September.

Occurrence.—Rare.

Expanse.—♂, 50 mm. ♀, 62 mm.

Larva bright green with a pale yellow dorsal longitudinal streak from the head to the horn, seven oblique narrow waved pale yellow side stripes from the 4th segment to the horn. Head triangular, green, with a pale yellow dorsal streak. Anal flap bordered with yellow. Horn, legs and claspers pale pink. Spiracles white with bright red centres. Horn covered with small tubercles. short and curved anal, bifid at the extreme tip.

Length.—75 mm.

Time of appearance.—May and June.

Food-plants.—*Dipterocarpus tuberculatus*.

Pupa—Not described.

Length.—

Time of pupation.—June and July.

Situation.—Subterranean at or near roots of food-plant.

Sub-family.—PHILAMPELINÆ.

Philampeline, Burmeister, Descr. Rep. Argent., V, 345 (1878).*Philampeline*, Rothschild, Nov. Zool., IX (Suppl.), pp. 475 and 880 (1903).

Tribe.—Nepheliceæ. (Rothsch.), l.c. pp. 498 and 883 (1903).

Genus.—ANGONYX. Type: testacea.

Angonyx, Boisduval, Spec. Gen. Lep. Het. I, p. 317 (1875), (type: emilia-testacea); Rothschild, l.c., p. 543, CXXV, and p. 889, CXXVI, (1903).

Range.—Oriental Region. (Roths.).

Three species of which one is Indian.

ANGONYX TESTACEA (Walker).

Perigonia testacea, Walker, List. Lep. Ins. B. M., VIII, p. 102, n. 3(1856); id. l.c., XXXI, p. 29 (1864).*Angonyx testacea*, Moore, Lep. Ceylon, II, p. 26, t. 89, f. 1. (♂), (1882), Hampson in Blanf., Fauna Brit. Ind. Moths, I, p. 101, n. 160, f. 58, (♂), (1892.); Rothsch., Nov. Zool, IX (Suppl.), p. 544, n. 463 and p. 889, n. 467 (1903).

Distribution.—Ceylon and N. India eastwards to the Solomon Islands. (Roths.).

Two sub-species. (Roths.).

a. A. TESTACEA TESTACEA.

Perigonia testacea, Walker, l.c. (1856).*Angonyx testacea*, Moore, Lep. Ceylon, II, p. 26, t. 89, f. 1, (♂) (1882). (=emilia=ella); Hamps., in Blanf., Fauna Brit. Ind. Moths, I, p. 101, n. 160, f. 58, (♂) (1892); Rothsch., Nov. Zool, IX (Suppl.) pp. 544 and 889, n. 463 a, and 467 a (1903)

Habitat.—Ceylon and North India and Burma to the Moluccas, Roth.

Localities.—Ceylon; Sikkim; Silhet; Khasia Hills, Assam; N. and S. Burma; Nilgiri Hills, S. India; Andaman Islands.

Elevation.—(Vertical range) up to 6,000 feet.

Time of appearance.—June to August and November to March.

Occurrence.—Rare.

Expanse.—♂, 56 mm. ♀.

Larva in first stage is pale transparent green with a darker green stripe from pronotum to horn, which is black, there is also a sub-dorsal green line from head to horn, head is round and green all over; legs pink, claspers green.

In the second stage there is no decided change in its appearance except that it assumes a more greenish white hue, the horn has a yellowish tip, and the spiracles are black edged with white, the claspers become pinkish.

The third stage resembles the second in general appearance, the colouring being a little more pronounced.

The fourth or last stage of all marks a decided change, the head which was originally round becomes triangular, it is green with a white streak on each side bordered with black, the general green colouring of the caterpillar becomes brighter, the dorsal longitudinal stripe remains dark and the sub-dorsal line is green and edged with yellow throughout its entire length until it nearly reaches the horn when it shades off into bright yellow. The horn remains black on the upper surface with a bright yellow tip, the under portion is green, near the base it has a carmine hue on a white ground. The legs are intense black with the 1st segment of their bases bright yellow. The claspers are of a deep pinkish brown. The spiracles are black edged with white.

Time of appearance.—October to January.

Length.—100 mm.

Food-plants.—*Strychnos nux-vomica*.

Pupa.—deep mahogany brown colour, a little lighter on the abdominal segments, the eyes are conspicuous, the palpi are very prominent and appear separated, the tongue is short, cremaster which curves very slightly backwards is slender and bifid; in general appearance it is of a compact cylindrical form.

Length.—♂ ♀, 36 mm.

Time of pupation.—October to January.

Situation.—In slight cocoon just below surface of the earth.

Genus.—CIZARA.

Cizara, Walker, List Lep. Ins. B. M., VIII, p. 120 (1856), (type: *ardeniæ*); Rothschild, Nov. Zool., IX. (Suppl.), pp. 548, CXXXVII, and 890 CXXIX, (1903).

Angonyx, Hampson, (non-Boisduval, 1875) in Blanf., Fauna Brit. Ind. Moths, I, p. 102 (1892).

Range.—Oriental Region. (Roths.)

Two species of which one is Indian.

CIZARA SCULPTA (Felder).

Microlophia sculpta, Felder, Reise Novara, Lep. t.^o 75, f. 9, (♂), (1874) (Siam.—Mus. Tring.)

Angonyx sculpta, Hampson, in Blanf., Fauna Brit. Ind. Moths, I, p. 102, n. 161 (1892) (Siam; S. India).

Cizara sculpta, Rothschild, l.c. p. 549, n. 472, and p. 890, n. 476 (1903).

Habitat.—Indo-Malayan Sub-region:—Siam; S. Burma, and South India;

Probably of wider distribution in the Indo-Malayan Sub-region. (Roths.)

Localities.—Insein District, South Burma.

Elevation.—(Vertical range)

Time of appearance.—October to March.

Occurrence.—Very rare.

Expanse.—♂, 50 mm. ♀, 60 mm.

The larva of this species has two distinct forms, viz., a green form and a brown form. The first stage of the green form is entirely green with the exception of the horn which is black and minutely bifid at the extreme tip. In the second stage it acquires seven small black spots on the dorsal surface, otherwise there is no difference in appearance; these spots, with the exception of the one on the 5th segment, develop into lines or dashes as the larva grows bigger. In the 3rd stage the larva develops four elongated oval patches on the lateral surface of the 8th to 11th segments, ending at the horn, these are white in colour, edged with reddish brown above and yellowish below intersected with yellowish lines. The horn at these three stages is long and straight, olive green in colour, then pale yellow and tip black. In the 4th stage it assumes a very beautiful form of colour and markings. The dorsal surface is a bright yellowish green from the 5th segment to the horn, covered with numerous blackish and green speckles. There are four dark brown stripes on the lateral surface edged with white and reddish brown above and suffused with a purplish slate colour and pink dashes below. The lateral and under surface is a greenish cobalt blue. It has a small ocellus on the 4th segment which is greenish yellow centred with dark green and in the centre of which is a spiracle, it is thinly ringed with black. Head green, legs pinkish, claspers green, with brown bases, horn rough, and large, strongly curved anad, dull olive green with the tip black.

In the brown form, the larva is coloured green in the first three stages, subsequently in the fourth stage changing to brown. The head and dorsal surface as far as the 5th segment, are a purplish slate colour, and after this, from 5th segment to horn a pure brown shade. The lateral surface is pale purplish slate to the 6th segment, and from 6th segment to horn is a creamy white. It has

four brown lateral oblique stripes on this area converging towards the head, and two indistinct pale brownish stripes, converging towards the horn, just behind the ocellus on the 4th segment, which has a dark brown centre, circled with brick red, then a ring of white, and finally a black ring, a sub-dorsal creamy white line from the head to the 7th segment; there is a yellow spot on this line on the 3rd segment above the ocellus. Legs brown, claspers and underparts purplish slate, horn purplish slate, spiracles dark brown. The head of the larva is retractile into the first three segments, and this is a favourite attitude of the full grown larva when at rest.

Length.—74 mm.

Time of appearance.—November to March.

Food-plants.—*Gardenia sessiliflora* and *campanulata*.

Pupa.—General ground colour on the wing cases and thoracical segments is a pale yellowish buff, and the abdominal segments have a pale pinkish suffusion. It is profusely spotted all over the segments, but sparingly on the ventral surface and also on the wing cases with a darker shade of buff. Spiracles black, the middle ones being connected with each other by dark brown streaks. The eyes are bordered with a black crescent. Leg cases intense black peculiarly marked with buff coloured intersections. Tongue case buff ending in a black tip at the apex of the forewings. Two round buff coloured marks on the 4th abdominal segment near the apex of the forewings. Cremaster black and pointed with two minute bristles at the extreme tip. The pupa is smooth and glossy, and very compact. It is extremely lively in the pupa state and seems to be very sensitive.

Length.—♂, 31 mm. ♀, 37 mm.

Time of pupation.—November to March.

Situation.—In a slightly woven network of dead leaves and debris spun together on the surface of the ground at or near roots of food-plant.

Genus.—GURELCA. Type: hyas.

Gurelca, Kirby, Roy. Dublin Soc. (2) II, p. 330 (1880); Rothschild, Nov. Zool. IX (Suppl.), CXXXV, pp. 587 and 896 (1903).

Range.—North Western India (known as far south as Mhow) to Japan, the Philippines and Java. (Roths.)

Two species of which both are Indian.

GURELCA HYAS. (Walker.)

Lophura hyas, Walker, List. Lep. Ins. B. M., VIII, p. 107, n. 3, (1856).

Gurelca hyas, Kirb, l.c. (1880); Hampson in Blanf., Fanna Brit. Ind. Moths, I, p. 110, n. 173 (1892); Dudgeon, Journ., Bombay Nat. Hist. Soc., XI, p. 417, n. 173 (1898); Rothschild, l.c., pp. 588 and 896, n. 524 (1903).

Gurelca macroglossoides, Hamps., in Blanf., Fauna Brit. Ind. Moths, I, p. 110, n. 175 (1892); Dudgeon, l.c., XI, p. 417, n. 175 (1898).

Habitat.—Indo-Malayan Sub-region:—North-Western India; Mhow; eastwards to Java and the Philippines. (Roths.)

Localities.—Mhow; C. India; Khasia Hills and Silhet, Assam; Madras; Insein District, S. Burma; Sikkim and Bhutan.

Elevation.—(Vertical range) up to 5,000 feet.

Time of appearance.—February to July and November and December.

Occurrence.—Fairly common in some localities.

Expanse.—♀, 40 mm. ♀.

Larva.—There are apparently three or four different varieties of the larva of this species all feeding on the same species of plant, viz., *Morinda*. There is a green form with irregular brown markings, i.e., dots on the dorsal surface resembling somewhat the skin of a lizard, only in miniature. Then there is a

greenish yellow form with markings the same only reddish in tinge, and lastly there is a dark brown form, with greyish markings on the lateral surface and entirely dark brown on the dorsal surface. The horn is reddish brown in the green and yellow forms and slate coloured in the brown form.

Length.—62 mm.

Time of appearance.—May and June.

Food-plants.—*Pæderia* and *Morinda*.

Pupa is glossy, of a light olive yellow, and is profusely marked with greenish speckles.

Length.—

Time of pupation.—May and June.

Situation.—Enclosed in between two or three leaves of food-plant which are spun together.

Genus.—MACROGLOSSUM. Type: *stellatarum*.

Macroglossum, Scopoli, Intr. Hist. Nat., p. 414 (1777), Rothsch., Nov. Zool. IX. (Suppl.), p. 616, C.L. and p. 190, CLI, (1903.)

Range.—Old World. (Roths.)

Fifty-nine species of which fifty-two are Oriental. (Roths.)

MACROGLOSSUM AFFICTITIA (Butler).

Macroglossa affictitia, Butler, Proc. Zool. Soc., Lond., p. 240, n. 4, t. 36, f. 7 (1875); id., l.c. IX, p. 524, n. 3, (1877); Moore, Lep. Ceylon, II, p. 30, t. 93, f. 3 (1882); Hampson, in Blanford, Fauna Brit. Ind. Moths, I, p. 113, n. 182 (1892).

Macroglossa vialis, Butler, Proc. Zool. Soc., Lond., p. 240, n. 5, t. 36, f. 5, (1875); Moore, Lep. Ceylon, II, p. 30, t. 93, f. 2, (1882).

Macroglossum affictitia, Rothsch., Nov. Zool., IX, (Suppl.), p. 635, n. 570 and p. 902, n. 577, t. IV, f. 12 (♂), (1903).

Habitat.—Ceylon; South India; and Burma.

Localities.—Nilgiri Hills; Madras; Canara; Cutch; Sangli; Myitkyina and Upper Chindwin Districts, N. Burma, and Insein District, S. Burma.

Elevation.—(Vertical range).

Time of appearance.—May to July and November and December.

Occurrence.—Common.

Expanse.—♂, 42 mm. ♀.

Larva is coloured as follows:—The prevailing colour is generally bright green, sometimes entirely green but in some varieties the larva is yellow and green variegated with black.

The green form is usually of the same shade all over, head green, spiracles orange, legs black, claspers green, horn black.

The varietal larva is bright yellow on the dorsal surface with a broad black longitudinal band from the head to the horn, below the yellow is another black longitudinal line with white below it profusely speckled with black. Spiracles orange, head greenish yellow, legs black, claspers green with black sides which colour extends to the spiracles, horn medium length, black, and curved slightly upwards.

Length.—56 mm.

Time of appearance.—May and June and October to December.

Food-plants.—*Strychnos nux-vomica*.

Pupa olive green on the head except the eyes and tongue case which are pale pinkish brown, legs and wing cases pale olive green, the rest of the body is pale pinkish brown with black spots on the spiracles; it is variegated in the usual way with greyish brown markings on the legs and wing cases, and with black spots on the lateral and ventral surfaces of the abdomen. The divisions

of the segments are clayish buff, there is a pale line from the tongue case to the tip of the forewings which ends in being black. Cremaster long, dark brown on the ventral surface and with two minute points at the extreme tip.

Length.—♂, 25 mm. ♀, 37 mm.

Time of pupation.—May to July and October to January.

Situation.—In a cell just beneath surface of the ground.

MACROGLOSSUM HELIOPHILA (Boisduval).

Macroglossa heliophila, Boisduval, Spec. Gen. Lep. Hét., I, p. 354, n. 36, t. II, f. 2 (1875).

Macroglossa fringilla, Boisduval, l.c., p. 352, n. 33 (1875).

Macroglossa loochooana, Rothschild, Nov. Zool., I, p. 67 (1894).

Macroglossum heliophila, Rothschild, l.c. IX (Suppl.), pp. 645 and 904, n. 584 and 591, t. 3, f. 6, (♂), (1903).

Habitat.—South India to the Loo Choo Islands, eastwards to the Moluccas. (Roths.)

Localities.—Nilgiri Hills, S. India; Myitkyina and Upper Chindwin District, N. Burma, and Insein District, S. Burma; Tonkin; Hongkong; Loo Choo Islands; Formosa; Sumatra; Java; Sarawak; Philippine Islands; Batjan.

Elevation.—(Vertical range).

Time of appearance.—October to February.

Occurrence.—Rare, but occurs over a wide area.

Expanse.—♂, 48 mm.

Larva.—There are two district varieties of the caterpillar. The green form is coloured as follows:—In its first stage it is a bright green all over, and in the second and third stages it assumes a greenish white hue, there is a white dorsal and also a dorso-lateral line edged with green, and with slender green side stripes, horn pinkish. In the fourth stage it becomes darker and more conspicuously marked, the general colouring is much the same, but the side stripes are edged with white. The other variety is perhaps the most beautiful of the two, it is coloured as follows:—The dorsal surface is pink minutely spotted with darker pink spots, which are orange on the 3rd to 6th segments, there is a dark green dorso-lateral line from the head to the horn, bordered with bright yellow on the 1st to 5th segments. The lateral and ventral surface is a dull green with darker green oblique stripe from 4th to 12th segments. The head is green, spiracles bright red brown, horn purplish shading into bright pink on the under surface, tip yellow; legs yellow, claspers bright pink with black bases.

Length.—56 mm.

Time of appearance.—October to January.

Food-plants.—A creeper with evil smelling leaves and large bunches of pretty pink small flowers also on *Morinda angustifolia*.

Pupa of the usual *Macroglossum* type, its distinguishing characters are as follows:—Pale creamy yellow all over, a series of black stigmatal spots encircling the spiracles. A black line commencing at the base of the tongue and ending at the tips of the wings, a few small black dots and dashes the ventral surface of the abdomen, the segments of which are a buff colour. Cremaster black, sharp pointed and curved backwards. The antennæ, legs and veinings of the wings are very distinct.

Length.—♂, 34 mm. ♀.

Time of pupation.—October to February and also June.

Situation.—Amongst fallen leaves, etc., at or near roots of food-plant.

Sub-family—CHÆROCAMPINÆ.

Charoca pinæ, Butler, Trans. Zool. Soc., Lond., IX, pp. 546, 514 (1877), (type: elpenor); Rothsch., Nov. Zool. IX (Suppl.), pp. 672, 909 (typus: Pergesa elpenor).

Genus.—RHAGASTIS. Type: *velata*.

Pergesa, Walker, List Lep. Ins. B. M., VIII, p. 149. (1856), (partim; type: porcellus, *chaerocampa*, Boisduval, (non-Duponchel, 1835), Spec. Gen. Lep. Heb., I, p. 223 (1875), (partim).

Theretra, Dudgeon, (non-Hübner, 1822), Journ., Bombay Nat. Hist. Soc., XI, p. 411 (1898), (partim).

Rhagastis, gen. nov., Rothschild, l.c. pp. 791, 931, CLXV and CLXVI (typus *velata*), (1903).

Range.—Oriental Region, northward to Amurland and Japan, eastward to Borneo and Java.

Eleven species known to science, it is expected that more new species will be discovered.

RHAGASTIS OLIVACEA (Walker).

Pergesa castor var., Walker, List Lep. Ins. B. M., VIII, p. 153, n. 5 (1856).

Pergesa olivacea, Moore, Proc. Zool. Soc., Lond., p. 566 (1872).

Chærocampa olivacea, Hampson, in Blanf., Fauna Brit. Ind. Moths, I, p. 91, n. 136 (1892).

Chærocampa castor, id., l.c., IV, p. 453 (1896); Dudgeon, Journ., Bombay Nat. Hist. Soc., XI, p. 411, n. 136 (1898), (=olivacea).

Theretra spec., Dudgeon, l.c., p. 413, n. 137, B. a. (1898).

Rhagastis olivacea, Rothschild, Nov. Zool., IX (Suppl.), pp. 797, 932, n. 756 and 764 (1903).

Habitat.—North-West and North India.

Localities.—Mussoorie; Simla; Sikkim; Bhutan; Silhet; Shillong; Khasia Hills, Assam.

Elevation.—(Vertical range) 3,000 to 7,000 feet.

Time of appearance.—May to July.

Occurrence.—Common.

Expense.—♂, 74 mm. ♀ 80 mm.

Larva.—Green, profusely spotted with white all over, a dark line on the dorsal surface from the head to the horn; oblique lateral pale greenish yellow stripes from fourth to twelfth segments with a slight pinkish suffusion at their bases and with a series of black dots above; a bluish green ocellus on fourth segment with a black ring and black centre spot; spiracles white bordered with orange; head green, of the same shade as the body; horn a slate colour, long and blunt at the tip. Legs and claspers pale yellow. Underside of larva pale green.

Length.—65 mm.

Time of appearance.—August and September.

Food-plants.—*Vitis vinifera* and *Hydrangea*.

Pupa dark olive green on the head and wing cases, and dorsal and lateral surfaces, tongue case, prominent, eyes, antennæ and the base of the thorax a brighter green, some black on the inner margin of the wing cases and a few small black dots on the wing cases. Eyes prominent. Spiracles reddish brown edged with black. Ventral surface of abdomen creamy yellow, with a slight pinkish suffusion, two sharply defined black longitudinal streaks on the 5th and 6th segments, with three small ventro lateral blackish spots on each side extending to the 7th segment, the divisions of the segments from the 4th to the 7th are reddish at the brown edged with black. Cremaster blunt with four bristles arranged in pairs extreme tip, slightly pointing ventrad.

Length.—♂ mm, ♀, 50 mm.

Time of pupation.—October to May.

Situation.—On surface of the ground, in a slight web, under fallen leaves, moss, etc.

SOME OBSERVATIONS ON THE BIRDS AND MAMMALS
OF IMAW BUM.

BY

F. KINGDON WARD.

One of the highest peaks in the Htawgaw Hills, far Upper Burma, on the very threshold of a *terra incognita* so far as the naturalist is concerned, is Imaw Bum, 13,307 feet.

These mountains along the China frontier, owing to the incessant rainfall, are snow clad for at least seven months in the year, while the deep valleys are filled with semitropical vegetation; so that we find here one of the most richly assorted floras and densest forest regions in Asia, where animal life in all its forms—including many inimical to man—thrives abundantly. In 1914 I spent four months on the main Salween divide to the east of the Imaw Bum range, from whence I climbed Imaw Bum, and in 1919 I spent a further six months on the western flank of the Imaw Bum range itself, whence I several times reached the Summit of the main peak.

It is to be noted, then, that Imaw Bum, though one of the highest peaks in the district, is not on the main Salween—Irrawaddy watershed, but on another axis running parallel to it, and separated from it by the Ngawchang river, which rises from the junction of the two ranges much further north. After flowing south for seventy miles, this river sweeps westwards round the southern end of the Imaw Bum range, and immediately turns due north, again flowing parallel to the main ranges for some forty miles before joining the Irrawaddy; thus forming a complete U. It might then appear that the Imaw Bum range is a feature of original structure, determining the strange course of the Ngawchang river; but there is reason to believe, from differences in the flora of the valleys on either flank of the range, that these valleys have, in fact, been long isolated, and only comparatively recently become joined up; that the Imaw Bum range is not then a feature of original structure, but a part of the Salween-Irrawaddy divide; and that the Ngawchang river is a compound made up of two or more originally distinct streams, that on the west flank of the range having cut its way back till it has reached and beheaded that on the east flank.

The commanding height of Imaw Bum is doubtless to be ascribed partly to the fact that it is a solid mass of granite, a rock which bulks largely in the district.

These few topographical details are necessary to any proper appreciation of the distribution of fauna and flora in this region, and thence westwards to the Himalaya and eastwards to China.

Bird life of all kinds abounds on Imaw Bum, from the deep valleys 2,000 feet above sea level to the last of the silver firs and *Rhododendron* forest at 12,000 feet, but more particularly between 6,000 and 10,000 feet; at least it was so in 1919.

But in 1914 I remarked in my diary over and over again that birds were peculiarly scarce. It did occur to me that since there are many more *Lisus* in the upper portion of the Ngawchang valley—that is to the east of the range—than in the lower part, west of the range, this might account for the discrepancy noticed; for the *Lisus* are the great destroyers of bird life.

But this explanation was abandoned as too fantastic. Moreover in 1919 I marched right round Imaw Bum, spending a week on the east flank, during which time I saw many birds.

A possible clue is given by Belt in the "Naturalist in Nicaragua", where he states that in the year 1872 there was an epidemic amongst several classes of insects in Chontales.

This suggests two possible explanations.

(i) That there had been an epidemic amongst the young birds themselves in 1913 or 1914.

(ii) That there was an epidemic amongst insects in one or other of those years, with consequent lack of food for the young birds.

Considering the great irregularity of the climate in a mountainous region such as the N. E. frontier subject to a highly modified monsoon, the whimsicality with which a month will be fine one year and pouring with rain the next, such epidemics may be more common than is usually supposed.

If the Lisus are one enemy of bird life on the N. E. frontier, snakes are another. During the summer months small snakes of all kinds literally swarm in the temperate forest belt between 6,000 and 9,000 feet; and the curious thing is there are far more snakes there—or at least they are far more commonly met with—than in the hot semitropical valleys. During the rains of 1919 I rarely went into the forest without meeting at least one snake, generally two or three. Most of them were no doubt harmless to man—they were at any rate quite small reptiles; but it was otherwise with birds.

And now comes the strangest thing of all.

The great majority of small birds met with seemed to build their nests on, or close to the ground.

The fact that without any search, I ran into (it is the best expression) thirteen nests with eggs or young between June 1st and July 31st, says something for the bird life of the country. Of these, one was probably, and two were possibly beyond the reach of snakes; the rest were all either actually on the ground, or in long thick grass within a foot or two of it. I had long suspected, from seeing broken egg shells on the ground and finding nests deserted, that snakes took heavy toll of the birds, and at last I obtained direct proof.

One evening I flushed a small bird off a nest in the long grass which bordered the pathway below the village, at an altitude of 5,000 feet. There were three sky blue eggs, like an English hedge sparrow's, which the nest also resembled. These I left, deciding to return next day and spot the bird.

As I approached the place next morning I saw the male bird hopping about in the bushes close to the nest and twittering, evidently in great distress. At first I supposed I was the cause of alarm, but on approaching closer and peering into the nest I saw a small black snake with narrow yellow rings, calmly coiled up in the bottom of the nest sucking the eggs; it escaped my efforts to kill it and left the nest gutted.

The snake was not above 18 inches long, the nest about the same height above the ground.

However there were plenty of small birds seen above 8,000 feet, and at this altitude snakes were more rare. In 1914 I saw two vipers in a marsh at about 8,000 feet altitude, and in 1919 a snake three feet long came into our camp, in a marshy meadow at 9,000 feet, and was promptly killed. No doubt in such localities plenty of snakes might be met with.

It may be observed in passing that an abnormal number of snakes in one year might imply a decrease in the number of birds during the following year; and conversely, a decrease in the number of birds might re-act unfavourably on the number of snakes in the third year, allowing the number of birds to become normal again in the fourth—if indeed the ravages of one season can be made good again so rapidly.

I wish, however, in particular to insist on the number of snakes in the Htawgaw Hills; and in general to point out that in a country so prolific of life, there is a destruction of life correspondingly prolific.

In August the common Yunnan green parrot was often seen in the valley. On some days numbers of swallows (?) would be seen wheeling and darting over the village. Then they would disappear mysteriously and not be seen again for

weeks. Hawks were not common, and the few I saw were down in the valley; but in the evenings, when in camp, I frequently heard the plaintive cry of an owl. There were several kinds of pigeon in the valley, including green pigeon; and throughout May the cuckoo was often heard, though I saw but one.

Amongst the dense thickets which covered fallow *taungya*, were many warblers and robins; and higher up, wrens, tits, and flycatchers; a small black crested tit was one of the commonest birds in the Rhododendron forest at 11,000 feet. In the more open parts of the forest a scarlet-breasted woodpecker was seen, and there were some noisy magpies with long black and white barred tails. By streams a grey wag-tail was common; also a beautiful piebald wag-tail, a chocolate brown water ouzel, and a tiny white-pollered red and black rock wren. The last three are widely distributed for I have seen them over a large part of China as well as in India. But by far the finest birds met with were Sclater's Monaul (*Lophophorus sclateri*) and the Chinese Blood-Pheasant (*Ithagenes sinensis*) and both are, strange to say, moderately common, for they are not greatly persecuted by the Lisus--yet. Let us hope they will remain comparatively immune. I found them strangely tame, especially the Monaul; but then of course they are 'fool birds.' Though I offered a big reward for a Monaul none were brought to me; yet I myself saw six. I obtained one Blood Pheasant, shot—not trapped be it noted—by a Lisu, with the cross-bow.

The Blood Pheasants I saw several times in May, June and July in rhododendron, bamboo and *Abies* forest which clothed a great spur of the mountain, between 9,000 and 11,000 feet. They went about in flocks, and seemed to keep to the crest of the ridge as we did; for every time I went up the ridge in the summer I met these birds. We would hear them calling loudly as they plunged down the steep slope at our approach, but we generally managed to catch sight of them. Only on one occasion, however, did I glimpse a male bird, and suspect that the flocks seen were composed of young birds with the hen. On June 29th, at 9,000 feet, in open shrub meadow, I put up a hen and several young of this species just able to fly. Probably they were not above a month old, so that we may reasonably infer that the bird lays its eggs in May. It cannot then nest very high—probably below 10,000 feet in this country; for up to the middle of May at least there is plenty of snow about at that altitude. After July I did not see any more blood pheasants, though I frequently went up the ridge.

On July 27th I saw my first monaul at nearly 13,000 feet. It was a female however. The very next day I saw a male in the rhododendron scrub, and two more females squawking from a rock. The first female, a bird rather bigger than an English partridge, was also standing on a rock above the tree line, squawking plaintively. As I approached she ran up the cliff still calling loudly but after a time she took to flight and sailed past me, followed by a young bird. However she did not go far, but settling on a rock further down the ridge began calling again, till presently a second young bird joined her. Again I saw two females standing sentinel on a granite cliff, squawking loudly, at an altitude of 12,000 feet. As to the male, he ran behind a rock almost as soon as I saw him; but climbing over the rock I had quite a good view of him for half a minute before he flew a short distance down the cliff and disappeared in the scrub. The coloration of this bird is remarkable. The head is peacock blue changing to metallic green; neck bronze, breast and wings black. The short fan-shaped tail is cinnamon, with a broad band of white across it.

On August 29th, I saw my fifth adult bird, also a male. He was carrying on like a female, that is to say he stood up on a bare rock, squawking mournfully; he allowed me to approach quite close before he turned and walked slowly up the cliff, still calling.

In October I saw another male high up on the mountain; he sailed screaming down the slope, and after that I saw no more.

With the exception of the Takin I shall not say anything about the larger mammals of Imaw Bum, for the reason that they are well known. The Himalayan bear must be quite common, though I did not come across it. Two skins were brought to me by the Lisus, one of very large size; and two live cubs. There is also a small brown tree bear.

The barking deer was often heard in the deep valley of the Ngawchanghka, also gibbons. On one occasion the skin of a flying fox was brought to me, but I never saw that animal, and only a few times did I see bats. Squirrels were fairly common between 5,000 and 8,000 feet. I secured three or four, belonging to two distinct species, all shot by the Lisus with cross-bow and bamboo arrow; they also distinguish them, calling the larger *hibi*, the smaller *hape*.

In 1914 I sent to the Natural History Museum several specimens from the North-East Frontier, including a shrew (*Blarinella wardii*, Thomas), A water-shrew (*Chimarogale styani*—the second known example), several voles, and a harvest mouse.

In 1919 I collected some more specimens, including voles, shrews, long-tailed mice, bamboo rats, *Pica* hare and others. I found the region of bamboo and Rhododendron forest, at about 9,000 feet altitude to be the richest in ground mammals. Through this forest Conifers are also scattered, and there are open meadows in places along the crests of the ridges. Here indeed, throughout the summer at least, little animals swarmed in such numbers that it is evident they must play an important role in nature. When camped in this belt, with three traps I always caught at least one mammal, and this without stirring above a hundred yards from my tent. The steep slopes beneath the bamboo clumps and under the Rhododendron and other trees were honeycombed. Here I caught chiefly voles and long-tailed mice, also a pigmy hare and a shrew, both taken by day. Indeed the shrews seem to be diurnal rather than nocturnal in their habits, probably because their food is abroad by day. I caught two also running about inside my tent, both in the day time; they moved in sudden little darts, their long noses glued to the ground, poking under leaves and sticks. They all seemed to be blind and rather deaf, and even their sense of scent seemed at fault, at least so far as I was concerned, for they made no serious effort to escape my clutches.

In the same way the *Pica* hares are diurnal. On the grass hills of south-eastern Tibet the ground is riddled with their burrows, and I saw them scampering about, popping in and out of their holes like rabbits. *Chimarogale* too may be a day-light animal; the only one I caught was taken by hand in a stream during the day time at 11,000 feet altitude. But the voles and mice are certainly not nocturnal nor is it obvious why they should be. It must be harder for them to find their food in the dark, and as they have nothing to fear from man in these lonely forests, it must be something else they hide from. Birds of prey are rare at these altitudes, but weasels are more common.

Having found the 9,000 feet belt prolific in small mammals during the heavy rains of June, I tried 1,500 feet higher in July. Camp was pitched on a narrow granite ridge, in a forest of bamboo, *Rhododendron arizelum* and *Abies* sp. On either side the ridge sloped very steeply, and beneath the almost horizontal stems of the outgrowing Rhododendrons, mammal burrows were extraordinarily plentiful. Yet in six nights, using three traps a night, I did not catch a single mammal here. Either (i) the original inhabitants of the holes had temporarily abandoned this altitude at this particular season for lower or higher altitudes; or (ii) the area had been worked out for good and permanently deserted as fallow, the mammals migrating. I could think of no other possible explanation to account for the absence of mammals from a place where they had obviously once lived in thousands. The weather was extremely wet during six days I remained, in camp here, but we had two fine nights. Moreover, it was just as wet lower down, and the mammals came out at night just the same wet or fine.

Again, higher up there were small mammals. Returning one day from the summit, I saw a brown Pica hare dart into a hole under the Rhododendron scrub, and I sat down to watch. Presently he peeped out again, took a look at me, and emerged. Sitting up at the entrance to his home, he first rubbed his face all over with his paws, like a squirrel; then began to lick his breast and belly, twisting his head round beneath his fore paws and polishing away energetically. But he kept an eye on me, darting into his hole if I moved, only to re-appear almost instantly.

The specimen of a Pica I obtained was shot by a Lisu with the cross bow. I saw the little animal pop into its hole close to my tent one morning, and called up one of the Lisus, who stood by with his cross-bow strung, when presently he came out, the Lisu let fly at ten yards range and pinned the Pica to the ground.

Towards the end of August I saw the first herd of Takin on Imaw Bum—fourteen of them. They were on a spur below me and not far away; six of them were lying down in the short Rhododendron scrub, with their stumpy fore legs thrust out straight in front of them; the rest were grazing. One or two were on the look out. I was particularly struck by the peculiar sea-roll of their walk, and the swaying of the head from side to side. But they looked even more odd when they broke into a run lumbering down the slope, yet leaping nimbly from rock to rock on the rough scree. The long hair fringing the chest and shoulders, and the short stumpy legs, gave them almost the appearance of Yak in the distance, though the horns and bob-tail at once betrayed them for what they really were.

In colour this species has the face and legs soot black, the lower half of the flanks, neck, belly, rump and tail dark brown to black; back, extending thence half way over the flanks, pale yellow, except for a sharply defined black line down the centre, and the upper half of the neck pale yellow. This may therefore be the Mishmi species, *B. tawicolor*; on the other hand it may not.

REPORT ON THE
ORTHOPTERA OF MESOPOTAMIA AND PERSIA.

COLLECTED BY

MESSRS. P. A. BUXTON, M. A., AND W. E. EVANS, B. SC.

DICTYOPTERA AND ENSIFERA.

BY

L. CHOPARD, D.Sc.

(With three plates.)

DICTYOPTERA.

FAM.—BLATTIDÆ.

Gen.—ISCHNOPTERA, BURM.

Ischnoptera evansi, n. sp.

(Fig. 1 and 2).

Type.—One female from Mesopotamia, Amara (at light, W. E. EVANS, 7-8-1918).

A small species for the genus, of a rather pale, very uniform testaceous colour. Head testaceous, the vertex exposed; face darkened between the eyes, which are widely separated; no ocellar spots visible. Antennæ testaceous, darker in the distal part. Maxillary palpi yellowish, the 4th joint shorter than the 3rd, much dilated at the apex, 5th joint long, brown at the apex which is acute. Pronotum testaceous, translucent laterally; anterior and lateral margins rounded, posterior margin slightly produced in the middle. Meso and metanotum testaceous with a small fuscous mark on each side. Abdomen testaceous with two lateral fuscous bands; supraanal plate translucent, slightly triangularly produced; subgenital plate broad, almost truncate at the apex.

Legs concolorous; front femora armed beneath on the outer edge with 5 or 6 spines subequal in length, rather strong, one of which is apical, on the inner edge, from base to apex, with 4 moderately strong spines, 10 very small ones, 1 rather large and 2 very long apical ones; tibiæ short, armed with 5 apical spurs, 3 superior (1 ext., 2 int.) and 2 inferior spines (1 ext., 1 int.); tarsi short, the 3 first joints spiny beneath, presenting two minute lateral spines at the apex, 4th joint very short, 5th almost as long as the metatarsus; arolia between the claws large. Intermediate and posterior femora armed with two internal apical spurs and 6 or 7 spines on each inferior margin; intermediate tibiæ armed with 5 apical spurs, 7 superior (2 ext., 3 med., 2 int.) and 6 inferior spines (3 ext., 3 int.); posterior tibiæ with 5 apical spurs, 13 superior (4 ext., 4 med., 5 int.), and 9 inferior spines (4 ext., 5 int.); posterior tarsi longer than those of the two other pairs.

Elytra and wings extending little beyond the apex of abdomen. Elytra very pale testaceous, almost transparent; marginal field broad, occupying more than the third of the total width of the tegmen; 8 costal veins; humeral vein furcate after the 8th costal, its superior sector giving 10 branches; the inferior one furcate at the apex; median vein trifurcate at its base; ulnar vein forming 4 branches, parallel, somewhat angled near their base. Wings hyaline; mediastinal vein furcate at the apex; humeral vein furcate little after the middle, having given 4 branches, its superior sector giving 5 more parallel branches, the inferior trifurcate at the apex; median vein very slightly sinuate; ulnar vein giving 3 branches towards the apex of the wing and 3 short ones to the dividing vein; axillary vein trifurcate.

Length of body, 13 mm.; length of pronot., 3.5 mm.; width of pronot., 5 mm.; length of tegmen, 12.7 mm.

This species looks very much like a *Blattella* but the venation of the wing is that of an *Ischnoptera* or rather an *Ischnopterite* as that large genus is much too comprehensive and should be restricted after examination of large series of the species referred to it.

Gen.—BLATTELLA, CAUDELL.

Blattella germanica, L.

Mesopotamia: Kurna, 20-5-18, 1 ♂; Amara, 27-11-17, 1 ♀; 10-6-18, 1 ♀; 30-6-18, 1 ♀; 7-8-18, 1 ♀ (at light).

Persia: Enzeli, 10-2-19, 1 ♂.

Cosmopolitan species.

Gen.—SUPELLINA, nov. gen.

Very closely allied to *Supella* Shelf. Male narrow and elongate, with tegmina and wings extending beyond the apex of abdomen. Head with eyes well separated; interocular space flattened, forming with the facial shield a sub-angular line. Tegmina with the discoidal sectors oblique; wings with the ulnar vein ramose, no apical triangle. Dorsal segments of abdomen unspecialized; supraanal plate very weakly produced; subgenital plate with styles well developed, almost symmetrical, inserted near the apex of the plate. Front femora armed anteriorly with two long apical spines and a row of very short, spiniform bristles, posteriorly with one apical spine and one before the apex of the inferior edge. Femora of the other legs armed with a few spines on each edge. Female unknown.

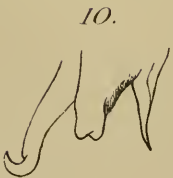
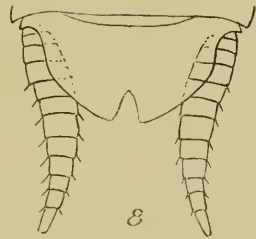
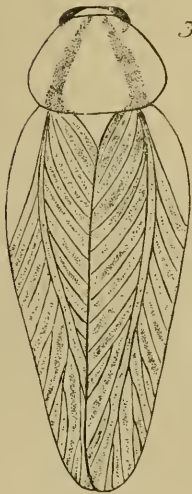
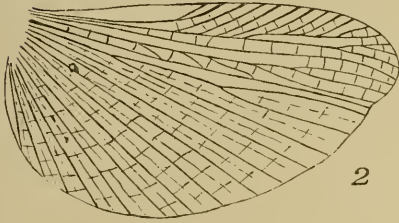
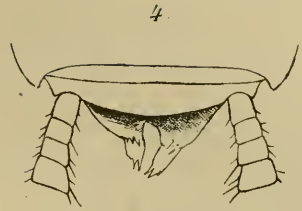
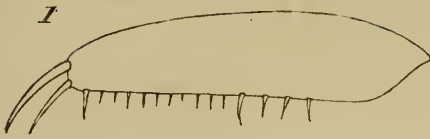
Genotype: *Supellina buxtoni*, n. sp.

Supellina buxtoni, n. sp.

(Fig. 3 to 7).

Type: One male from Mesopotamia, Amara (P. A. BUXTON, 14-9-1918.)

♂. Size medium, form slender. Colour very pale yellowish with two brown longitudinal bands on the pronotum, and numerous longitudinal brown lines on the elytra between the principal veins. Head elongate; occiput short, brown; interocular space wide; front, between the ocellar spots, whitish; face brown. Maxillary palpi long, brown, the last segment short, truncate. Antennæ brown. Pronotum broad, slightly convex, anterior and posterior margins almost straight, lateral margins convex; disk pale yellowish marked with two brown bands converging anteriorly; lateral portions transparent. Meso and metanotum testaceous. Abdomen testaceous with two brown lateral lines; supraanal plate, very short, subrounded at the apex; subgenital plate rather large and produced, emarginate at the apex, depressed on each side with a longitudinal keel in the middle. Cerci formed of 12 articles, depressed with their outer angle somewhat produced and rounded, the two distal ones much smaller. Style rather big, inserted almost in the midst of the posterior margin of the plate, armed with two very minute denticulations at their apex; the superior margin of the subgenital plate bearing 2 or 3 such denticulations at their base. Genital valves showing a long chitinous process and a rounded head entirely covered with stiff bristles. Legs rather long and slender, yellowish. Front femora armed anteriorly with two apical spines very close together, the superior one longer and curved, posteriorly with one apical spine and one about at the distal third of the inferior margin; anterior margin bearing about 30 spinuliform bristles from proximal third to the apex; tibiæ shorter than the femora, armed with 4 apical spines, 3 superior (1 ext., 2 int.) and 2 inferior ones. Intermediate and posterior femora armed with 4 or 5 spines on each margin



beneath; intermediate tibiae armed with 5 apical spines, 8 superior (3 ext., 3 med., 2 int.) and 4 inferior ones (3 ext., 1 int.); posterior tibiae with 5 apical, 13 superior (5 ext., 4 med., 4 int.) and 7 inferior spines (4 ext., 3 int.).

Elytra very long, their anterior margin somewhat sinuate, internal margin almost straight; humeral vein with 7 branches, the two apical of which are furcate; anal field elongate. Marginal field transparent, the remainder of the tegmina pale yellowish with longitudinal brown bands between the veins. Wings transparent, the costal veins somewhat darkened and clubbed; ulnar vein triramous, no intercalated triangle.

Length of body, 9.5 mm.; length of tegmen 10 mm.; width of tegmen, 3 mm.; length of pronot, 2.5 mm.; width of pronot, 3 mm.

This species shows very distinctive features in its general coloration, armature of the front tibiae and apex of the abdomen. It seems closely related to *Supellia Shelf.*, but cannot enter this genus on account of the lack of spines on the anterior margin of the front femora and the absence of a specialized gland on the abdominal tergites.

Gen.—BLATTA, L.

Blatta orientalis, L.

Persia: Enzeli, 19-6-19, 1 ♂.

Gen.—PERIPLANETA, BURM.

Periplaneta americana, L.

Mesopotamia: Amara, 1 ♀.

Gen.—SHELFORDELLA, ADELUNG.

Shelfordella tartara, Sauss.

(Fig. 8 to 10).

Mesopotamia: Amara, R. Tigris, 7-4-18, 2 ♀ (immature), common in fields; billets, etc.; 25-6-18, 1 ♂; 31-5-18, 1 ♂; 24-9-18, 1 ♂; 30-9-18, 1 ♂; Kurna, 20-5-18, 1 ♂.

This interesting species had not yet been recorded from Mesopotamia; the specimens collected by Mr. BUXTON agree fully with ADELUNG's description.* There is very little to add to this very good description. The front femora are armed anteriorly with two long apical spines and 13 ones on the inferior margin, these being rather strong and regular; posterior inferior margin with 5 spines, one of which at the apex; front tibiae with 5 apical, 3 superior (1 ext., 2 int.) and 6 inferior spines (3 ext., 3 int.). Intermediate and posterior femora armed beneath with 6-7 spines on each margin; intermediate tibiae with 5 apical, 8 superior (3 ext., 3 med., 2 int.) and 8 inferior spines (4 ext., 4 int.); posterior tibiae with 5 apical, 14 superior (5 ext., 5 med., 4 int.) and 13 inferior spines (7 ext., 6 int.). Genital valves rather short and broad, with three sharp hooks.

Gen.—POLYPHAGA, BRULLE.

Polyphaga aegyptiaca, L.

Mesopotamia: Kurna, 20-5-18, 1 ♂; Basra, 16-8-17, 1 ♂; Amara, 7-3-17, 1 ♀; 10-3-18, 1 ♀ (under palm logs); 27-4-18, 1 ♂ (flying).

Persia: Menjil, Gillan, 2,000 ft, 1 ♀ (running in stony desert).

Two egg-cases of this species have been collected by Mr. W. E. EVANS; they agree with the description given by Dr. W. INNES BAY (*Mem. Soc. ent. Eg.*, I [1912], p. 37), one being 10, the other 9 mm. long, both bearing 16 denticulations on the crest (fig. 11).

* *Horae Societatis Entomologicae Rossicae*, XXXIX [1910] p. 331.

Polyphaga subhyalina, n. sp.

(Fig. 12 and 15).

Type : 1 ♂, from Persia, Qazvin, 4,000 ft., 25-8-19. (P. A. BUXTON).*Co-types* : 2 ♂, same locality, 30-9-19.

♂. Medium sized species; form elongate, coloration very pale, not very hairy. Head small, occiput and forehead black with long reddish hairs, face and mouth parts very pale yellowish. Eyes very large, black, a little more approximate than the ocelli; these are big, yellow, the space between them forming a rounded keel. Antennæ rather thick, yellow. Maxillary palpi yellow, the 3rd article longer and thicker than the 4th, the 5th comparatively very short, truncate. Pronotum small, short and broad, its anterior margin fringed with long hairs, its surface covered with short, silky, reddish hairs; general shape regularly oval, the anterior margin feebly truncate, clearing the summit of the head; disk slightly convex, adorned with symmetrical brown lines, forming a triangular impression. Abdomen broad, whitish, almost glabrous; supraanal plate small, rounded at the apex; subgenital plate a little a symmetrical, with no style, its posterior margin concave, lined with short spinuliform hairs, angles rounded. Cerci short, yellowish. Genital valves short, folded on the right, presenting a long hook on the left.

Legs yellow, rather short. Front femora bearing long, irregular bristles; tibiæ armed with 8 spines round the apex and 1 on the upper margin; tarsi long and slender, the metatarsus equaling the other joints together. Intermediate femora bearing scarce long bristles and armed with 1 external genicular spine; tibiæ armed with 7 long apical spurs, 6 superior (2 ext., 2 med., 2 int.), and 2 inferior spines (1 ext., 1 int.). Posterior femora armed as the intermediate ones; tibiæ with 7 spurs, the longer one much shorter than the half of the metatarsus, 11 superior regularly disposed (5 ext., 3 med., 3 int.), and 5 inferior spines (2 ext., 3 int.). Tarsi long, all the articles covered with spinelets; arolia between the claws small.

Elytra extending much beyond the apex of abdomen, almost transparent with numerous small greyish spots and the costal area whitish; humeral vein sending 6 or 7 branches to the internal margin; branches of the median vein very numerous, 12 to 14; anal field short. Mediastinal vein with a small inferior lobe. Wings transparent except a few small greyish spots near the apex and a narrow white opaque band along the anterior margin in its apical midst ulnar vein with 5 branches; 1st axillary vein with 10 branches.

Length of body, 13 mm.; length of pronot., 3.5 mm.; width of pronot., 6 mm.; length of tegmen, 19.5 mm.; width of tegmen, 7 mm.; post tib. 5.6 mm.; post. metatarsus, 6 mm.

Although looking much like *H. livida* Burm., at first sight, this species belongs to the *algerica* group, having the spines of the posterior tibiæ regularly disposed along the whole length of the tibia. *H. Roseni* Brancs, seems to be a very close species but BRANCSIK does not speak in his description of the disposition of the tibial spines; anyhow, the shape of the pronotum is different from that of the present species, the elytra and wings are shorter and the tarsi possess no arolium.

Polyphaga africana, L.

Mesopotamia: Azijiysh, R. Tigris, 1-11-18, 1 ♂; under flood refuse, slopes of Jebel Hamrin, 1 adult and 2 young ♀ (?).

The male specimen here referred to agrees quite well with the good figure of this species given by SAVIGNY (Descr. de l'Égypte, Orth., pl. II, fig. 11), but the anterior part of the pronotum is not whitish; I do not think this colour variation is sufficient to authorize the creation of a species or even a geographical race. There is a very distinct small arolia between the tarsal claws and the posterior

tibiæ are armed with 9 superior spines, the three distal ones forming a group not very clearly separated from the other 6; 4 inferior spines inserted in the distal half of the tibia, of which 2 external and 2 internal, the latter much longer.

The female specimens seem to belong to the same species, showing the same tibial armature; there is no tarsal arolia but this must be characteristic of the females of all the species of this genus. The adult specimens are covered with a reddish hairy clothing and show the supraanal and subgenital plates slightly notched at the apex.

Polyphaga persica, n. sp.

(Fig. 14 and 16).

Type :—One male from Persia, Qazvin, 4-9-1919 (P. A. BUXTON).

Size medium, form rather short and stout, coloration testaceous brown with numerous small brownish spots on the tegmina. Head hidden by the pronotum; occiput and forehead black; facial shield and clypeus yellow, the former depressed, the latter forming a protuberance with a fine median furrow. Eyes large, black, as distant one from the other as the ocelli; these are very large, yellow, oval; between them is a tuft of reddish hairs. Maxillary palpi testaceous, the last joint much shorter than the fourth one. Antennæ brownish, thick.

Pronotum rather wide, testaceous, covered with long reddish hairs; a narrow band along the anterior border almost transparent, posterior part somewhat darkened, 8 small black spots on the disk which is convex; anterior margin slightly produced in the middle, lateral margins almost straight, posterior one convex. Mesonotum testaceous, its posterior margin subangulate, its exposed part very large, brownish.

Abdomen broad, depressed, testaceous above, yellowish with reddish hairs beneath. Supraanal plate small, subtriangular, its posterior margin sinuate, apex feebly notched; subgenital plate a symmetrical, its posterior margin sinuous, thick, covered with reddish hairs; styli irregular, the right one much shorter than the left which is inserted in the concavity of the margin. Cerci very short, testaceous.

Legs yellowish; anterior femora provided with very long hairs and a few spiniform bristles on the inferior inner edge; tibiæ very short, armed with 8 strong spines round the apex and 1 on the superior margin; tarsi long, rather slender, the metatarsus equaling the other joints together; no arolia between the claws. Intermediate and posterior femora provided with long bristles, without genicular spines; intermediate tibiæ with 7 very long apical spurs, 7 superior (4 ext., 2 med., 1 int.) and 1 inferior spines; posterior tibiæ with 7 apical spurs, 10 superior (4 ext., 3 med., 3 int.) and 4 inferior (2 ext., 2 int.) spines, the superior ones forming 3 imperfectly limited groups. Tarsi longer and thinner than the anterior ones, the metatarsi longer than the other joints together.

Elytra and wings extending beyond the apex of abdomen. Elytra very broad, chiefly near the apex, subhyaline with many little greyish spots; marginal field narrow, whitish; humeral, median and ulnar veins with numerous parallel branches. Wings slightly smoky, chiefly towards the apex and along the anterior margin; anal angle very pronounced. Veins brownish; median vein emitting 9 branches, ulnar vein with 13 branches; many of the radiate veins are furcate.

Length of body, 15.5 mm.; length of pronot., 4.5 mm.; width of pronot., 7 mm.; length of elytra, 18.5 mm.; width of elytra, 6.5 mm.

This species has exactly the same form and size as the preceding; it differs from it by its general colour and by the absence of arolia between the tarsal claws. The hook of the genital valves (fig. 13-14) is much thicker and more curved in *africana* than in *persica*.

FAM.—MANTIDÆ.

Gen.—MANTIS, L.

Mantis religiosa, L.

Mesopotamia: Amara, nov. 1917, 2 ♂, 3 ♀; Kizil Robot, north-east of Baghdad, 1 ♂, 1 ♀; Masharra Canal, Amara, 8-6-18, 1 ♀.

Gen.—IRIS, SAUSS.

Iris oratoria, L.

Mesopotamia: Kut el Amara, R. Tigris, 9-8-18, 1 ♂; Shahroban, R. Diala, 30-7-18, 1 ♂.

Gen.—FISCHERIA, SAUSS.

Fischeria fasciata, Thunb.

Mantis fasciata, Thunberg, 1815, *Ac. Petersb.* V., p. 292; *Fischeria fasciata*, Giglio-Tos, 1916, *Bull. Soc. ent. it.* XLVII [1915], p. 21; *Fischeria baetica*, Rambur, 1839, *Faune And.* II, p. 19, pl. 1, fig. 1,2.

Mesopotamia: Amara, 11 and 20-9-18, 1 ♂, 2 ♀;—Kut el Amara, R. Tigris, 9-8-18, 2 ♂.

Three male specimens, collected by Mr. P. A. Buxton, are very much larger than Spanish examples (length of body, 68 mm.; length of pronot., 18 mm.: length of tegmen, 47 mm.); they are quite similar to these in every other respect but might be considered as a local race.

Gen.—BOLIVARIA, STAL.

Bolivaria brachyptera, Pall.

Persia, Qazvin, sept. 1919, 2 ♀.

Gen.—EMPUSA, ILLIGER.

Empusa egena, Charp.

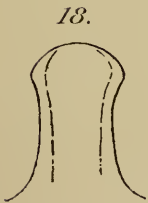
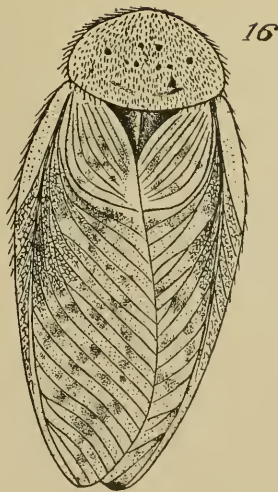
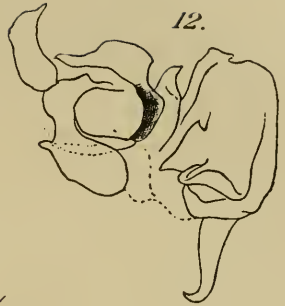
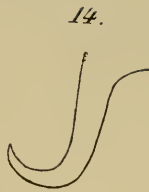
Mesopotamia: Amara, R. Tigris, April 1918, 1 ♂;—Masharra, 20-3-18 1 young ♀.

Empusa uvarovi, n. sp.

(Fig. 17).

Types:—One male from Mesopotamia, Amara, on Alhagi, margin of dry marsh (W. E. EVANS, 12-9-18).—One female, same locality (P. A. BUXTON, 10-9-1918).

Very much like *E. egena* Charp., but smaller. Male with conical process of vertex rather short, rounded above, slightly furcate at the apex; prothorax slender weakly denticulated anteriorly, its posterior part almost unarmed. Elytra transparent, tinted with greenish near the anterior border and the apex; marginal field opaque, green with the extreme border yellow (in life wholly green?) and a narrow yellow band (in life green?) along the humeral vein, extending from base to the stigma which is yellow; median vein furcate on the stigma, its superior branch furcate; discoidal vein trifurcate. Wings transparent, greenish near the apex; discoidal vein furcate. Legs green banded with yellowish (in life wholly green?); lamellar expansions of the femora smaller than in *E. egena*, subtriangular. Female with process of vertex rather short, divided in two almost equal parts, the apical one rounded above, canaliculate beneath,



its sides convex and weakly lamellar; prothorax as in the male but more strongly denticulate. Tegmina almost entirely of a fine green with the same yellow marks as those of the male; wings more greenish than those of the male; lamellar dilatations of the femora as in the male. Abdomen similar to that of *E. egena* but with weaker median and lateral lobes.

Length of body, ♂, 48 mm. ♀, 56 mm.; length of pronot, ♂, 19.5 mm. ♀ 23 mm.; length of ant. fem., ♂, 11.5 mm., ♀, 14.5; elytra, ♂ 26.5 mm., ♀ 34 mm.

This species is much smaller and more slender than *E. egena*; it differs from it by the shape of the process of the vertex and by its tegmina much more brightly coloured. It seems very close to *E. unicornis* Johans. but the prothorax is comparatively much shorter than in this last species and the shape of the vertex of the female seems intermediate between that of *E. unicornis* and *E. egena*.

I take much pleasure in dedicating this beautiful Mantid to Mr. B. UVAROV who has so carefully studied the Orthopterous fauna of West Asia.

Gen.—BLEPHAROPSIS, REHN.

Blepharopsis mendica, F.

Mesopotamia: Amara, R. Tigris, may 1917, 1 ♂; 7-4-18, 1 ♂; 16-8-18 (at light) 1 ♀; 27-9-18, 1 young.

ENSIFERA.

FAM.—PHASGONURIDÆ.

Gen.—HOMOROCORYPHUS, KARNY.

Homorocoryphus nitidulus, Scop.

Mesopotamia: Amara, 20-10-17, 2 ♀; 30-10-17, 1 ♀.

Gen.—CONOCEPHALUS, THUNB.

Conocephalus fuscus, F.

Persia: Enzeli, 20-6-10, 1 ♂.

Conocephalus fuscus turanicus, Semenof.

Xiphidium fuscum turanicum, Semenof, 1915, *Rev. russe Ent.*, XV [1915] p. 451.

Mesopotamia; below Amara, on Tigris, 15-5-18, 1 ♀; 22-10-18, 1 ♂, 1 ♀,

Conocephalus buxtoni, n. sp.

(Fig. 18 to 20).

Type:—One male from Mesopotamia. Amara (P. A. BUXTON, 30-6-18).

Size medium, form rather slender; general colour pale green, dorsum of head and pronotum with a broad median band of reddish brown; on pronotum, this band is outlined on each side with opaque yellow. Head with dorsum of vertex very slightly ascending above the plane of the occiput; fastigium of vertex narrow, little more than half as wide as the basal antennal joint, very slightly enlarged at apex. Pronotum with lateral lobes high, their posterior margin very weakly convex, callosity slightly convex, broad. Abdomen slender, 10th tergite notched at apex, subgenital plate truncate, bearing rather long, cylindrical styles. Cerci very large, almost triangular, the internal margin being strongly produced in a triangular process, ending in a small tooth directed downwards; apex rounded, medial portion somewhat swollen, part of the internal margin between the process and the apex depressed, almost lamellar.

All the femora unarmed beneath; anterior and intermediate tibiæ with 6 pairs of inferior spines; posterior femora with 2 very small genicular spines on each side. Elytra much longer than the posterior femora, a little shorter than the wings.

Length of body, 14.5 mm.; post. fem., 12 mm.; length of tegmen, 19 mm.; length of wing, 20.5 mm.

The present species is very interesting as it belongs to the subgenus *Neoxiphidion* which contains chiefly American forms; only two species of this subgenus have been described from the palearctic region; *C. japonicus* Redt., from Japan and *C. Chavesi* Bol., from Azores. Those three forms may be distinguished as follows:—

1. Cerci of ♂ dentate in the middle; dorsum of vertex and pronotum unicolorous; tegmina shorter than posterior femora which are spinose beneath.
..... *C. japonicus*, Redt.

—Cerci of ♂ dentate before the middle.....2.

2. Posterior femora longer than the body and than tegmina; their inferior margin with 1 or 2 spines.....*C. chavesi*, Bol.

—Posterior femora entirely unarmed beneath, shorter than the body; tegmina very long..... *C. buxtoni*, Chop.

Gen.—PHASGONURA, STEPH.

Phasgonura viridissima, L.

Mesopotamia: Amara, May 1918, 1 ♂, 4 ♀.

Gen.—TETTIGONIA L.

Tettigonia albifrons, f.

Mesopotamia: Amara, May 1918, 2 ♂, 1 ♀.

Gen.—PHOLIDOPTERA, WESMAEL.

Pholidoptera persica, n. sp.

(Fig. 21 to 23).

Types:—One male from Persia, Qazvin, 20-7-19 (P. A. BUXTON)—One female, same locality, 20-9-19.

Reddish grey or brownish. Head concolorous; occiput a little darkened behind the eyes; fastigium of vertex short, broader than the first joint of antennæ, slightly rounded at the apex, convex above, narrowing beneath and separated from facial shield by a transverse furrow; face glabrous, shining, yellowish or brownish; facial shield and clypeus with two small blackish impressions. Pronotum concolorous with indistinct blackish marks on the disk; shape similar in both sexes, somewhat produced posteriorly, lateral lobes high, their inferior margin subangulate, anterior margin straight, posterior one subtruncate, lined, black; disk without keels, convex anteriorly, feebly depressed posteriorly; prosternum unarmed. Abdomen concolorous with about 10 small black spots on the posterior edge of each tergite to the 7th; 10th tergite of male presenting two long, almost cylindrical processes; supraanal valve triangular; cerci short, bluntly curved near the apex which is dentiform; subgenital plate large, weakly emarginate at the apex; style cylindrical, equaling about the third of the plate. Titillators short, slightly curved at the apex, basal part inflated with many small spines. Female with 10th tergite emarginate, bearing short processes similar to those of the male; cerci conical; subgenital plate large, very widely concave at the apex. Ovipositor very short and thick, gently curved, blackish at the apex.

Legs concolourous, rather short and stout. Front femora thick, armed beneath with 3 small black spines on the inner edge; tibiæ longer than the femora, armed above with 3 external spines, beneath with 6 rather strong ones on each side; tarsi very short, the metatarsus scarcely longer than the 2nd joint. Intermediate femora longer than the anterior ones, bearing, like those, 3 very small black spines beneath; tibiæ armed above with 2 external, 4 internal spines, beneath as the anterior ones. Posterior femora short and stout, armed beneath with 4-5 small black spines on the outer edge, 2-3 on the inner edge; tibiæ a little shorter than the femora, with 4 apical spurs and 6-7 small spines inserted in a black spot on each inferior margin, the apical ones much longer than the others; about 25 spines on each superior margin; tarsi short, the free plantulæ equaling scarcely half the length of the metatarsus.

Elytra extending in both sexes a little beyond the apex of the 1st abdominal tergite; they are brownish with blackish spots between the anastomosed veinlets which are very numerous; ♂ with 3 lateral veins; humeral vein simple, thick, sinuate near the apex; discoidal vein furcate; ♀ with 2 lateral veins and 3 dorsal ones.

Length of body, ♂, 25mm., ♀, 26 mm.; length of pronot., 8 mm.; ant. fem., 6.5 mm.; ant. tib., 7.7 mm.; interm. fem., 8.5 mm.; interm. tib., 8.5 mm.; post. fem. 21.5 mm.; post. tib. 20.5 mm.; ovipos., 13 mm.

This species is very distinct by reason of its stout stature, the small black spines of all the femora, the very short free plantulæ of the posterior metatarsi, the form of the anal segment of the male and the brevity of ovipositor. It might perhaps enter the genus *Ariagona* Krauss, previously known from a single canarian species, as well as *Pholidoptera*.

Gen.—METRIOPTERA, WESMAEL.

Metrioptera escaleraei, Bolivar.

Mesopotamia: Amara, R. Tigris, May-June 1918, 4 ♂, 4 ♀.

Metrioptera persica, Uvarov.

(Fig. 24 to 26).

Platycleis persica, Uvarov, 1917, *Bull. Mus. Caucase*, XI, p. 11, fig. 9.

Mesopotamia, Amara, R. Tigris (W. E. EVANS, June 1918) 1 ♂, 1 ♀.

This species is known only from the female; the specimens here referred to have been identified by M. B. UVAROV himself, who had the kindness to send me the undescribed male.

♂ (Macropterous). Slender, smaller than the female, almost unicolourous testaceous. Anal segment very deeply and acutely divided at the apex, forming two long acute processes, the basal part of the tergite angularly folded; sub-genital plate large with two longitudinal keels, apex deeply and narrowly notched, presenting above two small black lines along the sides of the hollow; styli rather long, cylindrical. Cerci stout, as long as the processes of 10th tergite, narrowing towards the apex, bearing at their proximal third a strong internal tooth. Titillators slender, strongly curved, armed with a few small spines.

Length of body, 18.5 mm.; length of pronot., 4.8 mm.; elytra 20.5 mm.; post fem., 18 mm.; post. tib., 16.5 mm.

Gen.—PARADRYMADUSA, HERMAN.

Paradrymadusa qazvinensis, n. sp.

(Fig. 27 to 30).

Types:—One male from Persia Qazvin, (P. A. BUXTON, Nov. 1918) and one female, same locality (P. A. BUXTON, 17, July 1919).

Large species, testaceous or rufous brown. Occiput concolourous; apex of vertex not much broader than the first article of antennæ; face yellowish.

shining, glabrous. Pronotum rather strongly produced backwards in both sexes, its anterior margin straight, the posterior one convex; lateral lobes high, their inferior margin subangulate, widely bordered with yellow; prosternum with two small spines. Tenth abdominal tergite of male very deeply and angulately emarginate at the apex, supraanal valve triangularly produced; cerci short and stout, bearing a small apical tooth, directed outwardly, their internal face slightly extending in a blade, bearing an acute tooth about the middle; subgenital plate wide, slightly concave at the apex; styli? (wanting). Tenth tergite of female like that of the male but less deeply emarginate, supraanal valve smaller, feebly produced; cerci short, conical; subgenital plate wide, its posterior margin emarginate, forming two rounded lobes with two small tubercles near the apex of the notch. Titillators angled, the inferior border of their apical part armed with a few strong spines. Ovipositor long and almost straight, apical margin of the valves obliquely truncate.

Legs concolourous; anterior coxæ with a very long, strong spine; femora stout, armed inwards with 3 or 4 inferior spines and a very small genicular one; tibiæ armed above with 3 external spines, beneath with 6 spines on each margin; intermediate femora armed with 2 small genicular spines and 1 to 4 inferior external ones; tibiæ armed above with 2 external, 4 internal spines, beneath with 6 spines on each margin. Posterior femora very long, armed beneath with 5 internal, 7-8 external small spines and 2 small genicular ones; tibiæ a little longer than the femora, armed with 4 inferior apical spurs, 12 acicular small spines on each inferior border and 2 superior apical spurs, 30-31 external and 26-27 internal rather strong spines. Tarsi rather long, 2nd joint almost as long as the 1st, 3rd short, very much depressed, free plantulæ of the metatarsus much shorter than the half of the metatarsus.

Elytra of the male extending almost to the apex of the 2nd abdominal tergite, rufous brown with the marginal field whitish and a fulvous marking near the internal angle; anterior margin weakly convex, apex truncated, internal margin sinuate; 2 lateral veins, humeral vein furcate. Elytra of the female almost hidden by the pronotum, rounded, their sutural margin slightly overlapping.

Length of body, ♂, 27 mm., ♀, 25 mm.; length of pronot., ♂, ♀, 10 mm.; elytra, ♂ 7 mm., ♀, 4.5 mm. ant. fem., ♂ ♀, 9.5 mm.; ant. tibiæ, ♂ ♀, 11 mm.; interm., ♂ ♀, 11 mm.; interm. tib., ♂ ♀, 12 mm.; post. fem., ♂ ♀, 33.5 mm; post. tibiæ, ♂ ♀, 32.5 mm.; ovipos., 26 mm.

Gen.—MAGRETTIA, BR.

Magrettia mutica, BR.

Magrettia mutica, Brunner von Wattenwyl, 1888, *Verhandl.k-k.zool-bot. Ges. Wien*, XXXVIII, p. 285, fig. 18—Adelung 1902, *Ann. Mus.Zool.Ac.Sc. Petersb.*, VII, p. 16.

Mesopotamia: Ruz, 16-18 (W. E. EVANS), 1 young male, in tuft of earth.

Although immature this example shows the principal features given in ADELUNG's very good redescription of this interesting species.

FAM.—GRYLLIDÆ.

Gen.—GRYLLOTALPA, LATR.

Gryllotalpa gryllotalpa, L.

Mesopotamia: Amara, R. Tigris, 10-12-17, 1 ♂; 30-3-18, 1 ♂.

Gen.—TRIDACTYLUS, OLIV.

Tridactylus savignyi, Guer.

Mesopotamia: Amara, R. Tigris, 10-4-18, 1 ♂; 30-6-18, 1 ♂.

These two specimens are large (5 mm.) and of a very recessive coloration.

Gen.—PTERONEMOBIUS, JACOBS.

Pteronemobius gracilis, Jak.

Gryllus gracilis, Jakovleff, 1871, *Hor. Soc. ent. Ross.*, VI, p. 20, tab. 1, fig. 3, 3a.—*Nobius mayeti*, Finot, 1893, *Ann. Soc. ent. Fr.*, Bulletin, p. 252.—*Nemobius adelungi*, Uvarov, 1912, *Hor. Soc. ent. Ross.*, XL, p. 39.

Mesopotamia: Amara, R. Tigris, April-June 1918 (P. A. BUXTON), 4 ♂, 11 ♀;—Amara, at light (N. E. EVANS, 7-8-18), 2 ♂, 1 ♀.

MR. B. UVAROV himself supposed that his *N. adelungi* was the same species as the north African *N. mayeti*; after a careful comparison between the specimens collected in Mesopotamia and examples of *N. mayeti* from Algeria, I cannot hesitate to publish this synonymy; but, in its turn, as M. UVAROV makes me remark, the latter species must fall in synonymy with *Gryllus gracilis*, Jak. which, although described in Russian, is valid, the drawing being quite sufficient to recognize the insect. The species is a *Pteronemobius* as the male possesses a tubercle-like spine very near the base of the internal border of the posterior tibiae.

Gen.—ACHETA, L.

Acheta bimaculata, De Geer.

Mesopotamia: Amara, 9-8-18, at light, 1 ♂; under stone by Diala River north-east of Baghdad, 1 young.

Acheta amarensis, n. sp.

Types:—One male, one female from Mesopotamia, Amara (P. A. BUXTON, 26.6-18).

Co-type:—One male, same locality.

Rather small species, wholly shining black, very similar to *A. morio*, F. Head smaller than in this latter species, scarcely wider than the pronotum: ocelli extremely small, disposed almost in a straight line; face tumid. Pronotum as wide posteriorly as anteriorly, its posterior border almost straight. Abdomen black; subgenital plate of ♂ very much compressed, that of ♀ small, notched at apex. Ovipositor shorter than the posterior femora. Legs black; the posterior femora somewhat tinged with reddish at their inferior margin chiefly in the male; posterior tibiae short, armed with 3 external and 4 internal very strong spines; internal spurs strong, the superior decidedly longer than the intermediate one; metatarsi longer than the other joints of the tarsus, somewhat dilated in the middle, their internal face rounded, the external one depressed; external superior margin keeled and armed with 3 rather strong spines, the internal one rounded, armed with 1 apical spine; apical spurs strong, the internal extending a little farther than the midst of the last joint of the tarsus.

Tegmina of male as long as the abdomen; speculum broader than long, rounded anteriorly; diagonal vein rather long, slightly sinuate; 3 postaxillary veins, the 2nd one very much curved; 2 veinlets between the diagonal and the postaxillary veins; 3 oblique veins; apical field rather short with 6 longitudinal veins and a very wide, somewhat irregular reticulation. Lateral field black with 5 longitudinal veins and the mediastinal which is triramose and very much curved at apex. Tegmina of female with 9 dorsal veins, the 5 internal of which very close, the 4 others separated by veinlets forming a wide reticulation; 5 veins in the lateral field and the mediastine which is triramose as in the male but not curved at apex. Wings candate, blackish near the anterior border.

Length of body, ♂, 16 mm., ♀, 18 mm.; length of tegmina, ♂ ♀, 11 mm.; length of wings, ♂, 17 mm., ♀, 17.5 mm.; post. fem., ♂ ♀, 8.5 mm.; post. tib., ♂ ♀, 6 mm.; post. tarsi, ♂ ♀, 4.5 mm.; ovipos. 8 mm.

Individual variations.—The second male of this species has tegmina a little shorter than the abdomen, with no veinlet between the diagonal and post-axillary veins and 7 longitudinal veins in the lateral field.

This species looks very much like the African *A. morio*, F., of which it differs however by many small features, the most striking of which is the form of the posterior metatarsus (fig. 31).

Gen.—GRYLLUS, L.

Gryllus desertus, Pallas.

Mesopotamia: Amara, April-May 1918, 3 ♀; Kut-el-Amara, 7-8-18, 1 ♀; Kurna, 20-3-18, 1 ♀.

Persia: Enzeli, 1 ♀.

All these examples belong to the macropterous form *desertus*, Pall.

Gryllus domesticus, L.

Persia: Qazvin [4,000 ft.], 17-9-19, 2 ♀.

Gryllus tartarus, Sauss.

Mesopotamia: Basra, 30-6-18, 1 ♀; 12-8-18, 1 ♀; Amara (W. E. EVANS), very common at light.

Gryllus chinensis, Web.

Mesopotamia: Amara, May-Sept. 1918, 5 ♂, 3 ♀.

All these examples belong to the *Cerisyi* form; two of them are very large with the veins of the lateral field of the tegmina almost straight and quite equidistant.

Gryllus frontalis, Fieb.

Mesopotamia: Kizil Robot, N.E. of Baghdad, 1 young individual.

Gen.—GRYLLODES, SAUSS.

Grylloides lateralis, Fieb.

Mesopotamia: Amara, 2-11-17, 1 immature ♀.

Grylloides macropterous, Fuente.

Mesopotamia: Amara, April-June 1918 (P. A. BUXTON), 5 ♂, 1 ♀; 2-7-18 at light (W. E. EVANS), 1 ♀.

Compared with a typical male from Ciudad Real (I. BOLIVAR in coll. Finot) the ♂ examples cannot possibly be differentiated from it; yet 3 of them are smaller and less coloured, one being almost wholly pale yellow, but they show absolutely no other character allowing us to consider them as a different species.

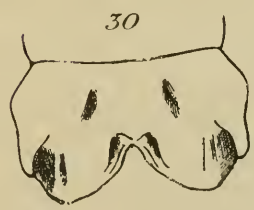
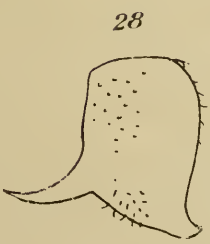
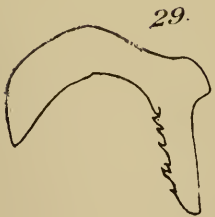
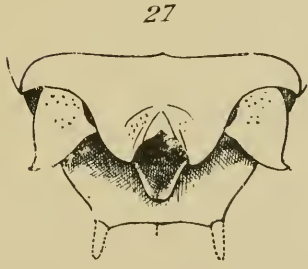
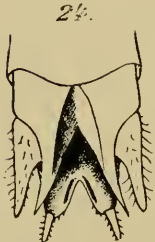
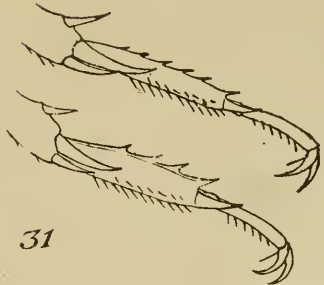
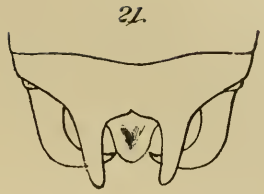
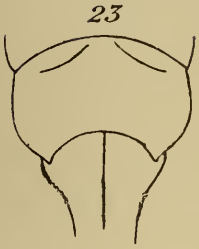
The females are a little smaller, very pale yellowish, with a small head. I refer them with much doubt to this species although they may be considered as a small variety with very recessive coloration, corresponding to the ♂ which is above recorded.

Gen.—METIOCHE, STAL.

Metioche, sp.

Mesopotamia: Amara, on herbage by Tigris (W. E. EVANS, 19-9-18), 1 ♀.

This specimen must belong to one of the species described by STAL from the oriental region (*M. coleoprata*, *M. tibialis*, *M. pallipes*); it is quite impossible to separate those species with the author's short diagnosis and very possibly



there may be only one species. The specimen here referred to looks very much like the ♀ of *Trigonidium cicindeloides*, Ramb., but the elytra are not so convex, with false veins between the longitudinal nervation; the antennæ are testaceous with the two first articles black. Legs testaceous, anterior tibiæ, tarsi and spines of the posterior tibiæ feebly darkened; anterior tibiæ showing no auditory foramen but a depression at base of the inner face, this being certainly a character of the wingless condition of the species.

The types of all the new species have been deposited in the British Museum.

Explanation of Plates.

Plate I.

- Fig. 1. *Ischnoptera evansi*, n. sp.—Internal face of anterior tibia, × 6.
Fig. 2. *Ischnoptera evansi*, n. sp.—Venation of Wing, × 4.

Supellina buxtoni, n. sp.

- Fig. 3. Male, dorsal view, × 4½.—Fig. 4. Apex of abdomen, dorsal view, × 12.—Fig. 5. Subgenital plate, × 12.—Fig. 6. Styli, dorsal view, × 26. Fig. 7.—Genital valves, × 16.
Fig. 8. *Shelfordella tartara*, Sauss.—Supraanal plate and cerci of ♂, × 6.
Fig. 9. *Shelfordella tartara*, Sauss.—Genital valves, dorsal view, × 10.—
Fig. 10. Apex of left valves of same, × 12.

Plate II.

- Fig. 11. Egg-case of *Polyphaga egyptiaca*, L., × 4.—Fig. 12. *Polyphaga subhyalina*, n. sp.—Genital valves, dorsal view, × 17.—Fig. 13. Hook of genital valves of *Polyphaga africana*, × 26.—Fig. 14. The same hook of *P. persica*, n. sp.
Fig. 15. *Polyphaga subhyalina*, n. sp.—Dorsal view of male, × 3.
Fig. 16. *Polyphaga persica*, n. sp.—Dorsal view of male, × 3.
Fig. 17. *Empusa uvarovi*, n. sp.—Dorsal view of process of vertex, × 6.
Fig. 18. *Conocephalus buxtoni*, n. sp.—Fastigium of vertex, × 17.—Fig. 19. Id.—Outlines of lateral lobe of pronotum, × 6.

Plate III.

- Fig. 20. Id. Dorsal and lateral outlines of cercus of ♂, × 12.—Fig. 21. *Pholidoptera persica*, n. sp.—Apex of abdomen of ♂, × 6.—Fig. 22. Id. Left titillator, × 16.—Fig. 23. Subgenital plate of ♀, × 6.
Fig. 24. *Metrioptera persica*, Uvarov.—Apex of abdomen of ♂, dorsal view, × 6.—Fig. 25. Id. Right cercus, dorsal view, × 12.—Fig. 26. Id. Right titillator, × 16.—Fig. 27. *Paradrymadusa qazvinensis*, n. sp.—Apex of abdomen of ♂, dorsal view, × 6.—Fig. 28. Id. Right cercus, dorsal view, × 12.—
Fig. 29. Id. Left titillator, × 16.—Fig. 30. Subgenital plate of ♀, × 6.
Fig. 31. External face of posterior tarsi of *A. Acheta morio*, F.: *B. A. amarensis*, n. sp.

SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

XXVII.

BY

OLDFIELD THOMAS F.R.S.

*(Published by permission of the Trustees of the British Museum.)*The Geographical Races of *Scotomanes ornatus*.

In connection with the naming of specimens of *Scotomanes* from Assam and Annam submitted to me respectively by Messrs. Wroughton and Robinson, I have laid out all the available material of the genus. As a result I find that though all are undoubtedly very closely allied, and referable to the species *S. ornatus*, yet three geographical races may be distinguished as follows:—

1. *S. ornatus ornatus*, Blyth.

Size averaging larger, the forearm 58-60 mm., occasionally reaching 63. General colour above brighter and lighter, generally approximating to some tone of buffy or light ochraceous, the underfur more or less whitish subterminally.

Hab.—North India. Type from Darjiling. A large number of specimens examined from Sivok, Bengal.

2. *S. ornatus imbreensis*, sub. sp. n.

Size about as in *ornatus* or rather smaller. Colour distinctly darker and browner, with less or in some cases no buffy suffusion, the dark brown ends to the hairs forming the chief element of the dorsal colour. Dark collar on throat blackish, strongly contrasted with the rest of the undersurface.

Hab.—Hills of Assam. Type from Konshnong, Jaintia Hills, 3,000'. Other specimens from Garo and Khasia Hills.

Forearm of type 56 mm.; skull, condylo-basal length 18·2, zygomatic breadth 13·5.

Type.—Adult male B. M. No. 20.11.1. 78. Original number 866, collected 2nd August 1920, by H. W. Wells. Presented by the Bombay Natural History Society.

This is evidently a dark, saturate form corresponding to the exceptionally heavy rainfall of the Assam Hills.

3. *S. ornatus sinensis*, sub. sp. n.

Size smaller, forearm generally about 50-55, rarely reaching 60. Colour deeper and richer, approximating to tawny or ochraceous tawny.

Forearm of type 55 mm. Skull, condylo-basal, length 18·2; zygomatic breadth 15.

Hab.—China. Type from Kuatun, N.-W. of Fokien. Other specimens from Fen Ping, Fokien, and Chungking, Szechuan.

Type.—Adult B. M. No. 97.9.3.1. Original number 4. Collected April 1897. Presented by J. D. la Touche. Five specimens examined. Curiously similar to the Indian form, but distinctly darker on the average.

The Annam specimen is unfortunately in very worn pelage and cannot be subspecifically determined with any certainty.

No. XXVIII.

ON THE *erythræus* GROUP OF SQUIRRELS.

By

THE LATE R. C. WROUGHTON.

Throughout Peninsular India, from Ceylon to Baluchistan and from the Indian Ocean to the Ganges, the squirrels (exclusive of the Giant and Flying Squirrels) are represented by a single genus, *viz.* *FUNAMBULUS*. The genus moreover is practically limited to that area, the only exceptions are a comparatively small number of Palm Squirrels, the common striped squirrel of our bungalows, a form which wherever found is commensal with man.

North of the Ganges, in Nepal, etc., we find a number of genera, *e.g.*, *CALLOSCIURUS*, *TOMEUTES*, *DREMOMYS*, *TAMIOPS*, etc., which range eastwards and southwards to Szechuen, Yunnan, Burma, Siam, Malay Peninsula and Archipelago, Formosa, etc.

Amongst these *Callosciurus* the genus to which *erythræus* belongs is remarkable for its quite extraordinary variability. An excellent example of this will be found in this Journal in a paper by Mr. Thomas and myself on the squirrels collected by Mr. Shortridge, for the Mammal Survey, on the Chindwin River (xxiv, p. 230, *et seq.*).

The tail in *Callosciurus* may be black, red, grizzled, or white, or it may be particoloured with any two, or even three of these colours. The upper side of the body, the belly, the feet, and the face each may (and does) vary to an almost equal extent. So that with so many combinations possible with this large number of variations, joined to the extraordinary variability in the genus we should naturally expect to find (and do so find) an immense number of forms closely related but easily distinguishable by colour and pattern, in many cases intergrading into one another on their common boundaries.

In dealing with a genus containing such a large number of named forms, which though to a certain and large extent homogeneous are at the same time so varied, it has long been recognised that convenience required a system of arrangement in "groups."

The arrangement has, however, been carried out haphazard, for the most part, each author basing it on some character or characters which appealed, specially to him. The latest arrangement is that of the list by Robinson and Kloss, published in the Journal of the Federated Malay States Museum (xv., p. 196, 1918). In this list, as well as the Assam forms, others from as far away as Siam and Formosa are included in the '*erythræus* group' while about the intervening country are recognised other quite distinct groups. The system of using groups seems to me here to cease to be a convenience and to become instead a very possible source of confusion, I would urge therefore that the composition of groups should be controlled geographically and as the system is confessedly provisional I can see no objection to this course.

To make a start, I propose for the '*erythræus* group' the area lying between the Brahmaputra and Chindwin Rivers as a habitat. North of the Brahmaputra we find *bhutanensis*, Bonhote, in Bhutan, and *crumpi* named by myself in Sikkim. These two squirrels are very closely related and no other has been recorded from this region. As extreme western outliers of the genus they may be accepted as forming a group of their own, while along the eastern bank of the Chindwin are found, at intervals of less than fifty miles, extending from its source to its junction with the Irrawady, a series of forms which make up another group, *sladeni*. This '*sladeni* group' almost certainly fills the area between the Chindwin and the Irrawady.

The species *erythræus* was named by Pallas in 1778, 'ex India orientali.' The Indian Museum seems to have had specimens from the Garo Hills which were identified by Blyth as *erythræus*, the National Museum has however so far had only one poor specimen collected by Griffiths in 'Assam'. The series collected by Mr. Wells for the Mammal Survey, at Tura, Garo Hills, confirm Blyth's identification and may now be accepted confidently as representing *erythræus*, Pallas.

The next oldest forms are *erythrogaster*, Blyth and *punctatissimus*, Gray, established in 1842 and 1867, respectively. The type of the former has prevented its examination. Its type locality is Manipur. From a fine series in the National Collection, obtained by Hume from Manipur, it has long been recognised that there are two forms found in that country, viz., a southern dark, and a northern paler one. Selater in his "Catalogue of the Mammals in the Indian Museum" writes: "Southward a little in Cachar and Manipur the whole dorsal surface becomes very much darker, so that the extreme forms are almost black, this form was named *S. erythrogaster*, by Blyth and *Macroxus punctatissimus* by Gray." Robinson and Kloss mention Sylhet and Chittagong as other localities where this dark form is found. It is evident therefore from this that *erythrogaster*, Blyth, is the darker

form of Manipur, while *punctatissimus*, Gray, is the form from Cachar.

The remaining named forms of the group have comparatively recently been described in this Journal, including *aquilo*, which I named as a subspecies of *C. castaneiventris* but which I now prefer, for the reasons given above, to regard as a local race of *erythræus*. The following is a list :—

C. erythræus nagarum, Thos. and Wrought. Sadiya. (xxiv, p. 228, 1916).

C. erythræus crotalius, Thos. and Wrought. Hkamti, Chindwin (l.c.).

C. erythræus kinneari, Thos. and Wrought. Tatkon, Chindwin (l.c.).

C. erythræus aquilo, Wrought. Dibong R., Lakhimpur. (Vol. XXVII, p. 601).

Finally, I propose to give a name to a form just received through the Mammal Survey, as follows :—

CALLOSCIURUS ERYTHRÆUS WELLSI, sub. sp. nov.

A *Callosciurus* of the size and general colour pattern of *erythræus*, but having a whitish tag at the tail tip.

Size as in *erythræus*. General colour above an olivaceous grizzle, below bay, varying to dark hazel ; limbs like the back ; feet black. Tail above grizzled like the back for some length, varying from one-fourth to one-half or rather more, beyond bay to the end except for the pale terminal tag ; below the grizzling extends much further along the tail, usually to within 50 mm. of the terminal tag.

Skull as in *erythræus*.

Dimensions of the type, those of the body measured by the collector :—head and body, 235 ; tail, 260 ; hindfoot, 51 ; ear, 20.

Skull.—Greatest length, 57·5 ; condylo-incisive length, 48 ; palatilar length, 24 ; interorbital breadth, 20·5 ; braincase breadth, 27 ; nasals length, 17 ; upper molar tooth-row, 10·5.

Hab.—Jaintia Hills, Assam. Type from Shangpung.

Type.—Adult. ♂. B. M. No. . . . Original number 652.

Collected 10th July 1920, by Mr. H. W. Wells and presented to the National Museum by the Bombay Natural History Society.

The character relied upon for the separation of this local race is not an important one, but it is so constantly persistent throughout the series as, in my opinion, to justify the separation. Eleven specimens constitute the series, of which two have mutilated tails, but the remainder are perfectly constant in showing the pale tag at the end of the tail.

The Key to the '*erythræus* group' published in my 'Summary' (xxvi, p. 368, 1919) now requires to be recast, and as in the meantime it has been decided that *stevensi* is a *Tomeutes* and not a *Callosciurus*, it seems advisable to rewrite almost the whole of the Key to

the genus *Callosciurus*, which I take this opportunity of doing, as follows :—

**Key to the forms of the genus Callosciurus.*

A.—As in Summary.

B.—Feet dark.

- a. Face coloured differently from the rest of the head.
- a'. Darker. Belly bay (9b) *bhutanensis*, Bonh.
- b'. Paler. Belly grizzled (7) *crumpi*, Wrought
- b. Face coloured like the head.
- a'. Self-coloured above and below .. (3) *ferrugineus*, Cuv.
- b'. Coloured differently above and below.
- a". Black splashes or stripes on back.
- a"". Underside maroon or bay .. (4) *atrodorsalis*, Gray.
- b"". Underside like flanks, washed with yellow (5) *atr. shanicus*, Ryley.
- b". No black dorsal marks.
- a"". Underside with a medium grizzled line.
- a"". Ground colour of belly rufous (11) *gordoni*, And.
- b"". Ground colour of belly white (12) *quinquestriatus*, And.
- b". Underside unicoloured.
- a"". A buffy mark on shoulder and base of neck .. (8) *epomophorus davisoni*, Bonh.
- b"". No mark on shoulder or neck (9) *erythræus* group.

Key to the forms of the erythræus group.

A.—Ears red or brown.

- a. No white tail-tip (9a) *erythræus erythræus*, Pall.
- b. A whitish tail-tip. (9i) *erythræus wellsii*, Wrought.

B.—Ears coloured like the rest of head.

- a. Colour very dark, almost black.
- a'. Grizzling coarser (9c) *erythræus erythrogaster*, Bly.
- b'. Grizzling very fine (9d) *erythræus punctatissimus*, Gray.
- b. Paler.

* I have retained the numbers before the names as used in the Summary in order not to destroy the connection with the corresponding numbers under Distribution.

- a'* . Whole tail coloured like back..(9*h*) *erythræus aquilo*,
Wrought.
- b'* . Tail not unicoloured.
- a''* . Tail chiefly white with black
tip(9*e*) *erythræus kinneari*,
T. & W.
- b''* . Tail like back with black tip.
- a'''* . Colour of inside of limbs
extending to front of
wrists and back of ankles;
tail usually with much
white in black tip ..(9*f*) *erythræus crotalius*,
T. & W.
- b'''* . Front of wrists and back
of ankles coloured like
rest of outside of limbs..(9*g*) *erythræus nagarum*,
T. & W.

DISTRIBUTION :—

- 9 (*h*) *C. erythræus aquilo*, Wrought-
ton*Type locality* :—Sadiya, Assam.
(Wells).
Other localities :—Upper Assam.
(M. S. I.)
Type :—B. M. No.
- 9 (*i*) *C. erythræus wellsi*, Wrought-
ton*Type locality* :—Jaintia Hills.
(Wells).
Other localities :—Jaintia Hills.
(M. S. I.)
Type :—B. M. No.

THE COMMON BUTTERFLIES OF THE PLAINS
OF INDIA.

(INCLUDING THOSE MET WITH IN THE HILL STATIONS
OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, C.I.E., I.F.S. (Retd.)

(Continued from page 447 of this volume.)

PART XXIX.

Family—*HESPERIIDÆ*—continued.

It will not be difficult to make a key to the larvæ of the Skippers as far as they are here known. In practice a hesperid caterpillar may be distinguished by its general appearance from all others, be they butterfly—or moth—larvæ. If to this is added the habits and the form of the pupa, the discrimination is still more easy; the shape and structure of the eggs is another factor.

All hesperid eggs are, as a rule, large for the butterflies except in the *Ismeninae* where they are comparatively rather smaller. They are also, generally, few in number as compared to other butterflies. They are all dome-shaped, more or less depressed; some nearly hemispherical, some broadest immediately above the base, others broadest at it, resting, so to speak, upon a narrow, shelved band or foot. They are either smooth or ribbed meridionally, the ribs being either extremely fine, quite evident, or very strong (*Cupitha*); in the first case, sometimes confined to the very base, where they may appear as mere indications of lines. Sometimes some of the ribs anastomose before reaching the top, at others not; sometimes they are tuberculate-rough or even toothed, at others nearly smooth; rarely, they all end at a raised circle on top of the egg. These ribs, even in the same species, may vary in number by two or three; in different genera they vary from 12-14 to as many as 48; in the *Ismeninae*, for example, there are 40 on an egg of *Ismene fergussoni*, all rather fine and low; whereas in *Badamia* there are only 13, rather strong and coarse. The number of eggs laid at a time is generally one, though *Ismene gomata* lays as many as 20 or more in a group together closely packed though never overlapping; *Hyarotis adrastus* lays 3 or 4 in a row as often as not, but they are generally quite separated from each other. Nearly all are laid on the undersides of leaves or at the extreme point, occasionally in the axil of a leaf—or flower—bud (*Hasora*, *Bibasis*).

The larvæ can be recognized by (a) their cylindrical bodies, more or less narrowed to the anal end and neck—they are generally stoutest in the middle and the belly or *ventrum* is generally somewhat flattened; (b) their short legs, the four prolegs and anal claspers being

well tucked under the body, held quite perpendicular to the resting surface, the anal segment always slightly overhanging these anal claspers, the other prolegs similar and all with the little hooklets of the sole of the feet disposed in a circle, which circle is, however, not closed, but open towards the inside—this sort of foot might be called “ring-soled” in contradistinction to the other type, or “lobed” foot in which the hooklets are disposed more or less in a line parallel to the longitudinal axis of the larva or in two lines where the lobe is divided, as it often is, into two sections (the great majority of noctuid moths); (c) the invariable lack of any fleshy or thorny processes on the body or head, there being, at most, only a clothing of short simple or branched hairs (there is never even a tail-point); (d) the fact that there is always a well-defined neck and the head is invariably large compared to it—the size is quite striking; and (e) by the fact that they always live in cells made of leaves, more or less closed and of many different shapes, often cylindrical, made by turning over a section of a leaf on to the top or by doubling up a leaf longitudinally or transversely and fixing the edges tight together, or by drawing them together more or less incompletely. The habits in this particular are various, though each type of larva has its own type of cell. There is one characteristic connected with this mode of life that is distinctly to the credit of butterflies as represented by the skippers and serves to distinguish them from practically all moths: and that is the fact that they never foul their houses (cells) but always keep them spotlessly clean, expelling all alimentary refuse at once. This praiseworthy quality of cleanliness is well worth remembering as it will always supply an extra factor for identification of skipper larvæ. The actual method of making cells will be described in detail under each insect further on. All caterpillars, when full-grown, are sluggish and move slowly but, often, when young, they will back into their cells at a great rate and, sometimes, when seriously alarmed even run out at the other end and drop to the ground—though this is rare. Some of the smaller grass-feeding ones will even sham death when roughly handled. All are shy of exposing themselves and many are exclusively night-feeders. Great numbers are destroyed by birds that pull them out of their cells either directly through the opening—although this is difficult because of the hard head-surface presented—or by pecking a hole in the side. Many more are parasitized by ichneumons though apparently they are rather better off in this respect than most of the other families of butterflies. Hibernation, or lying over for a period without feeding, is not a common phenomenon of butterfly larvæ in tropical countries but, nevertheless, it exists amongst these skippers, in a few cases as exemplified by the larva of *Tagiades atticus*. This has been observed to lie quiescent for several months without eating. It makes a new cell, retires to it, changes into a sort of translucent green (its ordinary colour is more

or less opaque green) and remains quite motionless during the interval. At the expiry of the time it changes into a pupa and the butterfly emerges in the stereotyped 10 days. The reason for the arrestation of development is that, in the cold weather, the foodplant of the larva dies down completely to re-appear in new stem and leaf during the ensuing hot weather. Is it instinct that teaches the caterpillar what it must do or has the weather some well-defined influence as it has on the dying-off and re-appearance of the stems and leaves of the plants ?

It has above been stated that *all* skippers have naked larvæ except for the clothing of hair referred to. This is not absolutely true as the caterpillar of *Gangara thyrsis* is covered with long, curly, more or less symmetrically disposed, pure white, soft threads of a cereous or waxy excretion from pores in the skin. These threads are, however, very easily removed and rub into a sort of white powder on being roughly touched. Other skipper larvæ also excrete a white, cereous powder, but none ever have it developed in the manner of *Gangara*. It sometimes is found in the inside of the cells and, quite frequently, covers the pupæ completely—in *Hasora* for example, to a far less extent in some species of *Halpe*, in *Baoris*, *Sancus* and allied genera.

The pupæ are characterised by much the same factors as the larvæ. They are all naked, very few having evident (to the naked eye) hairs, on any part of them ; they have no processes of any kind except sometimes a boss between the eyes and, occasionally, a conical "beak" in that position (*Baoris*, *Sancus*, &c.) They are, on the whole, as would be expected, much more like those of the majority of the moths than those of any division of the butterflies. They are occasionally covered, as said, with a white, cereous or waxy excretion, sometimes more completely, sometimes less ; the secretion finding egress from the body of the caterpillar, as a rule, in the lateral, ventral region between the prolegs. Many larvæ pupate in their larval cells ; others wander considerable distances before doing so and often finish up on other plants to those they have been born or bred upon : plants, of course, frequently, of quite different kinds. They never, equally of course, *eat* these, but they will always nibble holes in them, or lines, so as to enable them to manipulate the different parts to form the cells. Prior to actually settling down, they often change colour considerably, generally becoming more or less translucent-looking and blurred as to their original colours and colour-patterns ; then cover the interior of the abode with silk, some more perfectly than others and, finally, turning round, make a little pad at one end to which the tail is fixed. Often this pad is very slight, but, generally, compact, though small. The caterpillar grips this with its anal claspers and thereafter remains motionless until the change to pupa takes place. Sometimes, prior to the manufacture of the pad, three strong silks are fixed to the walls of the cell in the manner depicted for *Badamia exclamatoris* ; but this is not always done ;

the position of these threads being over segment 4 or 5 as is usual for all butterflies. The period of absolute quiescence at this stage varies, sometimes amounting to some days in normal cases. Then the outward change commences. The larva begins to heave and squirm. the skin splits down the three thoracic segments 2-4 at the last gigantic effort, the head divides down the middle and along the sides of the clypeus and the pupa begins to emerge slowly and with evident difficulty. The thoracic portion first disengages itself, the tracheæ of the spiracles appearing as thin, white threads which are left behind, evidently everted; then the head; then, by slow degrees and gradual backward and forward movements of the whole abdomen in successions of waves, the skin is pushed back until it reaches the very end when the cremaster is heaved out and curled over the skin lump accumulated under it, and pressed into the pad of silk above mentioned; then a series of screwing squirms, to entangle the little hooklets with which the extremity is provided, completes the operation. The pupa is held in position against the discarded skin by the end of the extensor ridges which form the lateral, ventral edges of the cremaster, the skin itself is held fixed to the pad by the anal claspers. The final screwing wriggle is generally sufficient to eject the lump of skin from its hold on the pad, sometimes it remains where it is. When freshly emerged, the pupa is as long as the caterpillar was but very soon consolidates itself and becomes shorter and hard. All external parts of the future butterfly, although intimately soldered together, can now be distinguished clearly, even to the veins in the upper wings—the lower being covered by these; the hind legs are also covered. The period of the pupal stage varies, being generally longer the greater the bulk. At an average estimate it lasts ten days; sometimes being as short as seven.

The process of emergence of the pupa is the same generally throughout the *Lepidoptera*; so there is nothing characteristic of this family in *that*. When we come to distinguishing characteristics of the pupa itself, it is somewhat difficult. Perhaps the chief one is to be found in the cremaster. In most moths the hooklets at the end when present (in some they are practically non-existent) are arranged in a definite order and are, mostly, eight in number. In all butterflies, and therefore, also, in the skippers, they are, on the contrary, not so arranged and their number is large; they seem to be bunched together in groups or lines or in one group or one line without any order. In most moths, as a matter of fact, there does not seem to be any defined cremaster, the goemeters forming one exception to the rule. The head, the thoracic segments, the abdominal segments barring the cremastral one, offer no character for distinction. Neither do the antennæ, palpi or legs. The proboscis is, generally, in the same case although, in a few instances, it is prolonged free beyond the ends of the wings—not that this feature would help to distinguish

any pupa from some moth-chrysalides. It is, however, worth nothing that the proboscis of the pupa of *Gangara thyrsis* is of abnormal length, being free beyond the wings and curled up under the ventrum, though even then surpassing the whole length of the abdomen; measuring when stretched out 47 mm. from the base at head to the end, while the free portion alone measures 30 mm., the length of the pupa being 35 mm.! In this particular insect, also, there is another peculiarity which is not common in the family and that is the presence of a sound producing adaptation. The pupa lies inside a roomy, compact tube made of a spirally twisted portion of the leaf, and, when the tube is touched roughly, rattles itself violently inside, producing a loud, rustling noise, accentuated by a hissing sound having its origin in this adaptation. The mechanism is fully described under the life-history of the species; it is sufficient to state here that it is concerned with the proboscis and the abdominal segment next the wing-end. Other genera have the proboscis free at the end too, as, for example, *Matapa*, *Celænorrhinus*, *Sancus* and others, although it is never anywhere as long as that of *Gangara*. Sound producing mechanisms have not been noticed in any other skipper in any stage of growth or evolution. The spiracles of the second segment are sometimes characterized by being protected (?) by small, though prominent risings on the margins of segments 2 and 3, generally the latter. These "expansions" as they have been designated, are of considerable value for the identification of species, being varied in shape, size and colour. They are found in the genera *Caprona*, *Odontoptilum* and others. The colour of the spiracles, the colour of the pupa generally, the production or not beyond the wings of the proboscis, the presence or not and the shape of the "boss" or "beak" between the eyes on the head, are all of considerable generic value though they are of very little use for the differentiation of higher groups.

Although practically all the skippers mentioned in these papers have had their larvæ and pupæ drawn and painted, the funds at the disposal of the Bombay Natural History Society are not sufficient to allow of their being published; neither is there any prospect of this ever being possible for the Society to accomplish. However, some were pictured many years ago in a paper, published in the Journal, written by J. Davidson of the I. C. S. and the late and very sincerely lamented EHA (E. H. Aitken) of inimitable literary fame and the author. (A reference to it would be, perhaps, useful to enthusiastic enquiries.) It is in two parts entitled *Larvæ and Pupæ of Butterflies* by EHA and J. Davidson alone and "*The Butterflies of the North Kanara District*" in which the author collaborated. The first appeared in this Journal, volume V, pages 260 and 349 of the year 1890; the second in four instalments: volume X, page 237: pages 372 and 568 in 1896; and pages 22 of volume IX in 1917; and deal with all the families of butterflies—perhaps the papers should have

been mentioned before as being of use for the other families. The coloured plates accompanying the letterpress are not very good, but will be found better than nothing; many larvæ and pupæ are depicted including 18 *Hesperidæ*.

The following is a classification of the known larvæ:—

A.—Larvæ generally more or less brightly coloured; the skin opaque, not translucent looking; the pattern both longitudinal and transverse.

a. Larvæ with the dorsal area chiefly velvet-black with longitudinal yellow and blue lines as well as yellow, transverse lines and the head red and black; or with the ground-colour greenish-white with broad, black transverse bands and head orange spotted black

a¹. Colours black, yellow and blue, the black appearing on sides as oval patches; head red and black Genus *Bibasis*.

One species only; the pupa stout, pinkish in colour with isolated, black markings and covered with a white powder; with an oval, bare, greenish patch occupying the middle of thorax. *Sena*.

b¹. Colours as in *Bibasis sena* except that the black on sides is continuous and does not show in oval patches, with the head similarly red and black; or colour greenish-white with broad, black transverse bands and head orange with black spots Genus *Ismene*.

a². Colour exactly as in *Bibasis sena* *fergussoni*.

b². Colour greenish-white with broad black cross-bands; head orange with black spots. *gomata*.

Pupæ as in *Bibasis sena*; that of *fergussoni* exactly alike except that it is stouter, larger; that of *gomata* much lighter, greenish-white with black markings. Larvæ of *Ismene fergussoni* and *Bibasis sena* feed upon *Combretum extensum*, that of *gomata* upon *Heptapleurum venulosum* belonging to quite a different family.

b. Larvæ dorsally suffused with mauve of a dark shade or bluish-green approximating to that colour; the head never red and black-patterned nor orange spotted with black Genus *Hasora*.

a¹. Larvæ with no yellow, longitudinal lines; spiracles white *alexis*.

b¹. Larvæ with yellow longitudinal lines from segment 2 backwards.

a². Larva with the double, sub-dorsal, yellow line on each side of the dorsal line ill-defined; a spiracular, white line. Spiracles light-yellow. *badra*.

b². Larva with the sub-dorsal lines rather broad, well defined; a supra and sub-spiracular line. *chabrona*.

c². Larva with the sub-dorsal lines finer; only a sub-spiracular, yellow line *butleri*.

The spiracles of these last three are all yellow; *badra* can be distinguished also, by having many black, transverse lines. The pupæ are very similar to each other, of the type of *Bibasis* and *Ismene*; green in colour, powdered with white powder; the "boss" between the eyes rather sharply conical. The spiracles in *badra*, *butleri* and *chabrona* are black; those of *alexis* are yellow.

The boss of the head is black in *chabrana* and *badra*, but not in *butleri*. There is a small, black, dorsal mark at the hinder margin of thorax in *butleri*, a much larger one in *badra*. All the larvæ feed upon dicotyledonous plants of the order *Leguminosæ*.

- b. Larva chiefly yellow with yellow head; the body with a dorsal, black line and, sometimes, many black, transverse lines; head marked with black transverse bands or spots Genus *Badamia*.
Only one species, very widely distributed . . . *exclamationis*.

The larva feeds, as do *Bibasis sena* and *Ismene fergussoni*, on *Combretaceæ* and has been found commonly on *Terminalia bellerica*, less often on *Combretum extensum*.

B.—Larvæ with the body covered densely with minute, star-topped or furcated hairs all over; the surface dull; sometimes opaque; the colour is plain olive-green of a dark shade, russet-green, brownish, grey-green, with, rarely, transverse, short, lateral, white lines or immaculate; sometimes plain yellowish-brown; never with bright colours.

- a. Larvæ with the second segment white in guise of a collar. Head naked.

- a¹. Larvæ olive-green or russet greenish-brown with, at most, a dark, dorsal line Genus *Coladenia*.
a². Larva russet greenish-brown without markings of any sort *tissa*.
b². Larva olive-green with a dark indigo-coloured pulsating, dorsal line *dan*.

The larva of *tissa* is, when full-grown, 24 mm. in length; that of *dan* is 20 mm; the former feeds upon many species of trees belonging to families as far apart as *Leguminosæ*, *Tiliacæ* and *Euphorbiacæ*; the latter is confined to the *Amarantaceæ*. The pupæ are similar in shape, the spiracular expansions of segment 2 large; the colour of that of *dan* is green with a white "bloom"; that of *tissa* light-brown with the first three segments darker.

- b¹. Larvæ dark olive-green or brown-green with white lateral line Genus *Sarangesa*.
a². Larva dark olive-green with dark dorsal line as well as a faint white, lateral line . . . *purendra*.
b². Larva brown green with an interrupted white, lateral and dorsal dark line *dasahara*.

The pupæ are similar in shape, each with a well-developed spiracular expansion to segment 2; that of *purendra* is dark-brown, that of *dasahara* emerald-green. The larva of the former feeds upon *Amarantaceæ* and of the latter *Acanthaceæ*.

- b. Larvæ with the second segment not white; surface not densely hairy, opaque; head not furred; the body olive-green, generally dark with longitudinal, white lines as well, sometimes transverse, white, short lines also. Genus *Cela*

- norrhinus.
a¹. Larva with short, lateral, transverse lines. *ambareesa*.
b¹. Larva with no transverse lines.
a². Larva without appressed, fine hairs on head . . . *leucocera*.
b². Larva with fine, appressed, short hairs on head. *fusca*.

The larvæ all feed upon *Strobilanthes* of the *Acanthaceæ*. The pupæ are comparatively slighter than those of *Coladenia* and have the proboscis produced free beyond the wings as far as the base of the cremaster; there is a prominent

spiracular expansion to the spiracle of segment 2. The colour of that of *fusca* is grass-green; of *ambareesa* and *leucocera* golden red-brown: the former dark, the latter light but the two, otherwise, practically identical.

- c. Larvæ with second segment not white; surface densely hairy, opaque; head furred; colour glaucous-green or glaucous whitish-green or red-brown .. Genus *Caprona*.
- a¹. Head with a bare patch below vertex of each lobe
A single species *rannonnetii*.
- b¹. Head with three spots of brown hairs in a line across upper part of face, the other hairs all white; no bare patches Genus *Odontoptilum*.
.. .. . *angulatum*.
- c¹. Head with no spots of a different colour and no bare patch; white or yellow Genus *Gomalía*.
A single species *albofasciata*.

The larvæ of *Caprona*, *Odontoptilum* cannot be mistaken for anything else, having the head strikingly long-furred; that of *Gomalía* has the head much more obscurely furred, but is much smaller, slighter. The pupæ of the two larger are, of course, also, much larger and are green and light yellowish soiled with brown, green on thorax and head with large, prominent, brownish spiracular expansions to segment 2 and marked with black; with a prominent boss or beak between the eyes; that of *Gomalía* more or less concolourous green with no beak or black spots and with the expansions smaller, lower, rounder. The food of the larvæ are sapindaceous for *Odontoptilum*, sterculiaceus for *Caprona* and malvaceous for the third.

C.—Larvæ never with bright colours; always opaque-looking, white or greenish-white; covered with erect, minute and simple hairs more or less densely; head with erect covering of hairs or not, round or triangular.

- a. Larva pure, opaque-white, hairs not at all prominently visible; head broadly cordate, thin, nearly naked Genus *Tapenu*.
Only one species *hampsoni*.
- b. Larva opaque-glaucous-green, covered with comparatively long, white and brown, erect hairs; head round, thick and densely furred on upper part Genus *Hesperia*.
Only one species *galba*.
- c. Larva opaque-yellowish-green, more yellow than green, the covering of hairs minute, somewhat sparse; head obcordate-triangular, very finely velute Genus *Cupitha*.
Only one species *purreea*.
- d. Larva opaque-white with a black collar on segment 2; hair-covering invisible; head roundly heart-shaped without, however, any sinus, naked, orange Genus *Matapa*.
Only one species *aria*.
- e. Larva really red and white in colour, but quite white with a dense covering of long, confused, excreted threads of a waxy nature; head triangular, thick; a very large larva Genus *Gangara*.
Only one species *thyrsis*.

The pupa of *Gangara* can be distinguished from all others by the enormous length of the curled, free end of the proboscis, as well as by its large size; that of *Matapa* by being a small reproduction of that of *Gangara* with the free end

of proboscis much shorter: both are a dirty, bone-white in colour. That of *Tapena* is very white; of *Cupitha* light olive green with two small points on vertex of head and no free end to proboscis; that of *Hesperia* greenish yellow with the surface covered with comparatively long, erect, white hairs. The food of *Gangara*, *Matapa* is palm and bamboos respectively; that of *Cupitha* is the combretaceous *Terminalia paniculata* or *Combretum ovalifolium*, of *Hesperia* the little sterculiaceus weed *Waltheria indica*; of *Tapena* the leguminous *Dalbergia rubiginosa*.

- g*² Larva greyish-green, the segment-margins yellowish; inconspicuously covered with hairs, much longer and visible round dorsoventral margins, head semi-elliptical, soiled yellow-green in colour with a brown cheek stripe and central (dorsal) brown band, with a sparse covering of simple hairs. Genus *Baor*
(*Telicota* ?).
A single species *bada*.

This butterfly is difficult to difficulty. It is certain that it has no affinity in the earlier stages with the genus it is always placed in, that is *Baoris*. For this reason it is considered here to be more comfortable in the genus *Telicota* but, even there, it does not seem to quite fit. The pupa is stout, square in front, without a raised boss or beak; spiracular expansions fairly well-developed; colour very light, translucent-looking yellow-green on thorax and head, soiled yellowish-white on abdomen.

D.—Larvæ naked-looking, of some shade of white or green, the outer tegument or skin allowing the tracheæ to show through as white threads; never coloured except in a single case (*Halpe honorei* which has red, longitudinal bands); the body usually covered, but generally very sparsely, with minute, simple, erect hairs hardly visible to the naked eye; heads of various shapes, never furred or conspicuously haired.

a. Larvæ elongated, the anal end flattened, depressed, rounded, kept pressed against resting-surface; the neck very much narrowed; the head comparatively small, dark-brown, the surface naked to the eye, rough; the whole larva naked and thin-skinned with the tracheæ showing through.

*a*¹. Head deep-black Genus *Udaspes*.
A single species *folus*.

*b*¹ Head deep chocolate-brown.

*a*² Larva with segment 2 whitish Genus *Sancus*.
Only a single species *pulligo*.

*b*². Larva with segment 2 not white Genus *Notocrypta*.

*a*³ Head immaculate *feisthamelii*.

*b*³ Head with a lateral, longitudinal, whitish band . . . *restricta*.

The larvæ of this group are unlike anything else but are difficult to distinguish from each other. The pupæ are all quite naked-grass-green with long snouts and thin cremastral segments and are quite indistinguishable one from the other. All the larvæ feed upon *Zinziberaceæ*; the food of *Udaspes* being generally *Curcuma*, that of *Sancus*, as far as known, always *Phrynium*, that of *Notocrypta* invariably *Zinziber*.

- b. Larvæ of the same general shape as the last, but the skin more or less opaque and greenish or bluish-white, naked to the eye; the head, however, large, more or less triangular, and marked with black, red or brown
- a¹. Larva with the head absolutely triangular in shape, green in colour with a brick-brown border, flanked on the inside by an equally broad yellow band, the vertex also brick-brown .. Genus *Gegenes*.
One species *nostradamus*.
- b¹. Larva with head not *exactly* as in *Gegenes* .. Genus *Baoris*.
a². Larva with the head similar in shape to that of *Gegenes*, but with a single black or red border; otherwise green *mathias*.
- b². Larva with the head very roundly triangular; semi-elliptical really. colour white with two large black spots on each lobe, one above, below vertex, the other below, near eyes .. *conjuncta*.
(Pl. II, figs. 31, larva; 31a pupa.).
- c². Head still rounder; white with a black band completely surrounding it as well as a longitudinal, thick, black streak in the middle of each lobe. *farris (occea)*.
- d². Head semi-elliptical; white in colour with a broad, black border and, sometimes, black down centre of face; occasionally suffused on lower part of face also *kumara*.
- e². Head triangular, clear-green in colour; bordered all round by black with a longitudinal black line on each cheek, inside which is a similar white line or band and a black dorsal (central) black line *colaca*.
- f². Head large, semi-elliptical in shape, brown-yellowish in colour with a dark-brown dorsal band Genus *Hyarotis*.
One species only known *adrastus*.

The larva is identical in shape with those of *Baoris*. The pupa likewise. The food is the *Phoenix* palm.

All these species of larvæ feed upon palm bamboos or grasses; the pupæ are exactly like those of the last group (*Udaspes*, *Notocrypta*) and have exactly the same habits. *Gegenes*, *Baoris mathias* and *colaca* are a good deal smaller than *kumara* and the other two.

- c. Larvæ of similar shape as the two sections *a* and *b* of D but stouter, the skin rather translucent, the colour olive-green dotted with white or yellow; the head very large, semi-circular, the broadest part upwards, with a deep, triangular sinus dividing it into two conical lobes, naked and unmarked Genus *Tagiades*.
- a¹. Larva with a strong roseate hue about anal end; head always dark; spiracles white .. *obscurus*.
- b¹. Larva without roseate flush; head sometimes orange, sometimes completely black .. *atticus* (Pl. II, figs. 30, 30a, and p.).

This genus should have really come under *a*, as it is more nearly allied to *Celænorrhinus* than to *Baoris*, the pupæ being stout and variously coloured and marked and not naked green; the shape is also more that of that group. *Atticus*, pupa has a large, triangular, enamel-white mark on the side as well as another, smaller one; *obscurus* is dotted with black, the colour of the latter is grey, of the former is greenish. Both larvæ feed upon *Dioscorea*.

E.—Larvæ of normal shape; the skin is translucent, showing tracheal, white threads beneath it or not; body naked to the eye; head naked, generally marked with brown, black or red lines or stripes, round triangular or semi-elliptical; colour some shade of green with, at most, longitudinal, white lines (except *Halpe honorei* where there is a broad, red, longitudinal and lateral band), and a dark, pulsating, dorsal line.

- a.* Larva always with a fine, lateral, distinct and spiracular, indistinct, white, longitudinal line as well as a darkish, dorsal line Genus *Æromachus*.

Only one species *indistinctus* (*jhora*)

The larva is whitish-green, the darker green showing through in small spots. It feeds on grasses. Pupa naked, dark-green, with a conical beak.

- b.* Larvæ as in *Æromachus* except that they are green with darker green spots showing through; or plain grass-green with a broad, subdorsal and narrow dorsolateral and supraspiracular white line as well as a thin subspiracular, yellow one . . . Genus *Ampittia*.

*a*¹. Larva like *Æromachus* *gola*.

*b*¹. Larva plain green with stripes *maro*.

- c.* Larvæ quite plain, with no longitudinal lines (except *Halpe honorei*), but there may be a dark, dorsal, pulsating line; skin translucent or not; head triangular, semi-elliptical or round, naked . . .

*a*¹. Head triangular; body dorsally yellow minutely dotted with green, a dorsolateral and supraspiracular line darker than rest Genus *Iambrix*.

Only one species *salsala*.

The larva feeds on grasses; the pupa is like that of *Telicota*: stout with large, spiracular expansions to segment 2, a very slight boss between the eyes.

- b*¹. Head triangular or semi-elliptical; colour of body dark-green translucent, allowing the tracheæ to show through: no other marking Genus *Telicota*.

*a*². Head triangular *dara*.

*b*². Head semi-elliptical *bambusæ*.

Both larvæ feeding upon bamboos. Pupæ as above for *Iambrix*

- c*¹. Head semi-elliptical; colour of body light grey-green covered with minute, green spots, rather opaque . . . Genus *Suastus*.
A single species *gremius*.

Larva feeds on palms; pupa stout, like that of *Telicota*.

- d*¹. Head semi-elliptical; colour of body plain grass-green or yellowish-green with a dark, dorsal, pulsating line and a lateral, less dark-green shade . . . Genus *Taractrocera*.

- a². Body plain grass-green *ceramas*.
 b². Body yellowish-green with dark, dorsal line and
 less dark lateral shade *mœvius*.

Both larvæ feed on grasses. The pupæ are like those of *Telicota*, but much smaller.

- e¹. Head round, or very nearly so; body-colour plain green with a dark, dorsal line and an extremely indistinct, subspiracular, whitish line Genus *Baracus*.
 One species *hampsoni*.

Larva feeding on grasses; pupa rather slight, like that of *Telicota*, but with the hinder end of cremaster ending at each corner in a little point.

- f¹. Head quite round, skin thin, translucent; plain green or greenish-yellow or banded longitudinally white, rose-colour, yellow and green Genus *Halpe*.

- a². Body with green, dorsal line flanked by a yellow, subdorsal band followed by a broader, rose-colour, lateral band, below this again a subspiracular, white, narrower band; head plain light yellow-brown *honorei*.

- b². Body translucent, soiled dark-greenish-yellow; head soiled-yellow, the margin brown and a brown dorsal line down middle *hyrtacus*.

- c². Body translucent soiled dark-green; head light yellow-brown, a dorsal, dark band down middle of face with a crescent-shaped-brown mark in middle of each lobe, sometimes joined at its bottom to dorsal band *moorei*.

It is quite probable that very useful characters for classification of larvæ might be obtained from a study of the grouping of the eyes in the eye-curve; whether two are confluent, whether some are larger than others, whether they are grouped in pairs or otherwise, &c. Also the length and shape of the true clypeus and false clypeus might give differentiating characters; the conformation of the labrum and of the ligula and so on. The shape of the head certainly is useful, the clothing and texture of the surface also. But all this would require a very detailed study indeed.

Then there is the larval cell: the method of making it and the shape when made. Some groups of skippers make very slovenly larval houses, others make them extremely solid and tightly closed. The egg-larvæ of some skippers start with a cell of a different form to that which they manufacture later on; others adhere to the one form all through, making new ones to accommodate their increasing bodies as required. There are also caterpillars that make many cells, seemingly just for fun, as do some Babblers amongst the birds; some wander away before pupation and change on any plant but none pupate anywhere but in or under leaves with the single exception as far as is known, of the genus *Ampittia*, which ties itself naked to a rice-stem.

We might classify:—

Egg-larva making a round cell on the top of the leaf, somewhere in the middle by eating away the substance in a circle, leaving just a hinge, turning over the

circle thus freed on to the top, fastening it down all round and coating the inside with a dense carpet of silk; hole for ingress and egress next the hinge. Full-grown larva turns over a triangular piece from the edge to midrib the hinge at midrib, the short side formed by the leaf-edge, on to the top of the leaf, fastening down all round, ingress and egress at hinge, inside densely carpeted, the cover thus formed becoming convex with withering (as does the little egg-larva lid-circle also); the larvæ always lying on the lid, its back towards the leaf-surface and it mostly eats the edges of the lid into a series of crenulations, sometimes eating holes in the lid also. . . . Genera *Celcenorhinus*, *Tagiades*, *Odontoptilum*, *Abaratha*, *Coladenia*, *Sarangesa* (these last two often are found in shrivelled-up dead leaves.

Egg-larva makes a circular cell as in the last, turning over the lid thus formed on to the top or underside of the leaf, living on the lid, coating with silk and fastening down the edges: hinge on edge or further in. Later on, when more grown makes a cell of an oblong piece formed from the edge, tightly fastening it down; then, when full-grown, of a whole leaf where the leaf is small, or at any rate not too large and makes a very strongly-closed cell, thickly lined inside; the pupa is formed in such cell which often withers and may fall to the ground. . . . Genera *Hesperia*, *Gomalina*.

Egg-larva makes a cell at the point of the leaf by bringing the edges together, cutting a line from the edge in to the midrib as a preliminary, the midrib being the hinge from the cut line to the point (*Ismene fergussoni*, all species of *Hasora*); or turns over a small triangular portion from edge inwards on to top or bottom, the hinge being part of the leaf—a short line is eaten at right angles to the edge for a small distance in towards the midrib—and the inside is lined with silk, the edges fastened down lightly; the full-grown larva turning over a triangular portion from point backwards using the midrib as a hinge, eating a line in from edge to midrib some way from the point (*Ismene gomata* and *Bibasis*) or turns over a small, oblong piece on to the top of the leaf or on to the bottom by cutting two parallel, short lines from edge at a suitable distance apart, (*Badamia*, *Cupitha*), the full-grown larva making a cell of a whole leaf which often withers (often on another plant of any species) in the case of *gomata*, in that of *Cupitha* of part of a leaf by cutting a straight line across the middle at right angles to the midrib, leaving the midrib intact, but gnawing it partly through and strengthening it with silks, making the cell of the part thus made to hang down by joining the edges and bending the whole piece back under the rest of the leaf behind—this cell-part then withers and is strongly coated with silk inside so as to be rather difficult to tear open, the egress being on the midrib. . . . Genera *Ismene*, *Hasora*, *Bibasis*, *Badamia*, *Cupitha*.

Egg-larva makes a cell at the tip of a leaf simply by joining the edges, strong, coated inside with silk; after it is full-grown often joins the edges of the whole leaf, living down towards the point and eating the midrib free from base downwards towards the point, the cylindrical or, rather, conical cell thus formed hanging by the thin midrib. Some larvæ (*Halpe moorei*, *Ampittia dioscorides* in a lesser degree) double the distal part of a bamboo-leaf across at right angles, making a cell by fastening the distal part to the top of the basal portion, then cutting the cell free so that it falls to the ground; others stick to the cylindrical cell and pupate in it (*Telicota*, *Padraona*, *Halpe hyrtacus*, *H. honorei*, *Aëromachus*, *Taractrotera*, *Baoris*, *Gegenes*); others, again, make an oblong cell to pupate in by cutting across the bamboo-leaf in the middle, at first cutting off the whole distal portion so that it falls to the ground, then cutting across further up, leaving the midrib, joining edges and ends, finally freeing the whole cell thus formed which falls to the ground and is there further strengthened by web. . . . Genera *Telicota*, *Padraona*, *Halpe*, *Ampittia*, *Taractrotera*, *Aëromachus*, *Baoris*, *Gegenes*, *Baracus*.

Egg-larva turning over a small, oblong piece from the edge of the leaf anywhere either on to the top or on to the bottom by cutting two parallel lines at right angles to the edge of the leaf about a couple of larval lengths apart and wide enough to make a little cylindrical cell, the end closed by a small shaped bit; these generally eat just next the cell-opening at one end of the cylinder and never move afield for the purpose; when grown they make a larger cell, eventually using the midrib as the hinge, waving both ends of the piece, joining the edges and coating densely with silk inside; this oblong cell is eventually cut free from the leaf and falls to the ground, as in some of the genus *Halpe*, the cell being completely closed, after it falls, with web mixed with a copious cereous excretion to keep out water. . . . Genera *Suastus*, *Plastingia*.

Egg-larva making an attempt at a spiral cell from the point of the bamboo-leaf or palm-leaf when young, lining the inside with little steps of silk; when full-grown making a big spiral cell (as described for *Gangara thyraxis* under that species) which is made to hang down or stand out stiff from the underside of the leaf: absolutely circular in section, the opening downwards and closed with web and cereous excretion; pupa with head down. . . . Genera *Gangara*, *Matapa*.

Egg-larva making a little, triangular cell by turning over a portion from the edge of the leaf, eating one line only and making the hinge of the leaf-surface; turned over generally on to the bottom; this form of cell persisted into the end but pupation taking place as in *Baoris*, *Gegenes*, &c., more or less naked on the underside of a leaf the edges of which are slightly drawn together for the purpose and with slight cereous excretion. . . . Genera *Sancus*, *Notocrypta*, and *Udaspes*.

The pupæ are also characteristic. There are some with knobbed snouts or head-beaks, others with long, pointed beaks, others, again, with convex frons and finally some with quite even frons: some have large spiracular expansions to segment 2, others none at all and there are degrees of prominence of that expansion; then the proboscis may be free beyond the end of the wings, the cremaster may be well-developed and long, or short and square and there may be no sign of suspensory hooklets which, however, are generally present; some pupæ are quite naked, others have a clothing of short, erect hairs; the spiracles also may be characteristic: small or large, prominent or flush and their colour also gives characters of differentiation. They, too might be classified:—

Stout pupæ, more or less marked with black spots and lines, pink or green in colour; the spiracles of segment 2 without expansion; the cremaster short stout, triangular; the proboscis not produced free; the head-frons with a short rounded boss which is really placed between the frons and vertex. . . . Genera *Bibasis*, *Ismene (gomata, fergussoni)*.

Pupa slighter, green (pinkish in *badra*), sometimes marked; similar to that of *Ismene* with a very slightly more accentuated boss on the frons and a very slight indication of expansion to the spiracles of segment 2. . . . Genus *Hasora*.

Pupa also slighter than in *Ismene*, the thorax more humped, the constriction behind the thorax more accentuated; dirty-white covered with cereous excretion; a short, triangular process ending in a spherical knob between the eyes; the spiracular expansion of segment 2 prominent and knob-like: the proboscis not produced; cremaster rather long. . . . Genus *Badamia*.

Pupa moderately stout, greenish with no markings; covering of erect, soft, rather long hair in *Hesperia*, each from a tiny tubercle or with short, erect, bifid hairs in *Gomalia*; the frontal snout is a mere rounded boss; the spiracular expansions of segment 2 are large and prominent, half-crater shaped; the proboscis is produced free to end of a segment 9; the cremaster is short, stout, the extremity set with long, numerous, very slightly hooked shaftlets. . . . Genera *Hesperia*, *Gomalia*.

Pupa green (*area*) or golden-brown (*ambareesa*, *leucocera*), unmarked, rather slight with no cereous excretion, shining as to surface and covered with minute, erect hairs all over; a short frontal knob between the eyes; the spiracular expansion of segment 2 large, strainer-shaped; the proboscis produced 2mm or more beyond the extremity of the body—therefore very long; cremaster long and not particularly stout, down-curved.... Genus *Celænorrhinus*.

Pupa stouter but similar to the above (the last), sometimes with colour green or whitish, marked with black or with enamel-white; slight cereous excretion always with minute, short hairs; the frontal snout not long, round-topped; large, strainer-shaped spiracular expansion to spiracles of segment 2; proboscis only shortly free beyond ends of wings; cremaster rather long, down-curved with bunched shaftlets at extremity which are hooked.... Genus *Tagiades*.

Stout pupæ, mostly bone-colour with greenish shade and many black markings; surface with short, erect and appressed hairs; a rather large, rounded, frontal process; large, spiracular expansions; proboscis produced free for a moderate distance beyond the wing-ends; cremaster stout, bent down.... Genera *Odontoptilum*, *Abaratha*.

Similar pupæ to last, green or brown, unmarked; surface with short, erect, often bifid hairs or hairs with bent tips; also with a "bloom" over the surface; spiracular expansions very prominent, nearly stalked; frons with a longer or shorter process or boss; proboscis produced to end of segment 9 or to end of body; cremaster triangular, not short.... Genera *Coladenia*, *Sarangesa*.

Pupa somewhat slight, shining greenish white, unmarked; surface without hairs; frontal process rather long, triangular, no spiracular expansions; proboscis not produced; cremaster short.... Genus *Tapena*.

Pupæ very parallel-sided, not stout, brown or green or whitish; surface, shortly haired; spiracular expansions strainer-shaped, large; the frons with a prominent, rounded process or only convex; proboscis produced slightly or not at all beyond wings; cremaster moderate, sometimes with simple hairs along the hinder margin which are without any hooks.... Genera *Telicota*, *Padroana* (only *dara*), *Halpe*, *Suastus*, *Iambrix*, *Baracus*, *Plastingia*.

Pupæ, moderately stout for length, thorax much humped; segment 13 square behind with points at each corner; the cremaster oblong, slightly curved; the proboscis sometimes enormously produced (*Gangara*); no spiracular expansions.—Genera *Gangara*, *Matapa*.

All the above pupæ are formed in cells made of leaves; the following are all formed under a leaf, practically open to the air, in an open fold made by slightly drawing the edges towards each other.

Pupa formed absolutely in the open; attached to a rice-stalkhead downwards by the tail and a body-band; colour green, unmarked; two frontal processes, small, pointed, one on each side of the head; surface shining, quite glabrous; no spiracular expansions; but a flat space on the thorax-surface just behind each spiracle; proboscis not produced, cremaster very long, triangular.... Genus *Ampittia*.

Small pupa, not stout, green in colour, unmarked; no spiracular expansions; proboscis not produced; a fairly long, triangular, frontal process, formed under a leaf, no cell.... Genera *Padraona* (*gola*), *Aëromachus*.

Long, narrow, plain green pupæ with very long, semi-hyaline cremasters which are rounded at the end; proboscis much produced; no sign of spiracular expansion; nearly naked body-surface and a very long, thin-conical frontal process. All are formed naked under a leaf in an open groove.... Genera *Baoris* (including *Baoris*, *Caltoris*, *Chapra*, but not *Parnara bada*) *Gegenes*, *Hyarotis*, *Notocrypta*, *Sancus* and *Udaspes*.

It is quite impossible to tell these last pupæ one from the other because they are so similar.

Lastly, the eggs. There are two large classes of these, those without meridional ribs and those with them. These extremes are connected, however, by some forms that have the ribs extremely numerous and so fine that it is impossible to tell without a lens that they are there at all. Amongst these smooth eggs it is difficult to make any classification, differences being hard to appreciate if, indeed, there are any. It would require special study. Smooth eggs belong to the genera....*Baoris Caltoris*, *Chapra*, *Telicota*, *Sancus*, *Udaspes*, *Hyarotis*, *Notocrypta*, *Iambrix*, *Taractrocera*.

Those that are known to have ribbed eggs are more numerous and some of the genera....*Hesperia*, *Ismene*, *Bibasis*, *Hasora*, *Badamia*, *Celcenorhinus*, *Tagiades*, *Odontoptilum*, *Abaratha*, *Sarangesa*, *Tapena*, *Cupitha*, *Suastus*, *Baracus* *Platingia*, *Aëromachus*, *Gangara*, *Matapa*.

A classification might be essayed on the knowledge gained as follows:—

Ribbed eggs.

Ribs coarse, strong. B : H : : 10 : 7 ; dome-shaped. The ribs beaded, anastomosing, about 20 in number of which about half reach the circumference of the micropyle-surface; larva emerging through the top....Genera *Hesperia*, *F.*, *Thanaos*, Boisd., *Spialia*, Swinh.

Ribs fine, clear, minutely beaded, not anastomosing, from 13 to 24 in number of which half reach the micropyle circle. B : H : : 10 : 7 : dome-shaped.... Genera *Ismene*, *Bibasis*, *Hasora*, *Badamia*, *Celcenorhinus*, *Baracus*, *Ampittia*.

Ribs extremely fine and very numerous, as many as 50, visible with difficulty even with a lens; the surface obscured by soft hairs from the anal segments of insect; shape that of a dome, H : B : : 190 : 55....Genera, *Gangara*, *Matapa*.

Ribs very coarse, about 14 in number from base to a raised circular ring of large diameter surrounding the micropyle; colour red, the ribs white; B : H : : 10 : 6....Genera *Cupitha*, *Suastus*.

Eggs smooth or practically so.

Eggs limpet-shaped, widest at base and, into the bargain, resting on a narrow basal band which slopes outwards and is extremely finely ribbed (the band only, which band, is besides, semihyaline; B : H : : 100 : 65....Genera *Hyarotis*, *Notocrypta*, *Udaspes*, *Sancus*, *Iambrix*.

Eggs high-dome-shaped, the surface celluloir under lens or even obscurely many-ribbed, or lumpy; B : H : : 10 : 8. (*Telicota*), or as 10 : 65 for the rest....Genera *Telicota*, *Baoris*, *Taractrocera*.

There are also occasional generic differences sometimes though they are not very helpful towards classification in all probability; but, on the whole, the eggs are fairly characteristic of the groups based on neutration, larvæ and pupæ. Further study is necessary of a much larger fauna than that at present available.

(To be continued).

BIRD NOTES FROM THE CAMPBELLPUR-ATTOCK
DISTRICT, WESTERN PUNJAB.

BY

A. E. JONES, M.B.O.U.

The following notes were made during a stay of fourteen weeks in the cold season, 1918-19.

For the most part the country in the district under notice consists of a bare undulating sandy plain, intersected towards the South by steep nullahs which drain into the Haro River, beyond which are the low hills known as the "Kala Chitta Reserve" rising to a height of some 2,000 feet above sea level. On the West at Attock the Indus runs between almost barren hills before it emerges once more in to flat country where it is, some miles lower down, joined by the Haro River, the junction of the two rivers being some 14 miles from Campbellpur.

Very few trees exist on this plain and these most along the roads and round the villages. These are principally "Sheeshum," "Keekur," and Mulberry. On the "Kala Chitta Reserve" hills, however, there is plenty of scrub interspersed with numerous stunted Keekur and Mimosa trees. As a consequence this portion of the district best pays investigation, from an ornithological point of view.

The list contains the names of some few species the respective distribution of which are but imperfectly known. A great many interesting additions would doubtless be made by the bird man fortunate enough to be in those parts during the height of the migration seasons.

The nomenclature is that adopted by Oates and Blanford in the "Fauna of India" volumes, and the serial numbers are those of the species in that work.

The few instances where trinomials have been used will, I hope, as in the case of *Emberiza cia par*, denote the race (or races) met with.

1. *Corvus corax laurencei*, Hume.—The Raven.

Abundant everywhere. Nesting operations commenced about the beginning of February and most nests were placed in small niches or on narrow ledges of the steep cliffs of the River Haro; one, however, was built on the girders of the iron bridge which carries the railway to Kohat. The bridge here is about 80 feet above the level (winter) of the river. One nest contained six eggs on 25th February 1919.

4. *Corvus macrorhynchus*, Wagler.—The Jungle Crow.

By no means common in the neighbourhood of Campbellpur; at Attock, however, where the country is hilly, and in the "Kala Chitta Reserve" it was noticed on most days, usually singly, but if food was at hand, sometimes as many as four or five might be seen at a carcass.

5. *Corvus frugilegus*, Linn.—The Rook.

Very common near Cantonments. Apparently roosting places were some distance away for I never saw any signs of their congregating towards evening.

7. *Corvus splendens*, Vieill.—The Indian House Crow.
More plentiful than any of the foregoing.
9. *Corvus monedula*, Linn.—The Jackdaw.
Occasionally seen passing over at considerable heights, often in company with *C. frugilegus*, its well-known call first attracting attention and then its smaller size and more pointed wing distinguishing it from the latter.
16. *Dendrocitta rufa*, Scop.—The Indian Tree-Pie.
Very common in the scrubby hills and nullahs of the "Kala Chitta Reserve." Usually in pairs.
31. *Parus atriceps*, Horsf.—The Indian Grey Tit.
Wherever there was a clump of trees (mostly leafless at this season) a pair was almost certain to be seen.
37. *Aegithaliscus leucogenys*, Moore.—The White-cheeked Tit.
Only seen on one occasion when a party of six or seven was seen in a nullah in the "Kala Chitta Reserve." One specimen sent to the B. N. H. Society. Habits very similar to *A. erythrocephalus*. Elevation 1,500 feet.
105. *Argya caudata*, Dumeril.—The Common Babbler.
Common wherever there was any scrub. Only one specimen obtained, which corresponds closely with birds from round Ambala, though it exceeds the latter in size.
187. *Myiophonus temmincki*, Vigors.—The Himalayan Whistling-Thrush.
Not uncommon along the banks of the Haro River and in the nullahs of the "Kala Chitta Reserve."
226. *Zosterops palpebrosa*, Temm.—The Indian White-eye.
A few were seen from time to time frequenting the few Peepul trees there are in Campbellpur.
283. *Molpastes intermedius*, A. Hay.—The Punjab Red-vented Bulbul.
Fairly common in the "Kala Chitta Reserve," especially where the wild plum was plentiful.
284. *Molpastes leucogenys*, Gray.—The White-cheeked Bulbul.
More plentiful than the last species. Six specimens obtained vary considerably from Simla birds. The chief differences being the shorter crest and, in most, the darker shade in colouring of this part. Wing measurements 85 mm.—93mm.
341. *Certhia himalayana*, Vig.—The Himalayan Tree Creeper.
Considering the dearth of trees in the district not uncommon, most of the specimens seen were of course in the better wooded parts of the "Kala Chitta Reserve."
384. *Franklinia buchanani*, Blyth.—The Rufous-fronted Wren-Warbler.
Very common on the scrub covered stoney hills. Occasionally seen in the mustard fields.
400. *Sylvia nana*, Hmp. and Ehren.—The Desert Warbler.
A single specimen seen (and obtained) on the left bank of the Indus, below Attock.
403. *Sylvia minuscule*, Hume.—The Small White-throated Warbler.
Common wherever there was sufficient cover, mostly on the stony hills.
407. *Phylloscopus tristis*, Blyth.—The Brown Willow-Warbler.
Plentiful wherever there were a few trees.
416. *Phylloscopus subviridis*, Brooks.—Brooks's Willow-Warbler.
A few seen in the "Kala Chitta Reserve."
418. *Phylloscopus humii*, Brooks.—Hume's Willow-Warbler.
Fairly common, but its numbers were much less than *P. tristis*.

434. *Cryptolopha xanthoschista*, Hodgs.—Hodgson's Grey-headed Fly-catcher Warbler.
Seen only occasionally in the low hills and once at Attock.
445. *Scotocerca inquieta*, Cretyschm.—The Streaked Scrub-Warbler.
First seen in a ravine running in to the Haro River. Afterwards found fairly common in the hills of the "Kala Chitta Reserve." Always in pairs.
450. *Horornis pallidus*, Brooks.—The Pale Bush-Warbler.
Only one specimen seen and obtained 24th December 1918. It was skulking at the base of a bush close to a pool in one of the nullahs of the "Kala Chitta Reserve" near Chhoi.
464. *Prinia socialis*, Sykes.—The Ashy Wren-Warbler.
A pair frequented the station hospital compound during the three months I was in Campbellpur. No others seen.
466. *Prinia inornata*, Sykes.—The Indian Wren-Warbler.
Several seen about a small jheel which I only discovered towards the end of my stay.
469. *Lanius lahtora*, Sykes.—The Indian Grey Shrike.
Fairly common, always in open country.
476. *Lanius erythronotus*, Vigors.—The Rufous-backed Shrike.
Scarce. Only definitely identified on two occasions.
479. *Lanius isabellinus*, Ehreub.—The Pale-brown Shrike.
Only one record, 8th December 1918.
488. *Tephrodornis pondicerianus*, Gmel.—The Common Wood-Shrike.
Small parties were seen on the scrubby hills during the early part of December. Afterwards disappeared.
495. *Pericrocotus brevirostris*, Vigors.—The Short-billed Minivet.
Frequently seen in small parties.
500. *Pericrocotus peregrinus*, Linn.—The Small Minivet.
One small flock noted, 24th November 1918, frequenting the Keekur trees on one of the nearer hills.
530. *Sturnus vulgaris porphyronotus*, Gould.—The Central-Asian Starling.
Two secured from a flock consisting of this and the next species, 24th February 1919, when they had almost assumed their full breeding plumage together with the yellow bill.
532. *Sturnus vulgaris menzbieri*, Sharpe.—The Common Indian Starling.
Certainly appeared to be the commoner Starling in these parts. Specimens shot from time to time always turned out to belong to this subspecies, until the end of February when I found a flock composed of both this and *porphyronotus*.
549. *Acridotheres tristis*, Linn.—The Common Mynah.
Fairly plentiful.
610. *Pratincola maura*, Pall.—The Indian Bush-Chat.
Only 2 or 3 records. Scarce.
615. *Oreicola ferrea*, Hodgs.—The Dark-grey Bush-Chat.
One record—at the small jheel, five miles East of Campbellpur, 16th February 1919.
618. *Saxicola picata*, Blyth.—The Pied Chat.
A good many seen, generally in the ravines or frequenting the precincts of villages. A decided ingress during February.
619. *Saxicola capistrata*, Gould.—The White-headed Chat.
By far the commonest species of the genus.
620. *Saxicola opistholeuca*, Strickl.—Strickland's Chat.
Almost as common as the last, but apparently preferred the wilder and more remote ravines.

625. *Saxicola isabellina*, Cretyschm.—The Isabelline Chat.
 Scarcer than any of the other members of the genus.
626. *Saxicola deserti*, Temm.—The Desert Chat.
 By no means uncommon but its numbers decreased appreciably in January.
628. *Saxicola chrysopsia*, DeFilippi.—The Red-tailed Chat.
 Not uncommon at the beginning of December but towards the end of this month and all through January not a single specimen was to be seen. In February it reappeared in fair numbers.
638. *Chimarrornis leucocephalus*, Vigors.—The White-capped Redstart.
 Very common along the Haro River where it could be seen disporting on boulders wherever these were plentiful enough to offer good feeding grounds.
642. *Ruticilla erythronota*, Eversm.—Eversmann's Redstart.
 First noted towards the end of December and for the next two or three weeks was present in fair numbers but towards the end of January its numbers lessened appreciably, but by the middle of February was again plentiful.
644. *Ruticilla rufiventris*, Viell.—The Indian Redstart.
 Very common during the whole winter. One specimen obtained has a pure white forehead.
646. *Rhyacornis fuliginosus*, Vigors.—The Plumbeous Redstart.
 Only seen on three or four occasions along the bed of the Haro River. In habits it closely resembles *chimarrornis*.
647. *Cyanecula suecica*, Linn.—The Indian Blue-throat.
 During the winter months so little cover remains for a bird of this species' habits, consequently very few were noted. One ♂ procured, 13th February 1919.
661. *Thamnobia canbeiensis*, Lath.—The Brown-backed Indian Robin.
 Fairly common in the ravines and along the steep rocky banks of the Haro River.
677. *Merula atrigularis*, Temm.—The Black-throated Thrush.
 Common in the better cultivated tracts, especially where there were a few trees.
693. *Petrophila cyanus*, Linn.—The Western Blue Rock-Thrush.
 Not uncommon about the ravines. Shy and wary.
716. *Tharrhaleus atrigularis*, Brandt.—The Black-Throated Accentor.
 Noted on several occasions in the low hills and also quite close to the cantonments. Usually 2 or 3 together.
734. *Uroloncha malabarica*, Linn.—The White-throated Munia.
 Only rarely seen, but judging by the numerous old nests seen in Acacia trees in the low hills common in the warmer months.
740. *Coccothraustes humii*, Sharpe.—Hume's Hanfinch.
 By no means uncommon in the low hills and occasionally seen in the neighbourhood of cantonments. Generally in small scattered flocks of three to six individuals. I, however, found their bathing pool in the low hills and here any number from a dozen to thirty or so could be seen, at a distance of a few yards, performing their ablutions. Usually a shy species but with care could be approached to within a few yards. The call-note, uttered on the wing, "Zitt," rather prolonged. The song might be represented thus "Pitt-zwee."
757. *Proponser grandis*, Blyth.—The Red-mantled Rose-Finch.
 Abundant in low the hills. Generally seen in scattered flocks. Full plumaged males comparatively scarce. Call-note "whre", rather plaintive.

767. *Carduelis caniceps*, Vigors.—The Himalayan Goldfinch.
Large flocks in the low hills ; rather local, probably due to food.
769. *Acanthis fringillirostris*, Bonap. and Schleg.—The Eastern Linnet.
First noted 20th December 1918 when a flock of seven was seen. They were so wild that I had difficulty in securing one with the 12 bore gun. Subsequently found to be fairly common about the waste stony ground at the foot of the hills.
772. *Hypacanthis spinoides*, Vigors.—The Himalayan Greenfinch.
Seen only on two occasions in the low hills. Parties of six and ten.
776. *Passer domesticus*, Linn.—The House Sparrow.
Common in cantonments and the vicinity of the villagos.
789. *Emberiza schoeniclus*, Linn.—The Reed Bunting.
Odd birds and pairs seen from time to time. One female secured.
794. *Emberiza stracheyi*, Moore.—The Eastern Meadow Bunting.
Not common. I shot one for identification but finding it was this species unfortunately did not preserve it.
Emberiza cia par, Hart.—The Meadow Bunting.
I found this, the western race of the foregoing species, common in the low hills. Occasionally seen in the plain.
808. *Cotile riparia indica*, C. B. Ticehurst.—The Sand-Martin.
This race, with the tarsial plume, was the only Sand-Martin obtained. Capt. C. B. Ticehurst who kindly examined my specimens, pronounces them to belong to this race. Nesting colonies were found on the Indus near Attock but at that time, 23rd February 1919, 2 eggs were the most that I found in one nest ; some contained one only, while others were just ready for eggs. Mostly the tunnels face N. W. Wing measurements mm. 90—93·5.
810. *Ptyonoprogne rupestris*, Scop.—The Crag-Martin.
Common about the river and rocky nullahs.
813. *Hirundo rustica*, Linn.—The Swallow.
Observed only near the jheels.
826. *Motacilla alba*, Linn.—The White Wagtail.
Very common about cantonments and along a tiny stream where the village cattle were taken to water.
829. *Motacilla personata*, Gould.—The Masked Wagtail.
Same as the foregoing species.
831. *Motacilla maderaspatensis*, Gmel.—The Large Pied Wagtail.
A pair could always be seen every 200 yards or so along the banks of the Haro River.
832. *Motacilla melanope*, Pall.—The Gray Wagtail.
Single birds were common along the Haro River and on most of the smaller streams.
837. *Motacilla citreola*, Pall.—The Yellow-headed Wagtail.
Two or three were found frequenting the small jheel in February.
844. *Anthus similis*, Jerd.—The Brown Rock-Pipit.
Only one seen and procured 19th January 1919. It is, as Capt. C. B. Ticehurst pointed out to me, a much paler bird than the race found about Simla and Amballa.
848. *Anthus campestris*, Linn.—The Tawny Pipit.
Uncommon. Generally seen about the waste land in small scattered parties.
851. *Anthus spinoletta*, Linn.—The Water-Pipit.
Very common near moist land.
859. *Melanocorypha bimaculata*.—The Eastern Calandra Lark.
Flocks appeared in February when they frequented the more barren fields. Has a melodious call-note.

860. *Alanda arvensis*, Linn.—The Sky-Lark.
Abundant, especially during February when the young wheat was well up.
867. *Alaudula adamsi*.—The Indus Sand-Lark.
Very common about the bed of the Indus at Attock.
874. *Galerita cristata*, Linn.—The Crested Lark.
Very common, either on barren ground, cultivation or the various parade grounds in cantonments.
878. *Ammomanes phœnicuroides*, Blyth.—The Desert Finch-Lark.
Common on the barren ground.
963. *Dendrocopus sirdianus*, Gould.—The Sind Pied Woodpecker.
Not uncommon in the better wooded parts of the Kala Chitta Reserve. Rare in the plains.
972. *Liopicus mahrattensis*, Lath.—The Yellow-fronted Pied Wood-pecker.
Identified for certain on two occasions only. A female obtained 31st January 1919.
1022. *Coracias indica*, Linn.—The Indian Roller.
One seen near the railway station, 1st February 1919, another used to frequent a well in the camel lines.
1033. *Ceryle varia*, Strickland.—The Indian Pied Kingfisher.
Common along the Haro River.
1035. *Alcedo ispida*, Linn.—The Common Kingfisher.
Fairly common both on the Haro and Indus. Without having obtained specimens I cannot say to which race these belonged.
1044. *Halcyon smyrnensis*, Linn.—The White-breasted Kingfisher.
Much scarcer than either of the two foregoing species.
1066. *Upupa epops*, Linn.—The European Hoopœ.
Very common. Its numbers were augmented during the latter half of February.
1068. *Cypselus melba*, Linn.—The Alpine Swift.
A pair seen on 19th February 1919. No other record.
1073. *Cypselus affinis*, Gray and Hardw.—The Common Indian Swift.
Very common till 19th December 1920 after which none were seen till 29th January 1919 when a single bird put in an appearance.
1138. *Palæornis torquatus*, Bodd.—The Rose-ringed Paroquet.
Not uncommon. Only seen in the plains.
1168. *Bubo bengalensis*, Frankl.—The Rock Horned Owl.
Probably not uncommon. A single bird seen in a rocky nullah which contained several likely-looking nesting caves. Another was disturbed from a small nullah scarcely six feet deep.
1180. *Athene brama*, Temm.—The Spotted Owllet.
Not uncommon in the ravines. Trees containing suitable holes are practically non-existent in the locality but the ravines contain numberless suitable cavities.
1189. *Pandion haliaetus*, Linn.—The Osprey.
Once seen at close range just above Attock and again on the Haro River. Both records in February.
1190. *Vultur monachus*, Linn.—The Cinerous Vulture.
Two records only, both in January. On the first occasion a single bird was seen in company of several Griffons. On the second occasion three were seen on the top of an earthen cliff on the Haro River.
1191. *Otogyps calvus*, Scop.—The Black Vulture.
While Chukor shooting in the hills a pair was seen, one adult, the other in immature plumage.

1192. *Gyps fulvus fulvescens*, Hume.—The Griffon Vulture.

Very common. I shot one specimen off a nest and sent to Mr. Hugh Whistler, who kindly skinned it and forwarded it on to the Society, who in their turn also kindly forwarded to England, whence Mr. E. C. Stuart-Baker pronounced it as pertaining to the above race. He says *in epist.*, "Your Vulture appears to me to be a young *Gyps fulvus fulvescens*, it is not *himalayensis* but I have never seen any specimen of *fulvescens* like it. The black breast, dark underparts and well-feathered head are unlike anything I have seen in any collection."

On January 1st I saw several of these birds carrying sticks up to various ledges in the cliffs in the hills and on 18th of that month took the first egg from a solitary eyrie, which was a poor affair composed as it was of a few sticks and lined with dry grass. Next day I took another egg from an eyrie some distance from the last. In this cliff were several more eyries 20 feet to 60 feet apart. Both the foregoing eggs were fresh. Subsequently I took 16 more eggs from different colonies, only one of which is at all well-marked. With the exception of one, which had to be stoned to get her to move, there was little trouble in getting the bird to leave its charge.

I would here like to say that the distinctive character of the separating various species of birds of prey by the comparative length of the primaries is most unsatisfactory. Vultures, and many other Raptores, shed these feathers gradually, so that a newly-grown fully developed 3rd primary might easily be longer than an old and worn 4th primary and *vice versa*.

Two birds at the largest colony were exceptionally pale, in strong contrast to the remainder which are of a decided *warm fulvous* on the upper parts.

1198. *Neophron percnopterus*, Linn.—The Large White Scavenger Vulture.
Very common. Only one specimen shot which was attributed to this race.

1199. *Gypætus barbatus*, Linn.—The Lämmergeyer.

Occasionally seen near cantonments but the hills are the home of this fine bird and here it could be seen almost any day. One nest found in a small cave in an almost perpendicular cliff contained 2 poorly marked eggs on January 5th. Elevation 1,200 feet above sea level.

1202. *Aquila bifasciata*, J. E. Gray.—The Steppe Eagle.

Not uncommon. Usually seen seated on the ground near a carcass waiting for the Vultures to leave.

1203. *Aquila vindhiana*, Franklin.—The Tawny Eagle.

In such a treeless country this bird naturally was scarce. Single birds were occasionally noted and towards the end of February a pair was found building on the top of a lone "Sheeshum" tree four miles from cantonments.

1207. *Hieraëtus fasciatus*, Vieill.—Bonelli's Eagle.

A pair of these fine birds was always to be found on each visit I paid to the nullahs near Jhalar in the Kala Chitta Reserve.

1216. *Circaëtus gallicus*, Gmel.—The Short-toed Eagle.

Fairly common but what it subsisted on in this barren country was ever a mystery to me. Never seen near a carcass.

1223. *Haliaëtus leucoryphus*, Pall.—Pallas's Fishing Eagle.

A pair seen at their eyrie at the top of a "Sheeshum" tree. This was on the Indus five miles below Attock.

1229. *Milvus govinda*, Sykes.—The common Pariah Kite.

Very common about cantonments. A nest taken in February contained four eggs.

1234. *Circus ? Sp.*
or
1235. Harriers of this type were occasionally seen but as no specimen was obtained the species must remain in doubt. Only males were seen.
1237. *Circus aeruginosus*, Linn.—The Marsh Harrier.
One was seen at the small jheel, 16th February 1919.
1247. *Accipiter nisus*, Linn.—The Sparrow-Hawk.
Only one record, 30th January 1919. It had just killed a *M. atrigularis*.
1256. *Falco barbarus*, Linn.—The Barbary Falcon.
A fine male was obtained, 23rd December 1918, while we were out Chukor shooting. At the time I took it to be a Peregrine, but on shewing it to Mr. Hugh Whistler he identified it as the above. Other large falcons were seen rarely and were probably of this species.
1257. *Falco jugger*, J. E. Gray.—The Luggar Falcon.
A pair had appropriated a section of the river-bank four miles South of cantonments.
1263. *Esalon regulus*, Tunstall.—The Merlin.
Two records only. One at Attock, 22nd February 1919. The other near Cantonments.
1265. *Tinnuculus alaudarius*, Linn.—The Kestrel.
Decidedly uncommon. Two or three noted in February.
1292. *Columba intermedia*, Strickl.—The Indian Blue Rock-Pigeon.
Large flocks frequented the nullahs in the hills and the more remote ravines in the plains. Both this species and *livia* were to be seen in the same flock. Two or three pale grey (mottled) birds were seen consorting with normal birds, and frequenting the same cliffs—probably domestic birds which had lapsed into the feral state.
1298. *Palumbus casiotis*, Bonap.—The Eastern Wood-Pigeon.
A good many were seen in the hills of the Kala Chitta Reserve. Several were obtained.
1309. *Turtur cambayensis*, Gmel.—The Little Brown Dove.
Common both in the low hills and the plains.
1310. *Turtur risorinus*, Linn.—The Indian Ring-Dove.
Same as *cambayensis*, though rather more gregarious.
1316. *Pterocles arenarius*, Pall.—The Large Black-bellied Sand-Grouse.
Not uncommon on the north side of the railway line, generally in or near cultivation.
1321. *Pteroclorus exustus*, Temm.—The Common Sand-Grouse.
A few were occasionally brought into the camp by some of the Officers.
1370. *Caccabis chucar*, Gray.—The Chukor.
Plentiful in the hills. Never found in the plains. The cattle-men trap a good many by means of a small pit over which a flat stone is propped with an arrangement of sticks, while a few grains of corn act as bait. In one of these traps on one occasion I found an unfortunate common Babbler (*A. caudata*) which had been there some days! Local name "Kouk".
1371. *Ammoperdix bonhami*, Fraser.—The Seesee.
Very common in the plains at the foot of the hills. In pursuit of it I enjoyed some of the best sport I have ever had. Coveys of 20 were by no means uncommon. Local name "Kuekie".
1375. *Francolinus pondicerianus*, Gmel.—The Grey Partridge.
Sparsely distributed along the foot of the Kala Chitta Reserve hills.

1415. *Houbara macqueeni*, Gray.—The Houbara.
A few were seen but none shot.
1431. *Sarcogrammus indicus*, Bodd.—The Red-wattled Lapwing.
Common along the Indus and Haro rivers and also at the few small jheels.
1436. *Vanellus vulgaris*, Linn.—The Lapwing or Peewit.
Common only at the jheel, 10 miles N. of Campbellpur. Several were seen on the Grand Trunk Road.
1447. *Ægialitis dubia*, Scop.—The Little Ringed Plover.
A few pairs appeared on the Sand-banks of the Haro River towards the end of January, apparently preparatory to breeding there.
1454. *Numenius arquata*, Linn.—The Curlew.
A few only were seen, and one obtained, at the Jheel N. of Campbellpur.
1462. *Totanus ochropus*, Linn.—The Green Sandpiper.
Common along the rivers and in fact wherever there happened to be any running water.
1464. *Totanus calidris*, Linn.—The Redshank.
Numbers were seen at the jheel to the North of Campbellpur.
1466. *Totanus glottis*, Linn.—The Green Shank.
Abundant both along the rivers and at the jheels.
1484. *Galinago caelestis*, Linn.—The Common Snipe.
A fair number were seen and obtained.
1487. *Galinago gallinula*, Linn.—The Jack Snipe.
Two or three were shot while we were after the foregoing species.
1503. *Sterna seena*, Sykes.—The Indian River-Tern.
Plentiful on the Indus at Attock.
1504. *Sterna melanogaster*, Temm.—The Black-bellied Tern.
Pairs were seen both above and below the bridge at Attock.
1526. *Phalacrocorax carbo*, Linn.—The Large Cormorant.
Small flocks were seen from time to time both on the Indus and Haro Rivers.
1555. *Ardea cinerea*, Linn.—The Common Heron.
A few solitary individuals were noted both at the jheels and along the rivers.
1574. *Botaurus stellaris*, Linn.—The Bittern.
A pair was flushed on several occasions at the small jheel East of Campbellpur.
1587. *Carsarca rutila*, Linn.—The Ruddy Sheldrake.
Abundant at the jheel N. of Campbellpur. Pairs seen along the Indus.
1592. *Anas boschas*, Linn.—The Mallard.
Fairly abundant. Flocks were seen at the large jheel and small parties occasionally met with on the quieter stretches of the Haro River.
1597. *Nettion crecca*, Linn.—The Common Teal.
The commonest duck. Found on all the jheels and occasionally on the Haro and Indus Rivers.
1600. *Dafila acuta*, Linn.—The Pintail.
Only seen on the large jheel, when it was common.
1612. *Mergus albellus*, Linn.—The Smew.
Noted on two occasions only, 20th December 1918, on the Haro River when among a small flock a full plumaged male was seen, and on 23rd February 1919 on the Indus below Attock where 3 females were seen.

A CONTRIBUTION TO OUR KNOWLEDGE OF THE
ORTHOPTERA ACRIDIODEA
 OF MESOPOTAMIA AND N. W. PERSIA.

By

B. P. UVAROV, F.E.S.

The material for this publication was collected by Dr. P. A. Buxton and Mr. W. Edgar Evans during their active service with the Mesopotamian Force, and kindly submitted to me for working out. As the Orthopteran fauna of Western Asia has always interested me very much, I am extremely obliged to Dr. Buxton and Mr. Evans for placing this material at my disposal. The spelling of native geographical names adopted by me in the following list is generally in accordance with the map of N. W. Persia, issued with Dr. Buxton's article on the Birds of N. W. Persia in this number and with the map of Mesopotamia which was published with Capt. R. E. Cheesman's on the mammals of Mesopotamia. In some instances, however, I used somewhat different spelling; thus, instead*, Qazvin—Kazvin; Talish—Talysh.

LIST OF SPECIES.

1. *Paratettix meridionalis* Ramb.—Numerous specimens from Amara, Baghdad, Enzeli and Qurnah (side of stream).
2. *Acrida turrita deserti*, Uvarov †.—This desert race of common *Acrida turrita*, St., has been described by myself from Eastern Transcaucasia and Transcaspa; in Dr. Buxton's collection there is a pair (1 ♂, 1 ♀) of the same from Kazvin taken, 17—20-7-19, so it is obvious that it is distributed over Persia as well.
3. *Acridella miniata* (Klug).—Garden by Tigris, below Amara, 3-6-18, 1 ♂ taken by W. E. Evans. The species is known from Algeria, Egypt, Arabia and Beluchistan; I have also seen the specimens from Palestine.
4. *Acridella robusta* (Uvarov).—Amara, 5—14-6-18, 3 ♂♂, taken by Dr. Buxton. I know this species, previously described by myself ‡ from Eastern Transcaucasia and from different localities of Kurdistan and Persia. It is now evident that it is distributed all over the Persian and Mesopotamian deserts.
5. *Duroniella fracta* (Krauss).—Garden above Amara, 9-4-18 (Mr. Evans).
6. *Ochridia tibialis*, Fieb.—Baghdad, 23-9-17. (Dr. Buxton); Amara, 20-10-17 (Dr. Buxton); garden above Amara, 28-6-18 (Mr. Evans); Chahala, nr. Amara, among grass, 30-10-17.
7. *Parapleurus alliaceus*, Germ.—Enzeli, 20-6—10-7-19 (Dr. Buxton). This species is boreal in its origin and has not been known as yet from the Southern shore of the Caspian Sea; the whole fauna of this locality (Gilan) is remarkable for the presence of several truly boreal forms.
8. *Stauroderus bicolor* (Charp.).—Persia; Menjil, Safid-Rud, 27-1-19 (Dr. Buxton); Mesopotamia; Jebel Hamrin, N. E. of Baghdad, 26-9-18 (Ak-i-Girreh, W. Persia, grassy ledges, limestone cliffs, 15-1-19 (Mr. Evans).
9. *Dociostaurus anatolicus* (Krauss).—Kazvin, 4,000 ft., 25-8—7-9-19 (Dr. Buxton).

* See papers on Birds of N. W. Persia by P. A. Buxton published in this number, and Birds of Mesopotamia by C. B. Ticehurst which will shortly appear.

† Revue Russe d'Entomologie, xvi., 1916, p. 10.

‡ l. c. p. 8 (*Acrida robusta*).

10. *Doclostaurus genei* (Oesk.).—Amara, 1—16-6-18 (Dr. Buxton); among vegetation in garden on Tigris below Amara, 3-6-18; garden above Amara, 15-6-18 (Mr. Evans).
11. *Pallasiella truchmana* (Fisch. Wald.).—Roadway through large marsh, 12 miles below Amara, 22-5-18 (Mr. Evans).
12. *Æolopus thalassinus*, Rossi.—Numerous specimens from Amara, Enzeli Baghdad, Kazvin.
13. *Æolopus strepens deserticola* (Uvarov)*.—Palm grove, Beit Na'ama, near Basrah, 8-4-19 (Mr. Evans). This desert subspecies of *A. strepens* (Latr.) was described by me from specimens taken in Eastern Transcaucasia and Transcaspia.
14. *Pachytylus danicus* (L.).—Amara, 11-11-18, 20-10-18 (Dr. Buxton); Chahala, Amara, grassy ground, 5-11-17; Masharra, Amara, among Acacia scrub, 17-8-18 (Mr. Evans). The dates of development of imago in Mesopotamia are quite different from those obtained in more northern localities and they seem to indicate that this species has here two generations in a year.
15. *Edaleus senegalensis*, Krauss.—Enzeli, 7-6—10-7-19, vii., 19, common; Gilan, 14-6-19 (Dr. Buxton). As synonyms of this species are to be regarded:
Edaleus monkosiewitchi, Bolivar, Ann. Soc. Ent. Belge, 28, 1884, p. cv.—cvi.
Edaleus nigrofasciatus, Deg. var. c. Saussure, Addit. ad Prodr. Oed., p. 42.
16. *Edaleus nigrofasciatus* (Deg.).—Kazvin, 7,000 ft., 26-8-19; Amara, 13—26-6-18 (Dr. Buxton); garden above Amara, 21-6-18; uncultivated land, right bank of Tigris, 8 miles above Amara, 10-6-18.
17. *Mioscirtus wagneri* (Ev.).—Tehran, 12-10-19; Amara, 15—28-6-18 (Dr. Buxton); on dry earthy places in garden on Tigris, Amara, 1-11-17 (Mr. Evans). Saussure's *Conozoa rogenhoferi* (Add. ad Prodr. Oedip., p. 62, tab. 2, fig. 4, 4a, 4b, 4c) is evidently synonymous with Eversmann's species.
18. *Edipoda schochi*, Sauss.—Kazvin, 5—7-9-19 (Dr. Buxton).
19. *Edipoda gratiosa*, Serv.—Kazvin, 17-7—25-8-19 (Dr. Buxton).
20. *Acrotylus insubricus*, Scop.—Many specimens from Enzeli, Kazvin, Menjil, Baghdad and Amara.
21. *Helioscirtus moseri*, Sauss.—Mesopotamia; Jebel Hamrin, gravelly summit, 3-12-18 (Mr. Evans). The specimens are quite like those from Turkestan. I think that *H. moseri ab. pietschmanni*, described by N. Ikonnikov†) from Mesopotamia is a mere colour form.
22. *Sphingonotus cærulans*, L.—In very large numbers from Enzeli, Gilan Menjil, Kazvin, Baghdad, Amara. One specimen taken by Dr. Buxton at Tula Rud (Talysh) was the prey of a dragon-fly; Dr. Buxton gives the following note on this occasion: "I saw the Acridian fly up as I came along and the dragon-fly catch it securely in the air. Both were netted instantly and the Acridian was not hurt at all, so far as I could see. Both species were common. The Odonatan has been determined by K. J. Morton as *Orthetrum sabina*, Drury."
23. *Sphingonotus satrapes*, Sauss.—Amara, 26-6—4-7-18 (Dr. Buxton). This large species of *Sphingonotus* has been known, so far, from the southern parts of Transcaucasia and Russian Turkestan; I know specimens (in the Tiflis Museum) from Tehran, but it is evidently distributed further west and southwards.

* I described in "Entom. Monthly Magazine" 1921.

† Ann. d. k. k. Naturhist. Hofmus. Wien, xxvii, 1913, p. 331.

24. *Leptopternis gracilis* (Ev.).—Mesopotamia: Jebel Hamrin, N. E. of Baghdad 20-11-18 (Mr. Evans).
25. *Tmethis carinatus*, Fabr.—Khaniqin, R. Diala, 1-8-18 (Dr. Buxton) known from Egypt, Arabia and Palestine; I have seen specimens from N. W. Persia.
26. *Nocarodes serricollis*, Fisch. Wald.—Menjil, valley of Sufid-Rud, 3,000 ft. 24-4-19 (Dr. Buxton).
27. *Pyrgomorpha conica*, Oliv.—Baghdad, 7-10-17; Amara, 30-3—30-6-18 (Dr. Buxton); garden above Amara, 14-3-18 (Mr. Evans).
28. *Leptosirtus evansi*, sp. n.
- ♂: Subdepressus, rugulosus, ochraceus, nigro, rubro, rufo et albo punctatus ac variegatus, sparse pilosus; subtus albidus.

Antennæ caput cum pronoto unitis subæque longæ; 8-articulatæ; articulo tertio longiore quam latiore; articulis 4-7 subæque longis ac latis; articulo octavo longissimo, præcedentibus six æquilongo, creviter incrassato, apice truncato. Facies parum oblique reclinata, albida, lata, subplana, punctis magnis impensis, hand numerosis. Costa frontalis inter antennis validissime compressa, lamellaris, angustissime lineari-sulcata, infra ocellum nulla; ocello magno, ovoideo. Tempora apicem vertici formantia, parum declinata, fere superiora, magna, trigonalia, marginibus calloso-elevatis, intus late sese contigua. Vertex valde impressum marginibus lateralibus in dimidia antica valde elevatis, postice subdepressis, dehinc elevatis introrsumque incurvis, carinis transversis, medio hand attingentibus, formantia; carina longitudinali mediana antice nulla, pone medio et in occipite parum distincta. Occiput callositas duos sat magnos rotundos, albos, ad angulum interno-posticum oculorum positos, duosque posticis majoribus, sed depressis, instructum. Oculi magni, valde globosi.

Pronoti prozona gibbulosa; tuberculis callosis six minutis ad marginem anticum, duosque sat magnis albidis in parte antica prozoni et quadris minoribus, subacuminatis, figuram trapezoideum formantibus in regionem sulcos transversos positos, instructa. Metazona planiuscula, callositas albidos duos, depressis, oblongis, in medio positos, instructa; margine postico lato rotundato. Carinæ laterales in prozona per tuberculis tres callosis magnis, in serie obliquo positis (duos ad marginem anteriorem positos et sese appropinquatis, unoque parum remoto, inter sulcos transversosposito) substitutæ; in metazona in dimidio postico tantum expressæ, callosæ, postorsum sat valde divergentes. Carina mediana medio tantum parum perspicua, antice et postice obsoleta. Sulcum transversum secundum parum ponemedium situm in medio antrorsum parum angulato recurvum; sulcum primum per callositas obliquos interruptum. Lobi deflexi haud planæ, medio valde ac late impressæ, antrorsum angustatæ; angulo antico subrecto, tuberculo calloso magno oblongo instructo; angulo postico recto, vix calloso.

Prosternum antice valde laminato-elevatum. Spatium mesosternale longius quam latum, metasternale valde transversum.

Elytra angusta, apicem femorum posticorum attingentia in tertia parte apicali membranacea, rugulosa, tuberculis callosis albis oblongis in serie uno positos, instructa. Alæ cærulescentes, elytrorum parum longioræ.

Femora antica parum incrassata, albida; tibiæ antice parum curvati, spinulis margine infero-externo duobus, infero-interno uno instructæ. Femora intermedia elongata, parum decurva, albescens, fusco fasciata. Femoras postica extus ochracea, maculis rubris irregularibus in area superno-media, nigrisque in area dicta et in margine inferiore areæ extermo-mediae positos, ornata; intus albida. Tibiæ posticæ griseo-cærulescentes, spinis margine externo quattuor, in margine interno duo instructæ; calcaria valde elongata, sat crassa, apice ipso levissime subarcuato, nigro; calcar supero-internum longissimum, calcaria supero-externa

ac infero-interna sese æquilonga et supero-interno parum breviora; calcar externo-infernum præcedentibus sat brevior, distincte decurvus. Tarsi postici articulo primo sat longo, secundo brevissimo, tertio præcedentibus simul sumptis æqualio, decurvo; unguiculi graciles, sat longi, decurvi; pulvilli dimidio unguiculorum æquantes.

	♀ (typus)	♀ (cotypus)
	mm.	mm.
Long. corporis ..	11	17
„ pronoti ..	2	3
„ elytrorum ..	9	13
„ femori postici ..	6, 5	9

Hab.—Mesopotamia: Jebel Hamrin prope Baghdad, 13-11-18 (W. E. Evans leg).

Typus ♂ et cotypus ♀ in collectionem Musei Britannici positi; alii cotypi in collectionibus Musei Edinburgensis, Evansi et me a conservati.

I have been in doubt as to the genus to which this interesting insect belongs: in its general appearance it seems to be an *Oedipodid*, but the position and form of the tempora, which are most clearly contiguous and forming the extremity of the fastigium, indicates its place among *Pyrgomorphidæ*, near *Chrotogonus*. The nearest known thing is *Leptoscirtus angustus*, Blanch. (= *L. savignyi*, Sauss.) and after a careful study of the unique specimen of the latter species in the British Museum, I came to the conclusion that my species is to be placed in the same genus. It is obvious, also, that Saussure was wrong in placing *Leptoscirtus* in *Oedipodidæ*, since the genotype of this genus is *L. angustus*—a Pyrgomorphid; on the other hand the remaining two species which are included in the genus *Leptoscirtus* by Saussure—*L. unguiculatus*, Sauss. and *L. aviculus*, Sauss., are doubtless *Oedipodidæ* and ought to be withdrawn from this genus. Thus, the genus *Leptoscirtus* (of Pyrgomorphidæ) includes in it two species only: *L. angustus*, Blanch, and *L. evansi*. * The genus itself is well characterised by the short fastigium of vertex, by the antennæ composed of 8-9 articles while the terminal article is very long and incrassate, and by long spurs of the hind tibiæ. The new species is quite easily separated from *L. angustus* by more markedly marginated tempora, by the characteristic callosities on head, pronotum and elytra, by the 8-jointed antenæ, &c.

This remarkable insect is truly desert in its habitation, being discovered by Mr. Evans on gravelly slopes, where it ought to be exceedingly well protected by its coloration and habits.

28. *Tropidopola cylindrica*, Marsh.—Amara, 30-10—1-11-17; 10-4—2-5-18 —Qalatsaleh, 6-1-18 (Dr. Buxton); grassy ground near Tigris, Amara, 31-10-17 (Mr. Evans).
29. *Derocorys gibbosa*, Fisch.-Wald.—River Tigris, 8 miles above Amara, uncultivated ground, 10-9-18 (Mr. Evans).—This species has been known so far only from Aralo-Caspian deserts.
30. *Acrydium ægyptium*, L.—Enzeli, 10-4-19; Amara, 30-9—27-10-17 (Dr. Buxton); Masharra Canal, Amara, on willows, 5-9-18 (Mr. Evans).
31. *Schistocerca gregaria* (Forsk.) (= *peregrina*, Ol.)—Enzeli, 24-5-19, “migrant?” (Dr. Buxton); courtyard, Beit Na’Ama Hospital, Basrah, 5-4-19. (Mr. Evans).—Mr. Evans remarks that “a flight of this species appeared at Basrah in April 1919.” The supposition of Dr. Buxton that the Enzeli specimen belongs to a migrating swarm ought to be true, since this

* It is possible that some species of *Chrotogonus* with small number of joints of antennæ (*Ch. savignyi*, Burm., for instance) might be replaced in *Leptoscirtus*, but it can be done after study of specimens only.

locust is not known to have breeding places so far north: he informs me that the species was common at Enzeli at the end of May, and that drowned specimens were frequently washed up on the shore of the Caspian.

32. *Calliptamus italicus*, L.—Large number of specimens from different localities (Menjil, Kazvin, Baghdad, Amara, Mendeli).
33. *Thisocetrus littoralis*, Ramb.—Amara, 30-10-17, 15-6—1-11-18 (Dr. Buxton); among herbage near Tigris, Amara, 1-11-17 (Mr. Evans). The synonymy of this species is rather large, since I cannot agree with J. Bolivar*, who regards *Euprepocnemis charpentieri*, St., and *E. littoralis*, Ramb. as distinct species, the only difference being in the number of spines on the hind tibiæ, which is rather inconstant. As I have also had the opportunity of seeing some of Walker's types in the British Museum, I am able to add some new synonyms to the known ones and the chief synonyms of this species are as follows:—
1838. *Gryllus littoralis*, Rambur, Faune de l'Andal., p. 78, tab. vii, fig. 1-2.
1861. *Caloptenus similis*, Brunner-Wattenwyll, Verh. Z.-B. Gesellschaft. Wien, xi, p. 224.
1870. *Cyrthacanthacris notata*, Walker, Catal. Derm. Salt. Brit. Museum, iii, p. 574.
1870. *Heteracris annulosa*, Walker, l. c. iv., pp. 673, 674, n. 41.
1871. *Acridium continuum*, Walker, l. c., v, Suppl., p. 61.
1873. *Euprepocnemis charpentieri*, Stal, Rec. Orth., 1, p. 75.
34. *Thisocetrus buxtoni*, sp. n.

Th. littorali, Ramb, proximus, sed major et robustior.

Griseo-flavescens, haud maculatus. Antennæ supra flavæ. subtus nigrescentes. Caput griseo-ochraceum, vitta angusta occipitale, postrosum paulo dilatata, vittisque angustis verticalibus ad marginem inferiorem oculi usque ad clypeo perductis, nigris. Pronotum supra carina mediana angustissime nitido-nigra, in vitta castanea diluta inclusa; canthi laterales pronoti anguste nigri, inferius diluti; sulci transversi in lobis lateralibus ad partim nigri. Elytra testaceo-flavescens, maculis nullis; parte anali pallidiora; basi ipso vitta curta obscura, valde diluta; venis principalibus basi ad partim nigrescentibus. Femora postica corpore concolores, ad carinam supero-externam internumque maculis tres nigris angustissimis; sulco infero sanguineo; lobis genicularibus vitta superna fusca punctoque uno nigro infra posito ornatis. Tibiæ posticæ flavicantes (in parte apicali vix roscantes), fascies duabus nigris (prima per annulo angustissimo flavo in dua parte divisa) ornatae; spinis flavis, apice ipso nigris. Tarsi postici flavi.

Antennæ medio paulo dilatatae, 22-annulatae, capite cum pronoto unitis valde longiores. Costa frontalis subgibbosa, verticem versus paulo angustata, irregulariter denseque impresso punctata. Vertex valde prominulum, planum, vix impressum, hand acute delineatum, rhomboidale, apice subrotundato, medio anguste carinulatum, carinula in occipite perducta; occiput subglobosum. Pronoti prozona a latere visa distincte gibbosa; metazona subcoriacea, angulo postico obtuso, rotundato; carina mediana acuta, elevata, per sulco typico recto, pone medium sito, profunde intersecta; sulcis duabus anterioribus hand profundis, curvatis; carinis lateralibus acutis, granulosis; lobis lateralibus coriaceis, sulcis duabus posterioribus valde impressis, margine antico vix sinuato, inferiore in medio obtusangulato, postico obliquo, subrecto, angulo postico valde obtuso, subrotundato. Tuberculum prosternale obtuse conicum, parum decurvum. Pedes omnes sat robusti, aroliis inter ungues sat magnis, rotundis; tibiæ posticæ

* Trab. Mus. Nac. Cienc. Natur. Madrid, Ser. Zool. N. 20, 1914, p. 23.

spinis extus intusque 9-10 armatae. Lamina subgenitalis ♂ curta, apice obtusissima. Cerci ♂ compressi, laminae subgenitali longiores, pone medio decurvi, validissime compressi et dilatati.

	♂ (typus).	♀ (cotypus).
	mm.	mm.
Long. corporis ..	36	58
„ antennarum ..	14, 5	18
„ pronoti ..	8	11
„ elytrorum ..	33	45
„ femori postici ..	22, 5	32

Hab.—Mesopotamia: Amara 25-5-18 (Dr. Buxton leg.); Ibidem, 8-6-18 (Mr. Evans leg.)

Typus ♂ et cotypus ♀ in collectionem Musei Britannici; una ♀ cotypica in collectionem Musei Ediburgensis.

This splendid species is rather closely related to *Th. littoralis*, Ramb., as is obvious from the resemblance of the lamina subgenitalis and cerci of male, but it differs from the said species by the numerous characters—size, coloration, number of spines at the hind tibiae, &c.

Th. buxtoni is the fourth known palearctic species of its genus. The specimens taken by Mr. Evans were captured among grass and camel-thorn at Masharra Canal, Amara.

35. *Thisoecetrus adspersus*, Redt.—Amara, 13—30-6-18 (Dr. Buxton); above Amara, on *Sueda*, 17-6-18; 12 miles below Amara, on *Acacia* in dry marsh, 12-9-18 (Mr. Evans).
36. *Thisoecetrus dorsatus*, F.-W.—Amara, 25—30-6-18; Kazvin, 19-7-19 (Dr. Buxton); among herbage, in garden above Amara, 21-6-18 (Mr. Evans).—J. Bolivar in his recent publication *) regards *Th. dorsatus* and *Th. pterostichus* F.-W. as two different species, but I have proved † by the study of the type specimens that the second name is a mere synonym.

For separating four palearctic species of the genus *Thisoecetrus* the following key may be of some use ‡):—

- 1 (2). Pronotum rounded above, without lateral carinae; median carina very feeble. Antennae in ♂ $2\frac{1}{2}$, in ♀ twice as long as the head and pronotum taken together. Lamina subgenitalis ♂ is long and acute. Pronotum with a broad and sharply marked black stripe along the middle which does not proceed on the elytra. Elytra green with very few (or none at all) scattered small black points. Hind femora green, without any marking; hind tibiae red, without black rings.

Th. dorsatus, F. W.

- 2 (1). Pronotum not rotundate above; sometimes with raised median carina; lateral carinae well expressed. Antennae in ♂ not more than $1\frac{1}{2}$ times as long as the head and pronotum together, in ♀ as long as these, or a little longer. Lamina subgenitalis of male short and obtuse.

*L. c. p. 23.

† Uqber die Orthopteren fauna Transcaspiens.—Horae Soc. Entom. Ross., xl, N3, 1912.

‡ See also my paper on the Transcaspien Orthoptera (l. c., 32-34; fig. 3).

- 3 (4). Lamina subgenitalis ♂ obtuse, not marginated at the apex. Anal area of the elytra infuscated at the base. Hind femora with sharp black markings on the upper side keel.
- 5 (6). Pronotum with sharply delimited black stripe along the median carina. Elytra with numerous large black spots. Hind tibiæ sanguineous, with 15-17 spines on the outer side and about 13 on the inner side; hind tarsi rose.

Th. littoralis, Ramb.

- 6 (5). Pronotum with only median carina black, the median stripe being castaneous and not sharply defined. Elytra without any black spots or points. Hind tibiæ yellowish-grey, with 9-10 spines on both sides; hind tarsi yellowish.

Th. buxtoni, Uvar.

- 4 (3). Lamina subgenitalis ♂ marginate at the apex. Anal area of elytra not infuscated; elytra with numerous black spots. Hind femora with indistinct testaceous patterns on the outer side. Hind tibiæ rose, with 15 spines outwards and 12 inwards.

Th. adspersus, Redt.

37. *Euprepocnemis plorans* (Charp.)—Beit Na'ama near Basrah, 8-4-19 (Mr. Evans).—The following Walker's species are synonymous with *E. plorans* as I am convinced from the study of type specimens in the British Museum:

1870. *Cyrthacanthacris ornatipes*, Walk., Cat. Derm. Salt. Brit. Mus., iii, p. 575, N. 50.

1870. *Heteracris consobrina*, Walker, l. c., iv, pp. 673, 674. No. 40.

The Zoogeographical character of the Acridioid fauna of Mesopotamia.

The records on the Mesopotamian Acridioid fauna, previous to this one, are rather scarce, but, nevertheless, we can find in them some species not taken by Dr. Buxton and Mr. Evans.

Saussure in his "Prodrusus Ædipodiorum" (p. 149) quotes *Ædipoda miniata*, Pall. var. *flava* from Baghdad, but the general character of distribution of this species leaves no doubt that either Saussure's determination of the specimen or its label is wrong. In the "Additamenta ad Prodrumum" the said author described from Baghdad *Cobocoa rogenhaferi*, Sauss. (l. c., p. 62, tab. 2, fig. 4, 4v, 4b, 4c) which is synonymous with *Mioscirtus wagneri*, Ev., as I have stated above. In 1913 N. Jkonnikov* published a list of Mesopotamian Acridioida collected in 1910 by the Austrian Pietschmann's Expedition, and in this list 19 named species are recorded, ten of them being not found again by our collectors. In 1916† I had the opportunity of working out a collection of Orthoptera made by P. Nesterov on his journey along the Turko-Persian boundary, i.e., partly in the Mesopotamian plains; in this list ten species of Acridioida are recorded, amongst them two not taken by Dr. Buxton and Mr. Evans. Thus, the number of species known from Mesopotamia is 43. If we compare this figure with the number of species known from Transcaspiæ which is about 70, we may conclude that the bulk of Mesopotamian fauna is already known and the list of known species may serve rather well the purpose of drawing some Zoogeographical conclusions.

* Ann. Naturhist. Hofmuseums Wien, xxvii, pp. 389-390.

† Bull. du Muséum du Caucase, x, 1916, pp. 181-194.

In the following list * the distribution of the Mesopotamian Acridiodes in the adjacent countries is shown, as follows :—

	N. African deserts.	Meso- potamia.	Table- lands of Persia and Asia Minor.	Trans- caspia.
1. <i>Paratettex meridionalis</i> (Ramb.).	+	+	+	+
2. <i>Acridalla robusta</i> (Uvar.) ..	v.	+	+	+?
3. „ <i>miniata</i> (Klug) ..	+	+	—	v.
4. „ <i>nasuta</i> (L.)	+	+	+	+
5. <i>Duroniella fracta</i> (Krauss) ..	+	+	+	v.
6. <i>Ochridia tibialis</i> (Fieb.) ..	+	+	+	+
7. <i>Stauroderus bicolor</i> (Charp.) ..	—	+	+	+
8. <i>Dociostaurus maroccanus</i> (Thunb.)	+	+	+	+
9. <i>Dociostaurus anatolicus</i> (Krauss).	—	+	+	—
10. <i>Dociostaurus genei</i> (Ocsk.) ..	+	+	+	+
11. <i>Pallasiella truchmana</i> (F.-W.) ..	—	+	+	+
12. <i>Æolopus thalassinus</i> (Rossi) ..	+	+	+	+
13. „ <i>tamulus</i> (F.)	—	+?	—	—
14. „ <i>strepens deserticola</i> (Uvar.)	—	+	+	+
15. <i>Pyrgodera armata</i> , (F.-W.) ..	—	+	+	+
16. <i>Pachytylus donieus</i> (L.) ..	++		+	+
17. <i>Ædaleus nigrofasciatus</i> (D. G.).	+	+	+	+
18. „ <i>senegalensis</i> (Krauss) .	+	+	+	+
19. <i>Mioscirtus wagneri</i> (Ev.) ..	+	+	+	+
20. <i>Ædipoda gratiosa</i> , Ser.	+	+	+	+
21. „ <i>schochi</i> , Sauss ..	—	+	+	—

* Following abbreviations are used in the list: + means that the species is known from the country; — it is absent from it; v—it is replaced by closely related species or race.

	N. African deserts.	Meso- potamia.	Table- lands of Persia and Asia Minor.	Trans- caspia.
22. <i>Acrotylus insubricus</i> , Scop. ..	+	+	+	+
23. <i>Helioscirtus moseri</i> , Sauss. ..	v.	+	+	+
24. <i>Sphingonotus cœrulans</i> (L.) ..	+	+	+	+
25. „ <i>satrapes</i> , Sauss. ..	—	+	+	+
26. <i>Leptopternis gracilis</i> (Ev.) ..	—	+	+	+
27. <i>Tmethis carinatus</i> (F.)	—	+	+	—
28. „ <i>gibber</i> (St.)	—	+	+	—
29. „ <i>cisti</i> (F.)	+	+	v.	v.
30. <i>Pyrgomorpha conica</i> (Ol.) ..	+	+	+	+
31. <i>Leptoscirtus evansi</i> (Uvar.) ..	v.	+	—	—
32. <i>Chrotogonus homalodema</i> (Blan.)	+	+	v.?	v.
33. <i>Tropidopola cylindrica</i> (Marsh.)	+	+	+	+
34. <i>Derocorys gibbosa</i> (F.-W.) ..	v.	+	+	+
35. <i>Acridium aegyptium</i> (L.) ..	+	+	+	+
36. <i>Schistocerca gregaria</i> (Forsk.) .	+	+	+	+
37. <i>Calliptamus italicus</i> (L.) ..	+	+	+	+
38. <i>Sphodromerus cœlosyriensis</i> (Gig.-Tos) *	+	+	+	+
39. <i>Thisœcetrus littoralis</i> (Ramb.) .	+	+	+	+
40. „ <i>buxtoni</i> , (Uvar.) ..	—	+	—	—
41. „ <i>adpersus</i> Redt. ..	+	+	+	+
42. „ <i>dorsatus</i> (F.-W.) ..	—	+	+	+
43. <i>Euprepocnemis plorans</i> (Charp.)	—	+	+	+
Total ..	25+5v.	43	37+2v.	32+4v.

* *Calliptamus italicus*, L. a^b. *carbonaria*, Uvar. (Revue Russes' Entom., xiv 1914, p. 226); this synonymy will be explained fully in another paper.

First of all it is evident from this table that as many as 28 out of 43 Mesopotamian Acridiodes are distributed all over the countries mentioned in the table; this group is composed partly of species very widely distributed generally, which are of small zoogeographical interest, but not less than 12 species are of peculiar interest, since their distribution is confined to the so called "desert belt" of the northern hemisphere; they are as follows:—

Acridella robusta.
Ochrilidia tibialis.
Dociostaurus maroccanus.
 „ *genei.*
Mioscirtus wagneri.
Ædipoda gratiosa.
Helioscirtus moseri.
Tmethis cisti.
Chrotogonus homalodema.
Derocorys gibbosa.
Sphodromerus cœlosyriensis.
Thisocetrus adspersus.

Some of these species are certainly to be found a little beyond the limits of the deserts, as for instance both species of *Dociostaurus* and *Ædipoda gratiosa*, but this fact may be easily explained by recent migration.

The remaining 13 species which are not distributed all over the "desert belt," setting aside *Thisocetrus buxtoni*, which is described in this paper, and *Æolopus tamulus*, the occurrence of which in Mesopotamia is rather doubtful, may be divided into two distinct groups. One of these groups is composed of species common to Mesopotamia and the dry desert table-lands of Persia and Asia Minor, as follows:—

* *Stauroderus bicolor.*
Dociostaurus anatolicus.
 * *Pallasiella truchmana.*
 * *Æolopus strepens deserticola.*
 * *Pyrgodera armata.*
Oedipoda schochi.
 * *Sphingonotus satrapes.*
 * *Leplopternis gracilis.*
Tmethis carinatus.
 „ *gibber.*

Altogether ten species, six of them (marked with an asterisk) penetrating also into the Transcaspien plains. A careful study of these species and their relatives shows us most clearly that they all (except *Stauroderus bicolor* which is dealt with later on) doubtless originated on the Iranian or Armenian table-lands and migrated from there into the adjacent Mesopotamian and Aralo-Caspian plains. As for *Stauroderus bicolor* which is of rather northern origin, it is evident that it found its way to Mesopotamia through the mountains of the Caucasus and Transcaucasia entering the plains along the rivers.

There is, lastly, only one species of Acridiodes in Mesopotamia belonging to the second group which is not to be found anywhere else, while its very near relatives are known from Egypt; it is described in this paper as *Leptoscirtus evansi*. I think that its small size and exceedingly good protective coloration account for the fact that it is not known as yet from Persia, where it ought also to occur.

Thus the Acridiodes fauna of Mesopotamia may be regarded as a true eremian fauna of the great desert belt, being under strong influence of the fauna which originated on the dry table-lands of Persia and of inner Asia Minor.

ON THE NOMENCLATURE OF THE SOUTH INDIAN LONG-TAILED MACAQUES.

BY

M. A. C. HINTON AND THE LATE R. C. WROUGHTON.

In connection with the revision of Blanford's "Mammals," we have had to examine in detail the synonymy of the two species found in the Madras Presidency and Ceylon, and called by Blanford *sinicus* and *pileatus* respectively. Both these species have a whorl of long hairs radiating from a point on the vertex which from its fancied resemblance to a cap has obtained for them the names of Bonnet Monkey and Toque. *Inter se*, exclusive of differences in size and colouring, they are readily distinguishable by the fact that, in the Madras animal the circlet of long hairs, or bonnet, is anteriorly interrupted so that the whole of the forehead is exposed, showing a parting down the centre from which the hair is directed laterally, right and left, while in the Ceylon form the bonnet is complete, almost entirely covering the forehead, leaving however enough exposed to show that there is no parting but all the hairs below the cap lie directly forward.

The earliest name is *Simia sinica*, L. (Mant. Plant. p. 521), 1771. It was not based directly on a specimen but, confessedly, on Buffon's "Bonnet chinois" (Hist. Nat., pp. 224 and 241, pl. xxx), 1766. Daubenton's description (p. 241) opens as follows:—*Nous avons donné à cet animal (pl. xxx) le nom de Bonnet chinois, parcequ'il a sur le dessus de la tête de longs poils dirigés du centre à tous les points de la circonférence, et que ces poils formoient une sorte de coiffure qui ressemble à une calotte, ou à un bonnet, qui est en usage chez les Chinois.*" The very precise and detailed description which follows proves absolutely (and we wish to particularly stress this point) that Buffon's Bonnet Chinois is based on a single specimen. In his pl. xxx Buffon gives pictures of his animal in two positions. The chief figure shows a front view of the specimen in a sitting posture. The hairs of the "bonnet" are of course shown with the anterior ones fore-shortened and the shading employed to that end produces a strong though quite superficial appearance of a median parting, with the result that a cursory examination leaves the impression that it is a representation of the Madras Macaque. Possibly the artist recognised the false impression produced, at any rate, he added, a subsidiary figure, which depicted the specimen in such a way that practically only the top of the head is visible. This view of the bonnet shows it to be quite uninterrupted and consequently to represent that of the Ceylon Macaque. Buffon added nothing of importance to the details recorded by his assistant, Daubenton, beyond naming the habitat as "Bengale."

Linnaeus' own diagnosis of *sinica* is "*Simia caudata imberbis, capillitis unidique horizontaliter caput obumbrante*" and, after giving its habitat as: "in India orientali," adds a further description of the animal "*Capillitium horizontale orbiculi instar caput obumbrat.*"

Schreber redescribes Buffon's specimen and gives a careful description of the colour (Säugethiere, i., p. 108, 1775). The most important part of his description may be translated as follows:—"The chief character lies in the length and position of the hair upon the head, which radiates from the vertex, in every direction, over the whole crown and gives the animal the appearance of wearing a straw hat. The crown of the head, with the middle of the back, is chestnut brown. The arms as far as the elbows, light brown. The forearms and legs together with the hands yellowish. Breast and belly very thinly haired, brownish. The tail surpasses the body in length, and is concolorous with the back above and the belly beneath." He added that the specimen is too young to give a fair idea of the size. The description is accompanied by a coloured reproduction

(Taf. xxiii) of Buffon's original plate, and the representation is that of the bright coloured Ceylon Macaque and cannot apply to the soberer Madras Macaque.

In 1799 Audebert (Hist. Nat. Singes) published a plate (coloured) of the Bonnet chinois of which he states "Celui que j'ai dessiné fait partie du Museum François," so that we have yet another presentation of Buffon's specimen and this time there can be no kind of doubt that the animal represented is the Ceylon Macaque.

Thus we find that the testimony of every authority for 30—40 years, and much more, after Buffon described it assigns his animal (and therefore the name *sinica*) to the Ceylon species, and we are driven therefore to the inevitable conclusion that the name *sinica* can no longer be employed for the Madras Macaque but must be re-transferred to the "Toque" of Ceylon. We have been unable to trace exactly who first transferred the name *sinica* to the Madras Macaque. Jerdon and Blyth both used the name *sinica* as we propose it should now be used. Probably Anderson was the first to use it for the Madras Macaque and thus influenced Blanford to a similar use of it.

The next name in order of seniority is *pileata*. It was established by Kerr (Animal Kingdom, p. 69), 1792 (not by Shaw, 1800, as usually stated). Kerr first attaches the name to the Ceylon animal and then (by a startling adoption of trinomial nomenclature, a system only generally accepted in quite recent years) describes a form *sinicus pileatus*. He bases his description entirely on that of Pennant (Hist. Quad. No. 105), 1781. Pennant describes his animal, a specimen in the Leverian Museum, as follows:—"Monkey with a dusky face: on the crown a circular bonnet, consisting of upright black hairs: on the sides of the cheeks the hairs are long: those and the body brown: legs and arms black. Size of a small cat." Kerr merely paraphrases this and adds "Inhabits India" without indicating any authority for so doing. This description obviously does not apply to either of the Macaques under consideration nor so far as we know to any Indian Macaque. It is not improbable that the specimen dealt with belonged to an African species.

The same comment applies to the name *mitrata* given by Bechstein (Pennant's vierfusz Thiere, p. 211 (60), 1799, to the Leverian Museum specimen. Both these names, *i.e.*, *pileata* and *mitrata*, must, we hold, be ignored as unidentifiable.

The next name is *radiatus*, Geoffroy, 1812, but it will be more convenient to reserve our consideration of it for the moment returning to it later.

In 1862 Reichenbach published a revision of the Primates (Vollständ Naturgesch. Affen). The Macaques with radiating hair are there referred to a subgenus *Zati* of the genus *Cynamolgus* (*sic*). Three species are enumerated, *viz.*: *sinicus* (p. 130) with hair radiating without any parting (based on the 'subsidiary' figure in Buffon's pl. xxx.) brown in colour, inhabiting Madras; *pileatus* (p. 131) with a median longitudinal parting, tawny face, yellow frontal band, coat olive greenish grey, under surface and insides of limbs bluish grey, hands blackish above, hands and feet below, like the ears, flesh coloured (based on the chief figure in Buffon's pl. xxx) and distributed in all parts of the west and south coastal provinces of Ceylon; *audeberti* (p. 132) based on Audebert's figure of *Simia sinica* (already mentioned above in discussing Buffon's Bonnet chinois) hair with median parting, the whole upper surface of the body red-brown, cheeks, lower surface and insides of limbs whitish. All these species are based either on one of the two figures on Buffon's pl. xxx or on Audebert's plate and therefore as we have pointed out are all ultimately based on a single specimen and that the type of *Simia sinica*, L.

The last name available in this group is *radiatus*. Geoffroy (Ann. Mus. H. N., Paris., xix, p. 98), 1812, described as a species of *Cercocebus* from India. The original diagnosis reads:—"Pelage brunverdâtre; dessus des jambes cendré;

le ventre cendré-clair ; poils du sommet de la tête se divergeant et disposés en forme de calotte." Some details with regard to the skull and more particularly relating to the form and position of the orbits are added ; but the observations upon which they were based seem to have been made on menagerie material and consequently to be valueless. F. Cuvier has given (Hist. Nat. Mamm. Folio i, 33) a good figure of Geoffroy's *radiatus*, probably drawn from the type specimen. The details of the bonnet are not clearly shown unfortunately, the animal being drawn in profile, but the coloration as depicted and as described in the original diagnosis, quoted above, corresponds with that of the Madras Macaque. We therefore propose to revive Geoffroy's name for the Bonnet Macaque of Southern India which animal must be henceforth be known as *M. radiata*.

The results at which we have arrived though no doubt calculated to give inconvenience temporarily, since they involve changes in the nomenclature which has been accepted for more than 25 years, nevertheless have their compensations. Firstly the name *pileata* which has caused much misgiving to those modern mammalogists who are conversant with the literature of the Macaques is eliminated. Secondly *sinica* is restored to its time honoured status as the Toque of Ceylon and the confusion which Buffon's artist induced, after a lapse of a century, in the minds of writers like Reichenbach (1862) is dispelled. Lastly in reviving *M. radiatus* for the Madras Macaque we are only returning to the nomenclature used by such pioneers of Indian Mammalogy as Sykes, Elliot, Blyth, Horsfield, Kelaart and Jerdon.

ANNOTATED LISTS OF ACULEATE HYMENOPTERA (EXCEPT
HETEROGYNA) AND CHRYSIDS RECENTLY COLLECTED
IN MESOPOTAMIA AND NORTH-WEST PERSIA.

BY

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(With four Text Figures.)

The greater part of the specimens recorded in these Lists—about three-quarters of the whole number—were taken by Captain P. A. Buxton (then of the Royal Army Medical Corps) either in Mesopotamia in 1918, or in N. W. Persia (near the South end of the Caspian Sea) in the following year. Together with these, and distinguished from them by being placed between square brackets [.], are included some captures made during the same period by two other officers of the R. A. M. C., namely, Captain W. Edgar Evans and Lieut. P. H. Harwood, the latter of whom collected in Mesopotamia only, and the former (partly in company with Captain Buxton) both in Mesopotamia and Persia. All records to which no statement to the contrary is added, may be assumed to have reference to specimens taken by Captain Buxton; and in these cases I have generally given the *day* and *month* of capture, but have thought it unnecessary to add the year, as this may always be inferred from the locality cited—1918 if the locality be Mesopotamian, and 1919 if it be Persian. (The letter (M.) attached to the name of a place indicates that it is in Mesopotamia, and similarly the letter (P.) that it is in North-West Persia.)

Captain Buxton forwarded to me all the specimens taken by him, a few at a time, as soon as possible after capture so that I could examine them while still comparatively fresh, and they have been in my hands ever since. These, therefore, I have been able to study at my leisure, and revise from time to time my first provisional determinations of them. Those which I received from my other correspondents were returned to the captors (named or unnamed) as soon as I had taken note of them, but I have lately examined afresh some of those taken by Captain Evans, and confirmed or corrected my first impressions about them. I understand that I have now seen nearly all his captures, and the rest are probably all duplicates of species already included in my Lists. I am much obliged to Captain Evans's father, Mr. W. Evans, F.R.S.E., etc., for communicating with me on this subject, and forwarding to me the specimens. Although the collection is small as compared with Captain Buxton's, it contains several insects, not included in the latter, which have especially interested me. Lieut. Harwood took only a very few *Aculeata*, but I have to thank him also for enabling me to make some welcome additions to the Lists. I should add that all my correspondents were mainly interested in other orders, and consequently that Hymenopterists should be grateful to them for sparing some of their valuable time towards the advancement of knowledge in a subject other than their own. So far as I know, only a few Russian Hymenopterists have collected in Transcaspia, and still fewer in Mesopotamia. In both these countries the Hymenopterous fauna appears to be almost exclusively Palæartic. That of N. W. Persia seems, if one may judge such matters from the evidence of a single year's collecting there, to be practically European, a large proportion of the species occurring even in England, and most of them in Central Europe and the Balkan Peninsula. That of Mesopotamia has a more Southern character. A good many of its species occur, to my knowledge, in Egypt, and others are pretty widely distributed round the Mediterranean. But, except *Polistes hebraeus* and *Xycolopa fenestrata*, I know of none, which can be thought to have reached

Mesopotamia by extending their range from Oriental centres of distribution, and both these are quite likely to have been introduced into the country—accidentally of course—by importation, in ships or otherwise. I have ventured to describe a few forms as new, but only because, being unable to recognize them in descriptions previously published, I could deal with them in no other way without violating a principle, which I think is sound—*viz.* that it is better to be the author of a “Synonym” than of a “Homonym.” The former can do no great harm, but the latter remains a perpetual cause of confusion to future workers. Yet, no doubt, I must have some times committed both these offences unwittingly, for though I have carefully studied such descriptions as I could meet with—especially those of Morawitz in *Hor. Ent. Soc. Ross., Fedtschenko's Reise*, etc., for Persian forms, and of Klug in *Symb. Phys.* for Mesopotamian—I have not had access, unfortunately, to any of their “Types.” Nor have I had the advantage of such help as has been kindly given me on previous occasions by many of my foreign correspondents, except in one case,—Herr Alfken having been so good as to examine and give me his opinion about several specimens of the Genera *Hylæus* (= *Prosopis*) and *Halictus*. Consequently I have had to trust far more than pleases me to my own judgment in deciding on determinations of insects that were new to me. I need hardly say, that, besides my own collections made in Egypt, Syria, etc., I have also studied with a view to this paper the “E. Saunders” and other collections in the Natural History Museum; but these unfortunately contain very few specimens of either Transcaspian or Mesopotamian Aculeates, and even of these few most are either nameless or named doubtfully, and perhaps in error. I should mention, however, that some of Captain Buxton's earlier “sendings” reached me while Mr. R. E. Turner was still working in the Museum, and that I was able to obtain his valuable assistance in clearing up some of the questions about which I was in doubt.

I should have been glad, if it had been possible, to make this paper more attractive by adding to it something about the “topographical” characters of the localities mentioned in it—something more than their bare names! But I understand that such subjects will be discussed in two* other papers now being prepared for publication in this Journal, and that each will be accompanied by a Map, shewing the exact situation of such places in either of the countries dealt with as are mentioned in these Lists.

I have only to add that the Text-figures given in them to illustrate structural details, except Fig. 4, were either drawn from the objects with a “Wollaston Prism,” or traced from their images thrown on the focussing screen of a Photo-micrographic Camera, so that, though I am no artist in draughtmanship, I believe that they are correct as to measurements, etc., in proportion of course to their various magnifications.

LIST 1. FOSSORES.

1. *Apterogyna Olivieri*, Latr.—♀ “desert near Amara” (M), “running rapidly on the bare earth,” 8th September 1918. [Another ♀ “on Tamarisk” 14th October 1918.—Captain Evans.]
2. *Mutilla (Ephutomma) Sanguinicollis*, Kl.—13 ♂♂ Amara (M), 28th May—2-19th June, 16-24th September [Also 2 ♂♂ “at light” at or near Amara (M) 6, 12th August—Captain Evans].

* (1) Birds of N.-W. Persia by P. A. Buxton appearing in this number.
 (2) Mammals of Mesopotamia by R. E. Cheesman, Vol. 27, No. 2.

I have little doubt that this is the true *Sanguinicollis* Kl. Possibly *continua*, F. may be its ♀, in which case the Fabrician name would have priority.

3. *Mutilla (Myrmosa) erythrocephala*, Latr.—1 ♀ Khaniqin (M), 1st August.

4. *Mutilla catanensis*, Rossi.—1 ♀, Baquba (M), 27th July.

1 ♀, Baghdad (M), 10th September.

[1 ♀, at or near Amara (M), 7th September 1918—Captain Evans].

5. *Mutilla chrysophthalma* Kl.—4 ♂♂, Amara (M), 20th June, 17th July, 7th September. [1 ♂ at or near Amara (M), 7th September 1918—Captain Evans].

There is some mystery about this and the last species. It will be noticed that both my correspondents found only ♂♂ of *chrysophthalma* and only ♀♀ of *catanensis*. Furthermore, Captain Evans took his *chrysophthalma* ♂ and *catanensis* ♀ together, and, at the time, was under the impression that they were paired, or on the point of pairing, though they were not actually paired when he took them out of the net!

It seems, however, to be well established, that the proper ♂ of *catanensis* is *floralis*, Klug, a form which, though evidently akin to *chrysophthalma*, is superficially at least, quite unlike it. Nor are the ♀♀ of *catanensis* and *chrysophthalma* so much alike that there can be any difficulty in distinguishing them. And in the Natural History Museum at South Kensington I find (a) a specimen of *floralis* actually paired with a ♀ of *catanensis*, and (b) a ♂ like those from Amara similarly actually paired with a ♀ of *chrysophthalma*, both these pairs having been taken on the same day and at the same place—namely, on April 14th, 1895, at Aden, by Colonel Yerbury.

This Amara ♂, which I suppose to be the proper mate not of *catanensis* ♀, but of *chrysophthalma*, Klug, seems to be undescribed. So far as actual "structure" is concerned it appears to me to have all the most characteristic features enumerated by André (*Species* VIII, p. 109) in his very complete and satisfactory description of *catanensis* ♂ (= *floralis*). Nevertheless the two forms are separable at a glance, though their differences are almost entirely matters of coloration and pilosity. Thus in *catanensis (floralis)* the wings are entirely fuscous; the thorax is largely red; the pilosity is mostly yellowish, not strongly contrasting with the red colour of the abdomen, so that André describes the second and following segments, as uniformly clothed with "pubescence d'un ferrugineux doré, sans bande de pubescence blanche." In *chrysophthalma* on the contrary the bases of the wings are quite clear and colourless; the thorax is entirely black; and the whole pilosity of the insect is pure white, forming perfectly distinct and well defined silvery fasciæ across the base and apex of the 2nd segment and the apices only of the three following segments (only after segments 5 can it be described as clothing the integument uniformly, without distinct apical bands")

6. *Mutilla dalmatica* André (?).—This species was not met with by Captain Buxton, but I have been kindly presented by Lieut. Harwood with two ♀♀ and a ♂ which apparently belong to it. He took them with several other specimens of both sexes near Baghdad in October 1918.

The ♂ seems to be undescribed. It is much smaller than *chrysophthalma*, but otherwise very like it, having similar pilosity, (though the abdominal fasciæ are somewhat less conspicuous) and wings with clear hyaline bases. But the tuberculation of the scutellum is merely rounded, not acutely conical. And only the two first segments of the abdomen are red, the rest of it, as well as the whole head and thorax being black. (Long. about 10 mm. Exp. alar. 16 mm.)

7. *Mutilla littoralis*, Petagn.—Var *grisescens*, September.

1 ♂, Amara, 27th October 1918.

8. *Mutilla rufipes*, F.—Var. *ciliata*, Pz. 1 ♂, Amara, 17th June, 1 ♂, Shahroban (M), 31st July.
Var. *platiensis*, Dest. 1 ♂ Qazvin (P), 17th July.
9. *Mutilla (Dasylabris) maura*, L.—2 ♂♂ (Var. *arenaria*, F) Talysh (P), 10th July.
1 ♀, Menjil, 29th March.
[1 ♀ on *Tamarix* 5 miles above Amara (M), 14th October 1918—Captain Evans.]
10. *Myzine arabica*, Guer.—(?) 1 ♂, Baquba (M), 27th July.
11. *Myzine fasciculata*, E. Saund.—(?) 1 ♂, Qazvin (P), 17th July.
I have done my best to identify these ♂♂ of *Myzine*, but I feel very little confidence that I have named them rightly.
12. *Scolia (Triscolia) hæmorrhoidalis*, F.—3 ♂♂ Talish (P), 10th July, 2 ♀♀ Astara (P), 2nd July, 3 ♀♀ Enzeli, (P), 14-26th June, 1st July; 4 ♀♀ Amara (M), May.
[1 ♂, 1 ♀ “Common on Hollyhocks, etc.” Beit Na’ama, Basrah (M), 27th and 31st March 1919—Captain Evans.]

The ♂♂ from Persia are very unlike normal South European specimens. Their pilosity is much paler, that on the thorax quite grey, and the yellow markings of the abdomen are singularly pale—very large and confluent, so that they appear rather as bands than as pairs of spots; and in all the specimens they occur not only on the 2nd and 3rd tergites, but on the 4th also. The ♂ from Beit Na’ama has no such peculiarities, and all the ♀♀ from both districts are quite normal.

13. *Scolia (Discolia) infuscata*, Kl.—9 ♂♂, 3 ♀♀, Amara (M), 4th May to 31st October.
1 ♂, 1 ♀, Baghdad (M), 26th July;
1 ♀, Khaniqin (M), 31st July.
[5 ♂♂, 2 ♀♀ at or near Amara (M), 2nd May, 20th June, 17th and 27th August 1918—Captain Evans.]
[2 ♂♂, Tanooma (M). No date stated. (Lieut. Harwood.)]
14. *Scolia (Discolia) maura*, Kl.—1 ♂, Qazvin (P), 17th July.
15. *Scolia (Discolia) 4 punctata*, F.—1 ♀, Qazvin (P), 24th July.
16. *Scolia (Discolia) hirta*, Schrk.—1 ♂, Qazvin (P), 20th September.
17. *Elis (Triclis) 6-maculata*, F.—8 ♂♂, 3 ♀♀ Talish (P), 10th July.
18. *Elis (Dielis) marginella* Kl.—1 ♂, Baquba (M), 27th July.
19. *Elis (Dielis) eriophora*, Kl.—1 ♀, Baquba (M), 30th July.

This ♀ is described and figured by Kl. (vide Pl. XXVII of *Symb. Phys.* Fig. 6) under the name *vestita*. But he suggests that it is the ♀ of “the preceding species,” i.e., of *eriophora* (Fig. 5 on the same Plate, a ♂). I have taken both forms together in Egypt, and have no doubt that they are, as he thought, conspecific. In v. dalla Torre’s *Catalogus*, however, *eriophora* is treated as a synonym of *albicollis* Chr., while *vestita* is referred to another species which he calls “*collaris* (Fabr.), Gmel.”

I find it difficult to believe that this large and handsome *Dielis* can have anything to do with Fabricius’s *collaris*, which is described by its author as a *Tiphia* of the size of *femorata* (!) It may, however, be identical with either or both of two other Fabrician species, namely, *T. nigra* and *T. thoracica*. Of these *T. nigra* was the first to be described, and on the whole seems to match the better of the two with Klug’s figure and diagnosis. (The pilosity of the thorax

is called 'red' in *nigra*, 'cinereous' in *thoracica*. Still the 'type' of the latter may have been a faded specimen.) The *Catalogus* sinks both *nigra*, F., and *thoracica*, F., as synonyms of *albicollis*, Chr., and, as aforesaid, makes *eriophora*, Kl. a var. of the same species. All this appears to me to be rather conjectural! Nothing is known as to the 'habitat' of either *albicollis*, or *nigra*, and that given by Fabricius for *thoracica* is "the coasts of Malabar." Personally I am inclined to await further evidence, and in the meantime acquiesce in *eriophora*, Kl., as the oldest name which is known for certain to have been applied to the Egyptian and Mesopotamian species. A ♀ very like that of *eriophora* (= "*vestita*") is common in Algeria, but its ♂ seems to be always black-bodied, whereas all my Egyptian *eriophora* ♂♂ are coloured as in Klug's figure (*i.e.*, with the abdomen for the most part orange.) This Algerian form was recorded by Saunders in Tr. Ent. Soc., Lond., 1901, and referred to *thoracica*, F. Whether they are really the Fabrician *thoracica*, and whether or not they are identical with *eriophora*, Kl., seem to me questions deserving further investigation.

20. *Tiphia femorata*, F.—1 ♂, Enzeli, 28th May.

21. *Psammochares* (= *Pompilus auctt.*) *melas*, Kl.—1 ♀, Amara (M), 20th September.

22. *Psammochares cingulatus*, Kl.—1 ♀, Amara (M), 10th June.

23. *Psammochares rutilus*, Kl.—1 ♂, Amara (M), 10th June.

[1 ♂, Tanooma (M), October 1918—Lieut. Harwood.]

24. *Psammochares modestus*, Kl.—1 ♂, Amara (M). 10th June, 2 ♀♀, Amara (M), 13th June and 19th July.

The ♀♀ agree with that described and figured in *Symb. Phys.* from Ambukohl in all important characters (size, general coloration, neurulation and clouding of wings, unidentate claws, etc.), but the propodeum and posterior coxæ are darker, (not bright red throughout like the mesonotum and scutellum,) but only a little rufescent in parts, and elsewhere black like the breast and abdomen.

The ♂ seems to be still undescribed. The present specimen was taken three days before one of the ♀♀, and in the same locality. It is coloured much like the ♀, except that the propodeum and coxæ are black entirely, the last dorsal segment of the abdomen white and fringed with short silvery hairs at the apex, the last ventral segment testaceous, the head black (except the mandibles, sides of the face, and orbits of the eyes narrowly, these parts remaining red), and the greater part of the antennæ (from about the 4th joint to the apex) black. The body is clothed (much as in *plumbeus*) with a very short whitish pubescence only visible in certain lights. This particular specimen is much smaller than either of the ♀♀, (only about 6 mm. long.) but it is well known that individual specimens of *Psammocharidæ*—♂♂ especially—often vary much in size. (In this specimen the abdomen is very strongly compressed laterally—perhaps this is accidental, but it may possibly be a real character, so I mention it.)

25. *Psammochares* (*Platyderes*) *orchesticus*, Kohl.—1 ♀, Amara (M), 19th July.

26. *Psammochares* (*Platyderes*) *denticulatus*, Tasch.—1 ♀, Amara (M), 1st June.

I took a very similar specimen on Roda Island in the Nile, near Cairo, in 1896

[27. *Psammochares* (*Anoplius*) *luctigerus*, Costa (?)—1 ♀, "near Ruz, N. E. of Baghdad," 24th November 1918.—Captain Evans.]

This ♀ is an *Anoplius* according to Suster's tabulation of the *Psammocharidæ* (1912). It is entirely black with dark wings, much larger than *nigerrimus* (which is the nearest to it among British species). The propodeum has no remarkable features, and is almost without sculpture of any kind. All the unguiculi are toothed pretty strongly near their bases. The spines of the tarsal pecten are sharp and long, on which account I suspect it to be *luctigerus*, but I know that species only from Costa's description.]

28. *Cryptocheilus* (= *Salius*, F) *bicolor*, F.—2 ♀♀, Amara (M), 19th June, 7th September.
[2 ♀♀, Amara, 27th and 29th August 1918.—Captain Evans.]
29. *Sceliphron* (= *Pelopoeus*, Latr.) *causicum*, André—1 ♀, Kurna (M), 20th May. [1 ♀ Amara (M), 27th August 1918—Captain Evans].
- 30 *Sceliphron tubifex*, Latr.—

[1 specimen taken near Basrah (M) in October 1918 by Lieut. Harwood.]

I forgot to take note of the sex before returning this insect to its captor. But I observed that the scapes of its antennæ were partly yellow. In this species they seem to be normally immaculate, but in *destillatorium*, Ill. (though otherwise a less highly coloured insect), I have always found them entirely yellow!

31. *Ampulex assimilis*, Kohl.—1 ♂, Amara (M), 19th June. [1 ♀, Lieut. Harwood. From Mesopotamia, but I have no note of the precise locality, nor of the date of capture].

Hitherto only ♀♀ of this species seem to have occurred. Kohl described it from specimens in the Vienna Museum, giving "Guinea" as their locality, but mentions that one of them came "angeblich von Bagdad." It is interesting to have confirmation of the latter record, which without such confirmation might reasonably be thought open to doubt.

Until I saw Lieut. Harwood's ♀ and identified it with the help of Kohl's monograph of the genus as *assimilis*, I thought that I had already determined the ♂ for certain as another of that author's new spp. namely, *gratiosa*. The latter, like *assimilis*, was described from Guinea, and also in one sex only—in this case the ♂! The characters of Captain Buxton's insect almost without exception are absolutely identical with those described by Kohl for *gratiosa* ♂: in fact the only points I can discover which might conceivably distinguish the two forms are as follows.

(a) The eyes of *assimilis* may perhaps be slightly nearer together on the vertex, the distance between them being only two-thirds of the length of the 3rd antennal joint, whereas in *gratiosa* it is simply called "hardly as long."

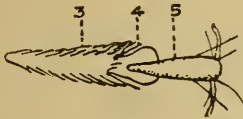


Fig. 1. 3 Last Joints of Hind Tarsi in *A. Assimilis* ♂.

(b) The fourth joint of the hind tarsi (Figure 1) is certainly not above half as long as either the fifth joint or the third (it is exactly as Kohl describes it in *assimilis* ♀!) But of *gratiosa* ♂ he says merely, that the fourth joint is "visibly" shorter than the third, at the same time calling it "about half as long as the fifth." From this it seems a probable inference that in *gratiosa* the 3rd and 4th tarsal joints differ less than in *assimilis*.

(c) Except a very slight ill defined cloud, filling the radial cell, but hardly extending beyond it, and another (still smaller) in the angle contained between the median vein and the brachial nerve (*n. transversus ordinarius*), I can find nothing in the wings of *assimilis* corresponding to the two feeble dark 'Querbinden' mentioned in the diagnosis of *gratiosa*.

(d) The mandibles of *assimilis*—at least in the specimen before me—are strongly rufescent. If this character occurs also in *gratiosa*, the author has not mentioned it.

An actual comparison of Captain Buxton's specimen with the Type of *gratiosa* might perhaps reveal other differences, or on the contrary might show that those above mentioned are unsubstantial.

In the meantime I will only add that in *assimilis* ♂, as in *gratiosa*, the 1st cubital nerve is completely aborted, but that in Lient. Harwood's ♀ it is present though obsolescent. This character, however, is expressly stated by Kohl to be variable in ♀♀ of *assimilis*, and also in those of other *Ampulex* spp.

32. [*Chlorion* (= *Sphex* auctt.) *Semenowi*, Morawitz.—1 ♀, Ruz Camp, N. E. of Baghdad, 15th November 1918—Captain Evans.]

I believe I have determined this splendid insect correctly, though I have not seen the Type, and have had to depend solely on the author's description of it *Hor. Ent. Soc. Ross.*, XXIV, 1890. This description appeared too late for Kohl to introduce the species into his Tables of *Sphex* L. published in the same year. But he reproduces the original description later on in his Monograph (No. 174 [p. 253] p. 451, *Ann. Nat. Hofm.* V.)

33. *Chlorion* (*Palmodes*) *melanarius*, Mocs.—1 ♀, Shahroban (M), 31st July.
 34. *Chlorion* (*Palmodes*) *argyrius*, Brull.—[1 ♀ "Garden below Amara," 5th June 1918—Captain Evans].
 35. *Sphex* (= *Ammophila*, K.) *occipitalis*, Morawitz.—2 ♂♂, Amara (M) 28th May.
 1 ♀, Amara (M), 4th, December 1917.

[1 ♂, 26th April, 1 ♀, 10th September 1918 "at or near Amara"—Captain Evans.]

36. *Sphex* (*Eremochares*) *dives*, Brull.—2 ♀♀, Amara (M), 28th May
 [1 ♂ "5 miles below Amara," 29th August—Captain Evans.]
 37. *Philanthus triangulum*, F.—1 ♂, 1 ♀, Talish (P), 10th June; 3 ♀♀, Enzeli (P). 14th June.
 38. *Philanthus coarctatus*, Spin.—1 ♂, Baquba (M), 27th July.
 39. *Cerceris emarginata*, Pz.—1 ♂, Baquba (M), 27th July; 1 ♀, Amara (M), November, 5 ♂♂, Qazvin (P), 17th to 24th July.

[1 ♀, "about mud wall, garden or Tigris, above Amara," 16th September—Captain Evans.]

40. *Cerceris subimprensa*, Schlett.—3 ♂♂, Amara (M), 14 to 28th May; 1 ♀, Amara (M), 8th May.
 41. *Cerceris insignis*, Klug.—1 ♂, Amara (M), 28th May.
 42. *Cerceris bupresticida*, Duf.—2 ♂♂, Baquba (M), 27th July.
 43. *Cerceris spinipectus*, Sm. (= *prisca*, Schlett.) 5 ♂♂, Amara (M), 28th May to 26th June; 1 ♀, Amara (M), 13th June.
 44. *Cerceris lutea*, Tasch.—4 ♂♂, Amara (M), 28th May to 14th June.

This and the last species seem to me best separable by the sculpture of the propodeum, its "cordiform area" being quite polished and shining in *lutea*, but dull in *spinipectus*. (The coloration of the thorax appears to be variable on both forms, the mesonotum being sometimes quite black, and sometimes chiefly yellow. The latter is the case with all the Mesopotamian specimens of both species now before me. Of my own captures in Egypt and Palestine all which I take to be *spinipectus* have the mesonotum black, and all but one ♂ of *lutea* yellow!)

45. *Cerceris dacica*, Schlett. (?) var.—1 ♀, Qazvin (P), 17th July.

A very highly coloured form, nearly answering to Schletterer's description of his var. *magnifica*. But the apical segment is entirely black.

46. *Cerceris*, sp ?—1 ♂, Qazvin, 17th July.

Possibly a ♂ of *capitata*, Sm. But the abdominal fasciæ are very wide, and not, as in *capitata* ♀, "subinterrupted." A ♂ sent to me from Madrid by Sn. Mercet as *capitata* differs from the present specimen only in being larger with narrower abdominal bands (none of them "subinterrupted") and smaller spots of yellow on the scutellum.

47. *Cerceris annexa*, Kohl.—1 ♂, 2 ♀ ♀, Amara (M), 9th September; 2 ♂ ♂, Fao (M), 10th August; 1 ♂, Khaniqin (M), 1st August.

48. *Nysson rufus*, Handl.—1 ♂, Amara (M), 25th June; 4 ♀ ♀, Amara (M), 14-25th June, 18th July.

49. *Sphecius uljanini*, Rad. (?)—1 ♂, Qazvin (P), 17th July.

I think this must be the ♂ of *uljanini*, and believe it has never yet been described.

It resembles *antennatus*, *luniger*, etc. in the form of its paradoxical intermediate metatarsi. The specimen before me, which is the only one I have seen, has unfortunately lost all but a few basal joints of its antennæ, but they seem to have been testaceous, except the scapes, which are yellow with *only their basal halves* blackened behind. The "pictura pallida" is of a light sulphur-yellow, and exceedingly copious. It occupies the whole face below the antennæ, and is continued upwards, along the inner orbits of the eyes, nearly to the level of the anterior ocellus; about half way between the upper end of each of these orbital yellow vittæ and the ocellus aforesaid there is a very minute and inconspicuous yellow spot. The edge of the pronotum is also yellow; as are the humeral tubercles; a square spot immediately behind them on the mesopleures; the front half of the tegulæ (their posterior half being rather rufescent); the *sides of the mesonotum* (N.B.) very widely, these being occupied by a large yellow longitudinal vitta, which runs along the tegulæ and is dilated downwards till it reaches the tubercles and fills the whole angle which separates them from the tegulæ; a large oval mark on the scutellum; nearly the whole of the anterior legs, (even the coxæ of the 1st pair are yellow in front!); the tarsi, tibiæ, and nearly half the femora of the hind legs; a large triangular spot occupying each side of the 1st segment; and very wide undulated subapical fasciæ on each of those following (the extreme actual apices of the segments are dully rufescent!). These fasciæ (except that on the apical segment) are to a certain extent continued on the underside of the abdomen forming triangular or sub-triangular macule on the sides of each ventral-plate. The pilosity of the head and thorax is whitish. The neuration of the wings pale reddish-brown.

50. *Stizus tridens*, F.—1 ♂, Talish (P), 10th July.

51. *Stizus cyanescens*, Rad.—2 ♂ ♂, Amara (M), 10th July; Amara (M), 12th September. 2 ♀ ♀, Amara (M),—September.

52. *Stizus bizonatus*, Klug.—8 ♀ ♀, Amara (M), 8th June to 19th July.

53. *Stizus ruficornis*, F.—1 ♂, Talish (P), 10th July; 1 ♀, Enzeli, 30th June.

54. *Bembex bidentata*, v. d. Lind.—5 ♂ ♂, 2 ♀ ♀, Talish (P), 10th July.

55. *Bembex bicolor*, Rad.—4 ♂ ♂, 1 ♀, Amara (M), 9-17th September.

56. *Bembex oculata*, Latr.—2 ♀ ♀, Enzeli (P), 6-26th June.

57. *Bembex mediterranea*, Handl.—9 ♂ ♂, 5 ♀ ♀, Enzeli (P), 6th June.

58. *Palarus fabius*, Nurse.—2 ♂ ♂, 2 ♀ ♀, Amara (M), 9th September.

These were taken on *Zizyphus*. Mr. R. E. Turner helped me to determine them by comparison with a specimen presented by Col. Nurse to the Natural History Museum, S. Kensington. Though hitherto this species seems to be recorded only from India, Mr. Turner considers the genus to be really part of the Palearctic and Ethiopian fauna, and not "Oriental" (cf. his "Remarks on the genus *Palarus*" in *Ann. and Mag. Nat. Hist.*, May 1911).

59. *Liris hæmorrhoidalis*, F.—1 ♀, Amara (M), 5th October [Taken also in both sexes by Lieut. Harwood.]

60. *Notogonia sculpturata*, Kohl.—3 ♂♂, Amara (M), 17th September on *Zizyphus*; 1 ♀, Resht (P), 18th February
 61. *Notogonia subtessellata*, Smith.—1 ♂, Amara (M), 17th September; 2 ♀♀, Amara (M), 23rd March and 23rd Oct.
 62. *Notogonia nigrita*, Lep.—1 ♀ taken by Lieut. Harwood.
 63. *Tachytes dichroa*, Smith.—1 ♂, 5 ♀♀, Amara (M), 12th June to 19th July.
 64. *Tachytes freydessneri*, Kohl.—1 ♂, Amara (M), 17th September.
 65. *Tachytes tricolor*, F.—1 ♂, Amara (M), 15th June; 1 ♀, Amara (M), 26th June.

The ♀ seems to me certainly *tricolor* F. according to Kohl's diagnosis in his *Gattungen* (etc.) *der Larriden*; and I think the ♂ belongs to it, though its hind femora are largely black.

66. *Tachytes ambidens*, Kohl.—6 ♂♂, Amara (M), June 14-21, some (perhaps all?) visiting *Acacia*; 2 ♂♂, Amara, July 20th; 1 ♂, Amara (visiting *Zizyphus*), September 17th. *Ambidens* ♂ was described from Sarepta, I have not seen Kohl's Type, but have a ♀ named by that author from Biskra, and a ♂ which, I think belongs to it. Captain Buxton's Mesopotamian specimens are all much smaller than the latter, but I see no other difference between them and my own ♂, and both have certainly the chief characteristic of *ambidens* ♂—namely an excavation near the base of the front femur somewhat like that of a *Tachysphex* ♂. The pygidium in all of them is pilose, as in normal *Tachytes* spp.; and the distance between their eyes on the vertex, and the measurements of their antennal joints seem to agree with Kohl's statements as to his ♂ from Sarepta.
 67. *Tachysphex gracus*, Kohl.—1 ♂, Amara (M), June 14th.
 68. *Oxybelus lamellatus*, Oliv.—14 ♂♂, 4 ♂♂, Amara (M), September, mostly on *Zizyphus*; 1 ♀, Baghdad (M), 10th September.
 69. *Oxybelus* 14—*notatus*, Jar.—3 ♂♂, Qazvin (P), 17th to 24th July.
 70. *Oxybelus pugnax*, Oliv.—2 ♂♂, Amara (M); 17th September.
 71. *Oxybelus*, sp. ?—2 ♂♂, Amara, 9th September.

A very small species, with whitish, translucent, straight and parallel-sided macro, red mandibles, and eburneous (nearly confluent) lateral markings on segments 1 and 2 of the abdomen. (I have something very like it, unnamed from Egypt.)

72. *Crabro* (*Entomognathus*) sp ? Qazvin (P), 17th July.

The specimen is broken, but I think it is a variety of *C. brevis* which has been recorded by Kohl from Egypt, with the collar, scutellum, knees, tibiæ, and tarsi yellow. The pygidium is of the normal width, so it is not *schmiedeknechti*, Kohl.

LIST 2. BEES.

1. *Colletes nanus*, Friese—2 ♀♀, Amara (M), 28th May.
 2. *Hyleus** *damascenus*, Magretti.—2 ♀♀, Shahroba (M), 31st July.
 3. *Hyleus scutellaris*, Morawitz.—1 ♂ and 1 ♀, Qazvin (P), 17th July.

The ♀ seems to me to have all the characters enumerated in Morawitz's description of *scutellaris* ♀. It is however a trifle smaller (about 6 mm. long, not 7), and in addition to the yellow markings there mentioned has also the lower part of the frontal area, and a longitudinal streak bisecting the clypeus, yellow. In this it resembles *damascenus* ♀; but the ground colour of the clypeus is black, not red; and it differs also from normal examples of *damascenus* in having a black postscutellum, and entirely yellow tibiæ.

* *Hylacus*, F=*Prosopis*, Jur.

The ♂, I believe, is undescribed. It differs from the ♀ only in the usual sexual characters, being considerably smaller (barely 5 mm. long) and more slender; the face more elongate and entirely pale yellow; the scapes of the antennæ curved, slightly incrassate and dilated towards their apices, and yellow in front; the flagella more widely piceous than those of the ♀.

H. scutellaris was described in 1873 from "Bacu." I cannot find that it has ever been recorded since.)

4. *Hylæus moricei*, Friese.—1 ♀, Qazvin (P), 17th July.

I took this species pretty commonly at Suez in 1896; Herr Alfken tells me that he has specimens from Araxes-thal and also from Hungary, so it is apparently widely distributed.

5. *Sphæcodes gibbus*, L.—1 ♀, Amara (M), 8th June.

The specimen is broken, but I have no doubt it is a *gibbus*. As often in examples from S. Mediterranean districts, the tibiæ and tarsi are testaceous.

6. *Halictus scabiosæ*, Rossi.—1 ♂, 1 ♀, Amara (M), 12th September.

5 ♀ ♀, Qazvin (P), 8th August.

7. *Halictus quadricinctus*, F.—5 ♂ ♂, 4 ♀ ♀, Talish (P), 10th July.

8. *Halictus tetrazonius*, Kl.—1 ♀, Qazvin, 17th July.

9. *Halictus leucognathus*, n. sp. ?—1 ♂, Baquba (M), 17th July.

Herr Alfken, to whom I sent this specimen, suggested, but with doubt, that it might be the *senilis* of Eversmann; but after careful consideration of the description of *senilis* I do not think this likely. That species is said to be smaller than *H. rubicundus*, whereas this is a large form—fully as large as *scabiosæ*, *sexcinctus*, etc. Nor does Eversmann describe *senilis* as having the mandibles largely white, which is a conspicuous and very distinctive character of *leucognathus*, and has suggested the name which I propose for it.

In the Saunders' Coll. at South Kensington there is an unnamed specimen of the same ♂, taken in Greece by the late Sir S. S. Saunders, and bearing a label signed 'J. Vachal' remarking on the above peculiarity. Herr Alfken tells me, that he has a ♂ like the present specimen, and that this too was taken in Greece.

Although superficially much resembling *scabiosæ*, etc., it seems to be really much more nearly allied to the smaller species *H. tetrazonius*, Kl. It agrees with the latter exactly, and differs from *scabiosæ*, in the structure of the antennæ, and the genitalia—also, to some extent, (as Herr Alfken observed) in the form of the head, though the mandibles are not dilated and the tempora (behind the eyes) are little if at all excavated beneath. (See Fig. 2.) The antennæ (except their two black basal joints) are entirely testaceous, the apical joint is not curved, and all joints from the fourth onwards are tuberculate beneath as in *tetrazonius*. The other pale parts of the body—namely the apex of the clypeus, the labrum, a large triangular mark

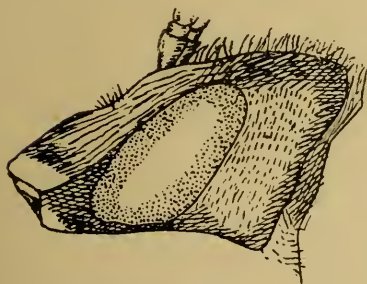


Fig. 2.

on each mandible and the greater part of the legs, which, as usual, are partly black (especially the anterior femora behind, and those of the hind legs in front also)—are not yellow (as according to Eversmann in *senilis*), but definitely white. The stigmata of the wings, however, and their veins (except the middle part of the subcosta which is fuscous) are yellow.

All the pilosity is snow-white or silvery, as in many "desert-forms". Tergites 1 to 5 of the abdomen have each a broad entire apical fascia, as in *scabiosæ*, etc., and tergites 2 and 3 are also fasciated (but more thinly) at their bases. The

tempora in certain lights are seen to be covered with a very short silvery pubescence, the hairs on the face are much longer, and decumbent; on the vertex and round the antennæ they are erect.

I have extracted the genitalia, and they appear to me exactly like those of *tetrazonius*. But I do not think that this and the other points of agreement between forms differing so much in other characters (stature, colour, pilosity, etc.; etc.) would justify me in treating them as actually conspecific.

10. *Halictus platyceustus*, Dours.—3 ♂♂, 5 ♀♀, Talish (P), 10th July.
 3 ♀♀, Amara (M), "on Sunflowers," 9th—12th September.

I think these are conspecific with a ♀ which I received, named as above, from the late Professor Perez.

11. *Halictus leucozonius*, Kirby.—1 ♀, Amara (M), April.
 1 ♀, Baquba (M), 30th June.
 2 ♀♀, Baghdad (M), 26th July.
 1 ♀, Talish (P), 10th July.
12. *Halictus chaldæorum*, n. sp.—3 ♂♂, Amara (M), 6th September—31st Oct.
 2 ♀♀, Shahroban (M), 31st August.

I can find no description to suit this species. It is a very diminutive member of the *leucozonius* group (5 to 6 mm. long). In its short broad form, in coloration, and in the sculpture of the propodeum, it comes near *interruptus*, Panzer. It seems also allied to *quadrinotatus*, Kirby, and *lativentris*, Schenck (= *decipiens*, Perkins). But it differs from all these in having the postscutellum densely tomentose in both sexes, in the uninterrupted and very conspicuous (almost, squamose) basal fasciæ on the intermediate abdominal segments, in the characters of the ♂ genitalia, and the structure of the inner hind calcar of the ♀ as well as in other minor details.

In the ♂ the antennæ (beneath from the 3rd joint onwards), and the tegulæ are fulvous—almost yellow. The clypeus is narrowly yellow at the apex, but the labrum is black. The tarsi of all the legs are yellow, and the tibiæ (especially the anterior pairs) are more or less yellow within. The propodeum has a sharply defined, undulately rugose, basal area, which is narrowly truncate (not rounded) at its apex. The mesonotum is opaque, very finely and closely punctured. The postscutellum densely clothed with short erect pile, completely hiding its actual surface. The thorax and legs are hirsute (much more so than in *interruptus*). The abdominal tergites are very shining; finely but not closely punctured on their discs, but with the depressed apical margins practically impunctate. Tergite 1 is pilose at the base; 2, 3, and 4 have entire and very conspicuous basal fasciæ of white and partly scale-like hairs. The 4th ventral segment is strongly excised at its apex and conspicuously fringed with long, white, decumbent hairs. The wings are clear, and the stigma yellowish.

The ♀ is very like the ♂, but the mesonotum is less closely punctured and slightly shining, and the disc of the 1st abdominal tergite quite impunctate.

The antennæ beneath and the tarsi are darker than in the ♂, but at least more or less fulvescent. The inner hind calcar is unlike that of any *Halictus* ♀ known to me, being armed with a single pair only of long blunt spines (See Figure 3). I notice also that the posterior ocelli are considerably nearer to the compound eyes than to each other. This is not the case in any of the other females with which I have compared these specimens.



Fig. 3. *Hind Calcar of H. Chaldæorum* ♀.

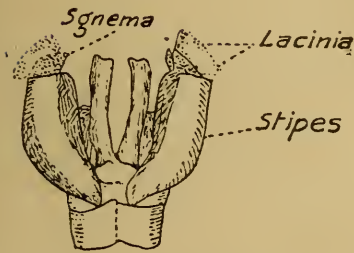


Fig. 4. Genital Armature of *H. Chaldæorum*.

The genital armature of the ♂ has a singular character, but it is difficult either to describe or figure it intelligibly. The *squama* at the apex of each *stipes* (which in *H. notatus* is comparatively simple, and in *H. lativentris* is so pilose that it can hardly be seen at all) is in this species crossed and partly concealed (in the dorsal view) by a long semitransparent '*lacinia*' clothed with microscopically fine pubescence, into which it (the *squama*) is produced. In the accompanying rough sketch (Fig. 4) drawn from a preparation mounted in balsam this *lacinia* is inevitably so much foreshortened as to give a

very unsatisfactory idea of its actual outline, but when viewed in such an aspect as to shew its full length it appears on the whole very elongately triangular, tapering gradually towards a bluntly pointed apex, and projecting to a considerable distance beyond the external outline of the *stipes*.

The species occurred visiting flowers of *Zizyphus*.

13. *Halictus longulus*, F. Smith.—1 ♂, Shahroban (M), 31st July.

1 ♂, Qazvin (P), 17th July.

14. *Halictus cingulatus*, Morawitz.—2 ♂♂, Qazvin (P), 17th July and 8th August.

5 ♀♀, Qazvin (P), 8th August.

1 ♀ Enzeli (P), 24th September.

15. *Halictus amaranus*, n. sp.—1 ♀, Amara (M), 7th July.

I feel some doubt whether this is more than a local race of *H. picipes*, Morawitz; but as Herr Alfken considers it to be certainly a new species "near *obscuratus* Mor." It may be as well to treat it as such provisionally.

The single specimen before me is in most beautiful condition. I find in it all the chief characters ascribed by Morawitz to *H. picipes* ♀—also apparently a "*unicum*"—including those by which he separates that species from *obscuratus* described immediately afterwards.

The coloration only seems to be rather brighter; approximately the apical half of each abdominal tergite is distinctly red, only its extreme apical margin is pale and scarious (yellowish); and all the tibiae and tarsi are flavescent; whereas in *H. picipes* only "the posterior tarsi" and "the hind tibiae" are described as "piceous," and of the abdominal tergites Morawitz says simply "*apice pallide-rubro*."

All the abdominal segments including the 1st are absolutely opaque (except their linear scarious yellow margins) and covered with an intensely fine and close puncturation. The propodeum is truncate, with a transverse, well defined, basal area, closely and irregularly but minutely rugulose, and sharply margined at the sides; the mesonotum, and especially the scutellum, more largely but less closely punctured than the abdomen, and so not quite dull; the postscutellum covered with dense short tomentum; the first four abdominal tergites have each a distinct and entire basal fascia of white hairs (some of which are scale-like), and those on tergites 3 and 4 are extremely broad (covering nearly half the segment). The sternites, like the tergites, have rufescent apices, and are clothed with many long sub-erect hairs of even length, forming almost such a "ventral brush" as characterizes the group "*Gastrilegidae*." The whole of the above described pilosity is white, or rather colourless. The clypeus is moderately convex and produced, distinctly shining, with comparatively few, but large,

punctures. The mandibles are rufescent at their apices, the antennæ beneath, largely fulvous, the tegulæ, costæ, and stigmata of the wings, and the tibiæ and tarsi of all the legs, yellowish.

16. *Halictus kervilleanus*, Pérez?—1 ♀, Amara (M), 11th May.

I name this very doubtfully, though it agrees in most respects with Pérez's brief diagnosis, e.g., the mesonotum is extremely shining, apparently quite impunctate—the pin unluckily makes it impossible to be certain of this!—and the propodeum is also as described for *kervilleanus*. But the tibiæ and tarsi are largely flavescens, and if *kervilleanus* has that character the author has not mentioned it. (Seems also near to *paucivillus*!)

17. *Halictus villosulus*, Kirby—1 ♀, Qazvin (P), 8th August.

Determined for me by Herr Alfken. The mesonotum much more closely punctured than in British specimens.

18. *Halictus lucidulus*, Schenck.—1 ♂, 1 ♀. Qazvin (P), 17th July.

The ♀ was determined by Herr Alfken. I have no doubt that the ♂ belongs to it.

(The next 7 species all belong to the group with æneous reflections on at least the head and thorax. Spp. 22-25 were determined for me by Herr Alfken.)

19. *Halictus variipes*, Morawitz.—1 ♀, Amara (M), 17th September.

14 ♀ ♀, Amara (M), "on *Zizyphus*", 9th September.

3 ♀ ♀, Amara (M), 25th, 26th June and 18th July.

2 ♀ ♀, Qazvin (P), 17th July.

20. *Halictus vestitus*, Lep.—1 ♂, Khaniqin (M), 1st August.

1 ♂, Shahroban (M), 31st July.

To this species Herr Alfken refers *pulvercus*, Morawitz. The description of the latter well suits the specimen from Khaniqin. That from Shahroban is much rubbed, but I have little doubt the two are conspecific. Both have what Morawitz calls "appendix distinctus" at the middle of the margin of the 4th abdominal sternite.

21. *Halictus*, sp.?—1 ♀, Qazvin (P), 17th September.

A small insect, much rubbed, but it seems, when fresh to have been entirely covered with dense silvery pilosity. The head and thorax, dark metallic green, the abdominal segments carneau with yellowish margins. I cannot identify it with any described species.

22. *Halictus dissidens*, Pérez.—1 ♀, Talish (P), 10th July.

23. *Halictus mucoreus*, Eversmann.—1 ♂, 1 ♀, Qazvin (P), 17th July.

24. *Halictus mongolicus*, Morawitz.—1 ♀, Amara (M), "on *Acacia*," 13th June.

25. *Halictus sogdianus*, Morawitz.—1 ♀, Baquba (M), 27th July.

26. *Nomioides variegata*, Oliver.—5 ♂ ♂, Amara (M), 9th-17th September.

1 ♂, Amara, November.

1 ♀, " 9th September.

This and also the following sp. occurred "on *Zizyphus*."

27. *Nomioides excellens*, E. Saunders.—6 ♂ ♂, Amara (M), 31st August—17th September.

1 ♀, Amara (M), 17th September.

I have named these after comparing them with Saunders's Types. They are much larger insects than any other *Nomioides* known to me.

(To be continued).

FALCONRY—THE CATCHING OF HAWKS AND FALCONS.
BEING A SUPPLEMENT TO "THE BIRDS OF PREY OF THE PUNJAB."

BY

C. H. DONALD.
(*With two plates.*)

I have frequently been asked whether Falconry is an expensive amusement and how best to make a beginning, so before going any further I shall endeavour to answer the above questions.

The expense depends entirely on the individual. Like everything else, you can make it as expensive as you like or as cheap as you like, but in either case it is not going to be done for nothing, and no Britisher in this country can carry on entirely by himself, and must have at least one falconer to train and exercise his birds and look after them generally. Plenty of time and unlimited patience are essential adjuncts to the successful falconer, and the former, at least, is not the usual cry of the European in India.

If it is intended to keep a large team of falcons and "do" the thing really well, and mount your falconers, then it becomes an expensive sport, but the writer well remembers the time when he indulged in a team of over a dozen hawks and falcons, with but one falconer and a "chokra" to run the entire business, and even if the establishment, and the unsystematic methods of its owner, were such as to cause acute pain and grief to good old Peter Ballantyne and his ilk, had he but seen us at work, they afforded no small amount of pleasure to the writer.

I was in a district where sport was fairly varied, but one had to go some distance to get it, and this could not always be managed, so we went on the system of "something for everything." The love of seeing the birds at work was everything to me, and if we could not go far afield for heron, houbara and duck, well there were always kites, crows, paddy birds, rollers, hoopoes, larks and such like near at hand, and it would be a bad day indeed that some of the above did not afford me a good morning's or afternoon's sport. One beautiful Saker never disappointed us, be the quarry kite or houbara, and a cast of Peregrines, and a lovely Shaheen were reserved for the days we could get out to the haunts of heron, houbara and duck. A cast of Laggars were ever ready to oblige when crows or paddy birds were about, and a Merlin and a couple of Turumtis whiled away many a pleasant hour in the pursuit of small fry. Though the fry was small the sport very often was grand in the extreme.

If £ s. d. had not been lacking the writer would have read up every old book on the subject and combined the methods of the East and West, and indulged to the full in the good old "sport of kings" according to the teachings of the many excellent books on the subject, but the ways and means being extremely short, a man and a boy was all that was possible and a fairly good horse that carried me on inspection duty, as well as out hawking, with equal regularity.

Since economy was the first consideration, it was obvious that the purchase of falcons and hawks, at fairs and bazaars, was out of the question, so the first thing to do was to catch them. This not only proved pretty simple, but extremely fascinating and instructive. My falconer was an adept in the art of making nets and nooses and we soon had all sorts of paraphernalia ready, and how many miles I walked with the old fellow, over river beds, ploughed fields and over every kind of abomination, I should be afraid to say. What was the result? I got so keen on simply catching birds that I was prepared to go on indefinitely much to the disgust of the old falconer, who mildly remonstrated and asked if I had only got him to catch birds or were they ever to be trained? The "chokra" by then was mounting guard over some half a dozen birds, quite three of which were only fit for decoys, being ancient tiercel's, but having been caught, it went to my heart to let them go again! The counsels of the falconer prevailed and we

set to work with a very fine young Laggar, and two Turumtis. In the meantime I read up books and watched the old falconer. The joy of first seeing the Laggar jump to the hand and thence to the lure and finally to see her mount and "wait on" and stoop, time and again, as the lure was thrown out! Then came the time when she followed an old crow into the midst of a lot of grazing cattle after quite a long chase and the way the crow took up a strategic position on the back of a buffalo, and dodged under the animal as the falcon swooped down from above, and finally killed it in the open. It was all very exciting and I was fairly "bitten" after my first real experience, and saw myself in imagination galloping madly over the country in the wake of a cast of well trained Peregrines one day, and watching a Saker rising rapidly behind a kite the next, and so on "*ad lib!*"

However, in spite of the lack of means to do the thing right royally, my anticipations, or rather my imagination did not fall far short of realization, and old Balinda proved a gem and no mean exponent of the art of training falcons. In spite of a very wizened body and a pair of stumps to do duty for legs, to say nothing of grey hairs and beard, the old chap was marvellous. Whether I galloped one mile or ten behind a falcon and her quarry, he invariably arrived on the scene on his own flat feet in a most amazing way by the time the falcon had been fed, simply bubbling over with endearing epithets if the quarry had been accounted for.

I must apologise for this digression and merely brought it in to show that even the keeping of half a dozen hawks need not necessarily be an expensive item. I do not advise it, as a general thing and if only one falconer is available, a couple of casts of good falcons, well trained and systematically hunted, will ensure better sport than half a dozen, which cannot possibly receive proper care and attention, and one cannot count on picking up a "Balinda" every day.

The catching and training of falcons is, as I have already said, in itself extremely fascinating and I will start by describing some of the methods adopted by falconers in this country, for catching birds.

The first and foremost is the "doguzza," which, as its name implies, is a "two yard" net. This is suspended between two sticks and stands up vertically between the bird it is intended to catch and the bait, like a miniature tennis net, and as the hawk makes for the bait it dashes through the net pulling it down over it. The net is fixed to two rings which run on a string from top to bottom of the sticks, and even if the sticks do not fall, the hawk dashing into the net, pulls the rings upwards and forms a half closed bag of the net, in the centre of which it struggles in vain. The "doguzza" is used chiefly for hawks, as they are usually found among trees among which a good background can be found for the vertical net. For falcons it is not nearly so successful, as a falcon, flying low in the open, sees the net against the sky line and swerves.

2. The next in importance is the "padam," which is made up of some 15 to 25 gut nooses, attached to little wooden pegs, some 3 inches long.

The end of the peg is dug into the ground (and is sharp pointed for the purpose) and the gut noose stands out in a hoop some 8 inches in diameter. These are placed round in a circle just touching each other and the bait is placed in the centre. A falcon swooping down to get at the bait, gets a leg caught in one of the nooses. This is almost infallible for falcons, and in fact *most* Birds of Prey, but does not always work with a slow flying and cautious kite or eagle. These birds will probably circle over once or twice and instead of swooping at an angle, will come down vertically from above, pick up the bait and rise high enough to get over the nooses.

3. The next in importance is probably a ball of nooses tied to the feet of a decoy falcon. A little cloth ball, smaller than a tennis ball, with tapes attached, will do very well. Into this ball are firmly sewn a collection of feathers of any small bird, such as a mynah for instance, and in among the feathers are also firmly fixed a number of horse hair nooses. The ball is then attached to the

front of the decoy's legs, by means of the tapes, which are tied to the back of the legs. The first four or five primary feathers of one wing are tied together, so that the bird cannot absolutely fly away, and is only able to travel 2 to 300 yards, with the help of the "throw" it receives from you. Go well out into an open plain, preferably near some river, and watch your opportunity when there are no big eagles about, and throw up the bird as high as you can. Before it has gone very far the chances are that some Peregrine, on the look out from some distant tree or stump on the river's bank, will see your decoy and take the ball and feathers, for a nice little tit-bit and promptly give chase. It will at once strike at the ball with its claws and get caught in one of the nooses. Be careful no eagles are about or you will stand a very good chance of having the poor old decoy, together with your ball and nooses, carried off bodily.

4. There are many other more elaborate devices than the above such as the "Jul," which is a line of vertical nets, placed along the top of a ridge in the Himalayas, each net being glorified "doguzza" and the whole line anything from half to one mile in length. These nets are suspended from branches of convenient trees or from poles dug into the ground and are usually fixtures. There should be a couple of feet of net to spare, on the ground. A string being passed through the last row of meshes, the ends of the string are tied to stakes a foot or two off the ground, thus leaving a bag, made by the sag in the net, into which any hawk striking the net, eventually falls and remains. If the net is raised above the ground it does no harm to any thing except to the hawks which it is intended to catch and to owls, but if the lower end touches the ground as it often does, it accounts for more pheasants than it does for hawks.

A triangle, or three sides of a square, or a square, made by three to four "doguzzas" placed in position is another common form of trap for hawks. This, known as "kothi," "phutti" or "thatti," and the "jul" are only intended for Goshawks and Sparrow-hawks, and are fixtures.

In the former no bait is used as hawks hunting in the very early mornings fly very low to the ground, and passing over a ridge dash into these nets. In the latter a pigeon or chikor may be used as a bait, tied to a stake in the ground, about the centre of the triangle or square, as the case may be, with a couple of feet of string to spare. Another string attached to the branches of a tree in the background, or a stake some eight or ten feet high may be fixed up behind the nets and a long string tied to the top of the stake. The string then passes over the bait and the other end is held by the man in hiding some little distance away. Immediately over the bait another bit of twine is knotted to the long pulling string and the other end of it to the bait. A pull on the long string raises it high above the ground and lifts the bait with it, making it flutter violently and attracting the attention of some passing hawk, which dashes head long into one of the nets.

The bow-net, as used by the old Dutch falconers of Valkenswaard, is not often used in India for hawks, nor is the draw-net, though both these devices are well known to bird catchers generally and used for catching other kinds of birds such as Sandgrouse, pigeons, starlings, etc.

The simplest method of the lot, given the conditions and a bit of luck, needs neither nets nor nooses, and was discovered by the writer quite by chance and consists of nothing but a well grown wheat field.

I cannot vouch for it always acting, but I have found it most successful on more occasions than one, with Steppe and Tawny Eagles.

On one occasion I had thrown up a decoy (A White-eyed Buzzard-Eagle) with a ball and nooses attached to its legs, for a Peregrine, and the bird landed in the midst of a heavy wheat field, with the Peregrine in full pursuit. A Steppe Eagle arrived unexpectedly and went down into the field where the decoy had

gone, the Peregrine flying away. I ran to the rescue of my decoy and on arriving within a few feet found the Steppe trying hard to fly off, but seemingly unable to do so. He had not been caught in the nooses and there was nothing to impede his flight except the stalks of wheat, against which his wings struck with violence each time he tried to flap them, and I had no difficulty in catching him. On another occasion I tried the experiment deliberately with equal success. Seeing a Tawny Eagle on a tree overlooking a field I dropped a dead partridge where he could get a good look at it, on the road, and then, as if on second thoughts, picked it up and flung it into the field and walked very slowly on, keeping one eye on the Eagle. Sure enough, down he went, and as he disappeared out of sight, I rushed back and caught him without much trouble.

Still another simple method, which I have heard is frequently adopted on the N. W. Frontier to catch big birds is to make a hole in a mudroofed hut. Through this thrust a fowl which is held by the legs from inside. An Eagle seeing the fowl in difficulties comes down and binds and you push through your other hand among the feathers of the fowl and grab the Eagle's leg, while somebody runs up and catches him.

I have never tried the method, and the drawback to it seems to be the spare leg of the Eagle. Well and good if you can catch both, but if the bird happens to be a Golden Eagle for instance, and one leg only is caught, it would probably end by a claw entering the back of your hand and the point coming out in the palm, in which case it would probably be you who would let go first.

Having first caught your hawk, the next thing to do is to get it back home without injuring some feathers. The simplest method is to have a varied assortment of old socks and stockings, from which the foot has been cut off, and a tape run through either end.

Pass the sock, or rather one end of it over the head and body, until the other end is just clear of the head. Then draw the string over the neck, fairly tight, so that it cannot slip over the wing joint, and tie the other end, after drawing the string tight over the leg, end of wings and tail and you have a neat parcel which cannot come to any harm, nor do you any harm.

Failing a supply of socks and stockings, take a handkerchief (for a small bird) and tie a knot in the centre of one side. Now place the knot directly below the chin of the bird and draw up the ends over its back. Take a point where the two sides of the handkerchief are just clear of the nape of the neck, probably about 2 inches on either side of the knot, and pin the two sides together, taking care that the pin faces upwards and not towards the bird. Now take one end and pass it round the back to as far as it will go down the side and then bring the other end over in a similar way and pin it (a thorn will do if no pin is at hand) over one of the wings. This secures the top end of the bird. Now take the other end of the handkerchief and wrap the two ends round the wings, legs and tail and tie a firm knot.

Having got your bird home put on the jesses, swivel and leash, a ruffer hood, if you have one, or an ordinary hood will do, then take the bird out on the lawn and tie it to a peg in the grass, where it wont come to any harm by fluttering. The dispositions of birds vary very considerably. One will flutter for a couple of minutes, and then resign itself to the inevitable and sit quietly with drooping head, and may even be taken on to the hand after a few minutes without much trouble. Another again will flutter and turn over on to its back, and grasp the hood with its claws, and incidently get one claw into its gape or mouth without seemingly noticing it, and scream and fight for half an hour. The fighter is generally the one that will settle down better in the long run and be easier to deal with. The quiet one is often a sulker, which will refuse food and sulk generally for sometime. Your falconer will probably wish to sew up the eyes as soon as you get home, but the sooner this custom is abolished the better as it is quite unnecessary. Personally, I do *not* think that there is much, if any,

pain inflicted on the bird, if done properly, but it might *not* be done properly always, and in any case the whole idea is barbarous and horrible and not to be encouraged.

As far as the actual training of the bird is concerned there are several good books dealing with the whole subject, and each and every branch of it, and the seeker after knowledge cannot do better than read up the chapters on Falconry, in the Badminton Library, by the Honourable Gerald Lascelles or "Falconry in the British Isles" by F. H. Salvin and William Brodrick, whom I will not insult by attempting to emulate.

Although I have done a good deal of falconry one way or another and tried my hand at most birds from the Golden Eagle to the Hobby, I may here state that I paid less attention to my birds from purely a falconry point of view than I did from a naturalist's point of view, and was more interested in the bird itself than in its training, and for that reason dabbled with all manner of useless species, at least, useless to a falconer but interesting to me.

All eagles are most unsatisfactory and extremely difficult to train chiefly owing to the fact that they can go without food for long periods.

The Spizaeti are the most easily tamed and trained, for they are not so bad in the above respect as some of the others, but they are very slack hunters, lacking in both courage and dash, for their size and strength.

The Golden Eagle is wanting in neither courage nor dash, but unless brought up from a youngster and accustomed to a couple of meals a day, there is no knowing when he will oblige by being hungry enough to even trouble to come to the lure. Moreover, caught when he is full grown, he is a dangerous bird to play with. Taken from the nest he is easily tamed and comparatively easy to train, but flying "at hack" does not suit him in the way of really teaching him to stoop, turn, and twist, with the result that when trained, he is likely to be extremely slow on the wing and not fit for much. I could never get an Indian falconer to take charge of a Golden Eagle for me. Old Balinda who had taken charge of as many as three Hodgson's Hawk Eagles for me at one time, and trained them with some success, so far as they are capable of success, absolutely refused to have anything to do with a Golden Eagle, the very first one I ever caught. I tried hard to get a Pathan to take over one for me, but in vain.

A Bonelli's Eagle I tried proved hopeless. Anything running along the ground he was good for, but once on the wing, he would take no further interest. He was quite prepared to tackle every duck or barndoor fowl in the vicinity, but a wild duck or a jungle cock had no attraction for him whatsoever.

The Booted Eagle is much more amenable to training than any of the other eagles, and gets hungry within a reasonable time, that is, forty-eight hours will make him ravenous and very "sharp," but he is no good for anything bigger than hares, and is slow and clumsy in turning.

All the true Eagles, excepting the Golden, are not capable of catching anything that flies, provided it is not maimed or sick, though they never fail to pursue a hare when they get a chance, but how often one succeeds in catching even a hare, it would be hard to say. I have only once seen one caught and that was because the poor beast was simply set on from every side and had some three kites and about four eagles of sorts after him. This was in the middle of the Lahore race course early one morning.

In concluding these papers on the Birds of Prey of the Punjab, I would like to re-iterate once more the fact they have only been written with the intention of making identification simpler, and by placing them in types with one or more common characteristics in each individual common to that type, and ignoring details, I think, and venture to hope, that I have been successful. The descriptions and keys, for the most part have been copied, either in full or in part, from the "Fauna of British India," Volume III, or from Hume's "Rough Notes." The descriptions therein given cannot very well be improved upon, and to

have attempted to have described the birds myself, would have altered the wording but by no means improved either the description or the text, and hence my copying "verbatim" from the works referred to.

The drawings in the accompanying Plates are from memory. I should have preferred keeping them for some time until I was able to check them with actual specimens on the wing, but to do so I should have to keep them over the winter, when alone a number of the birds represented may be seen, which would make them too late for the next number of the Journal. On the whole, they describe fairly well what they represent, except perhaps for some detail which may possibly be wrong, though the crudeness of the sketches need an apology to the members of the B. N. H. Society.

For explanation of Plates see *Birds of Prey of the Punjab*, Part VII page 514 of this volume.

FRESH-WATER CRUSTACEA COLLECTED BY DR. P. A. BUXTON
IN MESOPOTAMIA AND PERSIA.

By

ROBERT GURNEY, M.A.

(With two plates and two text figures.)

The Crustacea recorded in the following report were collected by Dr. Buxton during 1917 and 1918, mainly in the neighbourhood of Amara in Mesopotamia but a few collections were also made in North Persia and are included in the list.

My expectation had been that the district of Amara would have been a very favourable one for Phyllopora, and also that the Entomostraca would show a distinct mingling of eastern and western forms, but these expectations have not been realised. Only two species of Phyllopora are included in Dr. Buxton's collections, and the remaining Entomostraca recorded are, with the exception of *Daphnia lumholtzi* and *Moina dubia*, of a European type.

Between Basra and Amara there are immense areas of permanent shallow marsh on either side of the Tigris, generally some way from the river. The fauna of these marshes was sampled by Dr. Buxton at Azize, Kharaba (E. of Amara) and at Ezra's Tomb on the Tigris between Amara and Basra. Though 15 species were taken at the latter place the fauna seems to be surprisingly scanty. Dr. Buxton suggests that the scantiness of the fauna may be due to the intense sunlight and high temperature of the shallow water during the day-time in summer, or to the great daily fluctuation in temperature. With the exception of this marsh most of the collections were made in temporary pools where a varied fauna was not to be expected. In North Persia, on the other hand, the conditions seem to be much more favourable, and the collections from Resht and Enzeli contain a larger number of species than any of those from Mesopotamia, though their state of preservation makes the identification of some of them impossible.

I have not thought it necessary to give lists of the species included in the various collections since, for the most part, they were made in temporary pools and contained very few species. Two, however, seem to me of sufficient interest to record in full, namely, those taken in the permanent marsh at Ezra's Tomb near Amara and at Resht in North Persia.

Ezra's Tomb. 23.2.18.

A large swamp close to the Tigris with water from 2 to 4 feet deep. A broad belt of reeds, with submerged water plants and extensive open water.

Daphnia lumholtzi, Sars. Several young; few adults.

Daphnia longispina, O. F. M. Common, males present.

Simocephalus exspinosus, Koch. Common.

Scapholeberis mucronata (O. F. M.). Rare.

Bosmina longirostris, O. F. M. A few.

Ceriodaphnia reticulata (Jurine). Rare.

Alona rectangula, Sars.

Alona costata, Sars.

Chydorus sphaericus (O. F. M.). Common.

Diaptomus vulgaris, Schmeil. Common.

Cyclops vicinus, Uljanin. Rare.

Cyclops agilis, Fischer-Sars. Rare.

Canthocamptus staphylinus, Jurine.

Cypris pubera, Muller.

Rotifera—Asplanchna sp.

Dinocharis pocillum (Muller).

Ascomorpha sp.

Resht, N. W. Persia. Ponds and ditches. March 1919.

At sea level, in thick forest of a very wet type.

Daphnia longispina, O. F. M. Rare.

Daphnia pulex obtusa, Kurz. Rare.

Simocephalus vetulus (O.F.M.). Common.

Scapholeberis aurita (Fischer). Common.

Ceriodaphnia reticulata (Jurine). Rare.

Alonella excisa (Fischer). A few.

Chydorus sphaericus (O. F. M.). Abundant. Males and ephippial females present.

Cyclops viridis, Jurine. Common.

Cyclops vernalis, Fischer. Rare.

Diaptomus—three species unidentified.

Canthocamptus staphylinus, Jurine. Rare.

Cypris virens, Jurine.

Asellus aquaticus, Linn.-Sars.

LIST OF SPECIES.

I. MALACOSTRACA*

Sesarma bouleengeri, Calman. (Ann. Mag. Nat. Hist. (9) V. 1920).

Fao, Persian Gulf, in brackish water.

The specimens from which Dr. Calman's description was taken were collected at Basra, in fresh water.

Potamon fluviatile var. *ibericum*, Marschall de Bieberstein.

Tula Rud (S. W. Caspian), Qazvin and Kermanshah (N. W. Persia).

Potamon fluviatile var ? Qalat Saleh, R. Tigris.

II. ENTOMOSTRACA.

1. Phyllopoda.

Artemia salina var. *arietina*, Fischer—Daday.

A large number of specimens of *Artemia* were taken in saline pools in the neighbourhood of Amara, but among them no males were found. The number of setae on the furcal rami is very variable, ranging between 12 and 2, the average being 8 on each ramus.

Apus asiaticus nom. nov.

Apus granarius, Sars. Ann. Mus. St. Petersburg. VI. 1901, p. 4.

I have received from Dr. Annandale and from Dr. W. T. Calman specimens of *Apus* taken at Bagdad, and, though Dr. Annandale's specimens are small and immature, I have no doubt that all belong to the same species. The adults agree very closely with the species from Central Asia described by Prof. Sars under the name of *A. granarius*, Lucas, but I am not satisfied that that name is correctly applied. M. Simon's description (Ann. Soc. Entom. France VI. 1886, p. 446) is not very full and no figures are given, but he states that the flagellum of the first leg exceeds the length of the dorsal shield, which is far from being the case in Prof. Sars' species and my own. There are other differences also with regard to the length of the furcal rami, which M. Simon also states are "prope basin obtuse dentati haud setosi", and the denticles on the sulcus of the dorsal

* I am indebted to Dr. W. T. Calman for the identification of these Crabs.

shield which in *A. granarius* are few and very minute. In view of these differences I regard *A. granarius*, Sars, as distinct from *A. granarius*, Lucas, and for that reason I have reluctantly introduced a new name.

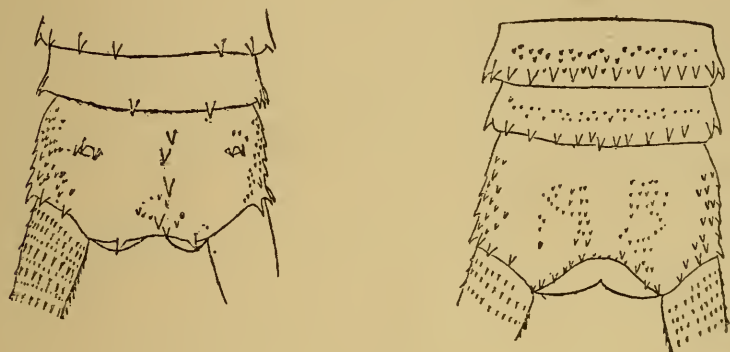


Fig. 1. Last Abdominal Segment of *Apus asiaticus* ♀. A=Dorsal view. B=Ventral view.

[Next Segments :—No. 3—11 spines, No. 4—9, No. 5—10, No. 6—9, No. 7—9, No. 8—11, No. 9—9, No. 10—9, No. 11—11, No. 12—11, No. 13—11.]

I was at first inclined to refer these specimens to *A. dukianus*, Day, but have had the opportunity of examining the type of that species, which proves to be entirely distinct. The following measurements, together with figures of the last abdominal segment, are given for purposes of comparison with the description and figures of Prof. Sars :—

	Length of dorsal shield (median).	Length of dorsal shield to post angle.	Width of dorsal shield.	Total length of animal (without furca).	Length of furcal rami.	Number of segments uncovered.	Number of limbless segments.	Number of denticles on sulcus of shield.	Length of 4th flagellum of first leg.
Male ..	15	18	13	35	20	28	12	44	10
Female ..	13	16	12	27	15	25	9	44	9
(Measurements in Millimetres.)									

The species is closely related to *Apus numidicus*, Grube which appears to range from South Africa to Central Asia, but I believe that two or more distinct

species have been confused under the name of *A. numidicus* and hope to be able to give reasons for this opinion on a future occasion.

Leptestheria sp.?

A number of specimens of *Leptestheria* were found in collections made at Amara, and these I believe represent a species hitherto undescribed. In shape of shell they closely resemble *L. ticinensis*, Crivelli, but the arrangement of spines on the post-abdomen is quite distinct and unlike that of any species known to me. Unfortunately Dr. Daday has published in the Hungarian language short diagnoses of a number of new species of *Leptestheria* (Math. Term. Ert. 1913), and, as these diagnoses are unaccompanied by figures, they are unintelligible to me. Until Dr. Daday completes his monograph of the *Conchostraca* in a language generally understood, the existence of this Hungarian synopsis effectually limits the study of the group to those who can read this difficult language.

Baird (Proc. Zool. Soc. 1862, p. 148) has recorded the occurrence of *L. dahalaensis*, Rupp., together with *Estheria lofti*, Baird, from pools by the river Tigris near Bagdad.

2. Cladocera.

Daphnia lumholtzi, Sars. Taken in November and December 1917 in fire buckets at Amara, and also in permanent marsh at Ezra's Tomb in February 1918. In the former locality the adults had extremely short head spines, and the posterior spine followed nearly the median line of the body, whereas in the young the head spine was long and the posterior spine dorsally directed. Specimens from Ezra's tomb were of typical form. The species is recorded from Australia, East Africa, Egypt and Palestine.

Daphnia magna, Strauss. In flood waters at Amara in January and March 1918. Though males were present no ephippial females were taken. Found also at Qazvin in N. W. Persia.

Daphnia pulex, De Geer. The obtuse form of this species was taken at Resht in N. W. Persia in March 1919.

Daphnia longispina. O. F. M.

Ezra's Tomb, Mesopotamia, and at Resht. N. W. Persia.

Simocephalus exspinosus, Koch.

Abundant at Amara in the moat of Fort Farm.

Simocephalus vetulus. O. F. M.

Amara—in a disused well. Azize, Mesopotamia; Enzeli and Resht, N. W. Persia.

Scapholeberis mucronata (O. F. M.)

The hornless form of this species was taken in small numbers at Ezra's Tomb (February 23rd, 1918).

Scapholeberis aurita (Fischer).

Common at Resht, N. W. Persia.

Ceriodaphnia reticulata, Jur.

Amara and Ezra's Tomb; Resht and Enzeli.

Moina rectirostris, Jur.

In flood pools at Amara. Common.

Moina dubia, Richard.

A few specimens of this species were found in a collection from the moat of Fort Farm, Amara.

In some respects these specimens are intermediate between *M. dubia* and *M. micrura*, Kurz, since for example the postanal part of the postabdomen is considerably shorter than that of typical *M. dubia*. On the other hand the comparative length of the antenna, the total length of the postabdomen as compared with the body, the presence of transverse rows of cilia on the postabdomen and

of a delicate comb on the claws sufficiently identify these specimens with *M. dubia*. The following table will make the comparison clear:—

	Proportion of 1st antenna and total length of body.	Proportion of 1st. postabdomen to total length of body.	Proportion of post-anal part to whole postabdomen.	Proportion of length of claws and postabdomen.	Number of teeth on 1 postabdomen.
<i>M. dubia</i> —Amara	1 : 5	1 : 2·3	1·3·5	1 : 5·2	6-8
<i>M. dubia</i> —R. Nile	1 : 5·9	1 : 2·4	1·2·3	1 : 5·3	6-7
<i>M. micrura</i>	1 : 6·5	1 : 2·7	1·4	1 : 6	6-8

Moina dubia is a characteristic feature of the plankton of the Nile throughout its length, and is found in Victoria Nyanza, where it forms the bulk of the plankton (Daday) and in various places in the neighbourhood of Lake Nyassa. It was originally described from West Africa (Senegal) and is evidently a widely distributed African species. On the other hand I have seen specimens hatched from dried mud from Palestine, and its occurrence there is comparable to that of the Nilotic species of fish and other vertebrates. Its extension to the Tigris region is noteworthy, though the Cladocera are not a suitable group from which to draw evidence for zoogeographical problems.

Bosmina longirostris, O. F. M.

Ezra's Tomb, Mesopotamia.

Alona costata, Sars.

Ezra's Tomb. One individual only.

Alona guttata, Sars.

Enzeli, North Persia. Rare.

Alona rectangula, Sars.

Ezra's Tomb, Mesopotamia and Enzeli, North Persia.

Alonella excisa (Fischer).

Resht and Enzeli, North Persia.

Pleuroxus aduncus (Jurine).

A single specimen taken at Amara (Bet Khodayer).

Alonella excisa (Fischer).

Resht and Enzeli, North Persia.

Chydorus sphericus, O. F. M.

A very strongly reticulate form occurred at Ezra's Tomb. Abundant in a collection from Resht, males and ephippial females being present.

3. Copepoda.

Cyclops vicinus, Uljanin.

Ezra's Tomb, rare. The occurrence of this species in this locality is somewhat surprising, having regard to the extreme heat of the waters of the Amara district in summer, since it is a distinctly northern species, like its close ally *C. strenuus*. It has been recorded from Sweden, Central Asia, Turkestan, Kolguev, Volga Delta, Aral Sea and China. My specimens agree in every respect with the description given by Prof. Sars (Crustacea of Norway).

Cyclops viridis, Jurine.

Irrigation runnel at Amara. Resht and Enzeli, N. W. Persia.

Cyclops vernalis, Fischer.

Resht, N. W. Persia.

Cyclops bicuspidatus, Claus.

Amara. The variety with 14 joints in the Antenna (*C. lubbocki*, Brady) was taken in a disused well together with *Cyprinotus incongruens*, but the typical form was found in flood water near the Sheikh's house (Bet Khodayer) at Amara.

Cyclops leuckarti, Claus.

Amara. In small numbers in several collections.

Cyclops crassus, Fischer-Sars.

Amara. In the moat of Fort Farm.

Cyclops albidus, Jurine.

A single male was taken at Kharabah Marsh and two females at Azize, both these localities are in the great permanent marsh east of Amara.

Cyclops agilis, Fischer-Sars.

Ezra's Tomb, Mesopotamia, and Enzeli, N. W. Persia.

Cyclops affinis, Sars.

A single mature female taken at Azize, Amara.

Cyclops bicolor, Sars.

Enzeli, N. W. Persia.

Cyclops diaphanus, Fischer.

Amara, in flooded ditches, and at Gantra Sarut' on the E. bank of the Tigris between Aligharbi and Amara. Prof. Sars (Crustacea of Norway) has identified *C. diaphanus*, Fischer, with *C. nanus*, Sars, but it seems to me that Fischer's description is so scanty and ambiguous that it is advisable to follow the interpretation placed upon it by Claus, Schmeil and others and to apply this name to the species of *Cyclops* fully described by Claus first as *Cyclops minutus* and later as *C. diaphanus*, Fischer. *Cyclops nanus*, Sars, is a very distinct form closely related to *C. languidus*, Sars, and a transfer of the name *diaphanus* to it will, in my opinion, only lead to confusion.

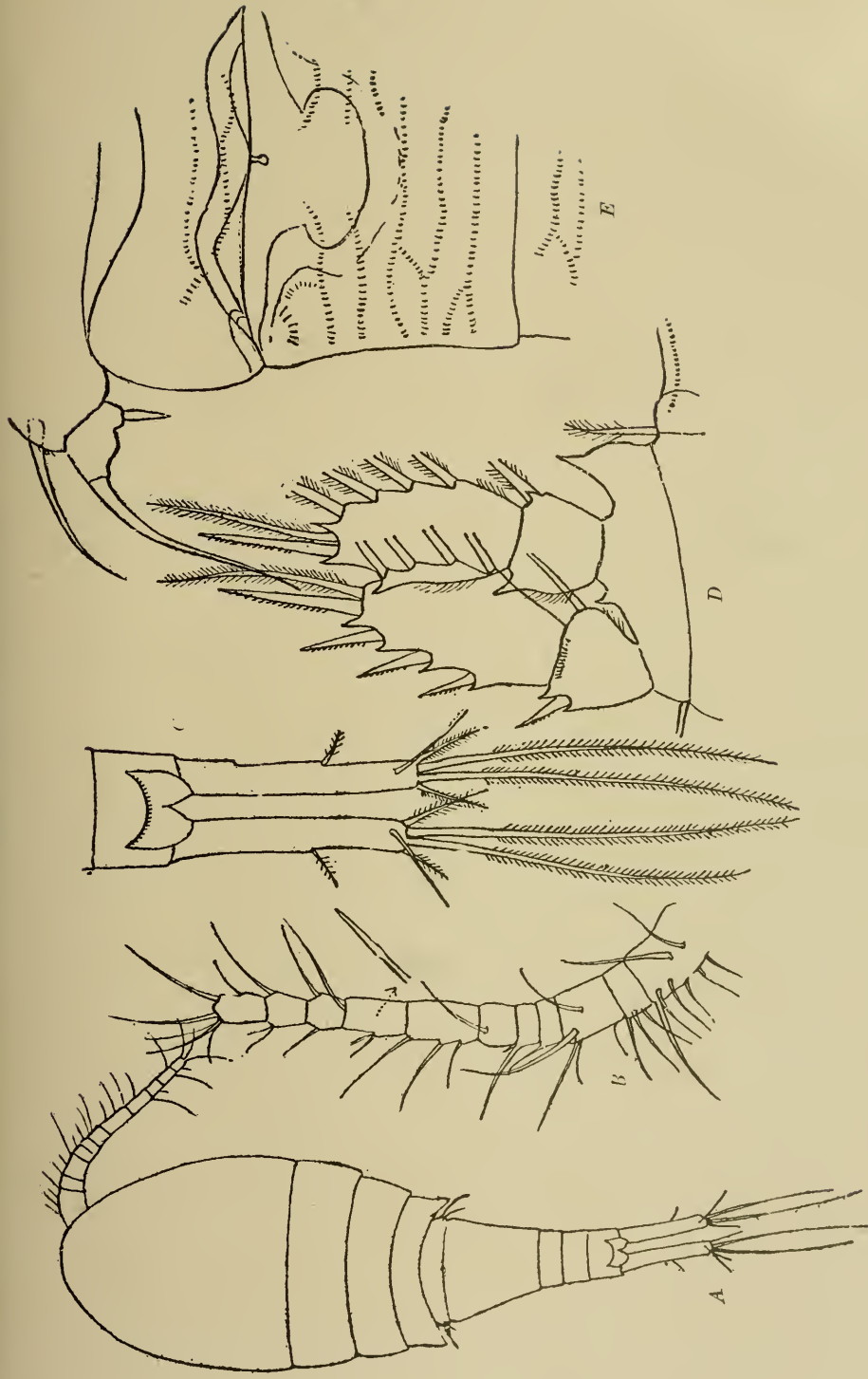
Cyclops luxtoni, n. sp.

Body robust, the cephalothorax slightly longer than the abdomen; epimera of the thoracic segments 1-3 not prominent. Segment 4 somewhat produced laterally. Genital segment of abdomen broad and slightly exceeding the length of the 3 following segments. Anal operculum fringed with minute denticles. Ventral surface of genital segment marked with lines of very minute cilia. Furcal rami long and slender, equal in length to the 3 preceding segments, and not divergent. Lateral seta inserted a little behind the middle of their length. The outermost apical seta slightly shorter than the innermost; the two inner setae of nearly equal length, the inner one less than twice the length of the furca. The first antennae consist of 11 joints and are considerably shorter than the first segment of the thorax. The eighth joint bears a sensory rod. Comparative length of joints as shown in following formula:—

20. 6. 13. 5. 4. 9. 15. 14. 8. 9. 11.

1 2 3 4 5 6 7 8 9 10 11

Swimming legs with all rami two-jointed. The second joint of the exopodite of the first leg bears 3 spines, while that of each of the three following pairs bears four. The endopodite of the fourth leg bears at its apex a single long spine and a seta. The first joint of the fifth leg is not distinct, its seta being apparently borne on the outer dorsal edge of the segment. The second joint is of peculiar shape, short and broad, bearing a long seta on its outer angle and a short spine on the inner side. This inner spine is longer in the male than in the female. Length 1.1 mm.



CYCLOPS BUXTONI, n. sp. ♀.

A.—Dorsal view. B.—First antenna. C.—Furcal rami. Right ramus slightly abnormal. D.—Leg of fourth pair. E.—Genital segment and fifth leg.

A few specimens of this species were taken in the river Tigris at Amara. It is evidently closely allied to *C. diaphanus*, Fischer-Claus, but is readily distinguished from it and from other species by the form of the fifth feet and of the furca and receptaculum seminis. It resembles most nearly *Cyclops panamensis*, Marsh, the fifth feet of which have an almost identical shape, but it differs in size, general form of body and other details.

Canthocamptus staphylinus, Jurine.

A few specimens of this species, agreeing in all respects with the typical form, were taken at Ezra's Tomb, Mesopotamia, and at Resht, N. W. Persia. The collections were made in February and March respectively. This is a northern cold-water form, which largely disappears in summer in Europe, and its occurrence under the climatic conditions of Mesopotamia is somewhat unexpected and remarkable.

Diaptomus vulgaris, Schmeil.

Common at Ezra's Tomb: a single male taken at Enzeli, N. Persia. The specimens from Ezra's Tomb agree in every detail with the typical form as described by Schmeil with the following exceptions: the antennae slightly exceed the length of the body; the second basal joint of the left fifth foot of the male bears a single narrow hyaline process; the last thoracic segment of the female is slightly asymmetrical. The species is distributed almost all over Europe, and a number of races or elementary species have been described from south-east Europe. Its occurrence in Mesopotamia and N. W. Persia is of interest as considerably extending its known range.

Diaptomus blanci, Guerne & Richard.

Amara, in irrigation runnels.

Originally described from Turkestan, this species has since been recorded from Central Asia, Aral Sea and from India.

Diaptomus chevreuxi, Guerne and Richard.

Female:—Cephalothorax almost parallel-sided, the width about one-third of the length. Last segment incompletely separated, with rather large, symmetrical, posterior lobes. Rostral filaments rudimentary. Abdomen slightly exceeding half the length of the cephalothorax and consisting of four segments: the first, or genital, segment very short and scarcely dilated, without any trace of lateral spines, but with a large flattened, dorsal expansion on the right side. Furcal rami rather long and narrow, the width less than half the length, the inner side without cilia.

First antennæ reaching, when fully reflexed, to the posterior edge of the first abdominal segment.

Fifth pair of legs without hyaline processes on basal segments or on first segment of exopodite. Endopodite one jointed, about two-thirds of the length of the first joint of the exopodite, bearing two short spines of unequal length at its apex. Second joint of exopodite short and broad, with an unusually short strong claw, denticulate on the side. Third joint absent, its place being taken by a thick, bent, spine, at the base of which is a short denticle.

Length. 3.3 mm.

Four females of this species were found in a collection from a dike beside an ancient causeway at Gantra Sarut on the left bank of the R. Tigris between Amara and Ali Gharbi.

Dr. Buxton noted that the species, when alive, was of a scarlet colour,

This species has only been recorded hitherto from Algeria and its occurrence in Mesopotamia is a matter of some interest as it is apparently absent from intermediate countries such as Egypt where it might be expected to occur. In Algeria it is found in ditches and other temporary waters, and the conditions in Egypt would seem to be entirely suitable. Three of the specimens

bear on the *dorsal* surface of the second and third segments of the abdomen a cluster of enormous spermatophores, the adhesive material of which almost covers and obscures the segments themselves.

Diaptomus, sp.

A collection from Resht contains three species of *Diaptomus*, but unfortunately every specimen is badly damaged and I am unable to name any of them. Of one species there are two male specimens of enormous size which resemble *Hemidiaptomus ignatovi*, Sars, but both of them lack the prehensile antenna and the fifth pair of legs.

4. Ostracoda.

Notodromas persica, n. sp.

A few specimens of a small species of *Notodromas* were found in a collection from Resht (N. W. Persia) but the shells are so soft and distorted that a satisfactory description of their shape cannot be given. Neither valve shows any sign of spines. The outline figure given is taken from a mature female which was comparatively undistorted, but, having regard to the softness of the shell, too much reliance must not be placed upon it. The two sexes seem to be alike in shape.



Fig. 2. *Notodromas persica*, n. sp.

1. Right shell of female. 2. Furcal ramus of young male. 3. Furcal ramus of adult male. 4. First leg of adult male. 5. First leg of young male. 6. Prehensile appendage of left side of male. 7. Prehensile appendage of right side of male.

The second antennæ consist of five joints only, the third and fourth being fused. The arrangement of setæ is as in *N. monacha*. The large seta borne on the anterior lower corner of the second joint is as long as the next two joints combined, extending to the apex of the limb.

The first maxilla of the male bears very large prehensile organs. That of the right side consists of an elongated stem, somewhat swollen at its base, and a large sickle-shaped hook, denticulate at its extremity and bearing a broad

MESOPOTAMIAN CRUSTACEA.



DIAPTOMUS CHEVERUXI ♀.

A.—Dorsal view. B.—Fifth foot. C.—Dorsal view of last Thoracic and first abdominal segments. D.—First leg. E.—Maxillipede.

triangular spine at its base. The appendage of the left side is shorter and stouter, with two conspicuous knobs along its lower margin and with a slightly curved, somewhat lamellar, hook.

The first leg, in immature specimens, has a large protuberance at the angle of the penultimate joint, and a trace of this protuberance remains in the adult. The furcal rami of one male examined are similar to those of *N. monacha*, having a much curved shaft and three subequal setæ at the end, but in all other specimens, male or female, they are shorter and stouter, and remarkable for the presence on the dorsal margin of a double tubercle about the middle of its length. Probably, this, as also the form of the first leg, is a mark of immaturity.

Length of shell .75 mm.

Height „ .38 mm.

The description given above is, owing to the nature of the material, very incomplete; but the species appears to me to be clearly distinct. It resembles *N. entzi*, Daday, in some respects, but differs strikingly in the form of the prehensile appendages of the male and the form of the furcal rami.

Cyprinotus dentatmarginatus, Baird-Sars.

Amara—Fort Farm moat.

Cyprinotus incongruens, Ramd.

Kharabah Marsh near Amara.

The specimens examined differ from the type in having rather more conspicuous tubercles on the shell margin, but agree so closely in other respects that I consider they should be referred to this species.

Eucypris virens, Jurine-G. W. Muller.

Resht, N. W. Persia.

The identification of this species is rather doubtful, since the specimens were so damaged that only a single shell valve was found intact.

Cypris pubera, G. W. Muller.

Amara and Ezra's Tomb, Mesopotamia. Enzeli, N. W. Persia.

Herpetocypris reptans (Baird).

Enzeli, N. W. Persia.

Potamocypris variegata (Brady & Norman).

Enzeli, N. W. Persia.

Ilyocypris bradyi, G. O. Sars.

Amara.

NOTES ON BIRDS FROM NORTHERN AND WESTERN PERSIA

BY

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(With a Map.)

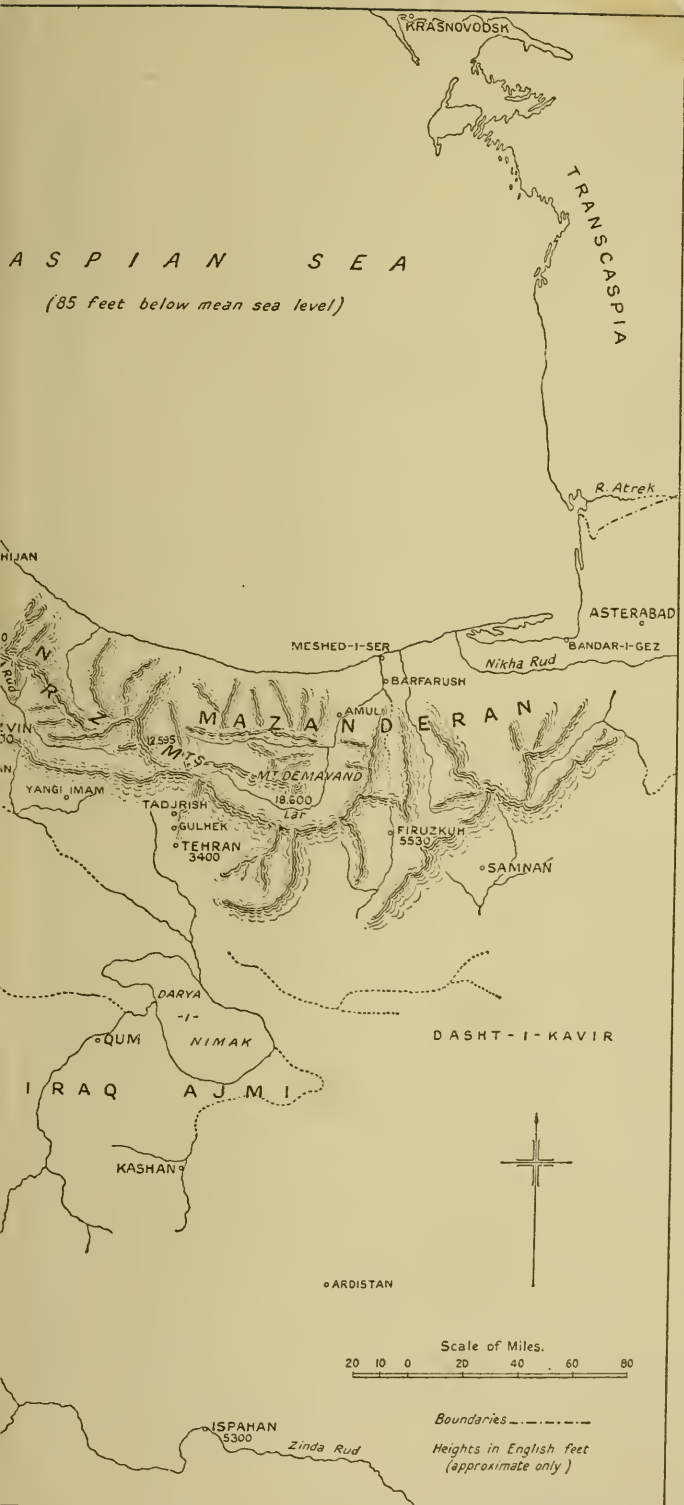
The following notes are based on several small collections made by Officers on active service in N. W. Persia in 1918 and 1919. The Society has lent me skins from the Cox-Cheesman collection, collected by Major R. E. Cheesman, I.A.R.O., while travelling from Baghdad to Tehran, and from Tehran to Enzeli in May and June 1919, and a few very interesting skins collected by Capt. C. M. Ingoldby, R.A.M.C., at Zinjan in Khamse and at Bandar-i-Gaz in Asterabad Bay. I am extremely obliged to the Society for the loan of these specimens, and to Major Cheesman for a copy of his very full notes. The majority of the specimens which I examined were collected by myself in 1918 and 1919. Cheesman's and Ingoldby's specimens and notes have been distinguished by the initials "R. E. C." and "C. M. I."; records and skins not so distinguished may be presumed to be my own. Any record to which no date is given refers to the year 1919.

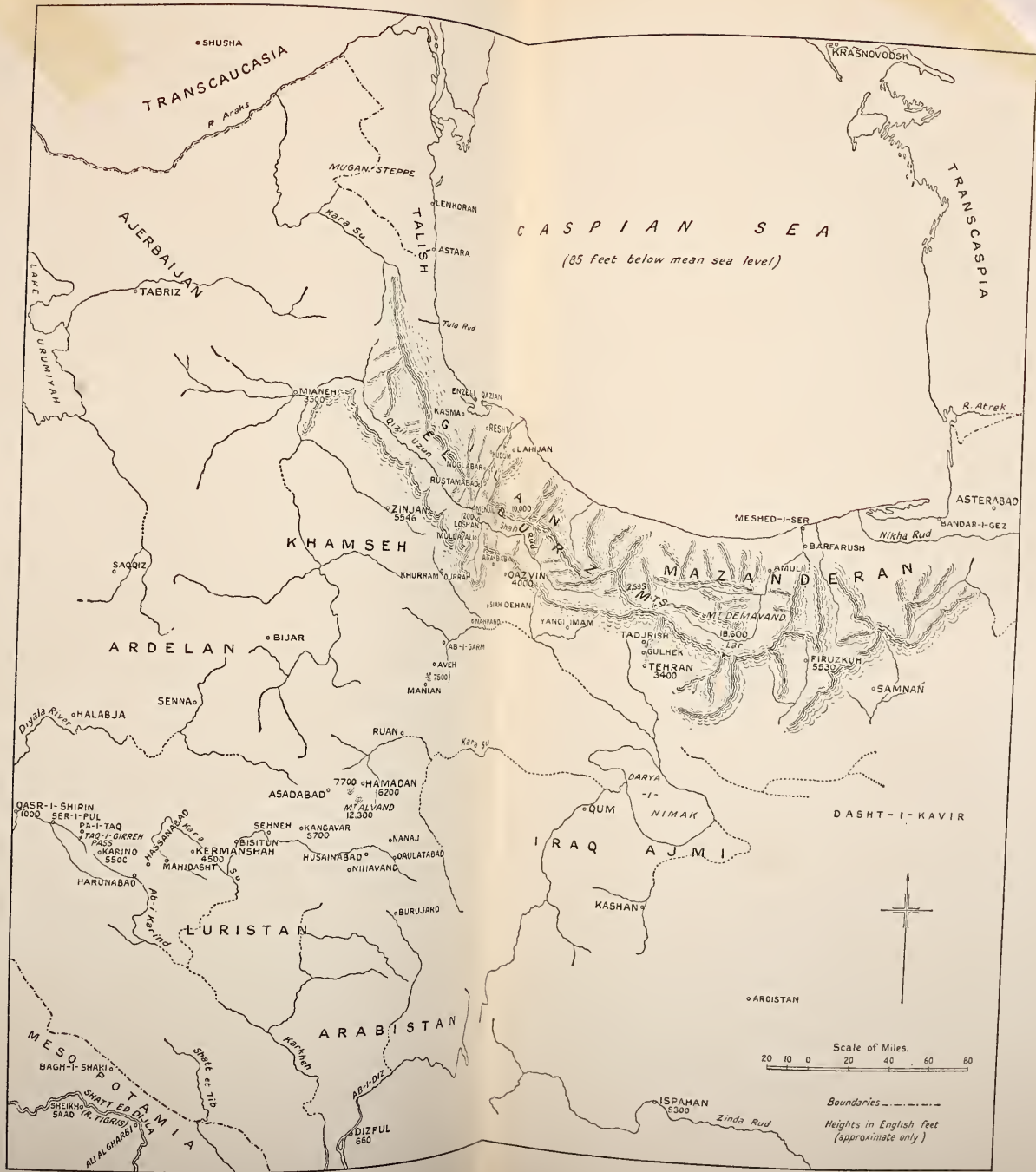
It is a pleasure also to acknowledge my deep debt to Lord Rothschild and Dr. Hartert at Tring, to the authorities in the Bird Room of the British Museum, and to Mr. H. F. Witherby and Dr. C. B. Ticehurst. I feel that I may congratulate myself that it has not been found necessary to describe a single new sub-species. The value of the sub-species as a record of geographical or environmental variation, and as a means of calling attention to what appear to be species in the making, is a thing which few modern zoologists would dispute. The description of sub-species from Persia, however, has done more than keep pace with our knowledge of the avifauna, and it is to be regretted that the greatest investigator of the birds of Persia, the late N. Zarudny, too often described new races, without sufficient reference to the work of ornithologists in Western Europe.

In this paper I always refer to a species by its binomial name, unless actual specimens were obtained for comparison. This is perhaps an unnecessary refinement for in most cases one could confidently give a sub-specific name on geographical grounds. Though there is little that is unexpected in the present paper I feel that it has value, partly because we resided some time in the country, partly because as a result of our collecting a number of previously described sub-species have now been critically examined and compared with the great collections at Tring and the British Museum. As will be seen below I have felt justified in sinking a number of sub-species described by Zarudny and others.

We find that we have added but two sub-species to the Persian avifauna, *Galerida cristata subtaurica* and *Passer domesticus biblicus*, and the first of these only appears on the Persian list in substitution for *G. c. caucasica*. The most striking thing about the fauna which we saw was the extremely sharp line of division between the forests of Gilan and the semidesert plateau. This is dealt with in some detail below, but is already well known, principally from Witherby's papers (1910). A point to which perhaps less attention has been directed, but which is now quite clear, is the intimate connection between the fauna of Persian Azerbaijan, or N. W. Persia generally, and that of Anatolia and Asia Minor generally; this is exemplified by the following species and sub-species:—*Petronia p. exigua*, *Galerida cristata subtaurica*, *Eremophila alpestris penicillata*, *Acredula caudata tephronota* and *Anthoscopus pendulinus persimilis*. The following too belong to this distinctively Western element though they are rather Syrian than Anatolian birds:—*Passer domesticus biblicus*, *Ammomanes deserti* (*fraterculus* ?), *Cettia cetti orientalis* and *Turdus merula syriacus*.







Map illustrating Mr. P. A. Buxton's Paper on Birds of Northern and Western Persia.

The political frontier between W. Persia and Mesopotamia coincides approximately with an important faunistic boundary, the boundary between the immense Mesopotamian plain and the mountainous country of Kurdistan and Luristan. On the latitude which we are considering (about lat. 34° N) some of the foothills of Persia the frontier into cross Mesopotamia and run N. W. as far as the Fateh gorge on the Tigris; these hills are the Jebel Hamrim: on the whole, however, the political frontier divides the palms of Mesopotamia from the scrub oaks of the Kurdish hills, and we have used the political frontier to divide our Mesopotamian collections, which are being worked out by Dr. C. B. Ticehurst, from our Persian specimens which are the subject of this paper.

Cheesman, Ingoldby and myself all entered Persia at different times by the ancient road which runs from Baghdad to Kermanshah and on to Tehran. The first place at which a few birds were collected was Qasr-i-Shirin (about 1,000 ft.). The gardens irrigated by the Hulawan river are the last place in which date palms are seen, but I failed to find the Mesopotamian Bulbul (*Pycnonotus leucotis mesopotamia*), a bird which is closely associated with the date. The surrounding country is covered with small red hills with a crumbling stony surface: characteristic birds in autumn are a See See Partridge (*Ammoperdix griseogularis ter-meuleni*), a Desert Lark (*Ammomanes desertorum* subspecies), Blue Rock Thrush (*Monticola solitarius transcaspicus*), Rock Doves (*Columba livia*), and the Wheatears (*Enanthe finschii barnesi* and *O. alboniger*). A very pale fox was also seen commonly. Ingoldby told me that in spring he saw the European Bee Eater (*Merops apiaster*) breeding, and in this and other respects the fauna is quite unlike that of the great plain of Mesopotamia. The road from Qasr-i-Shirin runs up the valley past innumerable little hills, and red ridges to Pa-i-Taq: from here it zigzags up the side of a very steep hill past Taq-i-Girreh to the Karind plain at 5,600 feet. The region between Pa-i-Taq and the top of the pass is clothed with a small scrub-oak with evergreen leaves, walnuts, brambles, etc. Though most of the trees are only six feet high we are here and at Kermanshah in woods inhabited by many of the birds which are characteristic of the Zagros forests, for example the Persian Blue Tit (*Parus caeruleus persicus*), the large pale Rock Nuthatch (*Sitta neumayer dresseri*) which is common on the bare rocks of the Pa-i-Taq pass; Cheesman shot also the desert Rock Sparrow (*Carpospiza brachydactyla*). The See See, which as I have said was common at Qasr-i-Shirin, belongs to the form found in Fars and in Mesopotamia (*A. g. ter-meuleni*) not to the form found in most other parts of Persia.

At the top of the pass the scrub-oaks are left behind, and we enter a long narrow plain, the plain of Karind, shut in by high parallel mountains on either side. This country is mostly under cultivation and is said to receive a higher rainfall than the plains round Hamadan and Qazvin. Where it is not cultivated it is covered with wild liquorice (*Glycyrrhiza*). Cheesman saw Black-headed Buntings (*Emberiza melanocephala*) and Red-rumped Swallows (*Hirundo rufula daurica*) in May, and his record of a colony of white Storks (*Ciconia alba*) breeding in a cliff above the village of Karind is particularly interesting. In winter (November 1918) I found the Karind plain singularly devoid of birds. I only saw Ravens (*Corvus corax*) and Magpies (*Pica p. bactriana*), and various common ducks and waders along the banks of the Ab-i-Karind, and in the gardens the Syrian Pied Woodpecker (*Dendrocopos syriacus*), Great Tit (*P. m. blanfordi*), and Corn Bunting (*Emberiza c. calandra*). I climbed to the crest of the Kuh-i-Nur, S. W. of Karind (8,000 ft.) and saw numbers of Chukor (*Alectoris graeca* sub-species), as high as the ridge, Chaffinches (*Fringilla c. caelebs*) and Yellow Buntings (*Emberiza citrinella erythrogenys*) in flocks up to 7,000 feet and nothing else. It was extremely cold except at midday, but no snow had fallen. From the top one saw ridge after ridge of hills all running N. W. & S. E. and all thinly covered with scrub oak and bushes of various sorts. As I have said many, perhaps most, of the birds of the Zagros forests occur here.

Progress by Ford Van convoy gives plenty of time for collecting but I found exceedingly little between Karind and Kermanshah. I saw four adult Great Bustards (*Otis tardus*) in a little boggy plain at Harunabad among wild liquorice. At Kermanshah I spent seven days (29 Nov.-5 Dec. 1918), and got a number of interesting birds. The margins of the river, the Kara Su, are marshy in places and held duck, common waders, Bittern (*Botaurus stellaris*) and Common Heron (*Ardea c. cinerea*). There were plenty of Ravens (*Corvus corax*) and Sharpe's Crows on the outskirts of the town, and Lämmergeiers (*Gypaëtus barbatus*) were commoner than I saw them elsewhere. Ploughing was in progress all over the country side, but there was a striking absence of birds in the plains: I only saw Sky Larks and a few Crested Larks. In the small wood immediately above the town of Kermanshah I found a most interesting avifauna. Certain birds represented the peculiar fauna of the woods of the Zagros mountains:—the Blue Tit (*Parus caeruleus persicus*), and the Longtailed Tit (*Acredula caudata tephronota*), which is confined so far as Persia is concerned to the S. W.; possibly also the Wren, provisionally ascribed to *Troglodytes t. hyrcanus*, should be identified with the almost unknown *T. t. zagrossiensis*, Zarudny and Loudon, another S. W. Persian form. Other birds of perhaps less interest were abundant. The Blue and Longtailed Tits moved about the wood in association with Persian Great Tits (*P. m. blanfordi*): and *Phylloscopus* sp. Syrian Pied Woodpeckers, Robins, Song Thrushes (*Turdus p. philomelos*), Blackbirds (*T. merula syriacus*), Cetti's Warblers, Grey Wagtails, Woodcock, Common Kingfishers, (*Halcyon smyrnensis*), and Eagle-Owls (*Bubo b. nikolskii*) were all seen several times. From 26th to 28th May, Cheesman was in Kermanshah: he found Common Bee Eaters, Sharpe's Crow and Cetti's Warbler breeding, the last two with young. Between Kermanshah and Hamadan he obtained evidence of the breeding of Caucasian Starling (*Sturnus vulgaris caucasicus*), White Stork, Swift (*Micropus apus pekinensis*), Crested Lark (*Galerida cristata subtaurica*), Black Kite (*Milvus migrans*), Black-headed Bunting, Hoopoe (*Upupa epops epops*). I was at Asadabad for five days in early December 1918, detained by snow on the pass: snow also fell in the camp and broke down some of the tents and we were visited by very severe wind. The only birds I could find were several Starlings (*S. vulgaris* subsp.), and Eversmann's Redstarts (*Phœnicurus erythronota*), one Wren, one Crested Lark, one Little Owl and three Magpies. On the Asadabad pass, and later on the Aveh pass I saw Snow Finches (*Montifringilla nivalis*) between 7,000 and 9,000 feet, on both occasions in December 1918.

At Hamadan (6,000 feet and over) I remained two days, (11th and 12th December 1918), and in spite of brilliant weather only saw Great Tits, Goldfinches (*Car. duelis c. härmsi*), Syrian Pied Woodpeckers, Crows (probably *C. c. sharpei*), and House Sparrows, all common; a few Eversmann's Redstarts, White Wagtails (*M. a. dukhunensis* ?), and Magpies; one Raven and one Crested Lark. It appeared to me that Aveh would be a good centre for collecting; the mountain above it would be accessible, and also the broken red foothills running down to the plain, and a considerable stream: unfortunately I only remained there a few minutes.

Qazvin in December 1918 and January 1919 was most unpleasant, but at any rate showed one which species could endure the cold (down to 10° F. and sometimes 0° F. at night), and the wind, which was sometimes terrific, and the snow of which there was only a little. The following birds were fairly common, Rook (*Corvus frugilegus*), Persian Wagtail (*Motacilla alba persica*) (of which no specimens were obtained), House Sparrow (*Passer domesticus biblicus*), Great Tit (*P. m. blanfordi*), Black Kite (sp ?), Griffon Vulture (*Gyps fulvus*): the following were seen rarely, Raven, Magpie, Grey Wagtail, Goldfinch (*C. c. härmsi*), Common Snipe (*Gallinago caelestis*), Crested Lark, Linnet (*Acanthis linota fringillirostris*) and Chukor: the following once only, Eversmann's Redstart, Syrian Pied Woodpecker, Golden Eagle (*Aquila chrysaetus*), and Song

Thrush. That is to say I only saw a score of birds in thirty days, most of them rarely. The paucity of the winter avifauna may be compared with what McGregor found at Erzerum in midwinter.

I was in Qazvin again from mid-July till the end of October, and concluded that it is an unpleasant place at the best of times, less so in summer than winter. It appears that several birds breed in Qazvin, but leave it before mid-July, that is to say when it become dry and intensely dusty. I never saw the grey-backed Warbler (*Ædon galactotus familiaris*) nor the Black-headed Bunting (*Emberiza melanocephala.*), both of which we know breed here; nor did I see Cuckoos though Cheesman noticed them a few weeks before.

Migration through Qazvin in autumn is not very noticeable, but my observations were rendered incomplete by malaria. No conspicuous movements were observed in spite of the fact that birds were concentrated in the gardens.

Cheesman collected at Tehran and Gulhek (from below 4,000 feet to above 6,000 feet) between 6 and 18 June and found the following species breeding, or feeding fledged young:—Sharpe's Crow, Magpie, Nightingale (*Luscinia megarhyncha africana*), Blackbird (*T. m. syriacus*), Olivaceous Warbler (*Hypolais pallida elceica*), Great Tit (*P. m. blanfordi*), Roller (*Coracias garrulus* sub-sp.), Common Kestrel (*Falco t. tinnunculus*), Scops Owl (*Otus scops pulchellus*), and a number of common birds. He climbed the mountain immediately N. W. of Tehran on 14th June and reached a height of about 12,000 feet. He observed the following birds:—up to 6,000 ft. Cetti's Warbler and *Ænanthe p. pleschanka*; up to 8,000 ft., Nightingale and Blackbird; up to 10,000 ft. Chukor (*Alectoris graeca*); up to 11,000 ft. Rock Sparrow (*Petronia p. exigua*); up to 12,000 ft. Meadow Bunting (*Emberiza cia par*) and Grey-necked Bunting (*E. buchanani*), Red-fronted Finch (*Serinus pusillus*), Shore Lark (*Eremophila alpestris penicillata*), and Red-tailed Wheatear (*Ænanthe xanthopygia.*)

Qazvin was our most northerly station in the Iranian highlands and the terrain was typical of all parts of the plateau which we visited, so that this description would apply almost equally well to the country surrounding Kermanshab, Hamadan, Tehran, or Qazvin. The plateau in these parts of Persia lies between 3,500 and 6,000 feet above sea level; it is crossed by numbers of ranges of mountains running from N. W. to S. E.; these mountains form considerable barriers for they contain no great peaks, but consist rather of wall-like ranges, and are not crossed by any low pass. In spite of this the plateau fauna is very uniform, and so far as we know species are never limited to one or other side of one of these ranges. The plains which lie between these hills are of width varying from five miles (Karind plain) to fifty miles or more. The soil is light and extremely stony and it is fertile wherever water is obtainable: boulders and outcrops of rock do not occur in the plains. Great areas are cultivated as soon as the snow has melted, and at this season there is abundant water coming down from the hill sides in stony bedded torrents many of which are dry for eleven months in the year. The principal crops are barley and wheat and the opium poppy is not grown extensively in the part of Persia which we are considering. A little rice is grown near Qazvin in relatively low-lying places, but I believe only one crop is obtained in the season.

In the spring the whole country is a blaze of wild flowers, a great number of species blossoming simultaneously soon after the Persian New Year's Day (March 25). Insect life is also concentrated at this season, and as I have said some of the summer birds which resort to the plateau to breed appear to remain there the shortest time possible, and depart before the middle of July, presumably as soon as their young are fledged. Before June is out the land is parched and the plants look like herbarium specimens, and they remain in this condition becoming more and more abraded by wind and dust till the rain and snow falls about Christmas time. During summer violent winds and dust devils are

prevalent in many places, and as they are loaded with dust and grit they add greatly to the discomfort of life. Rain and snow fall in winter and spring, and snow lies for weeks on end in January and February except in the lowest parts of the plateau. Apart from precipitation, water is carried from the hills far into the plains by under-ground tunnels known as Qanats, which are constructed by sinking a chain of wells in a line sometimes twenty miles long, and connecting the bottoms of the wells by a nearly horizontal tunnel. The wells are stone lined and frequented by Rock Pigeons and Rock Sparrows. The water channel reaches the surface far out in the plain and irrigates vineyards and groves of trees and gardens. In such places nearly all the European fruits and vegetables are grown. The sides of the irrigation runnels are planted with poplar and plane trees which constitute practically the whole of the timber and wood fuel of the country.

The high dry and stony plateau which I have described is limited on the north by the chain of the Elburz. These mountains are bare and rocky on their south side, but thickly afforested on the north, the side which receives an almost perennial rainfall from the damp winds which blow across the Caspian. The frontier between the forest and the desert is extremely sharply defined and the transition between the two faunas and floras is probably one of the most sudden that can be seen in any country. I was so fortunate as to stop several times at Menjil, a point at which this frontier may be studied. Menjil (alt. 1,200 feet) is in the desert or semi-desert country, but so close to its edge that in two hours one can walk into the forest. I passed rapidly through Menjil in January, but was there for a few days in March and April and also later in the summer. In the fields and among the stones Crested Larks bred; probably Sky Larks, Linnets and Corn Buntings bred also. Choughs were about in flocks, and Griffons, Egyptian Vultures (*Neophron percnopterus*) and Lämmergeiers were fairly common. See See (*A. g. griseogularis*) and Chukor were abundant among the rocks, and I shot the small Rock Nuthatch (*Sitta r. rupicola*) and the larger *S. neumayer obscura* without realizing how interesting they were. Crag Martins (*Riparia rupestris*) and Blue Rock Thrushes were common enough. Thus far the fauna was that of the stony desert and the stony hills of the plateau. But when one entered the forest all these forms were left behind and at once one found such types as the Cole Tit (*Parus ater gaddi*), Nuthatches (*Sitta europæa rubiginosa*), Green Woodpeckers (*Picus viridis karelini*), Meadow Buntings (*Emberiza cia par*), Jays (*Garrulus glandarius hyrcanus*), Blackbirds (*Turdus merula aterrimus*), and Great Tits (*P. m. major*). These are all of them species or sub-species which I had not seen before, and as I afterwards discovered the first four of them are characteristic not of the Caspian forests in general, but of the dry forests only. The great difference between the dry and the wet types of forest has not I think been previously noticed, but so far as the fauna is concerned it is of considerable importance. I saw dry forest near Menjil and also at Noglabar. It grows on the slopes of the hills and generally consists of mixed deciduous trees, (mainly oaks with a few beeches and other trees) scattered rather sparsely over well-drained ground. Flowers are abundant in spring, blue anemones, squills, &c., but in winter the ground is frequently snow covered. The upper limit of this open forest is reached at about 6,000 feet, where it is succeeded by thick beech-scrub. At about 7,000 feet one emerges upon open turf downs with a few juniper bushes.

The great forest which we have now entered may be divided as I have said into dry and wet belts, but this is a secondary matter. It is one continuous forest circling the south end of the Caspian Sea, stretching from near Lenkoran to Asterabad without interruption and presenting in every way a most marked contrast to the desert region. It is scantily wooded on the hills, densely in the maritime plain, and watered by a heavy rainfall distributed through most of the months of the year.

A list of nearly three dozen birds can be made out, each represented by a different sub-species in the plateau and the forest. Generally the desert race is pale or buff, as is so often the case. The forest race is either that typical of central Europe, or dark and saturated in colour.

The road north from Menjil runs through dry forests past Noglabar until the lowest of the foothills is passed, and before it reaches Resht it enters the wet forest. This covers the flat country and grows from wet and frequently black water-logged ground. Its altitude is very little above the Caspian level and it is probably all of it below mean sea level. The trees are more luxuriant, more closely packed and more covered with creepers than those in the dry forest. In fact the general appearance is not unlike that of a tropical rain forest in Equatorial Africa or the West Indies, until one examines the great trees and finds that they belong to well-known European genera (*Fagus*, *Alnus*, &c.) and that the creepers which climb high into their crowns are such well-known things as *Clematis*, *Rubus* and *Smilax*. The wet forest is never under snow for more than a few hours, though Woosnam encountered 2 feet of snow at Resht in the first week of February. The men who inhabit this region of wet forest raise great quantities of rice and deep-cut irrigation channels run in all directions; these and the denseness of the forest and the intense wetness of everything make exploration difficult. Until the war there was an extensive silk raising industry, and plantations of mulberry are common. Oranges and lemons are grown here in profusion, also cherries and large garden strawberries: there are one or two experimental tea gardens. It appears that conditions are uniform as regards climate, vegetation and animal life along the whole S. W. & S. shore of the Caspian, and Satunin's (1905) account of the low-lying marsh and forest of the Talish is true in all essentials of Gilan and probably Mazandaran. Apart from the forest there are the lagoons, of which there is a fine example between Resht and Enzeli. The water is brackish near the sea, but fresh on the Resht side. The lagoon is fringed by reed beds and bramble thickets and in places the shore is flat and muddy. Similar lagoons are found here and there all along the coast; some are a few acres only in extent and are blocked with reeds, others like Asterabad Bay and the Resht-Enzeli lagoon are ten or twenty miles across. They are all at Caspian Sea level and in the majority of cases lie a few hundred yards back from the shore. Between the lagoon and the sea is a tract of grazing land with scattered low trees of the thorny *Gleditschia*, Whitethorn, Medlar, &c. The actual sea coast at Enzeli, but not on the Talish is bounded by sand-dunes.

I myself spent seven months at Resht and Enzeli and travelled along the coast from Astara to Enzeli: Cheesman was in Enzeli in June: Ingoldby was in Resht and Enzeli in the winter and also at Bandar-i-Gez in Asterabad Bay. Our ornithological results were frankly disappointing. This was in part due to a so-called war with Kuchik Khan, a local insurgent; this war lasted through the spring and prevented one from leaving Enzeli during the nesting season: but apart from this the dense forest resembles similar country in most other parts of the world and has an extremely poor fauna, at any rate in summer. We saw enough of the lowlands and the wet forest to feel confident in recommending travellers to get quickly away from Resht and Enzeli. The wet forest is now fairly well known, not as a result of our work only, but of that of Zarudny and of Woosman (Witherby 1910). The dry forest is more attractive and less known and this applies particularly to the Talish hinterland, which would be most interesting country to visit. The Talish tribesmen have a bad name and speak an almost unknown language, but I formed the opinion that they would give little trouble if they were sure that the traveller were neither a Persian official nor a Russian.

The following birds are all more or less common, and all resident round Resht and Enzeli; they indicate the extremely European nature of the fauna — Sharpe's Crow, Magpie (*P. p. bactriana*), Jay, Chaffinch, Tree Sparrow (*Passer*

montanus transcaucasicus), Great Tit (*Parus m. major*), Blue Tit (*Parus cœruleus raddei*), Long Tailed Tit (*Acredula caudata alpina*), Robin (*Erithacus rubecula hyrcanus*), Song Thrush, Blackbird (*Turdus merula aterrimus*), Wren (*Troglodytes troglodytes* sub-sp. ?), Great Spotted Woodpecker (*Dendrocopos major palzami*), Black Kite, Sea Eagle (*Haliaëtus albicilla*), Tawny Owl (*Strix aluco*), Pheasant (*Phasianus colchicus talyschensis*). The commonest winter visitors in the forests are the Rook, Starling (*Sturnus vulgaris caucasicus* and *poltaratskyi*), Goldfinch (*Carduelis c. loudoni*), Fieldfare (*Turdus pilaris*), Robin (*E. r. caucasicus*), and Woodcock (*Scolopax rusticola*). The following species are summer visitors and breed:—Osprey (*Pandion haliaëtus*), Hobby (*Falco s. subbuteo*), Roller (*Coracias garrulus* sub-sp. ?), Swallow (*Hirundo rustica*) Nightingale (*Luscinia megarhynchos africana*), Olivaceous Warbler (*Hypolais pallida elæica*), and Red-backed Shrike (*Lanius collurio*).

In the reed beds around the lagoons the Common Cormorant (*Phalacrocorax carbo*) and the Little Grebe (*Podiceps ruficollis capensis*) are common and resident, also Montague's Harrier, Gallinule (*Porphyrio poliocephalus seistanicus*), Common Heron, three or four other Herons in all probability, and the Moustached Sedge Warbler (*Luscinia melanopogon mimica*). The Common Kingfisher (*Alcedo atthis pallasii*) is resident and breeds round the margin of the lagoons. In summer the Purple Heron (*Ardea purpurea*) comes to the reed beds and no doubt breeds, as also does the Great Reed Warbler (*Acrocephalus arundinaceus zarudnyi*). Some of the islands in the lagoon have extensive bramble bushes among the rough grass, and in these bushes the Large-billed Reed Bunting, (*Emberiza pyrrhuloides korejewi*), and the Reed Warbler (*Acrocephalus scirpaceus macronyx*), and the Black-headed Wagtail (*Mo'acil'a flava feldeggii*) make their nests. In winter the lagoon and its surroundings were alive with fowl. On the open water and in the smaller marshes were immense numbers of duck, geese and gulls, the species of which are dealt with in the second part of the paper; also Coot (*Fulica atra*), Great Crested Grebe (*Podiceps cristatus*) and Pygmy Cormorants (*Phalacrocorax pygmaeus*); on the mud banks small waders of various sorts were never very common and never interesting; in the marshes and paddy fields one found hosts of Common Snipe, and large numbers of Jack Snipe, and in the reed beds the most abundant bird was the Common Reed Bunting (*Emberiza s. schœniclus*). The open sea was generally thickly spattered with duck in winter, specially the diving and maritime ducks: the sandy shore was at all seasons disappointing. At any time of year it held Sea Eagles and Common Cormorants, and on migration small numbers of waders, generally common species, rested on it. The Lesser Ringed Plover (*Charadrius dubius*) bred just above the level of the sea water on sand with a few small pebbles.

I shall now discuss the species individually.

Corvus corax, L.—The Raven was common round towns and villages from Karind to Manjil in winter. In spring it retreats to the ranges of hills in which it remains common. It was never seen North of Manjil at any season. The specimens I obtained have failed to reach home.

Corvus cornix cornix, L.—Hooded Crow.

1 ♂, Qazvin—31st December 1918.

1 ♀, Resht—23rd February 1919.

The Hooded Crow is no doubt a winter visitor to the S. shore of the Caspian. I also saw it in mid-winter at Qazvin, and I believe that mixed flocks of this and Sharpe's Crow occurred there at that season.

Zarudny records the Hooded Crow as resident in the Caspian Provinces of Persia. I think that this must be an error, for we know that Sharpe's Crow occurs there, but it is exceedingly desirable that some one should obtain a series of breeding birds from the Caspian littoral and the plateau. (Wing 310 mm. ♂; 300 mm. ♀; culmen 52 mm. ♂; 50 mm. ♀).

Corvus cornix sharpii, Oates.—Sharpe's Crow.
Imm. ♀ 8th June, Gulahek, Teheran. (R. E. C.)
Iris blue-grey, feet black, bill grey-horn.

I have re-examined Woosnam's specimens from the South coast of the Caspian, shot in March. Witherby is undoubtedly correct in identifying them as *C. c. sharpii*. I take it then that the grey Crow breeding in the Caspian Provinces is Sharpe's and not the Hooded Crow, in spite of Zarudny's statement that *C. c. cornix* is resident here. Crows which I believe were *C. c. sharpii* bred commonly at Enzeli—lining nests 14 March, several nests still empty 10th April, feathered young fell from nest 27th April. Young were flying about in numbers by the end of May. In the plateau Cheesman found young fledged in nest 25th May, Kermanshah, and saw them flying about 6th June, Teheran. We do not know where the boundary lies between the breeding ranges of *C. c. sharpii* and *C. c. capellanus*, which breeds in Mesopotamia, and which is always associated, in my mind at any rate with the Date Palm.

Corvus frugilegus, L.—Rook.

A very few small parties of rooks were seen between Kermanshah and Qazvin in December 1918. At Qazvin they breed in numbers in the town, in plane and poplar trees: presumably these rooks are *C. f. tchusii*, Hart., but no skins are available. The rook is abundant at Qazvin at all seasons.

Rooks are abundant at Resht and Enzeli in winter. They completely disappeared in the second half of March.

Colæus monedula, L.—Jackdaw.

Jackdaws appeared at Qazvin on 18th October 1919. They were completely absent in summer, and by no means common in winter. I never saw them between the frontier and Hamadan in November and December 1918.

The specimens seen appeared to belong to the race generally known as *collaris* (Drummond), a name which must be replaced by the earlier *Sæmmeringi* (Fischer).

Pica pica bactriana, Bp.—Magpie.

1 ♂, Karind—November 1918.

2 ♀, Resht—January February.

The Magpie was seen in all parts of Persia which we visited, from the frontier to the Caspian. It was common in most of the gardens and small woods of the plateau, and extremely common in Gilan; in all places it appeared to be resident. Besides these specimens I have had the pleasure of examining a series of twelve Magpies collected by Lieut-Col. J. E. B. Hotson, at and near Shiraz. The wings of the males measure 198-208 mm, of the females 196-209 mm, and one exceptionally small specimen 188; my male from Karind measures 207, and one female from Resht 190. It is evident that the great development of white in the primaries is a more constant character than the broadly white rump: the presence or absence of white at the bases of the chin feathers is very variable, and useless as a sub-specific character. Though Magpies are to some extent variable birds it should always I think be possible to separate *P. p. bactriana* from the typical race, even if only a single skin is available. Zarudny records the Magpie of N. & W. Persia (the Caspian Province included) as "*P. pica*", that of S. & E. Persia as *P. p. bactriana*, but my Resht specimens appear to be definitely *P. p. bactriana*.

Garrulus glandarius hyrcanus, Blanf.—Jay.

1 ♀, 19th February (Wing 159 mm.) Resht.

1 ♂, Tula Rud, Persian Talish, sea level, 6th July (wing 173 mm).

I found the Jay of Gilan and Mazanderan common in the dry forests on hillsides at Menjil, and Noglabar; also in the wet forests round Resht and in the equally wet forests of the Persian Talish below mean sea level.

G. g. hyrcanus is quite different from *G. g. caspius*, but their distribution is very puzzling. We have skins of *hyrcanus* from Mazanderan shot as high as 6,500 ft. by Blandford (Brit. Mus.) and we know it occurs also as low as the shores of the Caspian. Westwards it is common in many parts of Gilan, and I obtained it at Tula Rud, in the Persian Talish; Satunin (1912) recorded this sub-species from the Russian Talish; now the Russian and Persian Talish forms one forest, continuous with the forests of Gilan and Mazanderan.

Satunin states that *G. g. caspius* and *G. g. hyrcanus* have "different distribution in altitude in the Russian Talish"; but does not state which occurs above the other. However we know from my specimen that *G. g. hyrcanus* occurs at sea level in the Persian Talish, so we must presume that *G. g. caspius* is a bird of the high-lying forests of the interior. This is curious if it is the case, for as I have said *G. g. hyrcanus* occurs as high as 6,500 ft. in Mazanderan. *G. g. caspius* is unknown in Persia except for Zarudny's vague statement that it is a "rare resident" in the region South of the Caspian, or apparently from anywhere except "Lenkoran", the type locality. The only skins of *G. g. caspius* I have been able to examine (one at Tring, two at Brit. Mus.) were obtained from the dealer Tancrè many years ago, and are labelled "Lenkoran." They may of course have come from almost any distance up country.

Pyrhcorax pyrrhcorax—(L.) Common Chough.

1 ♀, Menjil—22nd March.

The Common or Red-billed Chough is apparently resident in places where there are high crags; Kermanshah and Menjil (P. A. B.) and Bisatun, 28th May (R. E. C.). The wing of this female measured 288 mm., the culman 49. mm. The Alpine or Yellow-billed Chough was never seen.

Pastor roseus (L.)—Rosy Pastor.

1 ♂, 2 ♀. Enzeli.—2nd May.

1 ♂, Enzeli.—14th June.

2 ♂, Qazvin—19-20 June (R. E. C.)

Rosy Pastors appeared at Enzeli on 2nd May 1919 in flocks which consisted of adult males and females. These small mixed flocks remained about until 18th June. The testes of the males shot on 2nd May and 14th June were very large, and the ovaries of the females (2nd May) slightly enlarged. Presumably the birds bred locally, but I entirely failed to find any evidence of their doing so. Cheesman's males from Qazvin also had greatly enlarged testes though they were shot from flocks consisting of adult males and females, which were eating the white mulberries. At the end of July I saw large flocks of old and young birds in gardens at Qazvin. It is surely very unusual for males and females of any bird to be in flocks, at the actual breeding season. Mr. Stuart Baker informs me that males and females of the common Indian Mynah (*Acridotheres tristis*) flock in the early morning and late evening, even in the breeding season, and that the Bank Mynah (*A. ginginianus*) does the same.

Sturnus vulgaris caucasicus,—Lorenz. Starling.

2 ♂, 2 ♀. Resht—January February.

2 ♂, Enzeli—15th March.

1 ♀, 1 imm. Kangavar—28th May (R. E. C.).

1 ♀, Qazvin—20th June (R. E. C.).

S. v. pollaratskyi, Finsch.

1 ♀, Enzeli—15th March.

All my Starlings have been submitted to Dr. Hartert, who has determined them as above. In winter Starlings are common in flocks at Qazvin and fairly common at Resht and Enzeli: the last date on which I saw them in the latter places was 20th March. They were entirely absent until 25th June when flocks of adults and young appeared. Cheesman found *S. v. caucasicus* breeding at Qasr-i-Shirin, and feeding fledged young at Kangavar on 28th May. He

also saw flocks of adults and juveniles at Qazvin on 20th June. A series of breeding birds from any part of Mesopotamia or Persia is particularly desirable, as a large number of very closely allied local forms have been described and at present we know very little about the variation of this species in any one locality.

Chloris chloris chloris (L.)—Greenfinch.

1 ♂, Noglabar—3rd March.

Greenfinches were common round Noglabar in early March and were "singing". I have no other record. The specimen agrees exactly with the typical sub-species, which Zarudny has already recorded as resident in N. W. Persia and the Caspian Provinces.

Carduelis cannabina fringillirostris (Bp. and Schl.) (?)—Zinnet.

4 ♂, Qazvin—December 1918 and January 1919.

A race of the Linnet was not rare at Qazvin in December 1918, and January 1919 small flocks sheltering from the terrific wind in corners of gardens and similar places. I saw Linnets at Resht in the winter and found them preparing to breed at Menjil 7th April.

Zarudny records both *C. cannabina fringillirostris* and *C. c. cannabina* as breeding birds in many parts of N. Persia, from the N. W. to Khorassan. Hartert does not record *C. c. cannabina* in Asia at all. These birds are all much paler on the upper parts than winter skins from Britain and Western Europe, and can at once be separated from such skins. The wings measure only 81, 81, 82, 84 mm., which is less than the usual measurements of *A. c. fringilli rostris*, to which race however I refer them by reason of their colour.

Carduelis carduelis härmsi (Zarudny).—Goldfinch.

2 ♀, Hamadan—12th December 1918.

1 ♂, Menjil—March.

Carduelis carduelis loudoni, Zarudny.

4 ♂, 2 ♀, Resht.—January-February.

Goldfinches were fairly common in winter at Karind, Hamadan and other places along the road through the plateau; they frequented gardens and were generally seen in quite small parties, or even a pair only. They belonged no doubt to the race which breeds in the plateau, and which Cheesman saw feeding fully fledged young at Taq-i-Girreh, on 24th May. I also found the same race at Menjil early in April in small flocks in the olive trees. Goldfinches are reported to breed quite commonly at Qazvin. At Resht an entirely different race of Goldfinch is found in the winter, frequenting the wet pastures in flocks numbering many hundreds and often thousands. Most of these flocks left Resht in the middle of March, but I saw one party at Enzeli as late as 14th April.

There is not the least difficulty in separating these two sub-species, the one which we believe to be resident in the plateau, and the other which occurs in huge flocks in winter round Resht. The first is small, the wings of the females from Hamadan measuring 75-76 mm., of the male from Menjil 77 mm.; the colour of the back is grey-brown, and the rump grey, not white; one encounters great difficulties when one attempts to unravel the nomenclature of the Persian Goldfinches in order to name this race. Dr. Hartert is of opinion that they are probably *Carduelis c. härmsi*, Zarudny, described from specimens shot at Baku in April; I have seen no specimens from Baku, but at any rate for the present this name may be accepted for the plateau Goldfinch. The synonymy of this race is complicated by the fact that Zarudny first described it as "*Carduelis elegans brevisrostris* or *C. elangans minor*" (1889); in 1893 he referred to it as *Carduelis minor*, Zarudny; and in 1911 (b) he renamed it *Acanthis härmsi*, because the names *brevisrostris* and *minor* were both pre-occupied in the genus. As it is a sub-species of the Common Goldfinch we must speak of it as *Carduelis c. härmsi*. The second race that which occurs at Resht in winter, is very similar to *C. c. carduelis* both in size and in the colour of the back, but

the patches on the sides of the chest are dull brown, not red brown, and the red of the head is a crimson red, not a fiery red as it is in the type. In both these respects my specimens agree exactly with a short series labelled "*C. c. loudoni*, Zarudny" and collected by Baron Loudon himself in winter in the Russian Talish, a forest district close to the Persian frontier, on the S. W. side of the Caspian. The identity of this second race seems definitely established, if we can presume that Baron Loudon knew the race named *loudoni* by Zarudny. My specimens of *C. c. loudoni* have wing measurements as follows: 4♂ 77-81 mm. 2♀ 77, 78 mm. Three males collected by Loudon in the Persian Talish measure 79·5-81 mm., one female 76·5. It is to be hoped that members of the Society stationed in Persia will lose no opportunity of collecting long series of Goldfinches at every time of year. At present it is well nigh impossible to identify our specimens owing partly to the lack of others for comparison, partly also it must be owned to the number of races which have been described by Zarudny. Apart from the races to which I have referred this author has described *blanfordi* and *iranensis* from parts of Persia, and in his paper published in 1911 he adds "*C. carduelis*, *C. c. volgensis*, *C. c. major*, *C. minor*, *C. orientalis* and *C. caniceps orientalis*" to the forms which either migrate through or winter in various parts of Northern Persia. Small wonder that sub-species are in bad odour in certain quarters!

Serinus pusillus (Pall.) Red-fronted Finch.

1♂, Elburz Mountains near Tehran, 16 June (R.E.C.).

The Redfronted Finch probably breeds in all the gorges and bushy valleys of the Elburz. We do not know if it is there in winter. I saw it at about 3,000 feet near Menjil on 27 March, Cheesman up to 12,000 feet in the mountains just behind Tehran on the 16th June, "feeding on low ground plants near mountain spring—crop and gizzard full of white kernels of seeds." (R.E.C.)

Fringilla cœlebs cœlebs, L.—Chaffinch.

1♂, Kermanshah—30th November 1918. Wing 86 mm.

1♂, Resht.—26th February. Wing 92 mm.

1♂, Enzeli—14th June. Wing 85 mm.

1♂, Enzeli—30th June (R. E. C.) Wing 85 mm.

The Chaffinch was common above Karind up to 7,000 feet on 26th November 1918, also at Kermanshah. I did not see it at Hamadan or Qazvin in midwinter. In the lowlying Caspian Provinces it is abundant in winter (Resht, Enzeli) but the great majority leave in the last part of March. No nests were found, but the males shot on 6th June and 30th June (R.E.C.) were in full song with much enlarged testes. I saw a large family party at Astara, in the Talish district, on the Caspian littoral, on 3rd July.

Montifringilla nivalis (L.)—Snow Finch.

I saw Snow Finches in December 1918, always above 7,000 feet, on the Asadabad and Avah Passes. It is interesting to see how high this bird remains even in winter in spite of the snow and the wind.

Petronia petronia exiguus (Hellm.).—Rock Sparrow.

1♂, 1♀, Tochal, Elburz Mts. near Tehran, 16th June. (R.E.C.).

This race of the Rock Sparrow was observed by Cheesman breeding in high cliffs, at from 8,000—11,000 feet. The wings measure ♂ 100 mm. and ♀ 98 mm, so that the measurement agree with *P. p. exiguus*, which has already been recorded by Zarudny and Härms (1913) from this part of Persia, but not other parts; it is the form which occurs in the Caucasus and Armenia.

Carpospiza brachyactyla, Bp.—Desert Rock Sparrow.

The Desert Rock Sparrow was noticed by Cheesman at Taq-i-Girreh, "evidently breeding" on 24th May.

Passer domesticus domesticus (L).—House Sparrow.

2 ♂, 1 ♀, Enzeli. March.

Passer domesticus biblicus, Hartert.

7 ♂, Qazvin—January.

1 ♀, Qazvin—January.

The House Sparrow of the South Coast of the Caspian except perhaps the Eastern end, belongs to the typical race. Apart from the above 2 ♂, 1 ♀, I have examined 4 ♂, 1 ♀ in the British Museum collected by St. John and by Woosnam. Wing of males measure 74-77 mm. and all are grey cheeked with the exception of one ♂ collected by Woosnam on the "S. Coast of the Caspian Sea." As Woosnam traversed the coastal country as far east as Bandar-i-Gaz in Astera-bad Bay, this single white cheeked specimen (wing 75), may have come from the extreme S. E. Caspian. Hartert (p. 148) suggests that in Transcaspia we may find intermediate stages between *P. d. domesticus* and *P. d. indicus*. It will be seen that I disagree with Witherby (1910) who records Woosnam's specimens as *P. d. indicus*. Zarudny (1913) has already recorded *P. d. domesticus* and intergrades between it and *P. d. indicus* from Gilan and Mazandaran.

The House Sparrows collected at Qazvin from flocks frequenting stables in midwinter are larger than those from Gilan. The whole upper surface is much more unicolorous than that of either *P. d. indicus* or *P. d. domesticus* at the same time of year. In this respect they agree with winter skins from Palestine, and as their wings measure 79-83 mm. (average 80.25 seven males) I record them without hesitation as *Passer domesticus biblicus*, Hartert, a bird at present only known from Syria and Palestine. Zarudny records *P. d. indicus* as the prevalent sparrow in N. W. Persia exclusive of the Caspian littoral. His paper was published before Hartert described *P. d. biblicus* but he should have avoided this error as the sparrow of this region is grey-cheeked and large. *P. d. indicus* is small and nearly always white cheeked. House sparrows are common but not abundant in the towns of North Persia. I never saw any sign of their interbreeding with the Spanish Sparrows near Enzeli. I have already recorded (1920) that hen House Sparrows were feeding their young near Enzeli on the very prevalent larvæ of the painted Lady Butterfly (*Vanessa cardui*); one might have supposed that so spiny a larva would be distasteful, but they appeared to choose it in preference to other abundant insects.

Passer hispaniolensis transcaspicus, Tschusi.—Spanish Sparrow.

1 ♂ Enzeli—March.

The Spanish Sparrow was resident at Enzeli, but only in very small numbers: it frequented isolated fisherman's huts along the sea shore.

Passer montanus transcaucasicus, Buturlin.—Tree Sparrow.

2 ♂, Resht—February.

1 ♂, Enzeli—June.

1 ♂, Enzeli.—June (R.E.C.).

This race of the Tree Sparrow was described by Buturlin (1906) from Akhal-zikh. Zarudny and Härms (1913) state that the Tree Sparrow found all along the S. shore of the Caspian from Lenkoran to Bandar-i-Gaz belongs to this race. I have compared the above three specimens, also three collected by Woosnam on the S. coast of the Caspian, and one from the Tortum river between Eizerum and the Black Sea with a large series of the typical race. I find that they certainly are paler on the back when seen in series, but that the difference is very slight and that there is some overlapping. I can detect no difference between the two sub-species in size of bill, but the wings of these specimens are short

(wings of males from Caspian provinces 66, 68, 69, 69, 69, 72 mm, female 68). A female from Tortum River 66. Hartert gives ♂ 73-76, ♀ 69-72 as measurements of *P. m. montanus*. I have not been able to compare these N. Persian skins with any from Caucasia, and provisionally refer them to *transcaucasicus*, Buturlin, relying on Zarudny and Härm's identification.

Tree Sparrows are locally common round Enzeli and Resht, and breed.

Emberiza calandra calandra, L.—Corn Bunting.

1 ♀, Resht—January.

The Corn Bunting was seen at Karind in November 1918, and at Resht and Enzeli in occasional small flocks from January to March. At Menjil on 7th April it appeared to be paired; I found no nest, and was not in the locality later in the month.

Emberiza citrinella erythrogeus, Brehm.—Yellow Hammer.

2 ♂, 1 ♀, Resht—January-February.

1 ♂, Karind—November 1918.

This eastern race of the Yellow Hammer was first met with at Karind where I found small flocks at the end of November. At Enzeli and Resht it is common in winter, but I never saw it after the end of February. Zarudny states that it breeds in the Caspian Provinces of Persia.

Emberiza melanocephala, Scop.—Black-headed Bunting.

1 ♂, Karind—25th May (R. E. C.).

Cheesman saw the Black-headed Bunting in May at Karind and found a nest ready for eggs at Hamadan on the 30th. He also noted it as breeding at Teheran. I was at Qazvin from mid July until the autumn and never saw the bird.

Emberiza hortulana, L.—Ortolan.

3 ♂, Enzeli—28-30th April.

Small flocks of male Ortolans appeared at Enzeli on 28th April. Both sexes were common in the bushes among the sand dunes till mid May, after which I never saw them. They very likely breed on the slopes of the Elburz, but I do not think do so in the lowlying coastal country.

Emberiza buchanani, Blyth.—Grey-necked Bunting.

(*Emberiza huttoni*, Blyth.)

1 ♂, Tochal, Elburz Mountains, near Tehran, 16th June (R.E.C.).

I never met the Grey-necked Bunting. Cheesman's notes are:—"sings on rocks, twice on one note then 2 or 3 times on a lower note easily recognized as a bunting song. Several seen at 12,000 ft., but not at lower elevations, and only on bare mountain side with rocks and low vegetation. In distance is indistinguishable from *E. hortulana*: organs advanced, apparently breeding."

Emberiza cia par, Hartert.—Meadow Bunting.

2 ♂, Menjil—27th March.

1 ♂, Menjil—15th July.

1 ♀, Elburz Mts., Tehran 12,000 ft., 16th June. (R.E.C.)

I found this race of the Meadow Bunting above Menjil, both in open oak forest and also above the tree-line among Juniper bushes (7,000 ft.). The birds were paired, 27th March. Cheesman's specimen was shot at 12,000 ft. and contained "an unformed egg in the ovary. Iris brown, bill dark horn, legs light horn."

The specimens agree with the type of *E. cia par* at Tring.

Emberiza schœniclus schœniclus (L.) Common Reed Bunting.

1, 2 ♀, Resht and Enzeli. February.

The Common Reed-Bunting was common in reeds and bramble bushes round the lagoons in winter. The birds disappeared during the last fortnight in March

and had not apparently returned when I passed through Enzeli on 31st October. These specimens have been examined by Dr. Hartert who says he cannot separate them from typical *E. s. schanichus*.

Emberiza pyrrhuloides korejewi (Zarudny).—Large-billed Reed Bunting.

3 ♂, 2 ♀, Enzeli—18th April-27th June.

2 ♂, (1 imm.)—Enzeli 28th June.

This race of the Large-billed Reed Bunting, which is already known from Seistan and Syria, was first noticed at Enzeli on 17th April. The birds frequented bramble bushes on the reedy islands of the Enzeli lagoon and were common. I took a clutch of 5 eggs half incubated on 27th June and next day Cheesman shot a young male in first plumage. This clutch has been described by Jourdain (1920). Zarudny only records *E. p. korejewi* from Seistan and S. Baluchistan. He records the typical race as resident on the Caspian littoral. Dr. Hartert has however compared my specimens with some collected by Zarudny himself in Seistan and refers them to *E. p. korejewi*.

Ammomanes deserti, sub-sp? —Desert Lark.

1 ♀, Qasr-i-Shirin—24th November 1918.

This species of Desert Lark was quite abundant at Qasr-i-Shirin at the time of my visit. I never saw it elsewhere.

The single specimen obtained is quite unlike any in the British or Tring Museums. It is closest to *A. d. fraterculus*, Tristr., but is not so pale as that in the same plumage, and the underside and wing coverts in my bird are very much redder; the bill is very short and thick. A specimen collected by Woosnam in April at Ram Hormuz in S. W. Persia is indistinguishable from *A. d. fraterculus* from Palestine, and this form also occurs at Takrit, R. Tigris, in summer (C. B. Ticehurst.).

Galerida cristata subtaurica, Kolibay.—Crested Lark.

2 ♂, 1 ♀, Menjil—April, (breeding).

1 ♀. Hasanabad—29th May, breeding (R. E. C.).

2 ♂, 2 ♀. Qazvin—December 1918, and January 1919.

1 ♂, Qasr-i-Shirin—24th November 1918.

The specimens of the Crested Lark agree completely with two in the Tring Museum from Eregli in the Cilician Taurus. Crested Larks from Eregli have been described by Kollibay (1912) as *Galerida cristata subtaurica*.

These specimens show that *G. c. subtaurica* is intermediate in size and in colour between *G. c. caucasica*, Tacz (Lagodechi, Caucasasia) and *G. c. magna*, Hume (Yarkand). It is darker than *G. c. magna* with the feathers of the crown and back more darkly centered; the streaks on the breast and sides of the neck are also heavier than in *magna* at the same time of year. On the other hand the general tone is brown and buff as in *magna*, not grey as in *caucasica*. The ♀ bills of *subtaurica* in dried skins are much darker than they are in *magna*.

Dimensions: wings 5 ♂ 105-114 mm. (average 109) 4 ♀ 100-103 (average 101). length of bill ♂ 16-17.5, ♀ 14.5-16.5: of *G. c. magna* ♂ 15.5-18.5, ♀ 16-18 mm. and *G. c. caucasica* ♂ 15-17, ♀ 15-16 mm.

Zarudny noticed that the Crested Lark of N. W. Persia was different from *G. c. magna* in Eastern Persia, but he made the mistake of identifying it with *G. c. caucasica*. Woosnam's specimens from Shalamzar, S. W. of Ispahan, and from the Elburz Mountains are in the British Museum: they undoubtedly belong to *G. c. subtaurica*. Witherby (1907, 1910) recorded them as *G. c. magna*, a very natural mistake to make when skins from Western Asia were even scarcer than they are now. On the other hand Witherby's skins from Fars (Witherby 1903) and Woosnam's from Ahwaz (Witherby 1907) are certainly not *G. c. subtaurica* and his identification of them as *G. c. magna* can probably rest, for the moment at any rate. So far as we know therefore *G. c. subtaurica* occurs in N. W. and W. Persia, but not in other parts of the country.

The Crested Lark was present and generally common at all the places we visited in Persia, with the exception of the forests of Gilan and Mazandaran. I once saw a small party at Resht, in January. It is tempting to suppose that they were winter migrants of *G. c. caucasica*, Tacz, from Transcaucasia; at any rate I am sure that the Crested Lark is not a resident in the wet country round Resht. Even in the windiest weather in mid-winter this bird can still be found in the desert round Qazvin. I found a nest with four eggs, the bird sitting at Menjil on 31st March; Cheesman noticed it "obviously breeding" at Hassana-bad on 29th May.

Alda arvensis cinerascens, Ehmcke.—Eastern Sky Lark.

1 ♂, Qasr-i-Shirin—24th November 1918.

1 ♂, Enzeli—1st March.

1 ♀, Menjil—7th April.

1 ♀, Enzeli—15th October.

The Eastern Sky Lark was observed in November and December at many places between Qasr-i-Shirin and Qazvin; in the higher places, Hamadan and Qazvin it is distinctly rare at this time of year. I never saw the species at Resht or Enzeli in the winter, but on 1st March small parties appeared on the shore at Enzeli and in mid-October they were again common at the same place. The bird does not breed in the low country which borders the Caspian. I saw numbers of pairs of Sky Larks at Menjil on 7th April, and they were certainly breeding among the young wheat, but I did not find a nest. The female shot had an enlarged ovary.

Eremophila alpestris penicillata (Gould).

1 ♂, 1 ♀ Elburz Mountains, near Tehran, 16th June (R. E. C.).

One pair noticed among low plants on bare mountain side, 12,000 ft., organs advanced, two half-developed eggs in ovary of females. These exceedingly worn skins belong to *E. a. penicillata* (Caucasus and Asia Minor) and not to *E. a. albigula* (E. Persia &c.); those in the British Museum collected by Woosnam in the Elburz and at Ardal, S. W. of Ispahan, and in the Feridan district N. W. of Ispahan are also *penicillata*. The presence of this bird in Western Persia has already been recorded by Zarudny and by Witherby (1910), but Hartert only records it from the Caucasus and Asia Minor.

Anthus pratensis (L.)—Meadow Pipit.

1 ♀, Qazvin—1st January.

2 ♂, Resht—January-February.

1 ♂ Menjil—1st April.

The Meadow Pipit is fairly common in rice fields and pastures round Resht in January and February. The last I saw was on 1st April at Menjil. I also saw the bird once at Qazvin in January.

Anthus cervinus (Pall.)—Red-throated Pipit.

1 ♂, Enzeli—27th April.

I saw Red-throated Pipits in full breeding plumage on 27-29th April among flocks of various subspecies of Yellow Wagtails. Very few were seen.

Motacilla flava feldegg, Michahelles (*melanocephala*, Licht.)—Black-headed Wagtail.

1 ♂, Enzeli—28th April.

1 ♂, Enzeli—28th June (R. E. C.) (breeding).

The specimens are definitely *M. f. feldegg* and not *M. f. melanogrisea*.

I saw two or three Black-headed Wagtails at Enzeli on 17th March. I never saw them again till 28th April when one male appeared among the thousands of *M. f. campestris*, *beema*, and *thunbergi* which had then been frequenting the

sandhills for a week. Through May I occasionally saw them amongst the other sub-species and at the end of May they were obviously nesting among brambles on the reedy islands of the Enzeli lagoon. Several pairs bred without the least doubt, but I never found the nest. Cheesman shot one of the males on 28th June, the testes were enlarged.

Motacilla flava campestris, Pall.—Yellow Wagtail.

6 ♂, Enzeli—17-27th April.

M. f. beema, Sykes.—Grey-headed Wagtail.

3 ♂. Enzeli—22-24th April.

M. f. thunbergi, Billberg (*viridis*. Gmelin, *borealis*, Sund).—Sykes' Yellow Wagtail.

5 ♂. Enzeli—24th April.

In the last ten days in April huge mixed flocks of the Yellow-headed, Grey-headed, and Sykes' Yellow Wagtails appeared on the sandhills and grazing grounds round Enzeli. *M. f. campestris* was the commonest, *M. f. beema* and *M. f. thunbergi* both common. About $\frac{3}{4}$ or $\frac{4}{5}$ of the total number of birds were males. These flocks continued to pass through Enzeli throughout May. By 25th May $\frac{3}{4}$ of the whole were females of various sub-species; among the males *M. f. thunbergi* was commonest, *M. f. beema* common and *M. f. campestris* quite uncommon. A few Yellow Wagtails (*M. flava* sub-sp.) passed through Qazvin 7th September and onwards.

Motacilla cinerea, Leach.—Grey Wagtail.

Grey Wagtails are not rare in winter both in the uplands (Kermanshah November 1918. Qazvin December 1918 common) and in the low country round Resht. They were last seen round Resht in the third week in March. Cheesman saw one male at Gulahek, Tehran on 11th June. No specimens were obtained.

I do not know to which race the specimens seen belonged. Zarudny records the Western *M. cinerea cinerea* (*M. b. boarula*) and *M. c. melanope* (*M. boarula melanope*) from various parts of Persia, the first mentioned as a breeding bird.

Motacilla alba alba, L.—White Wagtail.

1 ♂, Menjil—1st April.

1 ♀, Enzeli—27th April.

M. alba dukhunensis, Sykes.

1 ♀, Qazvin—16th December 1918.

1 ♂, Qazvin—4th January.

2 ♂, Resht, and Enzeli—February March

1 ♀, Qazvin—1st September

M. alba persica, Blanf.

1 ♂, Tehran to Qazvin Road—18th June (R. E. C.).

1 ♂, Qazvin—1st September.

The correct identification of White Wagtails is always a difficult matter. *M. alba alba*, the ordinary "White Wagtail", is probably a migrant on spring and autumn passage. *M. a. dukhunensis* was the commonest form, and was seen in winter all the way from the Mesopotamian border through Kermanshah and Hamadan to Qazvin and on to Resht and Enzeli. At the last two localities it was not common in winter, but it became more frequent at the end of February and was seen once or twice a week from then until I left the place in July; family parties were seen on 2nd June, and I think we may be practically certain that this sub-species nested in or near Enzeli and Resht. I was

in Qazvin from the middle of July till the end of October, and never saw *M. a. dukhunensis* until 7th September after which it became fairly common. *M. a. persica* is more easily distinguished in the field than as a skin. My notes state definitely that at Qazvin it was commoner than the other race in mid-winter, but as I have no skin to support this I suppose we cannot regard it as a definite record. It appeared to be easily distinguished in the field by the much greater extent of black on the sides of the neck even in winter. Cheesman's specimen shot on the road between Tehran and Qazvin on 18th June is marked "Iris dark brown, bill and legs black, organs advanced, evidently breeding"; and at Qazvin this form was certainly not uncommon, generally in family parties, from the middle of July until the end of September. My only specimen was shot on 1st September.

Sitta europæa rubiginosa, Tschusi and Zarudny.—Nuthatch,
1 ♂. near Menjil—27th March.

I never saw the Nuthatch in the low forest round Resht Enzeli, but as soon as one mounts the lowest slopes of the hill it becomes quite common, and is often seen up to about 6,000 ft. which is the approximate height of the tree-level. It is found particularly in the mixed forest in which the Persian Oak is the predominant tree. Woosnam's specimens from Mazandaran and Gilan belong to this race. Witherby referred them to *S. e. caesia* (1910), no doubt because the original description of *rubiginosa* fails to point out the salient features of the race. Buturlin (1916) points out that *S. e. rubiginosa* differs from the other races of the species in not having white spots on the outer tail feathers, in the dark colour of the upper side, and in the very dark chestnut colour of the flanks; he gives other and in my opinion less reliable characters by which this sub-species may be distinguished. The bill of my male measures 18, the wing 80 mm.

Sitta rupicola rupicola, Blandford.—Rock Nuthatch.
1 ♂. Menjil—23rd March.
2 immat. Tehran—14th June.

Sitta neumayer obscura, Zarudny.
1 ♂, 1 ♀. Menjil—12th October.

Sitta n. dresseri, Buturlin (*Sitta syriaca tschitscherini*, Auctt., not Zar.)
1 ♀. Qasr-i-Shirin—22nd May (R. E. C.).

One of the most interesting results of our collecting is the re-discovery of Blandford's *Sitta rupicola*. This is a small species of Rock Nuthatch, and it inhabits the same ground as the larger *S. neumayer* sub-species in at any rate many parts of Persia. In the N. of Persia the small one is represented by the form *S. r. rupicola*, the larger by *S. n. obscura* and these two are mainly distinguishable by size. In S. W. Persia they are replaced by two forms similar to one another but differing entirely from all other Rock Nuthatches in the extremely pale colour, the smaller being *S. r. tschitscherini*, the larger *S. n. dresseri* (wrongly referred to as *tschitscherini* by British authors). Very little is known of the small species and ornithologists in Persia should lose no opportunity of studying this bird and obtaining specimens of it; its nesting habits are, I believe, entirely unknown. Major Cheesman was able to say that there are differences in the notes of the two; we want also to learn whether they are often found on the same piece of ground, as we know is sometimes the case; and what type of ground they affect if it is found that they do not generally live together. I have recently discussed certain technical points about the Rock Nuthatches of Persia (1920 *b*). Cheesman's specimen of *S. n. dresseri* is interesting as it is proof of the occurrence of yet another characteristically S. W. Persian bird in the country between the frontier and Kermanshah.

Parus major major, L.—Great Tit.

(*Parus major caspius*, Zarudny and Loudon).

(*Parus major karelini*, Zarudny).

3 ♂, Resht—February.

1 ♀, Resht—March.

1 sex? Resht—January.

1 ♂, imm, 1 ♀, Enzeli—June.

1 imm. Enzeli—June (R. E. C.).

The Great Tit is a common resident in the low damp forest round Enzeli and Resht, and also in the dry forest on the N. slopes of the Elburz. Young were flying in the third week of May at Enzeli. This series is entirely indistinguishable except by a slightly less size from long series of *Parus major major* with which I have compared it at Tring Museum and in Mr. Witherby's collection and this conclusion has been independently arrived at by C. B. Ticehurst. The Great Tit of the forest bordering the Caspian, was first described by Zarudny and Loudon (1905) as a different sub-species under the name *P. m. caspius*: none of the points on which they separated it appear to be reliable when a series is examined, and these authors appear to have doubted whether it was really separable at the time when they first described it. Subsequently (1911a) Zarudny replaced the name *caspius* by the name *karelini*, without explaining on what grounds he took this step. The wings of these specimens measure, ♂ 70-74 mm., 1 ♀ 67 mm., measurements which are consistently a few millimetres less than those of Western European birds.

Parus major blanfordi, Prazak.—Persian Great Tit.

(*Parus major zayrossiensis*, Zarudny and Loudon.)

3 ♂, Kermanshah—November and December 1918.

3 ♂, Qazvin—December 1918 and January 1919.

1 ♀, Hamadan—December 1918.

2 ♂, 1 ♀, Tehran—June (R. E. C.).

I found this race of the Great Tit a common bird in gardens and small woods in the plateau in winter, and Cheesman found it common in summer. He shot a female at Tehran "out of a party of flying young: it contained one egg complete so was apparently laying for a second brood" Prazak's type of *P. m. blanfordi* came from Tehran, and I can find no difference between Cheesman's three skins from this place and a series collected by Witherby in S. W. Persia; these last must on geographical grounds be the *P. m. zayrossiensis* of Zarudny and Loudon. Both Witherby's and Cheesman's skins were shot in summer and are so worn that it is not possible to form a definite opinion on them alone; fortunately, however, there are in England at present eight or nine skins from Shush, Shiraz &c., (coll. B. N. H. S.); some of them are winter birds. C. B. Ticehurst has compared them with my series and we agree that *blanfordi*, Prazak, = *zayrossiensis* Zar. and Loud. The wings of my specimens measure, ♂s 72-77 mm., ♀s 72 mm. The conclusion then is that the typical Great Tit of Continental Europe is found in the forests of Gilan, and presumably in the Talish, and in Mazandaran. In the plateau we find a very distinct larger and paler form which we now know extends from Tehran, Qazvin, etc., southwards and westwards to the Zagros country and Fars. All this was quite correctly stated by Witherby in 1910, I cannot agree with Hartert's statement (*Vog. pal. Fauna*, Vol. I, p. xxxii) that *caspius* is a synonym of *blanfordi* the range of which he gives as Tehran, Gilan, Mazandaran, Asterabad and the Talish woodlands.

Parus cœruleus persicus, Blanford.—Persian Blue Tit.

1 ♀, Kermanshah. 30th Nov. 1918.

The very pale Persian Blue Tit was first seen as soon as one reached the scrub oak country round Pa-i-Taq. It was fairly common in the small wood on the out-skirts of Kermanshah. This bird is one of the typical birds of the oak woods of the S. W. of Persia, and Pa-i-Taq and Kermanshah are about the northern limit of its range.

Parus cœruleus raddei, Zarudny.—Caspian Blue Tit.

1 ♂. 1 sex? Resht—January.

This race of the Blue Tit was described by Zarudny (1908) from Mazandaran, Gilan and Asterabad, that is to say, from the great forest which runs all along the S. coast of the Caspian. As he says the Blue Tits of this region are duller in colour, and smaller than the typical race. My two specimens measure, the male, wing 60 mm. tail 48 mm., and the unsexed specimen, wing 60 mm., tail 46 mm.,

Woosnam's specimens from the S. coast of the Caspian agree in these characters. I have not been able to go into the question of the identity of *P. c. raddei* and *P. c. calamensis*. At Resht and Enzeli this Tit is a somewhat scarce resident, scarcer than either the Great Tit or the Longtailed Tit; it occurs also in the higher forest 1,—3,000 ft.

P. c. satunini is described by Zarudny in the same place from "Lenkoran, Qazvin and the Mountains of Transcaspia". There is nothing improbable in the existence of a till-then undescribed form of Blue Tit in "Qazvin and the mountains of Transcaspia", or as one might say, in the semidesert country to the S. and E. of the forests inhabited by *P. c. raddei*: it is in the highest degree unlikely that such a tit would descend from the very dry highlands into the damp forest of Lenkoran, a forest moreover which is continuous with "Mazandaran, Gilan, and Asterabad", the home of *P. c. raddei*. Unfortunately there are no specimens with which to prove or disprove the existence of *Parus cœruleus satunini*, the distribution of which seems so anomalous.

Parus ater gaddi, Zar. and Härms.—Cole Tit.

1 ♀, 1 sex 3 Noglâbar—3rd March.

1 sex? Menjil—27th March.

The Cole Tit of the Caspian Forests has been referred to by Witherby (1910) as *P. a. phœonotus*, Blanford, which was described from oak forests near Shiraz. Witherby suggested that there had been some error in labelling and that the skins had really come from the Caspian Provinces. This we now know not to have been the case as Zarudny has re-discovered Blanford's race in the Zagros Mountains. He finds this race constantly different from that of the S. Caspian forests which he describes as *P. ph. gaddi*, stating that it differs from *P. ph. phœonotus* in the much browner colour of belly and flanks and much duller back. I have compared Blanford's type of *phœonotus* with eight skins (Woosnam and Buxton) from the S. coast of the Caspian, and the forests on the N. slopes of the Elburz, and I find that Zarudny was justified in separating *P. a. gaddi* on its less rufous, more olivaceous back. Without a larger series of *P. a. phœonotus* I am unable to decide whether the flanks and belly are browner in *gaddi* than in this race. I can find no difference in size; the only specimen of *P. a. phœonotus* (♂) in the British museum has a wing of 67 mm; 3 ♂ *gaddi* measure 67-69 mm, 4 ♀ 63.5-66 mm.

The Cole Tit of the Caspian forests is common among beech and oak trees on the slopes of the hills; Ingoldby found it common in such places near Bandar-i-Gez, I myself near Menjil and Noglâbar. It is never seen in the damp, low-lying forests round Resht and Enzeli.

Acredula caudata tephronota, (Gunther) (*passsekii*, Zarudny).—Long-tailed Tit.

1 ♀. 1 unsexed. Kermanshah—December 1918.

Acredula caudata alpina, (Hablizl.).

- 1 ♂. 2 ♀, Resht.—January.
 1 unsexed. Enzeli—February.
 2 imm. Enzeli—30th June (R. E. C.).
 1 ♂. Noglabar.—21st March.
 1 imm. Tula Rud, Talish—8th July.

I first saw Long-tailed Tits at Kermanshah, where they were common in the little oak wood on the edge of the town among parties of other species of Tit. The birds from Kermanshah are separable from Long-tailed Tits from Gilan by the much paler colour of their upper sides. On the other hand they are not separable from specimens from W. Turkey in Asia, and must therefore be called *A. c. tephronota*, Gunther (1865), (Terra typica, Asiatic side of Bosphorus). *Passekii* of Zarudny described in 1904 from S. W. Persia is a synonym.

I saw no Long-tailed Tits between Kermanshah and the great Caspian forests, and this agrees with Zarudny. The moment one enters the forest which borders the Caspian Sea, Long-tailed Tits are found; they are common both in the dry oak woods on hillsides at Menjil and Noglabar and also in the very wet lowlying mixed forest round Resht and Enzeli. I found a nest ready for eggs on 19th February at Resht, but never saw fledged young till the end of May when they became common at Enzeli, etc.

This race, which inhabits Gilan and Mazandaran and the Talish is much darker on the upper surface than *A. c. tephronota*. It must be called *A. c. alpina* Hablizl (Pallas, Neue Nord. Beytrag IV, p. 49, 1783, from Gilan). I am indebted to Mr. H. F. Witherby for pointing out the identity of the Long-tailed Tit of W. and S. W. Persia with that of Asia Minor, and its distinctness from the form which appears to be confined to the great forest which fringes the S. W. and S. shores of the Caspian. The juvenile plumage of *A. c. alpina* is undescribed, and Mr. Witherby has been good enough to draw up this description of it from our specimens. "Brown like juveniles of *A. c. caudatus* on upper parts, but not quite so dark, and centre of crown not white, but with only a few narrow white edgings to the feathers of centre of hinder part of crown; chin and throat pinkish-buff, not so pink as in *glaucoularis* and not extending down breast; throat with no black patch as in adult; upper breast with brown streaks much as adult, rest of under-parts whiter than in adult, and with no pink. Decidedly darker than *A. c. tephronota* in same plumage."

Anthoscopus pendulinus persimilis, Hartert.

- 1 ♂, 1 ♀, Khurramdurrah—23rd June (R. E. C.).

Cheesman's skins appear to belong to this race, which is known (Hartert 1918) from Eregh in the Cilician Taurus, Lenkoran on the west coast of the Caspian and L. Urumiyyeh. No doubt the *Anthoscopus pendulinus* which Zarudny records as breeding in N. W. Persia belonged to this form. The wing of the above male measures 53.5 mm, of the female 52 mm. Cheesman says "feeding in popular trees, organs small. Another pair was seen with flying young. Continually utters a shrill plaintive whine like a Reed Bunting. Sways from side to side meanwhile. Iris dark brown, bill brown, feet plumbeous." I saw a nest of some race of the Penduline Tit at Kermanshah in December 1918, hanging from the tip of a willow twig.

Lanius collurio, L.—Red-backed Shrike.

Red-backed Shrikes arrived at Enzeli in small numbers on 30th April and remained through the summer. I found a nest with newly hatched young at Tula Rud, Persian Talish in a bush on the shore of the Caspian on July 4th.

No specimens were obtained. This is regrettable; they would probably represent the little known *Lanius collurio kobylini* of Buturlin (*fuscatus*, Zar. non Lesson).

Lanius senator, L.

"Nest and fresh eggs, 24th May 1919, Taq-i-Girreh. Nest like that of *collurio*, in small oak, neater than usual shrikes, built of wool and hair with stalks of calvary clover with seed heads on it. Inside lined with white woolly flowers of a plant like eidelwies, and spiders webs. One piece of newspaper and dead leaf" (R. E. C.).

Lanius minor, Gm.—Lesser Grey Shrike.

1 ♂. Gulabek, Tehran—11th June (R. E. C.).

"Paired, testes plus." It is curious that I never saw that most conspicuous bird the Lesser Grey Shrike at Qazvin, though I was there from 17th July until the end of the summer. I am almost convinced that a number of the birds which breed in Qazvin, and no doubt in other places in the northern part of the plateau move away from their breeding places by the middle of July, just when everything becomes hot and dry and dusty.

Muscicapa parva parva, Bechst.—Red-breasted Flycatcher.

1 ♂. Enzeli—April.

The above was the only specimen I saw of the Red-breasted Flycatcher. It was shot in a dense wood close to Enzeli.

Muscicapa hypoleuca semitorquata, Hom. (*M. atricapilla semitoquata*).—Pied Flycatcher.

2 ♂, 2 ♀, Tehran—6th-10th June (R. E. C.). "Organs very small."

This race of the Pied Flycatcher "Seems to catch most insects on the ground, and occasionally on the branch of a tree—not seen catching them on the wing" (R. E. C.).

Phylloscopus collybita abietina (Nilss.).—Scandinavian Chiffchaff.

2 ♂, 1 ♀, Resht—February-March.

The Scandinavian race of the Chiffchaff was the only one of which skins were preserved. It was common through the winter at Resht and Enzeli. The wings of the males measure 65, 66 mm, of the female 57 mm.

I heard the note of some race of the Chiffchaff at Enzeli from 15th March to the third week in April. Zarudny records the Common Chiffchaff *P. c. collybita* as "breeding (?)" in the Caspian region of Persia.

Lusciniola melanopogon mimica, Mad.—Eastern Moustached Sedge Warbler.

1 ♂. Resht—January.

1 sex? Enzeli—March.

This Eastern race of the Moustached Sedge Warbler was locally common in winter in reed beds at Enzeli and Resht and I saw it until the third week in March. A very minor, but inconvenient "war" prevented my seeing the bird after that. Zarudny records it as breeding in the region south of the Caspian.

Cettia cetti orientalis, Tristram.—Cetti's Warbler.

1 ♂. Kermanshah—30th November 1918.

1 ♂. Enzeli—6th February.

1 ♀. Kermanshah—27th May (R. E. C.).

1 ♂. Khurramdarrah—23rd June (R. E. C.).

Apart from the above records Cheesman found Cetti's Warbler quite generally distributed in all the places he visited in the plateau in May and June. At Kermanshah he found a nest on 27th May "in a thick rose bush one foot from ground on a bank; neat and strong, made of grasses lined with hair. It contained unfledged young and one unhatched egg of a uniform anchovy sauce colour." At Tehran he saw Cetti's Warbler as high as 6,000 feet.

Specimens of Cetti's Warbler from Persia, Mesopotamia and Palestine agree in colour with the pale eastern race *Cettia cetti cettioides*, Hume, but in size they are small, like the western *C. c. cetti*. It seems best to admit the validity of Tristram's name *orientalis* even though, as Dr. Hartert informs me, the name

was subsequently quoted by Tristram himself as a synonym of *C. cetti*. The type of *Cettia orientalis* is an adult male shot on Lake Huleh, Palestine, on 14th May 1864. Dr. Hartert has seen this type and informs me that it is of the size of *C. c. cetti*. I have seen in all the following specimens of this race:—from the Caspian Provinces of Persia five males wings 65, 66, 66, 66.5, 69 mm.; from East Persia, a male 64, female 68 mm; from Fars in S. W. Persia a male 65, female 59 mm; from Kermanshah males 64 and 67, female 60 mm; from Amara in Mesopotamia a male 64 mm; from Palestine one female 54 mm. All these specimens are pale like *C. c. cettioides*, the wing measurement of which is ♂ 70-72.5, ♀ 64-65 (Hartert.).

Acrocephalus arundinaceus zarudnyi, Hartert.—Great Reed Warbler.

1 ♀. Enzeli—10th June.

1 ♂. Enzeli—25th June.

This race of the Great Reed Warbler was first seen during the last three days of May. It rapidly became common in all the reed beds round Enzeli. A bird was seen on 10th June carrying something in its mouth, presumably nesting material. The bird remained common through the summer.

These specimens have been compared with the type of *A. a. zarudnyi* at Tring. It will be observed that I find myself once again in disagreement with Zarudny who records the typical race of this species from N. W. Persia and the Caspian and *A. a. zarudnyi* only from various parts of Eastern Persia.

Acrocephalus scirpaceus macronyx (Severtzov.).

2 ♂, 2 ♀, Enzeli—10th-28th June (P. A. B. and R. E. C.).

This race of the Reed Warbler was found by Cheesman and myself obviously breeding in bramble bushes growing on dry land on islands in the Enzeli lagoon; we failed to find nests, but observed one pair feeding fledged young. The birds were exceedingly local and were practically confined to the bushes, though once or twice I saw, but did not obtain, small *Acrocephali* in the reed-beds, and I believe that these birds were of the same species. Cheesman made a note that the song and behaviour resembled that of the Olivaceous Warbler (*Hypolais pallida*). Dr. Hartert has seen the skins and there is no doubt of the correctness of the identification though they were found nesting so far from a reed-bed.

Hypolais pallida elaeica (Lindermayer).—Olivaceous Warbler.

1 ♂, Enzeli—May.

1 ♂, 1 ♀, Astara—July.

2 ♂. Tehran—June (R. E. C.).

I have no note of the arrival of the Olivaceous Warbler at Enzeli. It bred commonly in the bramble bushes on the islands in the Enzeli lagoon; at Astara, on the Persian side of the frontier between Persia and Azerbaijan I saw family parties in gardens on 3rd July. At Tehran Cheesman found three nests in rose bushes in gardens on 6th June.

Sylvia mystacea, Ménétr.—Ménétries' Warbler.

Ménétries' Warbler arrived at Enzeli in the second week in April, the males before the females, and bred in bramble bushes among the sand dunes along the shore. I obtained no specimens, but can vouch for this record of a species with which I became very familiar in Mesopotamia. I never saw it at Qazvin in July-October 1919. Ménétries' Warbler has already been obtained by Woosnam on the S. coast of the Caspian (Witherby 1910).

Sylvia curruca curruca (L.)—Lesser Whitethroat.

1 ♀. Enzeli—25th April.

The Lesser Whitethroat suddenly became common at Enzeli on 25th April. There is no question of the identity of this specimen; the wing measures 66 mm. and the second primary is intermediate in length between the fifth and sixth

Sylvia communis icterops, Ménétr.—Eastern Whitethroat.

1 sex ? Qazvin—14th September.

The above is my only definite record of the Eastern race of the Common Whitethroat.

Agrobates galactotes familiaris (Ménétr.)

1 ♂. Qazvin—20th June (R. E. C.).

“Several pairs evidently breeding at Qazvin, organs advanced, not noticed at Tehran” (R. E. C.). I was in Qazvin from 17th July till October and never saw the bird at all though I looked for it carefully; probably it migrates as soon as the young are fledged.

Zarudny (in collaboration with Härms) described *A. f. persica* from “Mesopotamia, Zagros and Baluchistan.”; no doubt he refers to *Persian* Mesopotamia and *Persian* Baluchistan. I can find no difference between specimens from Transcaspiæ, N. W. Persia, the Bampur River in Persian Baluchistan, and Baghdad and Amara in true Mesopotamia. It appears to me that the points on which *A. f. persica* was separated were due to individual variation.

Turdus merula syriacus, Hempr and Ehr.—Persian Blackbird.

1 ♂, 1 ♀. Kermanshah—November and December 1918.

1 ♀, Tehran—June (R. E. C.).

Imm. Tehran—June (R. E. C.).

This sub-species of the Blackbird was common at Kermanshah in December. In June Cheesman found it common up to 8,000 ft. in the hills above Tehran. Birds were feeding fledged young on 6th June, but on 12th June he shot at Gulahék, in the garden of the British Legation, a female which contained “organs very advanced, would have laid in three days. Iris brown, bill dark orange, upper mandible brown towards base. Hen is difficult to distinguish from cock unless handled, owing to dark colour and yellow bill.” One might add that the difficulty is due not only to the dark colour of the female, but also to the fact that the male is dark slate grey, not black.

The immature in *first plumage* (sex unrecorded, Tehran, 12th June 1919) had “iris brown, bill brown, legs dark olive brown”. It differs from *T. m. merula* (Great Britain) in the same stage of plumage by its much duller and less red colours. The upper side of *T. m. syriacus* is dark olivaceous brown and the streaks on the centre of the body feathers are less developed than in the typical sub-species and entirely without any reddish tint. The throat and breast lack the reddish colour of *T. m. merula*, the abdomen and under tail coverts are very dark and very grey. The measurements of the specimens are; ♂ exposed culmen 23 mm., wing 130 mm., tail 105 mm.; ♀ (Kermanshah) culmen 20 mm., wing 128 mm., tail 111 mm.; ♀ (Tehran, R. E. C.) culmen 21 mm., wing 128 mm., tail 109 mm.

Turdus merula aterrimus (Mad.)—Caspian Blackbird.

1 ♂ Resht—January—culmen 21, wing 127, tail 98 mm.

1 ♀ Resht—January—culmen 22, wing 124, tail 96 mm.

1 ♂ Enzeli—February—culmen 22·5, wing 130, tail 105 mm.

1 ♀ Menjil—March—culmen 22·5, wing 128, tail 96 mm.

This race of Blackbird is found in the forest on the south shore of the Caspian. It was common in January and February at Resht and appeared to become still commoner at Resht and Noglábár and in the woods above Menjil in March. After that it was much rarer though small numbers remained and no doubt bred, round Resht and Enzeli. The measurements of culmen refer to the exposed portion only.

Turdus musicus, L. (*T. iliacus*, Auctt.)—Redwing.

2 ♂, Resht—February.

The Redwing is common round Resht and Enzeli in winter, and was last seen in the third week in March.

Turdus pilaris, L.—Field Fare.

The Field Fare was common in the forest near Resht in winter and just as difficult to approach as it is in England. The last I saw were in juniper bushes at 8,000 ft. on the hills above Menjil on 27th March.

Turdus philomelos philomelos, Brehm.—Song Thrush.
(*Turdus musicus*, Auctt.)

1 ♀ Kermanshah—November 1918.

2 ♂ Resht—January and February.

The Song Thrush is common in the low-lying forests of Gilan in winter. A small number remained all the summer, though their number might easily have been overlooked in the dense jungle after the leaves were on the trees. The Song Thrush was also seen at Kermanshah and Hamadan in December 1918, and once only at wind-swept Qazvin in January.

The three specimens appear to differ in no respect from the Continental Song Thrush.

Monticola solitarius transcaspicus, Hartert.—Blue Rock-Thrush.
(*M. cyanus*, Auctt.)

1 ♂ Qasr-i-Shirin—24th November 1918.

The specimen has been compared with the type at Tring and undoubtedly belongs to this well-marked race. The Blue Rock Thrush was common among the crags at Menjil, I think at every season of the year.

Ananthe ananthe ananthe (L)—Common Wheatear.

1 ♂, Menjil—26th March.

1 ♀, Enzeli—30th April (ovary not enlarged).

The Common Wheatear passed through Enzeli from the last week of March till the first of May, and was abundant, April 20-30. The specimens belong to the typical race (wing of male 97 mm., of female 98 mm.).

Ananthe hispanica melanoleuca (Güld) (*xanthomelæna*, Hempr. and Ehr.)—Eastern Black-eared Wheatear.

1 ♂, Pa-i-Taq—May (R. E.C.).

“Roof of mouth and gape black. Organs advanced, evidently breeding.” This specimen appears to agree in every particular with the eastern race of the Black-eared Wheatear. The chin and throat are white, the wing measures 87 mm. It is interesting to find this race so close to “Arabistan and Luristan” from which Zarudny and Loudon (1904) described *Saxicola gaddi*.

Ananthe finschii barnesi (Oates).

(*Saxicola melanoleuca melanoleuca* (Güld).

1 ♂, 1 ♀, Qasr-i-Shirin—November 1918.

1 ♂, Pa-i-Taq—24th May (R. E. C.).

I found this Wheatear common at Qasr-i-Shirin and Cheesman's record for Pa-i-Taq (“organs advanced, evidently breeding”) is only a short distance further N. E. We know then that it is resident in this low rocky country. I saw it again at Menjil in March, also in rocky country at about 2,000 ft. We never saw it in the higher ground between Menjil and Pa-i-Taq. “Roof of mouth and gape orange yellow” (R. E. C.).

Ananthe isabellina (Cretzschm)—Isabelline Wheatear,

1 ♂, Enzeli—17th March.

1 ♂, Nahvand—June (R. E. C.).

The Isabelline Wheatear is common round Menjil in spring and summer. It is quite rare in the plateau round Kazvin in summer, and was not seen there in winter. The specimen shot at Enzeli was perching in a tree in a flooded wood, a most unsuitable place for this desert bird even on migration. Cheesman noticed them near Qazvin on 23rd June “feeding flying young on black ants.”

Enanthe pleschanka pleschanka (Lepech)—Siberian Wheatear.

2 ♂, 1 ♀, Tehran—13-14th June, (R. E. C.).

“Gape black : with flying young, feeding done entirely by ♀ during $\frac{1}{2}$ hour I was watching” (R. E. C.).

Enanthe xanthopyrmyna chrysopygia (De Fil)—Red-tailed Wheatear.

2 ♂, 1 sex ? near Qazvin—25, 26 September.

2 ♀ (one cream-coloured) near Tehran—13-16 June (R. E. C.).

2 ♂ (1st plumage) near Tehran—13th June (R. E. C.).

The Red-tailed Wheatear was common on the high-road between Menjil and Qazvin at the end of September at about 4,000 ft. It had then moved down from its breeding grounds, as in July it is never seen on that stretch of road ; nor is it found there in winter, Cheesman found this bird in the hills behind Tehran on 14th June at from 5,500 to 12,000 feet, accompanied by fledged young. He noticed that it frequently dives under the shadow of a large rock and then allows one to approach closely to it.

Saxicola rubetra noskæ (Tschusi)—Whinchat.

1 ♂, Enzeli—1st May.

The Whinchat was common at Enzeli in the last week of April and early May. The single specimen preserved belongs to the race *P. r. noskæ*, described by Tschusi from North Caucasia. The species did not remain to breed at Enzeli.

Phœnicurus phœnicurus phœnicurus (L)—Common Redstart.

The Common Redstart arrived in numbers at Enzeli on 30th April. I have no note of the date on which I last saw it in the spring, but it did not remain to breed.

Phœnicurus ochrurus ochrurus (Gmel.).

1 ♂, 1 ♀, Qasr-i-Shirin—24th November 1918.

These specimens were the only ones I saw of this Redstart.

Phœnicurus erythronota (Eversm.)—Eversman's Redstart.

1 ♂, 1 ♀, Asadabad—December 1918.

1 ♂ Hamadan—December 1918.

Eversman's Redstart is common in orchards in mid-winter, at Asadabad, Hamadan and Qazvin. No weather appears too severe for it, and it occurs at any rate up to 8,000 ft. at Christmas time.

Luscinia megarhyncha africana (Fisch. and Rehw.)—Nightingale.

1 ♂, 1 imm., Tehran—June (R. E. C.).

3 ♂, Enzeli—June (R. E. C. and P. A. B.).

Nightingales arrived and began to sing at Enzeli in the last few days of April. They were exceedingly local, but six or eight pairs bred undoubtedly in one swampy bramble and alder thicket of about three acres, and few others for miles around in very similar country. Cheesman found several pairs breeding at Gulahek and at Tehran, on 6-8th June he found eggs, unfledged and flying young. On 12th June at the Legation, Tehran three fresh eggs were found in a nest which was unfinished six days before. He heard Nightingales up to 8,000 ft. in the mountains just behind Tehran.

Erithacus rubecula hyrcanus, Blanf—North Persian Robin.

1 ♂, 1 ♀, Resht—21-28 January.

1 ♂, Noglabar—21st March (1,000 ft.).

Erithacus rubecula caucasicus, Buturlin—Caucasian Robin.

2 ♀, Resht—15th February, 8th March.

The North Persian Robin (*E. r. hyrcanus*) and that from Caucasia (*E. r. caucasicus*) winter together in the forests round Resht and Enzeli. They are common, but difficult to detect in the dense jungle. About the end of March, Robins become

rarer, because *E. r. caucasicus* goes away to Caucasia to breed. *E. r. hyrcanus* remains and no doubt breeds in the forest, but becomes even more retiring. The specimen shot on 21st March had greatly enlarged testes. I saw, but did not obtain Robins at Kermanshah in November and December 1918. Both sub-species are found on the River Tigris at Amara in winter.

Prunella modularis orientalis (Sharpe)—Caspian Hedge-Sparrow.

2 ♀, Resht—February.

I have compared my Hedge-Sparrows with a long series of the typical form and with two specimens labelled "*orientalis*" at Tring (from the Talish), and with Woosnam's single specimens from the "S. coast of the Caspian" (recorded by Witherby (1910) as *Accentor modularis blanfordi*). Sharpe originally described *orientalis* from Batum, and until a series is forthcoming from that place one cannot be certain that these birds are Sharpe's race; but at any rate the Resht, Talish, and "S. Coast of Caspian" specimens agree with one another, and differ from *P. m. modularis* in being less rufous above and more brownish (less grey) on the sides of the neck and on the throat. Provisonally I refer them to *orientalis*, Sharpe.

Of the status of Zarudny's *Accentor modularis blanfordi* (1904), to which Woosnam's specimen was referred by Witherby, we know nothing beyond Zarudny's description according to which it is quite a distinct race with unicolorous crown, &c. It was described from oakwoods S. and S. W. of Ispahan, and it does not seem probable that Woosnam's specimens would be referable to it.

Troglodytes troglodytes hyrcanus, Zar. and Loudon (?)—Wren.

1 ♂, Kermanshah—December 1918.

1 ♂, 1 ♀, Resht, January—February.

Wrens were not uncommon at Kermanshah, Asadabad, and other places in the plateau in winter in brambles &c., in the gardens, but they were of course exceedingly difficult to shoot. They were common at Resht and Enzeli in winter and probably in summer also, though it became impossible to see them after the leaves came out. I find it impossible to identify these three skins satisfactorily: they are very grey in general colour and this is most noticeable in the under tail coverts, and I cannot distinguish them from series of Wrens from the Terek, Vladikavkaz, and other places in Ciscaucasia. They are probably the form *hyrcanus*, Zar and Loudon; on the other hand it is not unlikely that Wrens from Kermanshah, &c., would be *T. t. zagrossiensis*, Zar and Loud. (1908). Members of the Society in Persia are strongly urged to collect series of Wrens from any part of the country in which they occur: two or three forms have been described by Russian ornithologists, but we have no skins and no knowledge of these forms at all.

Hirundo rustica, subsp.—Swallow.

1 ♀, Tehran—13th June (R. E. C.).

The Swallow arrived at Enzeli on 28th February, remained through the summer and bred commonly. I find it impossible to identify this single specimen. The underside is more suffused with reddish brown than is at all usual in *C. r. rustica* L., but is not so dark red-brown as it is in *C. r. transitiva*, Hartert, which is resident in Palestine, and in turn leads on to *C. r. savignii*, Steph, with a deep red-brown breast. Specimens similar to mine, and more or less intermediate between *H. r. rustica* and *H. r. transitiva* are, I believe, not unusual in Egypt, Palestine, &c.

Hirundo daurica rufula, Temm.—Red-rumped Swallow.

The Red-rumped Swallow was seen by Cheesman at Karind in May, where a pair were hawking flies in a rocky gorge. There was no evidence that they were breeding. This appears to be its most northerly occurrence in Persia.

Riparia riparia (L.)—Sand Martin.

The Sand Martin appeared at Enzeli on 3rd May; on 28th May Cheesman saw a large colony breeding near Kangavar. No specimens were obtained by either of us, though the birds presumably belong to the typical race of the species.

Riparia rupestris, Scop.—Crag Martin.

1 ♂, near Menjil—15th July.

Crag Martins are common all along the road 20-30 miles south of Menjil wherever there are cliffs. The birds are not there in winter; I do not know the actual date of their arrival, but I first saw them on 27th March, and they bred commonly. I have seen the nest, but never been able to reach it.

Coracias garrulus, L.—European Roller.

Rollers arrived 14th April at Enzeli. By the 24th they were paired and common. They bred commonly at Resht and Enzeli, several pairs in the ruined look-out in the middle of Enzeli town. Cheesman saw them breeding in trees at Gulahak, 11th June.

All my specimens have miscarried; Zarudny records *C. g. garrulus* on migration through the Caspian Province, N. W. Persia, &c., but has no breeding records for it; he records *C. g. semenowi* breeding in N. W. Persia and the Caspian provinces and many other parts of the country.

Micropus (Cypselus) apus pekinensis (Swinhoe)—Swift.

1 ♂, Hassanabad, 29th May (R. E. C.).

1 ♀, Qazvin, 20th June (R. E. C.).

Cheesman noticed this bird at Hassanabad, "very plentiful, breeding in crevices of mud-walled houses in all villages". The two specimens belong undoubtedly to *C. a. pekinensis* and not to *C. a. marwitzi*, Rehw, which is the form one might on geographical ground have expected to find.

Merops apiaster, L.—Common Bee-Eater.

The Common Bee-Eater arrived at Resht in the third week of April, and was seen at Enzeli on 30th April. It remained fairly common throughout the summer, and I also saw it at Astara, Menjil, Qazvin, and Cheesman saw it frequenting its nesting burrows at Kermanshah on 26th May. This species was common at Tehran as late as 12th October.

Upupa epops epops, L.—European Hoopoe.

2 ♂, Enzeli—14th March—27th April.

A single Hoopoe appeared on 14th March at Enzeli, but I saw no other until 16th April after which they were seen rather infrequently through the summer. On 3rd July I saw a pair feeding fledged young in a hole in a willow tree at Astara. Hoopoes were nesting commonly in bridges near Hamadan, and noticed carrying food as early as 30th May (R. E. C.), and family parties were common at Qazvin at the end of July. In June a pair had a nest in a hole in a chimney at the British Legation, Tehran, and another pair in a tree at Gulahak had nearly fledged young" (R. E. C.).

Alcedo atthis pallasii, Rehb.—Common Kingfisher.

(*A. ispida pallasii*.)

1 ♂, 2 ♀, Enzeli—February—March.

1 ♂ (1st plumage), Astara—4th July.

1 sex? Bandar-i-Gez—12th January (C. M. I.).

I saw the common Kingfisher at Kermanshah in November 1918, but the only specimen obtained was eaten by a cat. It is a common resident on the Enzeli lagoon, and the streams which run into it and was also common at Astara in July. The measurements of the specimens from Enzeli are as follows:—Male, wing 73, culmen 39; females, wing 74 and 73, culmen 37 and 34 mm.

Halcyon smyrnensis, L.—White-breasted Kingfisher.

I saw several of this most beautiful Kingfisher at Kermanshah at the end of November and the beginning of December 1918.

Picus viridis karelini, Brandt. (?)—Green Woodpecker,

1 ♀, Noglabar—4th March.

1 ♂, Bandar-i-Gez—13th December 1918 (C. M. I.).

The Green Woodpecker is another of the birds which are common on the northern slopes of the Elburz, in the drier forest, but which do not occur in the wet forest which surrounds Resht. This species is found commonly up to the tree-line, at about 6,000 feet. The wings of the two specimens brought home measure 158 mm., in each case: whether the Green Woodpecker of the forest of Gilan and Mazandaran is a separable race I am unable to say. At any rate it is so close to other subspecies that a couple of skins are insufficient to settle the question.

Dryobates syriacus syriacus (Hempr. and Ehren.).—Syrian Pied Woodpecker.

1 ♀, Kermanshah—November 1918.

1 ♂, 1 ♀, Hamadan—December 1918.

1 ♂, 1 ♀, Tchran—June (R. E. C.).

The Syrian Pied Woodpecker is common in winter in the plateau all the way from Karind to Qazvin. Cheesman found a nest in a pollard willow in the city of Hamadan on 30th May, but the pair he shot at Gulahek, Tehran, on 11th June were drilling a nesting hole, also in a willow tree. This bird is always extremely wary and difficult to obtain, but is quite one of the regular garden birds of the country, and one constantly sees it in the Legation garden in Tehran. I have compared this series with skins from Syria and Asia Minor. The development of white banding in the outer two pairs of tail feathers is a very variable character, apparently of no sub-specific significance.

Dryobates major polzami (Bogd.).—Great Spotted Woodpecker.

1 ♂, 1 ♀ Resht—January and February.

1 ♀, Noglabar—March.

2 imm. ♂, Tula Rud, Talish—July.

The differences between this race of the Great Spotted Woodpecker and the race with which I have just dealt are so apparent in the field that these birds furnish the clearest example of the difference between the avifauna on the plateau and the forest. The present race is absolutely characteristic of the forest, and occurs as far south as Noglabar, which is close to the edge of the forest: from there northwards to the Caspian it is a common bird and one which is found equally in the dry and wet localities.

It appears that the first plumage is unknown, and I have obtained this description of it from Mr. Witherby; it is taken from the specimens from Tula Rud. "Differs from the adult as in other *D. major* by the crown being crimson, each feather having a crimson tip; the vent is dull crimson and the belly has a very faint tinge of crimson or yellow: the black stripe from the base of the lower mandible is almost as strongly marked as in the adult, and is continued as in the adult; most of the ear-coverts in one specimen are sooty black, and in the other the centre of the ear-coverts is the same."

Lynx torquilla torquilla, L.—The Wryneck.

2 ♂, Qazvin—4th September.

The Wryneck passed through Qazvin in considerable numbers during the first ten days of September and was for a short time one of the commonest birds in the gardens.

Cuculus canorus, L.—The Cuckoo.

Cheesman heard the Cuckoo at Kermanshah and saw two at Qazvin, 20th June, and I saw several young birds, presumably on passage in the stony country round Menjil, 12th October. It is very much to be desired that some one will preserve a series of cuckoos from Persia.

Bubo bubo nikolskii, Zarudny.—Eagle Owl.

2 ♂, Kermanshah—November—December 1918.

I saw and shot two Eagle-Owls in the little wood on the outskirts of the town of Kermanshah; they were sitting most conspicuously on the branches of leafless trees, and I killed them without difficulty with a collecting gun. The wings measure 403 and 410 mm., and Dr. Hartert who has seen the skins is of the opinion that they probably belong to the race named *nikolskii* by Zarudny (1905); there is no material of this race available for comparison. I have compared the specimens with upwards of two dozen *B. b. turcomanus*: apart from their smaller size, the under surface is darker and more heavily streaked than that of the darkest *turcomanus*, and the upper side is as dark as that of an unusually dark specimen of that race.

Otus scops pulchellus (Pall.) (?)—Scops Owl.

2 ♂, 1 ♀, Tehran—June (R. E. C.).

“8th June. Gulahek, Tehran. Three eggs in a deserted Magpie’s nest, 12 feet from ground in thick woodland: eggs equally incubated. No addition had been made to the Magpie’s nest. At least twelve birds calling all night in the legation gardens at Gulahek” (R. E. C.). Series of Scops’ owl from various parts of Persia are a desideratum; the validity of Pallas’ race *pulchellus* to which I have referred these specimens, is very questionable. The males’ wings measure 148, 151 mm., the female’s 155 mm.

Strix (Syrnium) aluco, sub-sp.—Tawny Owl.

The Tawny Owl breeds in the compound of the Imperial Bank of Persia at Resht. It is particularly to be regretted that I obtained no specimens, but so far as we know the Tawny Owl of the Caspian Provinces is identical with that of Western Europe.

Athene noctua, sub-sp.—Little Owl.

1 ♂, Qazvin—24th September.

The Little Owl is not rare in the plateau and is resident even in the bleakest places, and at least as high as 8,000 feet. The only specimen obtained (wing 169 mm) is nearer to *A. n. bactriana*, Hutton, than to any other named form, but is much greyer than any specimen of that race at Tring or the British Museum, and this is true even when it is compared with other freshly moulted birds. In all particulars it is extremely like two specimens in the British Museum, one from the Taurus and the other from the Tamenlar Dagh.

Falco subbuteo subbuteo, L.—The Hobby.

1 ♀, Enzeli—28th June.

1 imm., Qazvin—18th September.

I have no note of the date on which the Hobby arrived in Gilan, but it was quite common during the summer at Astara, Enzeli, Qazvin and Tehran; I have definite breeding records from all these places, and we found a nest on 28th June at Enzeli at the top of an alder tree in an old Magpie’s nest: this nest contained two fresh eggs, and the female which Cheesman shot from this nest laid a third egg as she died.

Falco tinnunculus, L.—Common Kestrel.

Cheesman found a nest of the Common Kestrel at Gulahek near Tehran on 11th June; it contained young birds. He definitely identified the parents.

Aquila chrysaetus, L.—Golden Eagle.

saw a Golden Eagle twice at very close range at Qazvin in December 1918.

Circus æruginosus (L.)—Marsh Harrier.

The Marsh Harrier is a common resident in the lagoon between Resht and Enzeli.

Milvus milvus (L.)—Common Kite.

(*Milvus regalis*, Auctt.)

Ingoldby and myself put what we believed to be a Common Kite off a nest in a tall alder at Enzeli on 16th April, but we failed to obtain the bird. Cheestman also believes that he saw the bird on the highroad S. of Resht. Zarudny records it as breeding in the region S. of the Caspian.

Milvus migrans (Bodd.)—Black Kite.

The Black Kite was common on the outskirts of all the towns and villages from Karind to Enzeli during the winter, and was particularly common at Qazvin. In May Cheestman noticed it from Karind to Kermanshah, but saw no nests between Hassanabad and Hamadan; he found a nest in the first fork of a tall poplar on 30th May. The species breeds commonly round Resht and Enzeli, and on 16th April I shot a male bird from a nest in the top of a tall alder tree growing in a swamp at Enzeli; the nest contained three unusually heavily marked eggs.

The status of the form described by Buturlin as *M. m. rufiventris*, from Transcaucasia and Transcaspiia is very doubtful. If it is separable the Black Kite of Gilan and Mazanderan probably belongs to this race. Unfortunately my specimens have failed to reach home.

Haliaëtus albicilla (L.)—Sea Eagle.

The Sea Eagle is common all the year round at Enzeli, and one constantly sees the bird sitting on the sand dunes, and the muddy edges of the lagoon, or perched on telegraph poles. They are of course not common except close to the sea or the lagoon but I have seen single birds along the bed of the Sufed Rud as far S. as Noglabar. During the spring I had under observation a nest in a willow close to Enzeli. A pair of Sea Eagles were constantly seen perched in the tree from the end of January onwards, in fact they may be there all the year round, for I only reached Enzeli in January. From mid March they were generally standing, both of them on the nest, and they carried sticks to it. On 10th April I climbed to the nest, a huge mass of sticks five feet across, placed among the all too slender branches of the willow; it contained no eggs or young, but was draped around the edge with green weeds, and there was a heap of the same weed on the middle of the top of the nest. This decoration was no doubt the work of a Black Kite which shortly afterwards laid eggs on the eagle's nest and reared her young. It is extraordinary that the Sea Eagles tolerated this, as they had certainly repaired the nest, but they continued to hang about the tree all through the summer, roosting close to the brooding Kite by night and perching in the willow tree by day. The Black Kites never appeared to resent the presence of the Eagles, but then no Kite has a conscience. Sea Eagles breed commonly along the coast from Enzeli to Astara.

Pernis apivorus apivorus (L.)—Honey Buzzard.

1 ♀, near Qazvin—26th September.

This specimen is my only definite record of the Honey Buzzard. The wing only measures 405 mm.

Pandion haliaëtus haliaëtus, L.—Osprey.

Ospreys suddenly became very numerous on 15th March at Enzeli, and remained common through the summer, breeding in the forest, nearly always in dead trees. They fished more often in the lagoon than in the Caspian itself and were often seen taking fish out of the stake nets. I have no note of their disappearance in autumn, but they are entirely absent in winter.

Gypaëtus barbatus (L.).—Lämmergeier.

Lämmergeiers or Bearded Vultures were quite common at Kermanshah in November and December 1918 and at Asadabad in December 1918 and I also saw them at Menjil in March and April, but I never obtained a specimen.

Gyps fulvus (Hablizl.).—Griffon Vulture.

The Griffon was seen commonly all along the road from Qasr-i-Shirin to Menjil. As is of course natural it is sometimes not seen for many miles where a good road runs across level desert, but it is always quite common on passes and other places where the badness of the road kills the overburdened camel or mule. The Griffon was never seen in the forest country.

Neophron percnopterus (L.).—Egyptian Vulture.

The Egyptian Vulture is not so common as the Griffon, but was occasionally seen wherever there was food for it, for instance at Qazvin, and Menjil. I did not see the bird at Qazvin in mid-winter though I lived there for a month, and it is probable that it is a partial migrant from the colder and more wind-swept parts of the plateau during the winter.

Ciconia ciconia (L) (*C. alba*).—White Stork.

Cheesman found White Storks breeding at Kangavar, and at Karind he observed "a colony nesting on cliffs high above the village". I can find no other record of the breeding of the White Stork on cliffs, and this is a most interesting record.

Ciconia nigra (L.).—Black Stork.

I saw several Black Storks at Astara in early July; they frequented both banks of the Astara river, which here forms the northern boundary of Persia. I never saw the species elsewhere.

Plegadis falcinellus (L.).—The Glossy Ibis.

I saw one only, on 26th May at Enzen.

Ardea cinerea, L.—Common Heron.

1 ♂, Enzeli—10th June (wing 470, culmen 133 mm.).

I saw Common Herons fishing in the Kara Su marshes near Kermanshah on 29th November 1918, but I do not know whether the species breeds anywhere in the neighbourhood. The Common Heron is abundant all the year round in the lagoon of Enzeli.

Ardea purpurea, L.—Purple Heron.

I never saw the Purple Heron in winter, though Zarudny records it as present in winter and also breeding in his "South Caspian region". It appeared at Enzeli in the second week in April and was common all through the summer.

Egretta alba (L.).—Great White Heron.

The Great White Heron is common in winter both in the lagoon and along the actual sandy shore of the Caspian. The fact that I never saw it in summer is probably due to my having been unable to explore the lagoons at that time of year.

Egretta garzetta (L.).—Little Egret.

The Little Egret was common in winter on and about the water-buffaloes all round the lagoon.

Ardeola ralloides (Scop.).—Squacco Heron.

I shot two males of the Squacco Heron on 29th April at Enzeli feeding among cows in a marsh. I had not seen the species before and had I not collected them should certainly have recorded "Squacco Heron arrived, paired." The testes of both were enlarged.

Nycticorax nycticorax (L.)—Night Heron.

Small flocks of Night Herons are common at Resht and Enzeli in the winter, and I saw single birds in April and June. I have no doubt that they were breeding locally, but I have already explained why it was impossible to get definite breeding records for any of the marsh birds.

Botaurus stellaris (L.)—Common Bittern.

I saw a Common Bittern shot from a reed bed by the Kara Su at Kermanshah on 29th November 1918, and I saw the species occasionally in the reed beds round the Enzeli lagoon in winter.

Phænicopterus ruber antiquorum, Temm.—Flamingo.
(*P. roseus*, Auctt.)

I saw a flock of a dozen adult Flamingoes in July at Tula Rud, mid-way between Enzeli and Astara.

Cygnus cygnus (L.)—Whooper Swans.
(*C. musicus*, Auctt.)

I saw two adult Whooper Swans in the lagoon between Enzeli and Resht on 11th February. Capt. Ingoldby obtained a specimen, which was one of two that had been caught alive in a flight net, and which a boy was carrying alive to market. These flight nets are used with great effect in winter, at any rate against the ducks; they are spread across channels of water among the reed beds, and are often a couple of hundred yards long.

Anser, sp.

Grey Geese were common, but I never got one. I do not think they are killed in the flight nets except perhaps in very windy weather.

Tadorna tadorna (L.)—Common Sheldrake.

I saw a flock of 200-300 Common Sheldrakes on the lagoon on 16th February. That was the only time I saw the species.

Anas platyrhynchos platyrhynchos (L.)—Mallard.
(*Anas boschas*, Auctt.)

Anas crecca crecca (L.)—Common Teal.

Nyroca fuligula (L.)—Tufted Duck.

Mergus albellus, L.—Smew.

Bucephala clangula clangula (L.)—Golden Eye.

Nyroca ferina ferina (L.)—Common Pochard.

Netta rufina (Pall.)—Red-crested Pochard.

Anas penelope, L.—Wigeon.

Anas acuta, L.—Pintail Duck.

The Mallard and Common Teal were very common on the Resht side of the lagoon, that is to say, the inland, freshwater side, in winter. At Enzeli, that is to say, on the Caspian side, both on the lagoon and on the sea itself, they were relatively rare among the huge numbers of more truly marine ducks. At Enzeli the commonest duck of all was the Tufted, but Smew and Golden Eye were extremely abundant, Common and Red Crested Pochard hardly less so. Wigeon were quite common, Pintail occurred, but not in great numbers. The local people all stated that relatively speaking duck, geese and swans were not abundant during the winter of 1918-1919, and this was believed to be due to the N. end of the Caspian being less frozen over than it is in some years. Still it is curious that I never saw any of the following ducks which are recorded by Zarudny for this part of Persia:—Goosander, White-headed Duck (*Erimatura leucocephala*), Scaup, Long-tailed Duck, Common and Velvet Scoters,

Marbled Duck, Shoveller, Gargany, Gadwall and Ruddy Sheldrake. I am sure that I saw tens of thousands of ducks, on the sea and in the lagoon, and exposed for sale in the bazaar.

I do not know at what time the various species arrived in the lagoon; when I left Enzeli on 31st October 1919 it appeared that none had arrived. As to their departure in spring, in early February 1919 we had very warm weather and the duck at once became scarcer. The end of February was cold and wet but they continued to become fewer still, and were "scarce" on 28th February. By 15th March the only species left were "Smew, Golden Eye, Tufted Duck and Mallard, a few of each". After 31st March I never saw a duck except small parties of Tufted Ducks the last of which was seen as late as 26th April.

Mergus serrator, L.—Red-breasted Merganser.

I flushed a female Red-breasted Merganser from a ditch at Menjil on 1st April 1919. I saw the bird twice at very close quarters and am certain that it was a Merganser (*M. serrator*) and not a Goosander (*M. merganser*). Zarudny only records the Merganser from Seistan and the Persian Gulf.

Nyroca nyroca nyroca (L.)—White-eyed Duck.

Ingoldby told me that the White-eyed Duck was commoner than any other species at Bander-i-Gaz in Asterabad Bay in the S. E. Caspian, but I never saw it at Enzeli.

Podiceps cristatus cristatus (L.)—Great Crested Grebe.

1 ♂, 5th February—Enzeli (wing 198 mm. culmen. 52 mm.).

The Great Crested Grebe was extremely common in January in Enzeli harbour, and on the lagoon and the Caspian. All the birds disappeared in the third week in February.

Podiceps ruficollis capensis, Salva.—Little Grebe
(*Podiceps fluviatilis capensis*).

1 ♂, 2nd March.—Enzeli.

The Little Grebe is common and resident in Enzeli lagoon and harbour. It is an interesting fact that the Little Grebe of a country so far north as Gilan is the form which inhabits India and Tropical Africa, not that which inhabits Europe.

Pelecanus onocrotalus (Sub-sp ?) L.—Roseate Pelican,

1 ♂, 1 imm. Resht, lagoon. January and February (male wing, 685 mm. culmen 386 mm.)

Pelecanus crispus, Bruch.—Dalmatian Pelican.

1, Resht lagoon.

Both the Roseate and the Dalmatian Pelicans may be seen in large flocks on the south side of the lagoon during the winter, though the Roseate is far the more abundant. The two species rest together on the same mud-bank, but I do not know whether they go out on mixed fishing parties. I have no note of the date of their departure, but they certainly do not remain on the lagoon for the summer.

The single adult specimen of *P. onocrotalus* is small, but on geographical grounds probably belongs to the typical race. The tail is defective.

Phalacrocorax carbo (L.)—Common Cormorant.

The Common Cormorant is abundant all the year round at Enzeli and in winter wanders inland at any rate as far south as Menjil. It breeds in great numbers to judge from the dozens of old birds one sees flying towards the lagoon with nesting material, but I was never able to follow them. In early April the Cormorant appears to be more than usually abundant. Flocks of some thousands spent the day defiling the sandy margins of the Caspian, and every morning about 8 a. m. between 19th and 15th April one saw mile-long flights following each other eastwards. These flights were close over the sea about half a mile from shore. My skins have failed to reach home.

Phalacrocorax pygmaeus (Pall.) Pygmy Cormorant.
1 ♀, 30th January—Resht.

The Pygmy Cormorant is common in the lagoons in winter and was seen as late as 17th April. I was on the lagoon in a launch for several hours on 2nd June and never saw it. Zarudny does not state that they breed in this part of Persia, but one would have certainly expected them to do so.

Pterocles orientalis arenarius (L.)—Imperial Sandgrouse.
1 ♂, 18th June—Tehran (R. E. C.).
1 ♂, 1 ♀. September—Qazvin.

The Imperial Sand Grouse appeared at Qazvin in early February (Ingoldby). Cheesman found it paired and apparently breeding in various places in the plateau, from Hassanabad to Qazvin and Tehran. The male (18th June) had "organs not very advanced, iris brown, bill plumbeous, toes whitish grey." It is almost inconceivable that Sand Grouse should suddenly appear at Resht in spring, in view of the general swampiness of the ground and the constant rain: nevertheless a flock of a species which I could not identify certainly lit on the aerodrome at Resht on 5th March, and at that time the aerodrome was partly under water: this party of birds only stayed for a few hours.

Columba palumbus, L.—Wood Pigeon.

I saw Wood Pigeons between 3rd March and 27th April at Noglabar, Enzeli, &c.

Streptopelia turtur (L.) (sub-sp. ?) Turtle Dove.

The Turtle Dove arrived at Enzeli on 27th April and remained all through the summer: I saw it also at Astara in the beginning of July. It is exceedingly unfortunate that I did not secure skins: we may I think safely presume that they belong to the European race.

Burhinus œdicnemus œdicnemus (L.)—Stone Curlew.
1 sex? 21st September—Qazvin.
1 ♀, 16th October—Enzeli harbour.

Both the specimens of Stone Curlews belong to the typical race, which Zarudny has already recorded breeding and on migration in the Caspian Provinces and N. W. Persia. The specimen from Enzeli harbour was of course on passage, and I believe the one from Qazvin also; at any rate I never saw the bird there until the day on which I killed this specimen out of a flock of 20. I have a specimen of *B. œ. astutus* from Khaniqin in Mesopotamia, close to the Persian border.

Hematopus ostralegus ostralegus, L.—Oyster Catcher

Oyster Catchers were plentiful at Enzeli throughout the last three weeks of April: they occurred in large flocks.

Cursorius gallicus (Gm.)—Cream-coloured Courser.

I saw Cream-coloured Coursers in October between Qazvin and Teheran. They always frequented desert overgrown with Liquorice (*Glycyrrhiza*) and were extremely wild. Specimens are very desirable.

Charadrius asiaticus, Pall.—Caspian Plover.

1 ♂, 1 ♀, 1st May—Enzeli.

The pair shot were the only Caspian Plovers I ever saw. Enzeli was a most disappointing place for Waders.

Charadrius dubius, Scop.—Little Ringed Plover.

The Little Ringed Plover breeds at Enzeli, and at Astara, on the banks of sand along the edge of the Caspian. I have no note or recollection of its presence in winter.

Charadrius alexandrinus, L.—Kentish Plover.

The Kentish Plover appeared at Enzeli on 14th April in pairs, and I expected that they would breed, but they certainly disappeared from the small area I was able to investigate.

Vanellus vanellus (L.)—Peewits.

I saw Peewits at Karind on 27th November. Round Resht and Enzeli they were common in winter in small flocks in the rice fields. They disappeared by mid-March.

Numenius phaeopus, L.—Whimbrel.

The Whimbrel was common on the shore at Enzeli in flocks from the second week in April until early May.

Numenius arquata, L.—Common Curlew.

Recurvirostra avocetta, L.—Avocet.

Erolia alpina, L.—Dunlin.

Tringa nebularia, Gunner.—Greenshank.

The Common Curlew, Avocet, Dunlin and Greenshank, were all identified in January and February on the Resht lagoon. None of them were abundant.

Tringa totanus, L.—Redshank.

I saw Redshank commonly on the marshy borders of the Kara Su at Kermanshah at the end of November 1918; round Enzeli and Resht in March, but not in winter. They were probably passing through on migration, as I never saw them in winter.

Tringa hypoleuca, L.—Common Sandpiper.

The Common Sandpiper passed through Enzel at the end of April and in early May.

Tringa ochropus, L.—Green Sandpiper.

I saw Green Sandpipers at Karind and Kermanshah at the end of November 1918.

Gallinago gallinago, L.—Common Snipe.

The Common Snipe is common in the plateau in winter (Kermanshah, Qazvin,) wherever the ground is suitable. It is extremely abundant round the marshes and lagoons in Gilan in winter and one flushes them in tens at a time. The species became scarcer after the middle of February, but I saw a few as late as 17th April. The Snipe returned to the low lands in early September, but even in mid October one only flushed them in twos and threes.

Gallinago media (Lath.)—Great Snipe.

(*G. major*, Gm.)

The Great Snipe passes through Enzeli every year on migration at the end of April and in early May, as the local sportsmen well know.

Limnocytes gallinula (L.)—Jack Snipe.

The Jack Snipe was common in winter round the lagoons though not so extremely abundant as the Common Snipe. One or two were seen as late as the 17th April at Enzeli, and the bird returned in the middle of October in small numbers.

Scolopax rusticola (L.)—Woodcock.

1 ♂, 3rd December 1918—Kermanshah.

Woodcocks were common in the little wood above Kermanshah at the end of November and in early December and I was informed that they remain there all the winter. They are abundant in winter in the forest of Gilan (Resht, Enzeli, Noglabar, &c.). My latest record in spring is 20th March, and I do not know when they return in the autumn.

Larus argentatus cachinnans. Pall.—Herring Gull.

1 ♀, Enzeli—2nd March.

In January and February this race of the Herring Gull was very common in Enzeli harbour, and a very few remained through March. After that the species was completely absent, including young birds, all through the spring and summer, and it had not returned when I sailed from Enzeli on 30th October.

Larus ridibundus, L.—Black-headed Gull.

The Black-headed Gull is abundant round fresh and salt water at Resht and Enzeli in winter. They were last seen in the third week in March and had not appeared again on 31st October.

Larus canus canus.—Common Gull.

1 ♂, 1 ♀, Enzeli and Resht—February.

The Common Gull was common at Enzeli, and quite infrequent so far inland as Resht. It was last seen in the third week in March and had not returned by 31st October. Male wing 390, culmen 34 mm; female wing 340, culmen 30 mm.

Larus ichthyætes, Pall.—Great Black-headed Gull.

The Great Black-headed Gull is not rare in winter in the less frequented parts of the lagoon, but it is extremely shy and I never obtained a specimen.

Sterna tschegrava, Lepechin.—Caspian Tern.

(*S. caspia*, Pall.)

Large flocks of Caspian Terns frequented the sandy shore of the Caspian at Enzeli in the first fortnight of April. I never saw them at any other time.

Otis tarda, L.—Great Bustard.

I saw four Great Bustards, all apparently adult, among liquorice (*Glycerhiza*) in the desert at Harunabad on 27th November 1918.

Porphyrio poliocephalus seistanicus Zar. and Härms (1911).—Purple Coot.

(*P. p. caspius*, Hartert, 1917).

1 ♀, 16th February—Resht.

Zarudny separated the Purple Coot of Seistan as *P. p. seistanicus* from the Caspian bird, and stated that the form from Seistan differs in the paler colour of all parts of its body. Hartert (1917), overlooking Zarudny's description, described *P. p. caspius* from Lenkoran, but Zarudny's name must stand though his description is quite misleading, for birds from Seistan and the Caspian are identical. Hartert states quite correctly that there are no colour differences between specimens from India, Seistan and the Caspian littoral: on the other hand the Caspian and Seistan specimens are larger than those from India (the terra typica), and Ceylon, and not only is the wing longer, but the bill is much more stoutly formed. The wing of my female from the Resht lagoon measures 263 mm., that of a female from Lenkoran (Tring Mus.) 260, and a series from Seistan (Tring Mus.) males 277-285 mm., females 258-275. The bill of the Resht specimen measures from the point to the anterior edge of the nostril 29 mm, and to the posterior edge of the shield 63 mm. The species is quite common in the dense reed beds which surround the lagoon at Enzeli.

Purple Coots of this species are resident in the great marshes which lie on either side of, and between the Tigris and Euphrates in the lower part of their course. A small part of one of these marshes, the Hor Hawezeh, lies in Persian territory. Zarudny tells us that he has heard of the existence of Purple Coots in this place (the "Chauwizeh oasis"), and that he presumes them to be *P. caspius*. I have a series of these birds from lower Mesopotamia, none of them actually shot on Persian soil, but all of them from marshes which are continuous with the Hor Hawezeh, and they belong to *P. poliocephalus* and not to *P. caspius*. They differ from specimens from Seistan and the Caspian, in their smaller size. Dr. C. B. Ticehurst, who is working on the birds of Mesopotamia, informs me that they are inseparable from the typical Indian and Ceylonese race.

Rallus aquaticus korejewi, Zar.—Water Rail.

1 ♀, Resht—16th February.

This specimen was shot from reeds at the side of the lagoon between Resht and Enzeli: the ovaries were not enlarged; the wing measures 127 mm., the bill 45 mm. (exposed culmen). Woosnam's specimens from the "S Coast of the Caspian" are also referable to this form.

Water rails vary considerably in the colours of the dorsum, in any one locality. This race is distinguished by its pale dorsum, which is an olive brown rather than a reddish brown, but there seems to be a certain amount of overlapping between *R. a. korejeur* and *R. a. aquaticus*. It appears to range from Babylonia through Central Asia to E. China and to be found in India in winter.

Fulica atra, L.—Common Coot.

The Common Coot is extremely common on the lagoon, and on deeply flooded rice fields in winter, but I have no record of seeing it after the third week in March at all.

Porzana porzana, (L.)—Spotted Crake.

(*P. maruetta*, Leach).

1 ♂ Menjil—31st March.

My only record is a specimen picked up dead under a telegraph wire; the testes were small.

Coturnix coturnix coturnix, L.—Common Quail,

1 ♀, 20th April—Enzeli.

The Common Quail was fairly common at Enzeli from 14th April till early May among wild pomegranate bushes just inland of the sand hills.

Perdix perdix canescens, Butur.—Common Partridge.

1 ♂, 1 sex? October—Zinjan (C. M. I.),

The two specimens of the Common Partridge obtained for Ingoldby at Zinjan are a male and female just passing into adult plumage. They agree fairly well with specimens from Ereğli and Lake Urumiyah, and Dr. Hartert is inclined to refer them to the form described as *canescens* by Buturlin from Transcaucasia. Specimens of the Common Partridge from any Asiatic locality are very rare in British collections. I never heard of this species being seen round Qazvin, and am fairly confident that it does not occur there; I believe that in Persia it is confined to the province of Azerbaijan. Blanford records it on hearsay as far east as the Tehran neighbourhood.

Alectoris græca (Brisson) (*Caccabis chukar*, G. R. Grey).—Chukor.

The Chukor is common and often abundant all over the rocky hills in all the parts of Persia which we visited, and in winter it comes down in to the plains, so that in snowy weather it is sometimes found quite close to Qazvin. It does not really enter the Gilan forest though I have seen it among thick trees at Noglabar. Cheesman saw it as high as 10,000 feet, in the mountains behind Tehran in June.

Ammoperdix griseogularis griseogularis (Brandt.) (*A. lonhami*, G. R. Gray).—

See See.

4 ♂, 2 ♀, S. of Menjil—October.

The See See of the Elburz is undoubtedly the typical race. Though the species was not widely distributed like the Chukor it was locally common in the dry stony hills S. of Menjil. This country resembled the country round Qasr-i-Shirin, where the other form of the same bird was so common; the species frequents ground which is hillocky rather than mountainous and was abundant round Menjil among the innumerable nullahs. One hardly saw the birds by day but in the dusk they came down on to the main road and fed on mules droppings; at that time they were very tame.

Ammopertix griseogularis ter-meuleni Zar.—Persian See See.

2 ♂, Qasr-i-Shirin—24th November 1918.

This race of the See See, which appears to be found in N. Mesopotamia, W. Persia and S. W. Persia was only obtained at Qasr-i-Shirin. Males of the two races are not so easy to separate as females but these are freshly moulted and I am satisfied with the identification.

Phasianus colchicus talyschensis.—Caspian Pheasant.

1 ♂, 1 ♀ January—Resht.

1 ♂, March—Noglabar.

1 ♂, 1 ♀, Bandar-i-Gaz (C. M. I.).

This race of the Pheasant is common both on the northern slopes of the Elburz, and low down in the extremely marshy forest close to the Caspian. In-goldby flushed the bird at Bandar-i-Gaz from small tufts of rice straw in wet paddy fields in winter, and they are not rare in the dense reed beds, round the Resht lagoon country in which Purple Herons, Gallinules and Water Rails seem more naturally at home. If one were to judge from the few specimens at Tring and the British Museum, and the three males at my disposal one would conclude that the white ring so characteristic of some Eastern Pheasants was represented solely by an occasional white-tipped feather in some males and not in others, but this is far from being the case. I have seen many scores of specimens in the bazaars of Resht and Enzeli and a small proportion of them have very nearly complete white rings to their necks, but are in other respects typical *talyschensis*. The throats of these specimens had been cut almost to the point of decapitation, and I preserved no skins. Pheasants are sold for about one toman, approximately eight shillings, a price sufficient to put every gunner's hand against them.

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Tavoy District, Tenasserim.

A LIST OF BUTTERFLIES COLLECTED IN THE TAVOY DISTRICT, BURMA.

BY

O. C. OLLENBACH.

(With a map and plate).

No systematic collecting appears to have been done in the Tavoy District since Doherty's time and as I have now collected and received specimens for the past ten years, a list of the species taken may be of interest to readers of this journal.

As far as possible I have given exact dates, localities and altitudes of capture.

When Doherty visited the district in the eighties there must have been little or no communication with the interior, but now there are several good graded roads, suitable for motor traffic, so that travelling is rapid and comfortable. The accompanying map shows all the good collecting grounds, so far as I am aware of and the roads on which cars can be used. This list does not claim to be a complete one, and only shows the forms that have been received or taken by me.

It will be noticed that most of the collecting was done on hill-tops, and I should advise any one wishing to try Tavoy to keep to this, as on the plains little is to be seen and those mostly of the commonest species. The best collecting grounds are fairly open hill-tops, with evergreen forest, where the sunlight can filter through the foliage, and the best hours for catching are from 11 A.M. to 5 P.M.

These hill tops appear to be general meeting grounds and are frequented by large numbers of butterflies, many of which appear to fly about in an aimless manner, while others of a fighting nature, seem to come there with the sole object of attacking every butterfly that happens to pass within a limited distance of their resting spots.

The best seasons for collecting are from October to end of December and from the middle of February to end of May. Between June and September it is not possible to do much owing to the heavy rain and the flooded state of the country. In naming the species I have followed Colonel Evans' list of Indian Butterflies, which was published in Vol. XXI of the Society's Journal. I am greatly indebted to Mr. W. S. Wood, of the Bombay Burma Trading Corporation, Ltd., for the help he has rendered me and to whose knowledge of the country is due the little success I have gained. He also personally collected a large number of specimens including many of the rarities shown in this list.

To Colonel W. H. Evans, D.S.O., R.E., I am also much indebted for the help he has given me by identifying a large number of specimens—a task by no means light.

Family—NYMPHALIDÆ.

Subfamily—DANAINÆ.

1. *Hestia jasonia agarmarschana*, Felder.
Occurs along the coast and up tidal creeks where mangrove swamps exist. Not common anywhere.
2. *Danais similis vulgaris*, Butler.
Plentiful on Sabataung, 300', during December. It keeps to the lower slopes and flies from October to May.
3. *Danais aglea phormion*, Fruh.
Common at low elevations as well as on the lower slopes of hills; found at all seasons.

4. *Danais eryx agleoides*, Felder.
Common at low elevations from November to March; frequents gardens and road-side ditches. Its flight is weak and it settles frequently.
5. *Danais gautama*, Moore.
A male and two females only secured; the former at Wagon (Kalataung), 1,500' and the latter on Sabataung, 300', in December. It is probably not uncommon, but escapes notice owing to its likeness to *D. vulgaris*, But. Flies from September to March.
6. *Danais limniace*, Cramer.
Very common everywhere all the year round.
7. *Danais melissa septentrionis*, Butler.
Common on the plains. Appeared in large numbers during the last week of January 1920 and joined in the flight of *Euplæas*. This flight lasted many days, the direction being S. W.
8. *Danais plexippus*, L.
Common at low elevations at all seasons.
9. *Danais melanippus indicus*, Fruh.
A few specimens of both sexes taken on the lower slopes of Sabataung and also at Maungmagan near the sea coast. It is not common and flies from November to March.
10. *Danais chrysippus*, L.
Apparently rare: one female seen but not secured.
11. *Danais melaneus*, Cramer.
Plentiful on Kalataung, 1,500', N.-W. of Wagon during December, also found sparingly at Pagaye.
12. *Euplæa modesta*, Butler.
Common at all elevations and at all seasons. It took part in the flight of January 1920.
13. *Euplæa crameri bremeri*, Felder.
Fairly common and on the wing all the year round. Found at all elevations up to 2,000. Joined in the flight of January 1920.
14. *Euplæa godarti*, Luc.
Common at low elevations throughout the district at all times. Females are scarce.
15. *Euplæa deione menetriesi*, Felder.
A common species found both in the plains and hills. Appeared in great numbers and joined the flight of January 1920.
16. *Euplæa mulciber*, Cramer.
Very common everywhere and at all elevations. Took part in the flight of January 1920.
17. *Euplæa marares ledereri*, Felder.
Rather uncommon; a few specimens taken on Sabataung, 500', and at Maungmagan on the coast; two at Pagaye and one in the Mangrove swamps at Myegaungaine. Flies from November to April.
18. *Euplæa corus vitrina*, Fruh.
A rare species of which only a pair were secured and a few others seen. It keeps to low elevations frequenting gardens and plantations. The female was taken in Tavoy town on the 9th January 1920 and the male at the foot of Sabataung on the 26th December 1919. Appears to be very local and flies during January and February.
19. *Euplæa midamus margarita*, Butler.
Not uncommon; taken at all elevations throughout the district. Appeared in large numbers and joined in the flight of January 1920.
20. *Euplæa klugii crassa*, Butler.
Common all over the district and probably flies all the year round. Joined in the flight of January 1920 in great numbers.

21. *Euplaea diocletianus*, Fab.

Males plentiful but females scarce; appears to prefer low elevations and is plentiful along forest roads and clearings in the jungle. It flies all the year round but is most plentiful from November to March.

Family—NYMPHALIDÆ.

Subfamily—SATYRINÆ.

22. *Ypthima huebneri*, Kir.

Common all over the district at all seasons.

23. *Ypthima savara*, Gr.

Common in heavy jungle along streams at the foot of the hills and also on hill tops. Plentiful from November to May.

24. *Ypthima baldus*, Fab.

Very common everywhere at all seasons.

25. *Erites medura falcipennis*, DeN.

A few specimens taken in bamboo jungle at low elevations during December and January at Kambauk and Pagaye.

26. *Erites rotundata*, DeN.

Two males taken at Pagaye in April 1914.

27. *Erites angularis*, Moore.

Fairly plentiful in bamboo jungle at the foot of the hills but are difficult to take. It flies from September to June and may be seen in fair numbers round about Pagaye and along the Pachaung-Kambauk road.

28. *Ragadia crisilda*, Hew.

Very common in the streams at the foot of the hills. It has a weak flight and settles frequently and is to be found at all seasons.

29. *Ragadia critolaus*, DeN.

Not common. Flies in company with the above. A few specimens were taken at Yeawing and along the Kalachaung in February 1918.

30. *Lethe europa*, Fab.

Found sparingly in bamboo jungle on low ground at Pagaye and Talingya from November to May.

31. *Lethe minerva tritogenia*, Fruh.

Seven males and four females taken in bamboo jungle at the foot of the hills. I have specimens from Pagaye, Kambauk and Sabataung. This is probably a common species but escapes detection owing to its likeness to *L. mekara*, Moore. Flies from September to May.

32. *Lethe mekara*, Moore.

Common at the foot of the hills in bamboo jungle all over the district.

33. *Lethe dypta*, Felder.

A few specimens taken at Pagaye during December.

34. *Neorina chrishna archaica*, Fruh.

This appears to be a rare species as I have received only three males and two females in about nine years. One male was taken at Myekhanbaw and the rest at Pagaye, the former in February and the latter in May. It keeps to the hills and evergreen forest.

35. *Coelites epiminthia linghmi*, Moore.

A very rare species and seldom taken in good condition. Three males and two females taken at Kadantaung and two males and a female at Pagaye, from August to October, in evergreen forest.

36. *Mycalesis anaxias*, Hew.

Very common on hill-tops from December to February and less so at other seasons.

37. *Mycalesis perseus*, Fab.

Common all over the district.

38. *Mycalesis perseoides*, Moore.

Plentiful at Pagaye and Wagon during November and December at low elevations.

39. *Mycalesis mnasicles perna*, Fruh.

Not uncommon in bamboo jungle at the foot of the hills.

40. *Mycalesis fuscum*, Felder. ♂ No. III ♀ No. IV in plate.

Taken sparingly along the streams and in the swamps near Pagaye and Myitta. This butterfly is seldom seen on the wing, as it lies hidden under the "debris" that is left by the streams when the floods have subsided and has to be beaten out. Sometimes they may be flushed from the weeds and scrub that grow along the banks of the streams, but for this it is necessary to be on the spot before sunrise. Good specimens are difficult to secure and females are very scarce. Three males and one female were taken at Myitta, by Wood, in March 1912, and fourteen males and two females were taken in the streams near Pagaye during December and January 1919-20. The best spot for this species is a feeder of the Pauktaungchaung, about a mile East of Pagaye.

41. *Mycalesis oroatis surkha*, Mar.

Rather a rare species; one female taken at Kadantaung and several males at Sanchaung, 4 miles North of Pagaye, during September and October.

42. *Mycalesis meda*, Fab.

Common on the hills all the year round.

43. *Melanitis leda ismene*, Cr.

Common all over and at all seasons.

44. *Melanitis phedima belz*, Moore.

Does not appear to be so common as the above; a few specimens taken at Pagaye during December.

45. *Mycalesis zitenius auletes*, Fruh.

A single male taken at the foot of Pagaye hill on 15th December 1919.

46. *Anadebis diademoides*, Moore.

This species is not uncommon though very local. It is fairly plentiful in the Ouzinchaung near Kyaukmedaung and at Myekhanbaw; is easy to take as it flies little and settles frequently on twigs and leaves overhanging the streams and is not shy. The colour of the eyes is turquoise in freshly captured specimens but fades after a time to brown.

47. *Elymnias hypermnestra tinctoria*, Moore.

A common butterfly found at all elevations where palms and canes grow. In most specimens the females have the hind wings suffused with white, but the white varies considerably so that some specimens are indistinguishable from the same sex of *E. undularis*, Drury.

48. *Elymnias cottonis obrubila*, Mar.

A rare species which keeps to dense jungle where palms and canes grow. Two males and a female taken at Yeawing, 500' on the 22nd February 1919 and three males and a female on Kalataung 1500' on the 23rd December 1919.

49. *Elymnias dara daedalion*, DeN.

A pair taken on Pagaya hill 500' during November and December. It is a rare species and difficult to catch as it flies high and keeps to dense bamboo jungle.

50. *Elymnias malelas saueri*, Dist.

A single female taken by Wood at Kadantaung on the 22nd September 1915. This one is very like the female of *E. malelas*, Hew., on the upper side, though the outer margin of the forewing is prominently toothed near the middle. The underside resembles *E. timandra*, Wall.

51. *Elymnias nesaca cortona*, Fröh.

Plentiful on hill-tops in evergreen forest. Many specimens of both sexes were secured at Pagaye 600' during December and January. They keep to certain localities, fly high and seldom come within reach, but by fixing a net to a specially long bamboo a good number may be taken.

52. *Elymnias penanga chelensis*, DeN.

A rare species and seldom met with; three males and one female only taken in about nine years, the former on Kalataung 1,700' and the latter, on Nwalabo, 4,500'. It keeps to dense evergreen forest on the hill.

Family—NYMPHALIDÆ,

Subfamily—MORPHINÆ.

53. *Clerome arcesilaus*, Fab.

Common all the year round in damp shady ravines and near streams; also found on jungle paths on elephants' droppings.

54. *Xanthotania busiris*, Wd.

Fairly plentiful in swampy ground at the foot of the hills. It does not fly during daylight but can be flushed and taken as it settles after a short flight. It is fairly plentiful in the Pauktaung stream which flows by Pagaye and also at the foot of the hill east of Yeawing. Numerous males but only two females were taken from December to February; flies at all seasons.

55. *Thaumantis diores*.

Plentiful in evergreen forest from October to June.

56. *Thaumantis lucipor*, Wd.

Three males taken at low elevations in the Mergui district: two in April and one in December. It has so far not been taken in Tavoy district.

57. *Thauria aliris intermedia*, Crow.

A male taken at Pagaye in May and a female at Kambauk in October.

58. *Stictopthalma godfreyi*, Roth.

A pair of this beautiful species taken by Wood; the female at Taungshuntaung on the 17th May 1917 and the male at Kalachaung on the 28th March 1919. It keeps to heavy jungle and is attracted by over-ripe fruit. A description of this species will be found in J. B. N. H. S., Vol. XXVI, part 3, page 867.

59. *Zeuxidia amethystus masoni*, Moore.

Several males and three females taken at Yeawing, 300', in February 1919, and also at Pagaye and Wagon from December to March. It flies after sunset and may be seen along most of the streams and nalas in dense forest, most plentiful at Yeawing from December to February.

60. *Amathusia phidippus*, Joh.

This species like the above also flies after dusk and frequents palm groves, gardens and the banks of tidal creeks. I have known it to fly into houses after dark, attracted no doubt by the bright lights; a specimen I have was taken at night in the billiard room of the Tavoy club.

61. *Amathusia amythion*, Db.

Males uncommon but females very rare; two males taken at Pagaye in January 1915 and the female at Myekhanbaw in May 1919. This species is generally found in the same locality as *Z. masoni* but has also been known to fly during daylight.

62. *Discophora celinde continentalis*, Std.

Not uncommon at low elevations in bamboo jungle. It is a very shy insect and will not permit one to approach; males are often met with, but females appear to be exceedingly rare and I have not succeeded in securing one. The few males I have are larger than either Indian or Andaman specimens and are brighter also; the yellow spots on upper side of forewings being large and bright.

63. *Discophora tullia indica*, Std.

A common species found everywhere on low ground; it frequents bamboo jungle and also gardens and may be seen about dusk flying in the neighbourhood of habitations. The females oviposit on bamboo leaves.

64. *Enispe euthymius*, Db.

Appears to be an uncommon species as I have secured only two males, one at Pagaye, 300' on the 17th December 1919 and the other at Myekhanbaw in April 1915. The former has the dark markings very deep and about twice as wide as in any of the Indian specimens I possess, while the usual orange ground colour is overlaid with brown scales, so that the orange colour just shows through.

Family—NYMPHALIDÆ.

Subfamily—NYMPHALINÆ.

65. *Charaxes polyxena hierax*, Felder.

Several males and four females taken at Pagaye, Maungmagan and Myekhanbaw from September to May.

66. *Charaxes aristogiton*, Fd.

A few males only taken at Pagaye and Wagon from December to April; no females have so far been seen.

67. *Charaxes fabius sulphureus*, Roth.

A single male taken at about 300'.

68. *Eulepis aihamas*, Drury.

Males common along streams at the foot of the hills, but females are scarce.

69. *Eulepis arja*, Felder.

Common all over along streams.

70. *Eulepis jalysus*, Felder.

An uncommon species; three males only taken; two on Sabataung 600' and one on Kalataung 1,200' in December.

71. *Eulepis delphis concha*, Wd.

Two males taken at Pagaye in October 1916 and a pair at Kalachaung during April 1916 and 1917 respectively.

72. *Eulepis eulamippus*, Db.

Fairly common along streams during the summer and on hill-tops during the cooler months.

73. *Apatura osteria*, Wd.

Males plentiful on the top of the hill at Pagaye 600' and sparingly so on the hill West of Kambauk, but no females were taken or seen at either of these places. The only female secured was caught on Kalataung, above Wagon at about 1,700' on 22nd December 1919, no males being seen here. In all 33 males were taken in one particular spot, where they were to be seen daily between the hours of 3 to 5 P.M. They seldom come within reach of an ordinary net and keep to the higher branches of the trees; they settle with wings outspread in places where there are patches of sunlight and from these spots fly out and attack any other butterfly that chances to pass along, returning to the same leaf after the struggle. Fresh specimens may be taken from November to January and worn ones up to end of May.

74. *Euripus halitherses*, Db.

Males plentiful on the hills but females appear to be very scarce. One female of the form *Isa* taken at Pagaye, at the foot of the hill on 16th December 1919.

75. *Stibochiana nicea*, Gray.

Apparently a rare species as only one, a male, was taken on Kalataung, 1,700' on 22nd December 1919. This specimen has the outer white border on the hind wings very wide, about 1" in the middle of the margin, decreasing both ways to the termen and apex. The black central spots are small and crowned with blue inwardly, the post discal band on the hind wings is not very sinuous but well defined and the blue markings are bright and appear green in certain flights.

76. *Adolias dirtea*, Fab.

Plentiful all over the district where there is heavy jungle. Tavoy specimens are larger and brighter in colour than those from upcountry, the females in particular being of great size.

77. *Euthalia goodrichi*, Dist.

Four males and two females taken; a pair at Kalachaung in April, two males and a female at Pagaye in June and a male at Wagon in December.

78. *Euthalia derma*, Koll.

Three specimens, two males and a female taken at Pagaye at the foot of the hill during December and March.

79. *Euthalia dunya*, Db.

Fairly plentiful in heavy forest on the hills but most difficult to catch, as it is extremely wary and has a most irritating habit of allowing one to approach quite close and then flying off just when you are about to make a swoop. It appears to be most plentiful on Kalataung from November to March.

80. *Euthalia cocytus*, Fab.

Several males and a few females taken at Yeawing, Pagaye, Wagon and Myekhanbaw from December to May. It keeps mostly to the hills in heavy forest.

81. *Euthalia lepidea andersoni*, Moore.

A very common species found throughout the district in bamboo and scrub jungle, and along forest paths and streams.

82. *Euthalia appiades julii*, Bougain.

Very common and found in company with *E. andersoni*; females are rather scarce.

83. *Euthalia jahnu*, Moore.

Fairly common both in the hills and plains wherever a species of *Ageratum* grows, on the flowers of which they feed.

84. *Euthalia anosia*, Moore.

A common butterfly where mango trees grow, on the leaves of which the larvæ appear to feed.

85. *Euthalia kesava rangoonensis*, Sw.

Common all over the district and flies all the year round.

86. *Euthalia phemius*, Db.

Five females only taken but no males have been met with; the females are smaller and lighter than Khasi Hills specimens.

87. *Euthalia lubentina*, Cr.

A common butterfly found all over and at all elevations.

88. *Euthalia garuda*, Moore.

Very common at low elevations and in gardens where mango trees grow, on the leaves of which the larvæ feed.

89. *Euthalia jama*, Fd.

Found in the plains as well on the hills, but is not common.

90. *Euthalia apicalis*, Voll.

Six males only taken during December and January at Pagaye and Wagon.

91. *Euthalia kanda*, Moore.

A single male taken at Talaingya in February 1917.

92. *Parthenos gambrisius*, Fab.
Common at low elevations in bamboo and scrub jungle. Though plentiful it is difficult to take as it is a wary creature.
93. *Limnitis procris anarta*, Moore.
A common species found throughout the district at all elevations.
94. *Lebadea martha attenuata*, Moore.
Very common at all elevations at all times.
95. *Pantoporia nefte nivifera*, But.
Males very common but females scarce. This species is found at all elevations but apparently prefers hill-tops, where they may be seen in large numbers. The males are about the most pugnacious of all butterflies and will attack and drive away any others that happen to come, and I found it necessary to catch and destroy all the males I could before settling down to collect.
96. *Pantoporia zeroa*, Moore.
Two females only taken, one at Maungmagan on 9th April 1914 and the other in Mergui district on 12th November 1919; so far no males have been seen.
97. *Pantoporia kresna*, Moore.
Plentiful on hill-tops; numerous specimens of both sexes were taken on Pagaye hill 500' and Kalataung, 1,500' to 2,000', during December and January. It is found at all seasons, but is most numerous from November to March.
98. *Pantoporia kanwa*, Moore.
Males common but females very scarce, on hill-tops, from November to March. Many males and a few females taken at Pagaye, Wagon and Kambauk during December and January.
99. *Pantoporia opalina*, Koll.
A single male taken on Kalataung 1,700' on 22nd December 1919. This specimen is nearer to the Sikkim form than the N.-W. Himalayan form, so far as the spots and bands on the upper sides of the wings are concerned.
100. *Pantoporia perius*, L.
Very common at all seasons from about sea level to 1,000', all over the district.
101. *Pantoporia larymna*, Db.
Four males and three females only taken in about 8 years collecting. It keeps to the higher branches of trees and seldom descends low, which may account for it being so scarce. Specimens have been taken at low elevations as well as on the hills.
102. *Pantoporia asura*, Moore.
A single female taken at the foot of the hill at Pagaye. This one agrees in every respect with N.-W. Himalayan specimens in my collection.
103. *Pantoporia pravara*, Moore.
Plentiful on hill-tops in company with *P. kanwa* and *P. kresna*. Many specimens taken at Pagaye, Wagon and Kambauk during December and January.
104. *Neptis hylas adara*, Moore.
A common species found at all seasons throughout the district.
105. *Neptis soma*, Moore.
Not uncommon both on the hills and plains at all times of the year.
106. *Neptis nata cresina*, Moore.
Rather a rare species, found in heavy forest at all elevations. I secured about a dozen specimens; two at Yeawing in February and a few at Pagaye, Sabataung and Wagon during December 1919.
107. *Neptis columella martabana*, Moore.
Of this species only two males were secured, one on Kalataung 1,500' in December 1919 and one on Pagaye hill 500' in March 1916.

108. *Neptis jumbah*, Moore.
A few specimens, in all, taken at Maungmagan, Sabataung, Talaingya and Megyaungain during December, all at low elevations.
109. *Neptis harita*, Moore.
This is an uncommon species of which only a few were secured. The females are rare. All the specimens secured were taken at Pagaye and Wagon during December.
110. *Neptis vikasi pseudovikasi*, Moore.
A Common species which keeps to the hills and flies from December to May.
111. *Neptis anjana*, Moore.
A single male taken in the Kalcianaung Reserve forest in June.
112. *Neptis ebusa fuliginosa*, Moore.
Several males and a few females taken on the hills at Pagaye, Wagon and Kambauk during December and January.
113. *Neptis miah nolana*, Druce.
An uncommon species and so far only taken on Pagaye hill, 500', during December.
114. *Neptis viraja*, Moore.
This is an uncommon species as only four males and two females in all were secured; two males on Pagaye hill, 600' and the rest on Kalataung 1500', in December.
115. *Neptis heliodore*, Fab.
Plentiful in the hills all over the district. Numerous specimens of both sexes taken during December and January; very plentiful in the latter month.
116. *Neptis hordonia*, Stoll.
Common at all seasons throughout the district.
117. *Neptis peraka*, Butler.
Common on hill tops from November to March; numerous specimens taken at Pagaye, Wagon, Kambauk and Sabataung during December and January.
118. *Neptis aurelia*, Std.
Rather uncommon; flies in company with *N. peraka* and *hordonia* during December and January but found very sparingly at other times.
119. *Cyrestis nivea nivalis*, Fd.
Several specimens of both sexes taken during December and January, both on the hills and low grounds. This species comes down to the streams during the hot hours of the day and settles on damp sand.
120. *Cyrestis periander*, Fab.
Rather more scarce than the above and keeps to the hills. A few males and two females taken on Pagaye hill 600', and on Kalataung 1500' during December 1919.
121. *Cyrestis peraka*, Dist.
This butterfly keeps to the streams at the foot of the hills in dense jungle. It was very plentiful during January 1920 on the road from Pachaung to Kambauk, at a spot where a stream cut across the road near the 15th mile stone. It has a weak flight and settles frequently on the underside of a leaf, with outstretched wings.
122. *Cyrestis risa*, Db.
A common species to be seen everywhere and at all times of the year.
123. *Cyrestis rahria rahrioides*, Moore.
Taken sparingly in company with the above, at Pagaye, during January.
124. *Junonia iphita*, Cramer.
Common at low elevations.
125. *Junonia lemonias*, L.
Common at the foot of the hills.
126. *Junonia hierta*, Fab.
Common in the plains.

127. *Junonia orithyia*, L.

Plentiful though not so common as the above.

128. *Junonia atlites*, Joh.

One of the commonest of butterflies in the plains.

129. *Junonia almana*, L.

Common in the plains.

130. *Symbrenthia hippoclus lucina*, Cramer.

A few taken on Kalataung, 1,500', towards the end of December 1919.

131. *Symbrenthia niphanda*, Moore.

A single male secured on Pagaye hill 600' on 16th April 1916.

132. *Prothæ francki angelica*, Butler.

A rare species found mostly on hill tops in heavy forest. Nine males and a single female taken; four at Yeawing, 400', on 10th May 1919, four on Pagaye hill, 600' in January 1920, and one on Kambauk hill 700' on 19th January 1920. The single female was taken at the foot of Yeawing hill, inside a house, where she no doubt had been attracted by the scent of some ripe guavas. This butterfly keeps to very dense forest in places where the gloom is deepest; it flies little and settles frequently, always selecting the bare trunk of a tree. It settles with its head facing upwards, but immediately after turns about and faces downwards. It is not by any means shy and is easy to take when seen, but the colouring on the underside harmonises so well with the moss-covered trunks of the trees that it is by no means easy to spot. It appears to fly from December to May.

133. *Rhinopalpa polynice birmana*, Fruh.

Rather a scarce species which I personally did not take, but several specimens of both sexes were caught by Wood at Kalachaung and Kedantaung.

It is evidently a gross feeder, as five fresh males were taken in the Kalachaung, feeding on human excreta.

134. *Hypolimnas bolina*, L.

Common on the plains and some little way up the hills. They do not appear to attain the size of those found in N.-W. India.

135. *Hypolimnas misippus*, L.

Apparently a rare species as only one male was taken on Pagaye hill, 500', in December 1919.

136. *PentHEMA darlisa*, Moore.

Very scarce and seldom met with; two males and one female have so far been secured; the former at Yeawing in May and the female at Pagaye in September. The two males are typical, but in the female the discal series of spots, on the hind wings, are joined to the internervular streaks, which given the latter a clavate appearance. The streak in the submedian interspace is very short, from near the tornus to about half the length of the margin.

137. *Doleschallia bisaltide pratipa*, Moore.

Males common but females scarce. Keeps to the hills.

138. *Kallima inachus limborqi*, Moore.

Plentiful at Kadantaung and Myekhanbaw in June, also found near Pagaye in January. Tavoy specimens are brighter than the Indian forms and are very like the Japanese form.

139. *Cynthia erota*, Fab.

Rather an uncommon species of which I have secured only three males and two females; the former on Nwalabo hill, 4,500', in December and the latter on Sabataung, 500', in the same month. The males are very heavily marked with black, much more so than are the Indian specimens.

140. *Issoria sinha*, Koll.

Common and generally found at low elevations.

141. *Atella phalanta*, Drury.
Rather uncommon, found all the year round.
142. *Atella alcippe alcippoides*, Moore.
Plentiful on the hills at all seasons. The males when freshly taken have a beautiful purple gloss on the upper side of the wings when held in a certain light.
143. *Cirrochroa fasciata*, Felder.
One of the commonest of butterflies in the district. It was to be seen in great numbers on Penaichaung hill, 500', two miles N. of Pagaye during December 1919; also on Kalataung, about 1,200', and at the foot of the hill near Pachaung. At the last place it literally swarmed, attracted by the evil smelling ooze from the bed of a stream, also a favourite wallowing place for wild animals. This species is most in evidence during December and January and is found sparingly at other times.
144. *Cirrochroa surya*, Moore.
Fairly plentiful on the hills during December and January and less so at other seasons.
145. *Cirrochroa mithila*, Moore.
A very common species, frequenting the hills as well as the plains: Tavoy specimens are hardly distinguishable from the Andaman form *Anjira*, Moore. It is a thirsty creature and large numbers may be seen during the warmest hours of the day, sucking the moisture from damp patches in the beds of streams.
146. *Cirrochroa orissa*. ♂ No. II in plate.
Fairly plentiful on the hills near Yeawing, on Kalataung, Pagaye and Pinnehaung. This species is new to the Indian region and was recorded from Borneo. In flight it is almost indistinguishable from *Cupha erymanthis-lotis*, Sulz, and is probably the reason for it being overlooked by earlier collectors. It is difficult to take as it has an erratic flight and seldom settles. Flies from November to May.
147. *Ergolis ariadne*, Joh.
Common at low elevations at all seasons.
148. *Ergolis merione*, Cramer.
Common everywhere in the plains.
149. *Laringa castelnaui*, Felder.
Males are uncommon but females are rare. It keeps mostly to the hills and is generally found in bamboo jungle. Several males and three females were taken on Pagaye hill, 600', during December and January, a few males and a single female on Kalataung, 1,500', in the latter part of December and a few males at Yeawing, 500', in February.
150. *Cethosia biblis*, Drury.
A male and two females only taken; the male at Pagaye in January and the females at Myekhanbaw and Kyaukmedaung, respectively, during May. All these specimens are much smaller and darker than the Indian form.
151. *Cethosia hypsea hypsina*, Fd.
A male taken at Myekhanbaw in May and two females in the Mergui district in December. It appears to be scarce as I did not come across any during my visit to Tavoy in 1919.

Family—NYMPHALIDÆ.

Subfamily—LIBYTHEINÆ.

152. *Libythea myrrha rama*, Moore.
Fairly plentiful at all elevations for the greater part of the year.

Family—NEMEOBIDÆ.

153. *Zemeros flegyas confucius*, Fruh.
Very common both in the hills and plains at all seasons.
154. *Taxila thuisto*, Hew.
Not common, on the lower slopes of the hills throughout the district.
155. *Taxila haquinus fasciata*, Moore.
Common all over the district in heavy jungle.
156. *Abisara neophron*, Hew.
Very common in streams at the foot of the hills in dense jungle.
157. *Abisara echerius angulata*, Moore.
Very common at all seasons, both on the hills and in the plains.

Family—PAPILIONIDÆ.

158. *Papilio cæacus*, Fd.
Common from October to June at all elevations in heavy forest. Very plentiful along the banks of the stream, that passes by Pagaye, in March attracted there by the flowers of a shrub.
159. *Papilio zaleucus*, Hew.
Plentiful on Kalataung, 1,500', and on the hill W. of Kambauk, 600'. About 30 males and five females were taken there in two days, 21st and 22nd December 1919. They were attracted here by the flowers; they were not observed on any other part of the hill, nor did I see any at Pagaye. In examining the series I possess I find that the white areas on the upperside of the hind-wings vary considerably, from four white interspaces to one, and in a single specimen there is no white at all, the wing being entirely black. This single specimen is indistinguishable from *P. varuna astorion*, Wd. On the underside it has white interspaces, but so also has a specimen of *P. varuna* from Sikkim which is in my collection. I did not meet with *P. varuna* in Tavoy, so that it is probable that these two are only races of one species.
160. *Papilio aristolochiæ goniopeltis*, Roth.
This is not a common butterfly and was taken sparingly at Maungmagan during December 1919.
161. *Papilio coon doubledayi*, Wall.
A common species found at all elevations in heavy jungle. It is very plentiful from October to May.
162. *Papilio neptunus*, Guer. No. 1 in plate.
Two males and one female of this rare butterfly were taken. One male at Kalachaung in June 1912, a male at Mergui in April 1914 and a female on Kalataung, 1,700', on 23rd December 1919. This species is new to the Indian region and so far has only been recorded from Borneo, Malacca, Sumatra and Nias. The forewings are black above with pale, almost white, patches between the veins. Hind-wings black, with a discal series of elongate red spots in interspaces 1 to 4. Underside as above, but paler and the red patches much smaller; breast red at the sides; abdomen, fore part black, the rest yellow. The abdominal fold has some grey powdering.
Epanse ♂—3·8, ♀—4·1 inches.
163. *Papilio paradoxus telearchus*, Hew.
Evidently a rare species as only two males and two females have been taken in about 9 years collecting. A pair were caught at Pagaye in September and a male in October 1914, and a female in the Kaleianaung Forest Reserve in October 1916.

164. *Papilio paradoxus d. danisepa*, Butler.
Of this beautiful form I secured only three males; one at Wagon in October 1914, one at Yeawing and one at Pagaye, in February and April 1916, respectively. On the wing it appears very like *Euploea dioeletiana* and has the same habit of settling on damp sand.
165. *Papilio clytia*, L.
Common just before the rains set in.
166. *Papilio clytia* var. *lankeswara*, Moore.
A few specimens taken at Talaingya during April.
167. *Papilio clytia* var. *papone*, Wd.
Two males taken at Pagaye in May 1919.
168. *Papilio clytia d. dissimilis*, L.
Common all over the district from March to June.
169. *Papilio castor mehala*, Gr.
Several females but no males taken; flies from December to April. The specimens I have were caught at Pagaye and Kalachaung.
170. *Papilio mahadeva*, Moore.
Several specimens of both sexes taken at Pagaye, Wagon, Talaingya and Thingadon between March and October. It is most plentiful just before and during breaks in the rains.
171. *Papilio demoleus malayanus*, Wall.
A very common butterfly found on the plains and low hills, throughout the year.
172. *Papilio demolion*, Cramer.
Common in dense forests in the hills and occasionally along streams at the foot of the hills. It has a very rapid flight, is difficult to catch and when caught generally contrives to break off its tails or a goodly part of a wing in the net. It has a regular beat round and round which it goes during the warmest hours of the day.
173. *Papilio chaon ducenarius*, Fruh.
A few males only taken; one at Myekhanbaw in May, one in Mergui in February and one south of Tavoy in April. It appears to prefer the low country and has not been seen on the hills.
174. *Papilio helenus*, L.
Males common but females are rare as only one has been taken. It keeps to beds of streams in dense jungle and does not ascend the hills.
175. *Papilio polytes*, Liun.
Very common all over the district but prefers low elevations. Only two forms of females have been taken, the *cyrus*, Fab., and *stichius*, Hüb.
176. *Papilio mcmnon agenor*, L.
Does not appear to be common. Both the tailed and tail-less forms of females have been taken. It keeps to the densely wooded country at the foot of the hills.
177. *Papilio palinurus*, Fab.
This is not an uncommon species but is difficult to catch as it flies high and only occasionally comes within reach.
One male taken at Kambauk in May 1916 and two females at Wagon, 1,000', on 22nd December 1919. It keeps to low elevations and is never seen on the hills.
178. *Papilio aetes*, Wd.
Four males only taken, one at Pagaye in September, two on Sinbo Sinma in January and October, respectively, and one on Kalataung 1500' in October.
179. *Papilio antiphates*, Fab.
A male taken at Maungmagan in April 1914 and a few at Pagaye and Talaingya in January and March respectively.

180. *Papilio payeni amphis*, Jor.
A single male taken at Kalataung, 1,500', on 3rd November 1919. It appears to be very rare in this district.
181. *Papilio sarpedon*, L.
Common all over the district and on the wing throughout the year.
182. *Papilio eurypylyus cheronus*, Fruh.
Several males taken at Pagaye from September to January and one female at Wagon, 1,000', in June 1920.
183. *Papilio bathycles chiron*, Wall.
A single male taken on Sinbo Sinma on 12th November 1918.
184. *Papilio agammemnon*, L.
Common at all elevations in dense jungle throughout the year.
185. *Papilio macareus gyndes*, Jor.
Only one male taken on Sinbo Sinma on 11th November 1918.
186. *Papilio xenocles kephisos*, Fruh.
A few specimens of both sexes taken at Pagaye in September 1914 and at Kalachaung in April 1919.
187. *Papilio megarus*, Wd.
A very uncommon species of which only two males and a female were taken; a male at Yeawing on February, one at Myekhanbaw and a female at Maungmagan in April. On the wing it looks very like *Danais septentrionis* and may easily be overlooked.
188. *Leptocircus curius*, Fab.
Rather scarce at the foot of the hills and along streams.
189. *Leptocircus meges virescens*, But.
Common at low elevations throughout the district in fairly heavy jungle.

Family—PIERIDÆ.

190. *Leptosia xiphia*, Fab.
A common species found at low elevations throughout the district.
191. *Delias hypparete ciris*, Fruh.
Common both in the plains and on the hills. It is very plentiful during December and January.
192. *Delias descombesi leucacantha*, Fruh.
Common all over the district from October to June.
193. *Delias aglaia beata*, Fruh.
This is also very common and flies at all seasons.
194. *Prioneris clemanthe*, Db.
Males plentiful, but females are rare; numerous males and only one female were taken.
195. *Huphina nerissa dapha*, Moore.
Very common throughout the district.
196. *Huphina nadina*, Lucas.
Common in the plains at all seasons.
197. *Huphina lea*, Db.
Common on the hills all the year round.
198. *Appias lyncida hippoides*, Moore.
A common species at all elevations and on the wing throughout the year.
199. *Appias melania adamsoni*, Moore.
Fairly plentiful on the hills especially at Pagaye and Kalataung, but difficult to catch.
200. *Appias lade lalassis*, Gr. S.
Appears to be a rare species; two males taken on Kalataung, 1,500', on 6th November 1914, and a female on the same hill on 21st December 1919.
201. *Appias indra*, Moore.
A few specimens taken at Pagaye in February 1919.

202. *Appias lalage lagela*, Moore.
 Numerous males taken on Kalataung, 1,500', in November 1914, but no females were secured.
203. *Ixias pyrene latifasciata*, Butler.
 A very common species in the plains.
204. *Dercas verhueli pallidus*, Fruh.
 A few taken at Kalachaung along the stream, in April. It may be common but as it has a habit of hiding in dense foliage it is not often seen.
205. *Catopsilia pyranthe*, L.
206. *Catopsilia florella*, Fab.
207. *Catopsilia crocale*, Cramer.
208. *Catopsilia pomona*, Fab.
 The above are common all over the district at low elevations from November to January and again from March to June.
209. *Catopsilia scylla*, L.
 Very common during November and December in gardens and in the neighbourhood of villages. It keeps to the plains and may be taken in large numbers on the flowers of a species of *Cosmos* in gardens in the town of Tavoy. The larvæ feed on a species of *Cassia* which grows in cultivated areas. It appears to be single brooded.
210. *Terias libythea*, Fab.
 Common in the plains at all seasons.
211. *Terias lacta*, Bdl.
 Not common; a few specimens taken at Pagaye and Talaingya during June.
212. *Terias hecabe*, L.
 Very common throughout the year both on the hills and plains.
213. *Terias sari*, Hors.
 Common during October all over the district.
214. *Terias harina andamana*, Moore.
 Not common but may be taken at any time of the year. It is found at all elevations.
215. *Hebomoia glaucippe*, L.
 Males common but females are scarce. It keeps to the lower hills and plains and along streams.
216. *Pereronia avatar paravatar*, DeN.
 A few males and one female taken on Kalataung, 1700', in October. On the wing it is not possible to distinguish it from *Pereronia hippia*, Fab.
217. *Pereronia valeria hippia*, Fab.
 Very common from October to April at all elevations. The female *v. livilla* is also found but is rare.

(To be continued.)

TROUT CULTURE ON THE NILGIRIS

BY

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(With a map and two plates.)

The Nilgiris consist of an oval, grassy, undulating plateau about 20 miles across and about 7,000 feet above the sea. Occasional peaks rise to 8,000 feet or more. The western margin is marked out by a relatively elevated tract, the Khundahs, which falls away steeply, often precipitously, towards Malabar. About midway, the plateau is crossed from North to South by another high range of hills, the culminating point of which, Dodabetta, is 8,640 feet above sea-level.

Shielded by the Khundah and Mukerti Range from the heavy rainfall of the Wynaad, cool and cloudy weather is the rule rather than the exception, even in the Summer season. Without the grandeur of the Himalayan gorges or the majesty of eternal snows, the Nilgiris have a soft beauty of their own, recalling to the Englishman the undulating contours of his own western hills. The pedestrian can strike a bee-line over hill and dale, withersoever his fancy leads him, unimpeded by any obstacle more serious than an occasional peat-bog or a brawling hill stream.

RAINFALL:—There is a rapid decrease in the rainfall as we travel from West to East. At Naduvattam and in the Khundahs it is above 100 inches, at Paikara it is 78·23 inches, whilst at Ootacamund it is 48·35 inches.

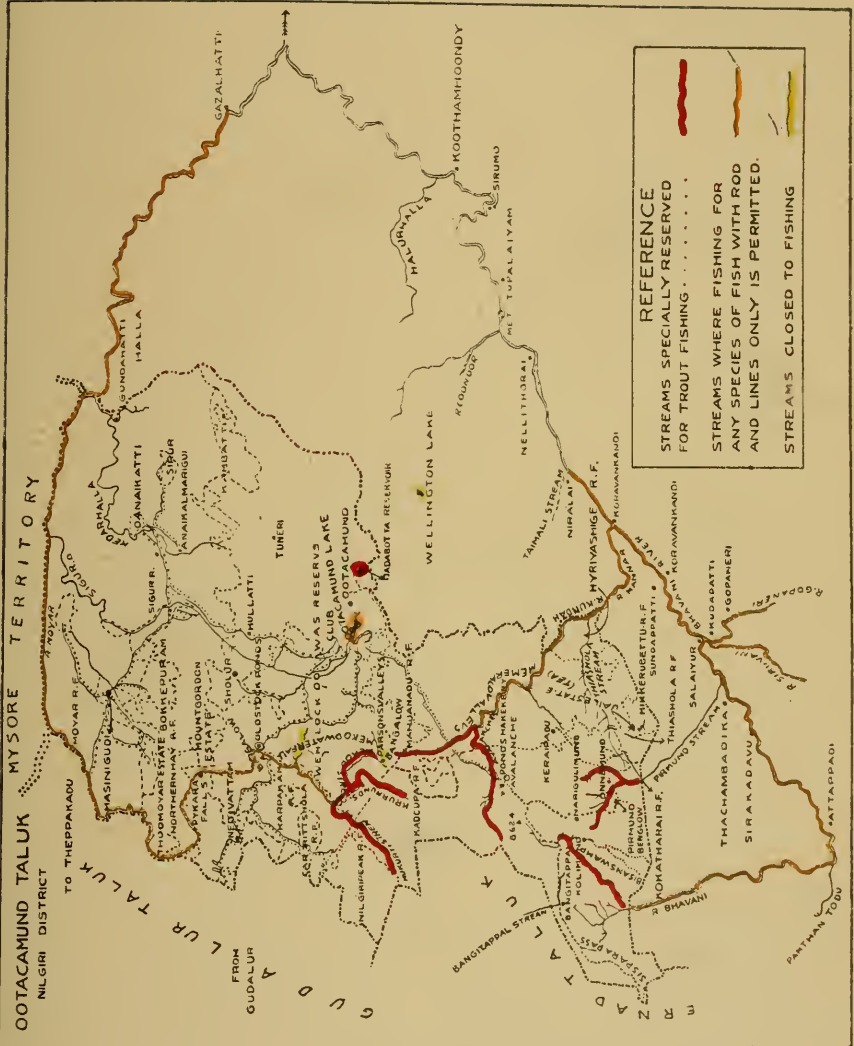
This distribution is not without its influence upon pisciculture. The rainfall at Ootacamund is too small to be of much use and as a general rule it may be laid down that the fishing improves as we go West or South-west into the area of maximum precipitation. Hence the most prolific streams are the Billithadahalla and the Pirmund in the Khundahs.

The Eastern half of the plateau, depending as it does on the North-east rather than the South-west Monsoon, possesses no streams of importance and is comparatively useless from a piscicultural point of view.

TEMPERATURE:—The mean temperature of the year is 55° at Ootacamund, that of May, the hottest month, being four degrees above this and that of January, the coldest, only seven below it. But the daily range in the clear weather which usually prevails in January, February, March and April may be as much as 31 degrees in the 24 hours (Blanford). It is in these months that the trout embryos develop, and it is in these months that they are most susceptible to sudden changes of temperature.

STREAMS:—The larger streams in the Khundahnad and the Todanad fall in cascades over the sides of the plateau into the Moyar on the North and the Bhavani on the South. In the North we have the Mukerti, the Krürmund, the Mekod or Parson's Valley Stream and the Yemmakal. Excellent trout streams in themselves, and protected by waterfalls from the incursions of carp, they stand out in sharp contrast to the Pykara in which carp predominate at the expense of the trout. The southern group consists of the Billitaddahalla, the Pirmund and the Thayar Shola streams on the Khundahs, and the Avalanche and Emerald Valley streams which by their union form the Khundah River. Here again the upper waters are the best, and trout which will rise to a fly disappear as we go downstream.

In all these rivers, beautifully clear water, slightly stained by peat, is the rule rather than the exception. Long stretches of relatively deep, still water mark the prevalence of soft gneissose rocks. Where bands of Charnockite intrude, we



REFERENCE
STREAMS SPECIALLY RESERVED
FOR TROUT FISHING
STREAMS WHERE FISHING FOR
ANY SPECIES OF FISH WITH ROD
AND LINES ONLY IS PERMITTED.
STREAMS CLOSED TO FISHING

have gorges, rapids and waterfalls. There is no waterweed to speak of, but a multitude of rocks and stones form ideal shelters for the fish. The clearness of the water and the absence of weed are not without disadvantages. Visibility is increased and there is nothing to deaden vibration. The heavy tread of an inexperienced angler is felt from far off and is often responsible for his lack of success in waters which may be overstocked.

INHABITANTS :—The greater part of the Todanad and the Khundahnad are essentially pastoral tracts inhabited by a race of buffalo herdsman, the Todas. Where the Badaga with his system of shifting cultivation has established himself, trout culture has proved a failure. Areas opened up for tea planting on a large scale, such as Melur and Kolacombar similarly contain no trout. The soil loosened by the hoe is washed down into the streams which run red during the rains and contain hardly a living creature. With the present remarkable boom in potato cultivation, there is an attempt to secure potato-growing concessions in the Toda country, to make it worth-while for the Todas themselves to support such applications, and to argue that it is anomalous that in an age of progress huge stretches of Downs should be conserved for hunting, shooting and fishing. It is possible, however, to justify the reservation of the Wenlock Downs and the contiguous areas on the score of safeguarding the interests of the grazing population, more particularly the Todas. Cultivation means the introduction of fish-eating labourers such as Canarese, Tamils and Badagas. The rivers will be polluted, the poacher will replace the herdsman, and trout culture will be at an end.

But it is not sufficient to cry out that an interesting tribe will become extinct if its grazing lands be brought under the plough. It is incumbent on all lovers of the gentle art to justify economically the retention of the Todana as pasture land. It will be sufficient, we think, to develop a system of co-operative dairy farming throughout the area in question. The latter is fairly well supplied with roads. It would be easy to improve the milk-yielding qualities of the Toda buffalo, to collect the milk each morning by means of the motor lorries, to distribute it to the residents of Ootacamund in the season and to convert it into condensed milk and the like when the visitors are away.

Trout culture can similarly be justified economically if it can be made an important source of food supply. At present an enormous quantity of stale sea-fish is brought up from Madras and Malabar. It should be easy to replace this by a supply of local fish, produced locally in an area which is eminently adapted for trout culture. But State Agency must be employed and the services of the Expert retained.

It must not be imagined that the dependence of fishing upon grazing is without its drawbacks. The herdsman must have young grass. In February and March each year, when the rivers are at their lowest and such food supply as comes down in the Spates is cut off, all the grass in the country that will burn is fired. The destruction of insect life, and more particularly of beetles, is enormous. The fast vanishing sholas or woods are eaten into further by each successive conflagration. Already enormous extents of country are without a single tree. Throughout the long valley of the Pykara or the bleak gorges of the Billitaddahalla the monsoon winds scream with unmitigated violence. It is difficult, often impossible, from the middle of June to the middle of August to keep one's cast on the water. The rain pelts down mercilessly on the enterprising angler, and soon, like his more effeminate brethren, he gives up the unequal struggle, persuades himself that there are no trout and betakes himself to the club-house or the dancing-floor.

A scheme has been started by the present Collector to grow trees and shrubs in such a manner as to form windcreens on the one hand and asyla for trout on the other. By choosing such varieties as flower readily, it is hoped to be able to attract and breed insects and improve the food supply for the fish. At intervals of a mile, dense thickets of *Acacia dealbata* are being formed. Angling will be impossible in these and the harassed trout will remain unmolested until he wanders

beyond their precincts. The river banks in the intervals between the asyla are being planted with flower bearing, insect attracting, plants, and while it is not anticipated that there will be a very great addition to the local food supply yet *Ephemeridæ* will be attracted and the trout will not so readily lose the fly-eating habit.

HISTORY :—In 1863, Dr. Francis Day attempted to import trout ova but they died before reaching the country. In 1866, he imported 6,000 ova and placed those which survived in a masonry hatching house in the Government Gardens at Ootacamund. Fine silt and the attacks of water organisms proved fatal to these.

About the year 1867, Mr. M'Ivor imported fry from Scotland. In 1869, he transferred them to ponds in the Government House Gardens. From there, they were distributed to the Ootacamund Lake, the Khundahs and other places.

Mr. M'Ivor was at that time Superintendent of the Cinchona Plantations. He was also charged with the care of the Government House Gardens. His activities centered in Ootacamund. It was there that Dr. Day and he located the earliest trout ponds and the hatchery. He clung to the relatively high slopes of Snowdon and Dodabetta. He demanded low temperatures rather than an equable climate. He established a tradition which for forty years made successful trout-breeding impossible. There were no long stretches of clean gravel in the streams. Contamination by sewage or cultivation was the rule rather than the exception. A large percentage of the population were poachers by instinct. At the present day it is doubtful whether there is a single trout in the Burnfoot or Lovedale Lakes, the Sandy Nullah Stream or the Marlimumd, Dodabetta and Tiger Hill Reservoirs.

In 1877, Mr. Wapshare and Mr. Hubert Knox put into the Pykara some carp caught in the Ouchterlony Valley in the Wynaad. In 1879, Mr. Barlow, the Commissioner, reported that the Pykara had been stocked with Mahseer (sic). When and by whom it was stocked, he does not say. These experimental measures were disastrous from the point of view of trout-culture. The myriads of carp in the Pykara River at the present day are too shy to be of much use to the angler. Competing as they do for the food in the river, they make it difficult for other fish to eke out a precarious living. Twelve miles of fine water from the junction of the Mukerti and Krurmund to the Pykara Waterfalls were completely spoiled.

In the early eighties, fryponds were made at Pykara about 12 miles from Ootacamund. A heavy flood about the year 1884 damaged the ponds and swept the whole of the fish into the Pykara River. It was unfortunate that the accident occasioned a return to Ootacamund. Unsuitable as Pykara was owing to the existence of Carp, it was at any rate preferable to the slopes of Snowdon and Dodabetta.

In 1884, the Game Association and the Collector reported that dynamiting and the use of small mesh nets were becoming general. A notification under Madras Act 2 of 1879 was then issued prohibiting such practices in the chief reservoirs and rivers of the plateau.

The position about this time was that the Ootacamund Lake contained Tench and Carp whilst the Pykara held numerous bony Carp. Trout were conspicuous by their absence.

In 1892, the fry kept by Dr. Ross in a reservoir at Dodabetta were almost all lost by the breaching of the dam. In 1893, the two females of the four large fish maintained at Dodabetta spawned in February, but as the males were in milt in November, the ova could not be fertilised. In this year, seven fry-ponds and a stock-pond were made at Pykara.

Forty thousand ova imported from England were put into the icehouse at Ootacamund where they froze and were destroyed. A second consignment arrived on March 4th. The high temperature of the water, however, destroyed the fry as fast as they hatched and only 83 survived. Messrs. Ross, Marsh, Wapshare and Lawson spent considerable sums in further attempts to propagate the species. The temperature of the water militated against success. Myriads



View of Pykara, Nilgiri District, with Wilson monument in the background. Pykara River in the right foreground, Ooty-Bangalore Road to the left, and the Rest House in the centre.

of crabs devoured the ova as soon as they were laid. Horned owls, water-snakes, which usually occur below 6,000 feet, otters, the larvae of the dragon fly, and mildew (*Saprologneus ferox*), were amongst the other enemies of the fish.

In December, 1893, a consignment of 20,000 Loch Leven Ova and 20,000 Rainbow Ova were received. Despite rain and a sudden rise in temperature, almost the whole of the Rainbow trout hatched out, whilst only 572 Loch Leven fry were saved. For a time, 20 to 50 fry died daily owing to a rise in the temperature but eventually 5,000 were saved. However, little permanent good resulted. Writing in 1897 with reference to the Khundah River, Major Grant remarked that he did not think the trout imported in 1888 had bred since the winter of 1893-94 and would be better out.

Consignments of ova, mostly of *S. fario*, continued to arrive at irregular intervals. But in 1900 the position was summarised as follows by Major Bagnall:—

“The only trout I have seen during the year were caught during our netting operations in Snowdon ponds. Three were secured, unwholesome looking fish of about 2½ lbs. each. I have heard of fish being caught in Burnfoot lake and have seen the bones of one killed by an otter.

The Pykara stock pond which should have contained 19 large trout was emptied after great labour. It contained no trout, but one small fish of the Mahseer species. The caretaker, beyond remarking that he was a poor man, had no information to offer.

Emerald Valley River, Avalanche and Khundah Rivers :—I have frequently hunted all along these rivers, and have seen three large trout in the Emerald Valley River, but no sign of fish life elsewhere. Nowhere have I seen a fish as large as a little finger, and I cannot find any watcher who has.

Pykara River :—I heard a friend say he rose a trout in the Pykara River, and I hope he was not mistaken, but those who have fished there will remember how red the Mahseer look in the water.

Our present position seems to be that we know of the existence of trout in the Emerald Valley River only, and in Snowdon Ponds, in the Dodabetta Reservoirs, and in Burnfoot Lake. They probably exist also in the Marlimund Reservoir.”

The same history of unsuccessful effort by enthusiastic amateurs continued up to 1905. At that time trout fishing on the Nilgiris might still be represented by the word nil. Simultaneous efforts by amateurs to introduce trout on the Palni Hills were even more disastrous. Apart from natural enemies, the high temperatures, even at Dodabetta which is more elevated than the present hatchery at Avalanche, proved fatal to *S. fario*. But the most insuperable difficulty was that the females spawned when the males were not in milt. The experiments with *S. irridens* though far from being successful were at any rate more promising than those carried out with *S. fario*. (Compiled from “The mighty Mahseer” by Skene Dhu, Higginbotham & Co., Madras, 1906).

In the autumn of 1906, the Nilgiri Game Association suggested that the services of a pisciculturist be obtained, and Sir Arthur Lawley, the then Governor of Madras, was approached. The suggestion was approved. From this time forward, trout culture ceased to be a private enterprise. Government took up the matter in earnest. Sir A. Lawley wrote to the Government of Ceylon. The services of the late Mr. H. C. Wilson were obtained. He arrived in Ootacamund in the autumn of 1906. Very soon he brought trout culture on a scientific basis. The Expert had replaced the amateur. An up-to-date hatchery was built at the Avalanche 13½ miles South-west of Ootacamund. This hatchery has proved a vast success. Both imported ova of *S. irridens* and stock fish have been successfully reared here and their fry distributed to all parts of the Nilgiris. As has been said above, it has been found useless to import ova of *S. fario* into the Nilgiris as owing to the relatively high temperature of the water, these fish will not breed although they develop well. It was Mr. Wilson who first emphasised the fact that the females spawned at one time whilst the males milted at another.

It has been suggested that certain of the present trout in the Nilgiri streams are in reality crosses between males of *S. irridens* and females of *S. fario*. Although a few brown trout were stocked at Avalanche up to 1919 and although there may have been a few wild ones in the streams, yet not a single cross-bred fish (with red spots) has been observed by the writers.

Early in 1907, Mr. H. C. Wilson went to Ceylon and obtained a hundred yearlings (*S. irridens*) from the hatcheries there. These he brought to Ootacamund, but owing to misfortunes *en-route* only twenty-seven live fish were placed in the Parson's Valley Stream.

One of them was caught on a fly in the late autumn of the same year having increased in weight four ounces. The Parson's Valley Stream holds a very heavy head of fish, is netted periodically, but is closed to angling.

On 21st April 1907, a consignment of 10,000 ova of *S. irridens* from Osnabruck in Germany arrived in bad condition.

In 1909, however, Mr. Wilson obtained ova of *S. irridens* from the Auckland Acclimatization Society in New Zealand. Most of these were successfully hatched out, and it is from them and the twenty-seven yearlings from Ceylon (and possibly from the survivors of previous experiments) that the bulk of the fish on the Nilgiris are supposed to be descended. In 1908, thirty trout from 12" to 16" in length from the Parson's Valley Stream were turned into the Krurmund River at Hodgson's Hut.

In May, 1909, thirty fish were transferred from the Parson's Valley Stream to the Emerald Valley, eighty-three to the Avalanche River and sixteen to the stock-ponds at the hatchery. The average length of these fish was 11½". It was in this year that the hatchery was completed.

In 1910, a stock-pond and spawning race were constructed below the hatchery. The fry were allowed to escape into the hatchery stream through the race. Since then, however, a second stock-pond has been excavated below this spawning race, and fry which seek to escape into the stream must run the gauntlet of the fish in this second stock-pond.

The Avalanche, Emerald Valley, Krurmund, Mekod and Pykara Streams were thrown open to trout fishing for the first time on September 5th, 1911. A large party was entertained at Krurmund Bungalow by the Governor, Sir A. Lawley, who caught the first trout in the adjacent pool.

The season ended on September 30th. No less than 299 trout were killed, the largest of them being 5 lbs. in weight. The limit of size was 12" and 140 small fish were returned.

In 1913, Mr. Wilson reported that the size of the fish was less than he had anticipated. He attributed this to lack of food. The remedy adopted by him was to diminish the number of fish by netting.

In 1914, it was remarked that the size of the fish killed was less than in the previous year. An attempt was, therefore, made to diminish the stock of fish in the rivers by reducing the size limit from 12" to 8". It was hoped that more fish might be killed and that more food would consequently be available for the survivors.

In the following year there was a general complaint from Sportsmen both as to the number of the fish and their size. The limit was accordingly abolished altogether in the hope that more fish might be caught.

A ten-inch limit was again imposed in 1920 on the advice of certain gentlemen who were interested in fishing. Much discontent has been the result as only one fish in every four or five caught could be retained.

Despite forty years of failure, there are still a few enthusiasts who seriously advocate the importance of brown trout. They argue that even if it does not breed well, it makes an excellent cross. They point to dark specimens of pure Rainbow trout in proof of their assertions. The fact that some Rainbows fight better than others is with them a further proof of interbreeding. They are unable, however,

to produce a single trout with red spots. They seem to be unaware that in the opinion of many Experts *S. irridens* fights better than *S. fario*. They ignore the fact that the foundation of Mr. Wilson's success was that he threw over *S. fario* once for all and pinned his faith to *S. irridens*. They forget that even Rainbow do not always thrive, the secret of Mr. Wilson's success being that he imported stock fish which had been acclimatised in New Zealand and Ceylon respectively.

Mr. Wilson's choice of a site for an up-to-date hatchery on a small tributary of the Avalanche stream was a remarkable instance of intuition. Abandoning the Snowdon-Dodabetta area where fry had perished in myriads owing to sudden rises in the temperature and other causes, he chose a spot where the climate though warmer, was more equable, where the water was relatively purer, where good shade prevented marked diurnal variations of temperature, and where an abundant vegetation ensured the existence of myriads of entomostraca and other supplies of food.

FOOD:—The problem of food has long been an important one. The following are largely in evidence in the Nilgiri Rivers according to Mr. Wilson:—

Water beetles—

Colymbetes striatus. *Acilius sulcatus*. *Corixa*.
Dystiscus marginalis. *Hydrophilus piscus*.

Mollusca—

Limnea pereger. *Planorbis corneus*.

(A common mollusc not enumerated by Mr. Wilson is *Neritina perotetiana*.)

Caddis—

Stenophylax. *Limnophilus lunatus*. *Phryganea grandis*.

Miscellaneous—

Crabs.

Indigenous minnow (*Danio nilgiriensis*)

Numerous small animalcules and larvæ.

In the Avalanche and the Billitaddaballa, Mr. Wilson noticed the presence of the Stone Loach. This also occurs in the Pykara.

In September 1908, *i.e.*, two years after stocking had taken place, Mr. Wilson remarked *a propos* of the Parson's Valley stream:—

“The decrease of the large natural fishfood is also marked. Crabs and minnows, especially the latter, where once numerous, are not now to be seen.”

In the year ending June 30th, 1913, Mr. Wilson reported that the reduced size of the fish was due to lack of food. Netting was therefore resorted to to reduce the number of fish.

At present, crabs, worms, molluscs (principally *Neritina perotetiana*), Caddis-worms, beetles, frogs, the Nilgiri Minnow (*Danio nilgiriensis*) and a loach form the diet of the trout. There are comparatively few Ephemeroidea. When the rivers were originally stocked, the trout grew rapidly to a great weight, the record fish (6½ lbs.) having been caught in the Billitaddahalla where now it is difficult to catch one over ten ounces although the number has increased enormously.

By some, including the late Mr. Wilson, it is considered that the stock of fish is too great for the available food supply. The diminution in size is ascribed by others to the fact that new blood is required. Steps have been taken to provide against both contingencies. No less than 7,500 eyed ova were imported from Kashmir in the Spring of 1920 in exchange for 7,500 local ova. Though most of these perished on the way, yet 300 Kashmir fry are being reared in No. 3 pond. Some of these will be used to replace the 3 to 5 year old fish in the larger stock-pond next Spring whilst the others will be put out in the upper tributaries of the Krurmund and Mukerti.

To improve the food supply, efforts have been made to import and acclimatize shrimps, to attract Ephemerae by growing flowering plants, and by planting watercress to increase the supply of Entomostraca. As yet it is too early to pronounce on the success of these measures.

Waterweeds have been advocated by many. But there are no trout to speak of in the Sandy Nullah Stream and the Ootacamund Lake where weeds abound. They have established themselves in the Big Bend of the Mukerti River where there are complaints about the quality of the fishing. They obstruct the current and they make angling difficult. It is desirable to estimate their effect in the Mukerti River before embarking further on the experiment.

But there is no real proof that, given a reasonable stock of fish, the food supply is inadequate or that new blood is required. As the result of living principally on crabs which abound at the bottom of the streams, the Nilgiri Trout after a few years becomes a bottom-feeder pure and simple. He takes the fly more and more shyly as the years roll by and finally ceases to rise at all.

The fact that up to a size of ten inches, he is continually being hooked and returned to the water, may have an adverse effect.

Owing to the prevailing direction of the wind in the fishing season, one has to cast downstream instead of up. The result of striking, therefore, is to pull the fly in a large number of instances out of the fish's mouth,—to prick him and to make him shy rather than to catch him.

Though the record fish caught on a fly in 1919 was only 2½ lbs. and in 1920, 2 lbs. 1½ oz., yet it is probable that by netting some of the large pools in the lower reaches of the rivers where the fish are bottom-feeders, it would be easy to get specimens of six or eight pounds.

It would be interesting to speculate as to the ultimate fate of these monsters of the lower reaches. Do they continue indefinitely to eat up the available food supply or are they impelled to migrate further into the region of snakes and otters and the falls and cataracts of the slopes? We all know that the rainbow trout is prone to disappear even through what appears to be solid masonry. Apart from periodical migration connected with the breeding impulse, the general tendency is to go downstream. Mere physical difficulties will not stop this. Mr. S. C. Berrige and one of the writers have found them far down the Billitadahalla at the foot of relatively high falls. One of the writers has found both large and small fish far down the gorges of the united Thiashola and Pirmund streams.

In 1920, the whole of the trout in the Yemmakal migrated, possibly into the Pykara, although a waterfall intervenes. Tradition has it that the late Mr. H. C. Wilson was of opinion that sooner or later the trout on the Nilgiris meet their end by being dashed to pieces on the cliffs in an insane rush for the sea.

It has also been alleged that they burrow in mud and that thousands which have mysteriously disappeared may thus have met their end. (Editor, Fishing Gazette, Febr. 22, 1919.)

Making every allowance for migration or for suicide, the tendency on the Nilgiris is for the fish to exhaust the available food supply. In this connection the history of Rainbow trout in New Zealand is interesting. As in the Nilgiris, the tendency is for reproduction to outstep the food supply (Howell). The advent of countless flocks of starlings and other insectivorous birds reduced the food falling into the rivers in the shape of grasshoppers, cicada, etc., and the fish consequently ran smaller and became more migratory in their habits (Fishing Gazette, March 13, 1920). The Hon. Secretary of the Ceylon Fishing Club also writes that the trout in some of the Ceylon Streams are getting smaller. They are outstripping the food supply. He advocates the formation of food farms. It is difficult to breed both for size and numbers. One or other must go to the wall. As natural reproduction in the Nilgiris is magnificent and is supplemented by the outturn from the hatchery, there is no necessity to have any size limit. The



MR. H. C. WILSON,
Piscicultural Expert to
the Government of Madras,
1906-1917.



WILSON MEMORIAL, PYKARA, NILGIRI DISTRICT.

rule compelling all fish below 10" to be returned to the water was a mistake. It was introduced against the wish of the Collector on the advice of a committee of gentlemen interested in fishing. It ignores the teaching of the past. It leads to migration or suicide. It has evoked a great deal of discontent. It has increased the stock of fish beyond the available food supply. It promotes over crowding and hence disease. It tends to diminish the revenue from license fees. It is an instance of the danger of calling in inexperienced amateurs to advise.

It must be remembered that the Rainbow is a great eater (Editor, Fishing Gazette, August 23rd, 1919). If you introduce a voracious element like the Rainbow into streams in which the indigenous food supply has only been able to exist in accordance with Nature's laws of supply and demand, you are asking for trouble which you will get as soon as the Rainbows begin to breed (letter from P. Fowke, Esq., Hon. Secretary, Ceylon Fishing Club). More than ever, therefore, is it necessary to "guard against overstocking, which will produce a sort of permanent famine. A stream should never be up to its possible limit in regard to stock. A little under will give you bigger and better fish." (Thomas Andrews in the Badminton Library, Fishing). At the present moment, the Avalanche and Emerald Valley Streams and all the waters on the Khundahs are overstocked. The Mokerti and Krurmund are probably slightly understocked in the Lower Reaches. This may be due to the migration. The remedy which is being applied is to transfer the fish in overstocked streams to those which are understocked, and in the meantime to improve the food supply. Additional remedies are to abolish the size limit and to net fish for sale to approved customers after fattening them in stew ponds.

This brings us to the question of what is the best food for trout. An interesting experiment is recorded in the Badminton. One lot of trout were fed daily on worms, another on live minnows and the third upon flies of various kinds. The first grew slowly and had a lean appearance. Those dieted upon minnows became much larger, whilst such as fattened wholly upon flies attained in a short space of time extraordinary dimensions, weighing twice as much as both the other put together, the bulk of food eaten by them being actually less.

The fresh water shrimp, which is condemned by Buckland on account of its ova-devouring properties, is also advocated in Badminton. Trout three quarters of an inch in length when placed in a pond with unlimited numbers of shrimps, attained an extraordinary size in two years, four or five pounds being the smallest whilst several weighed six pounds ten ounces. This opinion is supported by the learned Editor of the Fishing Gazette:—"I am a great believer in introducing the fresh water shrimp and other natural food into trout waters. Some do not seem to suit the shrimp, but I think wherever watercress will grow, shrimps will live and multiply. I have always found that in rivers where there is plenty of freshwater shrimp the trout and grayling are big and lusty." (Fishing Gazette, 23rd August 1910). But shrimps abound in Ceylon where the trout are no better than on the Nilgiris. It is obvious, therefore, that matters will not be materially improved if we introduce shrimps. The real remedy is the reduction of the stock of fish, and secondly the laying out of food farms. The late Mr. Wilson bred crabs in large wire cages. When the young crabs grew to a certain size, they crawled over the wire netting and escaped.

Mr. Wilson also attempted to acclimatize shrimps from the plains. The experiment was a failure. One of the present writers has introduced prawns from the Wynaad, but it is doubtful whether any survive. It is worthy of note that watercress, although it flourishes at Ootacamund, does not readily grow in any of the trout streams. The connection between watercress and shrimps noticed by the learned Editor of the Fishing Gazette is especially interesting in this connection.

In concluding this section, I cannot do better than quote in full a letter from Mr. P. Fowke to the Hon. Secretary of the Ceylon Fishing Association. Although he differs from the writers on one or two minor points, he is in thorough agreement with them on all questions of importance :—

NUWARA ELIYA,
CEYLON, *November 27th*, 1920.

The Honorary Secretary,
Ceylon Fishing Club,
Nuwara Eliya.

Dear Sir,

In thanking you for sending on the letter from Mr. Bryant, I would state that it is true of our Ceylon Rainbows that they are becoming smaller, but, and this is the important point, it is only true of them in some of the streams.

Like Mr. Bryant I have been giving this matter a lot of careful attention, especially just of late, and I am of the opinion that it is due to food supply alone, or rather I should say, the lack of it. I have experimented by removing Rainbows from streams from which they run fairly small, and putting them into virgin streams in which there is plenty of food, and in every case the rise in their bulk has been extraordinary. I do not think the diminution in size is due to the larger fish going down stream, partly from the reason given above, and also because we find that we get healthier ova from 2 or 3 lbs. fish than from the larger ones, in fact the ova from 5 or 6 lbs. Rainbows kept in stock-ponds nearly always appear to be unfertile.

For years I have endeavoured to bring it home to the Ceylon Fishing Club that if you introduce a voracious element like the Rainbow into streams, in which for untold ages the indigenous food supply has only been able to exist in accordance with Nature's laws of supply and demand, you are asking for trouble which you will get as soon as the Rainbows begin to breed.

This arrangement seems to me to be too simple even to admit of dispute, but yet many members argue against it. The extra food supply which will be required should be established before the Trout are put in, and these latter should be permanently *fenced out* from the breeding-places of the food supply.

These are the lines I am now going to work on to prove my case to the Fishing Club, and I shall be most happy to give Mr. Bryant the benefits of my experience if I prove myself to be right; for his part I would ask for any help he can give me as nothing but good can come of a mutual exchange of experiences.

Yours faithfully,
(Sd.) PHILIP FOWKE.

DISEASES.—Fungus may be due to overcrowding, to contagion or to fouling of the water caused by unconsumed food. Bread is especially to be avoided. Hooked fish often develop the disease after a time. Any curative treatment to be successful must be attempted in the early stages of the malady. Once it has established itself, it is better to destroy the fish affected.

To attempt a cure, the fish should be placed in water in which salt has been dissolved in the proportion of a table-spoonful of salt to half a gallon of water. Ordinary lump salt (rocksalt) should be used, not powdered tablesalt. The fish should be given this bath daily. The treatment should be kept up for a time even after a recovery has been effected. If the fish turns on its back, it must at once be replaced in fresh water.

THE HATCHERY :—The hatchery and attached ponds are enclosed in a wide fence in a pleasant glade in the woods. High hills shelter it from the winds. The stock and fry ponds reproduce as far as possible conditions met with in nature. The use of masonry and cement is cut down to a minimum, the walls of the ponds being for the most part composed of earth or loose stones. Flowering plants droop over the sides. Ferns grow in every crevice whilst a luxuriant

growth of grass trails over the top and affords a certain amount of protection from the sun. Artificial shade is also provided in each pond whilst the "redds" are screened by a transverse layer of split bamboos.

The two stock ponds contain fish varying from two to four and from three to five years respectively. Although females of five to six years still yield ova, yet it has been found that no fish will live in captivity more than seven years. The males go off sooner than the females and should be scrapped in their third year. "I have found that the largest and best eggs are produced by fish from three to five years old." (Badminton.) An advantage of dealing with large fish is that they produce more ova, the numbers given in Badminton being about 1,000 to the pound. Ova from immature or undersized fish may be easier to procure, but will never give the same satisfaction as those from parents of proper condition and age. (Howieton and Northern Fisheries Company's price list for 1918-19.) On this point we are in thorough agreement with the remark of Mr. G. C. L. Howell, F.Z.S., in the journal of the Bombay Natural History Society, Vol. XXIV, No. 2:—"Over six years old females still give us splendid ova, but a male trout (Brown Trout) in India is at his best when one year old, and his milt goes off after the third year." In fact three of the oldest stock males have just been scrapped and their place taken by younger males from the other pond, which will in turn be replaced by wild trout. It follows from what has been written above that the whole of the older stock should be replaced in the course of the next twelve months by yearlings reared from the ova imported from Kashmir.

Above each of the stock ponds is a long narrow reach or 'redd' where the water trickles over loose stones, thus affording an ideal spawning ground. It is along these 'redds' that reproduction has been allowed to take place, such fertilised ova as are required for sale or rearing being grubbed up from between the stones. The loss by disturbance must be immense. It is, however, proposed that in future the process of natural fertilization be supplemented by stripping and the use of the dry method.

This has been ably described by Mr. Howell:—"The eggs are carefully expressed into a moist basin in an adhesive mass. Milt is meanwhile collected from the male fish into a dry thermos flask, is poured on to the eggs and well mixed up with them by hand. An inch of water is poured into the pan and kept in circular movement to prevent adhesion to the basin. After three minutes, the milt is washed off." The eggs obtained from the redds or else fertilized by the dry method as described above are then poured on to glass grilles in hatching boxes with a gentle flow of water carefully filtered through six thickness of Turkish towelling flowing over them.

The use of glass grilles has by some been condemned as being antiquated. They permit only a single layer of ova to be developed at a time. With perforated trays, several layers can be superimposed, a far larger number of eggs can be dealt with and there would be economy in space and in labour. But as a matter of fact there are plenty of perforated trays at the hatchery. As natural reproduction is good, the hatching boxes have not hitherto been worked to their maximum capacity. When only a limited number of ova are required, the grilles are preferable to the trays. The ova are more accessible on them and diseased or unfertilised specimens are more easily removed.

In 15-45 minutes the eggs separate and are left to eye. In this stage they are extremely delicate. The slightest shock will kill them. Eggs which are unfertile or in which the embryo has been killed turn white and must be removed daily with a glass tube. Unless taken out, they will soon infect the whole batch with fungus. The eye of the fish generally appears as a dark spot after 25 days. The eggs are then hardy and can be moved with comparative safety.

It has not been the practice in the Nilgiris to plant eyed ova in natural nurseries. Another difference between local methods and those pursued in Kashmir

is to put out yearlings instead of three months old fry. It is argued that yearlings are the youngest trout which can escape being devoured by their elder brethren in the rivers. If fry are turned into the rivers, the probable consequence is that 99 out of every hundred will go down the throats of the larger fish (Badminton). But the Kashmir method presents certain advantages and saves so much trouble and expense that it will be sparingly adopted in future in tributary streams in addition to the local plan of rearing yearlings artificially. Generally speaking, however, it will not pay to diminish the supply of food brought in by tributary streams. Stocking them with fish will have this effect.

For the benefit of those who came after, Mr. Mitchell's method of planting eyed ova in natural nurseries will be given in detail:—The eyed ova are packed in boxes on trays protected by moss, the upper tray and the sides of the box containing ice. After being carried out to the springs or streams—those flowing into the lower Pykara where there is little or no natural reproduction being suitable—they are transferred into Pahari boxes, about 2,000 to a box. A lid to exclude the light is placed on each box and the ova are left to hatch out. A sketch of Mr. Mitchell's 'Pahari' hatching box was given on page 324 of Vol. 24 of this Society's Journal. ("The Making of a Himalayan Trout Water" by G. C. L. Howell, F.Z.S.)

Both in the artificial and the natural hatcheries, men must be employed to pick over the eggs daily and remove all dead eggs and dead alevins. The natural hatchery must abound in natural food which will generally be the case when it is situated in a wood and reproduces the conditions prevailing in the stream at the Avalanche hatchery.

The alevins at Avalanche are transferred to one or other of the four hatching boxes which has not hitherto been used and are left to develop into fry. They are not fed as they live on the contents of their own umbilical sacs.

The fry before being removed from the hatching boxes are given minute quantities of boiled crabs' meat which has been forced through a perforated spoon. The mortality is relatively small. They are transferred as soon as possible to the fry ponds where they receive boiled and pounded sheep's liver three times a day.

When a year or 18 months old, they are planted out in the upper waters of the streams which it is intended to stock. The most convenient months are February and March as by that time most of the big fish which have spawned have moved down to the lower waters.

The food allowance for approximately 2,400 fish, mostly fry, is 15 lbs. of liver and 5 lbs. of Spratt's puppy biscuit a week, or 2 lbs. a day of liver and $\frac{3}{4}$ lbs. of puppy biscuit. The latter is only given to large stock fish and is always mixed with liver. The biscuit is first soaked in water in which the liver is mixed with powdered rock salt.

It may be argued that at present prices, the cost of puppy biscuit and liver is prohibitive. Whilst it may be possible to support a few stock fish, it is impossible to fatten fish for the Ootacamund market unless a cheaper dietary is introduced. It must be admitted that there is much force in the objection. Fish refuse from which the oil has been expressed is available at Calicut. Experiments will shortly be conducted with this.

Sir Frederick Nicholson states that in Germany undersized haddocks, which it is illegal to place on the market, are ground up, bone and all, into a fine meal, dessicated, and given to trout.

The flesh of the herring after the oil has been expressed is given to carp.

Another field for experiment is the house fly. It produces millions of maggots and the problem is how to make them available as trout food. The experiments of Major Patton, I.M.S., suggest a method and it is hoped that the problem will be solved before long. But the Nilgiris are not a suitable field for experiment, as

dung is very scarce near the trout rivers whilst fish are not available at Ootacamund where dung, the natural breeding ground of the fly, is plentiful. A detailed account of how to conduct the experiment was published in the "South of India Observer" at Ootacamund in December, 1920.

Experiments conducted in the United States indicated that a food mixture consisting of wheat middlings and meat meal although not injurious and apparently an acceptable food for the fish, does not compare with fresh hog lungs as a food for yearling trout. (U. S. Fisheries Service Bureau, November 1, 1919).

PESTS:—These have been enumerated briefly on page 901.

It is intended in this place only to touch upon otters. Mr. Howell considers them a greatly exaggerated evil. Writing at p. 320 of Vol. XXIV, No. 2, of the *Journal of the Bombay Natural History Society* he says:—"I have watched an otter at work for hours (without his knowing it) from a point where every motion was visible. He fished hard the whole time and caught nothing in a pool full of fish. I agree with Mr. Armistead that an otter lives on many things besides fish; and that it is only in confined waters like a stock pond that he does wholesale damage, and in my heart I do not grudge him a trout or two."

From this opinion the writers respectfully beg to differ. It may be true of the otter of the Himalayas. It is essentially inapplicable to the Nilgiris otter. It is true that the smaller reddish otter may not do very much harm. But unfortunately the large grey variety, once unknown on the Hills, is now coming up from the plains. In one specimen of dung which one of the writers examined, there were no crab remains. About fifteen per cent. by weight consisted of bones of trout. In another specimen lower down the river, fragments of crab predominated, the percentage of trout bones being above five.

Further evidence of their destructive tendencies may be gleaned from statistics of fish caught. In 1918, fishing hard for a whole week from Avalanche Bungalow and in the absence of any size limit, retaining all the fish caught, the return of one of the writers (Mr. Bryant) shewed a catch of 17 fish. In 1920 fishing for a week in his spare time, he caught no less than 75 fish. There was no appreciable difference in methods. More or less the same flies were used. The only change was that in the interval Mr. Bryant had insisted on the destruction of otters in this particular river and had paid rewards for nine of them out of his own pocket. The upper reaches were simply boiling with yearlings, and even in the lower stretches at Parry's Bungalow and McIvor's Bund, where prior to 1920 there were few or no trout, relatively large catches might be made. The opinion is not that of the writer alone—it is concurred in by Mr. N. E. A. Mainwaring and Col. Molesworth, I.M.S. Both gentlemen have in fact stated in writing that the river is overstocked.

The most important part of the watchers' work in future is to locate the holts and lay unbaited gins in and around them. Especial attention should be given to this in the breeding season when the large trout are in the shallow upper reaches and fall a ready prey to the otter. One of the writers has located five holts on the Avalanche, four of them on the right bank and one on the left. Two of these are relatively close to each other, above half a mile above the crossing leading to the Avalanche Bungalow. The other two are halfway between the Avalanche Bungalow and Parry's hut and are well known to watcher Jogi. Lower down the river, in the pool under the Khundah Falls, otters are extremely plentiful and from here occasionally ascend as far as Parry's hut. Their holts must be discovered and they must be destroyed unmercifully.

Little has been done so far to locate the holts on the other rivers. But one exists on the Krurmund, a mile or two above Hodgson's Hut, on the left bank of the river two or three hundred yards above the waterfall. There is another holt in the lower reaches of the river above Preston's monument.

On the Mukerti River, there is a holt about 200 yards below the crossing on the right bank. Traces of otters have been seen in the Emerald Valley stream

at Black Bridge. Every effort should be made to locate the holt. The large otter has also been seen in all the rivers on the Khundahs.

The method of destruction usually employed is to place unbaited gins about the holts. But there is an absence of sustained effort about the operations. The warfare is carried on in a desultory manner in the trout country itself. The real homes of the large otters are in the Mayor and Bhavani Valleys. If we can strike a deadly blow at them in these places we shall not only conserve the Mahseer much more effectively than we do at present, but we shall be in a position effectively to cut off the stragglers that have wended their way to the plateau.

ADMINISTRATION AND FINANCE.—The total revenue accruing from license fees has increased from Rs. 1,495 in 1912 to Rs. 3,400 in 1918. In the latter year, leave to England was difficult to obtain and the number of licenses issued (517) attained its maximum.

In 1919, the revenue was Rs. 3,096-8-0 but Rs. 306-8-0 have to be deducted on account of Mahseer licenses and compounding fees.

The income from trout fishing alone may therefore be assumed to be rather less than Rs. 3,000. On the other hand the expenditure, including expenditure on carp and Mahseer, is approximately Rs. 7,000. Next year this will have to be increased. The services of an Assistant Inspector or bailiff are required. The Inspector also demands an increase of salary. Further no allowance has been made for depreciation of the hatchery and ponds. Since the lamented death of Mr. D. C. Wilson, there has been nobody to take his place as Director of Inland Fisheries. The place will have to be filled. It is useless to expect continuity of administration from ever shifting Collectors or Forest Officers, however able they may be assisted by their subordinates. It is not too much to maintain that the cost of pisciculture on the Nilgiris should in future be nearer Rs. 10,000 a year than Rs. 6,000 or Rs. 7,000. The deficit after deducting income will be Rs. 6,000 or Rs. 7,000.

It may be urged that loss might be avoided by making over the fishing rights to an Association. This would be a retrograde step. Both on the Palnis and on the Nilgiris, private efforts have invariably been a failure in the past. Instead of getting a season license for Rs. 100, the price would have to be put up. Subscriptions would at once fall off. Further enhancements would be necessary and the fishing would at length fall into the hands of a few plutocrats.

The question is complicated by the fact that it is not only trout, but mahseer, carp and other fish which would have to be considered. The otter difficulty is pre-eminently a problem relating to the Bhavani Valley. Disputes with the Jenmidars of Malabar or the Forest authorities would be always a possibility.

It may be argued that the law on the subject presents difficulties. Under Madras Act 11 of 1879, it is only Government officers or the Police that can demand the name and address of a poacher or accompany him to the police station.

Under the Forest Act (Madras Act V of 1882) fishing is regulated by rules made by the Governor in Council. The Association would have no power to frame such rules and could not break away absolutely from Government. In the opinion of the Director of Fisheries, India Act IV of 1897 does not empower Government to lease a fishery.

Associations have proved a failure in the past. They would not be in a position to command the services of scientists of the highest position. The cost of licenses would rise to a prohibitive figure. There would be no continuity of Administration.

On the other hand, the Fishery Department (which is transferred) is not in a position to increase its expenditure or to engage a trout expert. All that can be done, therefore, is to continue the regime of the Collector assisted by the Forest Officer and by experts from the Fisheries Department.

REVIEWS.

"A NATURALIST IN HIMALAYA".

(H. F. & G. Witherby, 326, High Holborn, London. Price 18s.)

We cannot let pass without comment a remark Captain Hingston makes in his preface to "A Naturalist in Himalaya." He says "I cannot expect that my record is likely to interest any but those who have a special taste for Natural History and have bestowed some little observation on it." Captain Hingston is very modest. We are of opinion that his publication will fascinate the veriest tyro and the most reputed field-naturalist on our membership roll.

Throughout its 300 pages the former will hardly find a paragraph he cannot delight in or readily understand, whilst the latter will be the first to pay tribute to the work of one who has gone to Nature for his facts, and has built his theories and hypotheses on the solid foundation of personal and prolonged observation.

Leaving the preface we turn to the book itself. Chapter I is in the nature of a prologue and introduces us to the scene of the author's labours—the Hazara country. But the creatures both big and small, with whose habits and instincts we become intimate in subsequent chapters, are by no means confined to that narrow strip of British territory which borders Western Kashmir. Nearly all are typical of the lower slopes of the Western Himalayas generally and a large number are resident in the plains.

The author's work is therefore wide in its application. Half the book is concerned with ants and spiders. There is '*Messor barbarus*,' the Harvester, who is a vegetarian, '*Myrmecocystus setipes*' the carnivorous ant who delights in grasshoppers and beetles, and '*Phidole indica*,' the communicating ant who can circulate information amongst his fornicary with the rapidity of a bazaar rumour.

But perhaps the most alluring chapters in Captain Hingston's book are those he devotes to spiders. We do not remember to have read elsewhere a more lucid description of the manner in which the geometrical spider weaves his web, whilst the experiments conducted to support the author's conclusions are of absorbing interest.

In this portion of the book in particular, we are struck with the subtle use the author makes of the important weapon of contrast. We constantly find ourselves marvelling at the wonderful instinct, skill, and organisation displayed by these humble creatures.

Then the scene changes.

A few pertinent observations and experiments follow, and along with the author "we laugh at their folly and pain," their crass stupidity, their utter lack of individual intelligence.

The remaining half of the book treats of a diversity of creatures—water-boatmen, bumble-bees, butterflies, moths, cicadas, glow-worms, termites, bulbuls, fly-catchers, sun-birds, flying-squirrels and Himalayan monkeys, etc. All are dealt with in a happy vein and with the keen glance of an ardent field-naturalist.

In the last chapter of all we have a geological sketch which gives us a bird's-eye glimpse of Hazara in the past.

The book is judiciously illustrated with a number of excellent photographs and illustrations, and we warmly commend it to our readers. It is not only the work of a talented and accurate observer of animal life, but of one who has the power of communicating his observations with charm, simplicity, and literary merit. These two gifts are not always combined.

ZOOLOGY FOR SECONDARY SCHOOLS IN INDIA.

BY

W. RAE SHERRIFFS, M.A., D.Sc.

We give a warm welcome to a pretentious little book lately published by Macmillan & Co., the work of Dr. W. Rae Sherriffs, M.A., D.Sc., Lecturer of Zoology. University College, Southampton, and formerly Professor of Zoology in the University of Madras.

It is (a) cheap, Rs. 1-8 is not dear for a book which purposes to run us through the whole of Zoology.

(b) It is very well illustrated, a fact which makes a cheap book always popular to the general public.

(c) It fulfils the essential points of a useful book once given to the writer by his head master :—

“ A Scientific or Historical work is never of real value unless well indexed, ” and at the end of the book Dr. Rae Sherriffs supplies us with a capital little Index.

Though written throughout in a most interesting form, a tremendous amount of technicality is fitted within its 175 pages. This fact and the points we mention afterwards rather incline to cramp the general trend of the work.

Invertebrates absorb the greater part of the book—98 pages are devoted to them—15 pages are given to worms which, in our opinion, is rather large, while only 66 pages are given to Vertebrates. Surely the rich Fauna of Birds and Mammals are deserving of more space than 66 pages in a book of 175 pages. We think that it is a mistake that in a modern book on Zoology Dr. Rae Sherriffs should have kept to the old system of nomenclature. In his preface he does not give his reasons but simply says: “ It (Zoology for Secondary Schools in India) deals specially with Indian Animals and in this connection notwithstanding the new nomenclature—particularly as regards snakes and mammals—lately adopted in the pages of the Journal of the Bombay Natural History Society, we have retained the names given in the ‘ Fauna of India ’ series.”

This little book in red cloth is an essentially readable work and both the student and amateur will derive much benefit from its perusal. We have no hesitation in recommending it according to its title as a very suitable text book of Zoology for Secondary Schools in India.

EDITORIAL.

Since the last Editorial was written the Society has suffered a great loss through the death of Mr. R. C. Wroughton. Mr. Wroughton joined the Society in 1886; being in the Indian Forest Service he had ample opportunities of indulging his love for Natural History and demonstrating his affection for the Society, but it was after his retirement from this country that his main work for the Society was done.

When the Mammal Survey of India was started in 1912 it was essential that practically the whole time services of an expert naturalist should be secured for the work at the British Museum. Mr. Wroughton volunteered his services as an honorary worker and until within three weeks of his death worked like a Trojan at his task. His reports in this Journal give but a small idea of the amount of work he did. Our collectors and the staff at our Museum know what encouragement his letters were to them, how great was the value of his advice, and how stimulating his determination to let no difficulties stand in the way of carrying out the task the Society had set its hand to. A true friend, his loss will be felt by many and the sympathy of our members will go out to his widow. His brother-in-law, Mr. T. B. Fry, who was also in the Indian Forest Service and collaborated for some years with Mr. Wroughton at the British Museum, has kindly offered to help with the work at the National Museum in connection with the Survey.

Several points have arisen of late of interest to members of the Society.

The response to the Committee's appeal that members should agree to an enhanced subscription has been most encouraging for the future work of the Society. Not only have there been very few resignations—exceptionally few—but members, realising the Society was in need of money, have paid up the extra Rupees Ten with commendable promptitude. Judging from results, the Committee's decision to allow old members six months grace in which to commute their annual subscription to Life membership at the old rate of Rs. 200 was too much in favour of the member. A large number of members have taken advantage of securing Life membership for a single payment of Rupees Two Hundred instead of an annual payment of Twenty-five, and we wish them many years of life in which to rejoice over their far sightedness. The money received on account of Life members is invested and not used as current income.

Unfortunately we have to report in a very different frame on the financial aspect of the Society's Mammal Survey. This is the most important time in the whole period of the Survey. The Home Government have sanctioned a revision of the Fauna of British India and Mr. Wroughton had been deputed along with Mr. M. G. Hinton to revise the volume on Mammalia. The work of the Survey up-to-date has proved of the greatest value in increasing our knowledge of the Mammalia of India, but much remains to be done, and to be done at once if the volume is to be published up-to-date. We do not want the first of the new Fauna Series to be out of date within a few months of publication, yet this is what will probably happen unless the Mammal Survey continues its work. Yet what is our present position? In Assam we have two Collectors, Mr. Wells and Mr. Primrose. On the borders of Travancore, we have one, Mr. Reilly O'Brien, who is kindly being looked after and assisted by Mr. A. P. Kinloch. In Nepal Col. Kennion has arranged facilities for one of our Indian Collectors who is doing satisfactory work. In Cashmere we have a youngster being trained to the work by Mr. T. R. D. Bell, and another young collector is being trained by Major Cheesman in the Persian Gulf Islands. The Map we published in No. II of this Volume will have shown members the amount of work there is still to do.

The above account shows that we have a useful staff available at a low cost to the Society, yet we have not sufficient funds to provide salaries and expenses for much beyond three months. An appeal is being sent out to members asking them to forget the many calls made on their purses and only to remember the need of the Survey, the good work it has done, the good work which remains to be done, and the urgency of the need. The need was mentioned to an old Life member of the Society who immediately responded with a cheque for Rs. 150. That is the kind of response we want made to our appeal. Unfortunately we cannot look to Government for financial help, though it is work for the good of India we are doing. During the late session of the Indian Legislative Assembly at Delhi the Secretary-in-charge of Education paid a tribute to the work done by this Society, work, he said, which in many instances ought to be undertaken by Government, yet he regretted it was not possible to ask the Assembly to vote any money grant to the Society or for its work. Perhaps it may be possible when the Finance Member has not to budget for a deficit of Eighteen Crores, but if we wait for that happy day we shall never be able to finish the Mammal Survey in time for the new volume.

Another disappointment has been the holding up of the scheme to move the exhibit part of the Society's collection to the Prince of Wales Museum. The Members having agreed to the conditions laid down by the Committee of the Society on the one side and the Trustees of the Prince of Wales Museum on the other, no time was lost by our Curator and his staff in preparing plans for the best utilisation of the very small space placed at our disposal. The pivot of the scheme was, however, money. The Society had and has no money for the purposes of a public Museum. In order that more space may be available for the research collections of the Society, the Committee were willing to let the public have the benefit of the Society's Natural History Exhibits and the services of their trained staff *provided* the money was found for the purpose. The Museum Trustees stated that all they could do was to provide the room—unfortunately even at the very beginning this is found to be too small—and the Bombay Government was asked by both parties to provide a minimum annual grant of Rs. 30,000 for the Natural History Section of the Museum. Owing to financial or other difficulties this grant has not been forthcoming and until it is there can be no move on our part. Fortunately the Bombay Government recognises the need of a Natural History Museum which can be visited by the public, and we have every hope that it will not be very long before payment is made.

In the meantime our Staff is obtaining estimates, plans and information which will be of use when we are able to go on with the scheme. At present we are all very hazy as regards estimates. The Honorary Secretary thought that Rs. 10,000 per annum would meet the Government contribution to the pay of the Museum Staff and that with the balance of Rs. 20,000, good progress in the way of providing show cases could be made each year. If it is true that the estimate for show cases for the Archæological Section of the Museum is well over a lakh of Rupees, our progress will be spread over a great many years and the real Natural History Museum Building will be ready before we have completed more than the Mammal Section.

The suggestion put before the Public of Bombay by the Chairman of the Prince of Wales Museum is hopeful for the early commencement of a building *designed* to be a Natural History Museum. Roughly the scheme is that the pressing demand in Bombay for business accommodation should be utilised to pay for the new Museum buildings and for their eventual endowment. A loan would be raised on the security of the land and buildings. With the proceeds of the loan the Museum buildings would be erected, but these would be let out for varying terms of years as offices. Gradually, as the sinking fund worked off the loan, more and more of the buildings would be put to their proper use until finally only a number of shops on the ground floor would be left, providing from their

rents a steady income for the benefit of the Museum. Such is the idea, it has great possibilities but success can only be possible if it is taken in hand at once and a determined effort made to overcome the delays and difficulties with which we are so familiar in this country. It will be interesting to see whether procrastination gains the day or whether a scheme which will undoubtedly be of benefit to the people of Bombay is successfully carried out.

The attention of the Committee has been given to the question of Egret Farming in Sind and other places. This matter has roused considerable interest at home both in the House of Commons, the Press, and at meetings of the B. O. U. One might almost say that the question was first raised in this Journal as it is round the illustrated article by Mr. Geo. Birch published in Volume XXIII that arguments centre. Apart from the very important scientific details which require settling, the main question may be taken to be—can the trade in Egret feathers be conducted in a similar way to the trade in Ostrich feathers? That is to say, can all the feathers required be obtained without cruelty or injury to the Bird, from Birds bred for the purpose, or are the Farms, which undoubtedly exist, merely intended to be a cloak for the export of feathers obtained from the slaughter of wild birds? Our Committee have made certain representations to the Bombay Government which, we hope, will lead to a settlement of this question.

We hope members will maintain patience despite the continual delays in the publication of Mr. Stuart Baker's Game Books. It is a wonder to us that the patience of the author and of Mr. Millard, who is looking after the publication, has not given way in view of the procrastination of English printers and book-binders. It is evidently useless to prophecy as to when the volumes will be issued as, if a date is announced in India, some malign sprite in England will raise some fresh difficulty or strike to delay matters further. All we can say is that both Messrs. Millard and Stuart Baker are doing all they can to expedite the finishing touches to the volumes and their despatch to India.

The delay has been a help to the office staff who have had a considerable amount of work to do in connection with the despatch of the snake charts to subscribers and Government Institutions. The large wall charts have proved a great success but there has not been the demand anticipated from members for the pocket chart. It is a handy useful work which should be in the possession of all our members in this country. Thanks to the assistance of Col. Luard the Society has been able to arrange with the Oxford University Press for the publication by them of vernacular editions of the hanging snake chart. The issue of the Chart has revived the demand for that very interesting book by Col. Wall on the Poisonous Snakes of India and has also increased the number of enquiries as to when we intend publishing in book form Col. Wall's illustrated articles on the "Common Snakes of India." As to the latter we must we fear wait until prices at home for paper and printers' wages have been very considerably lowered.

The increase in cost in printing out here has decided the Committee to accept advertisements in the journal from Publishers and Book Sellers, Taxidermists, and Scientific Instrument Makers, and the Committee hope that these advertisements will be of benefit to the advertiser, to the members, and to the Society in general.

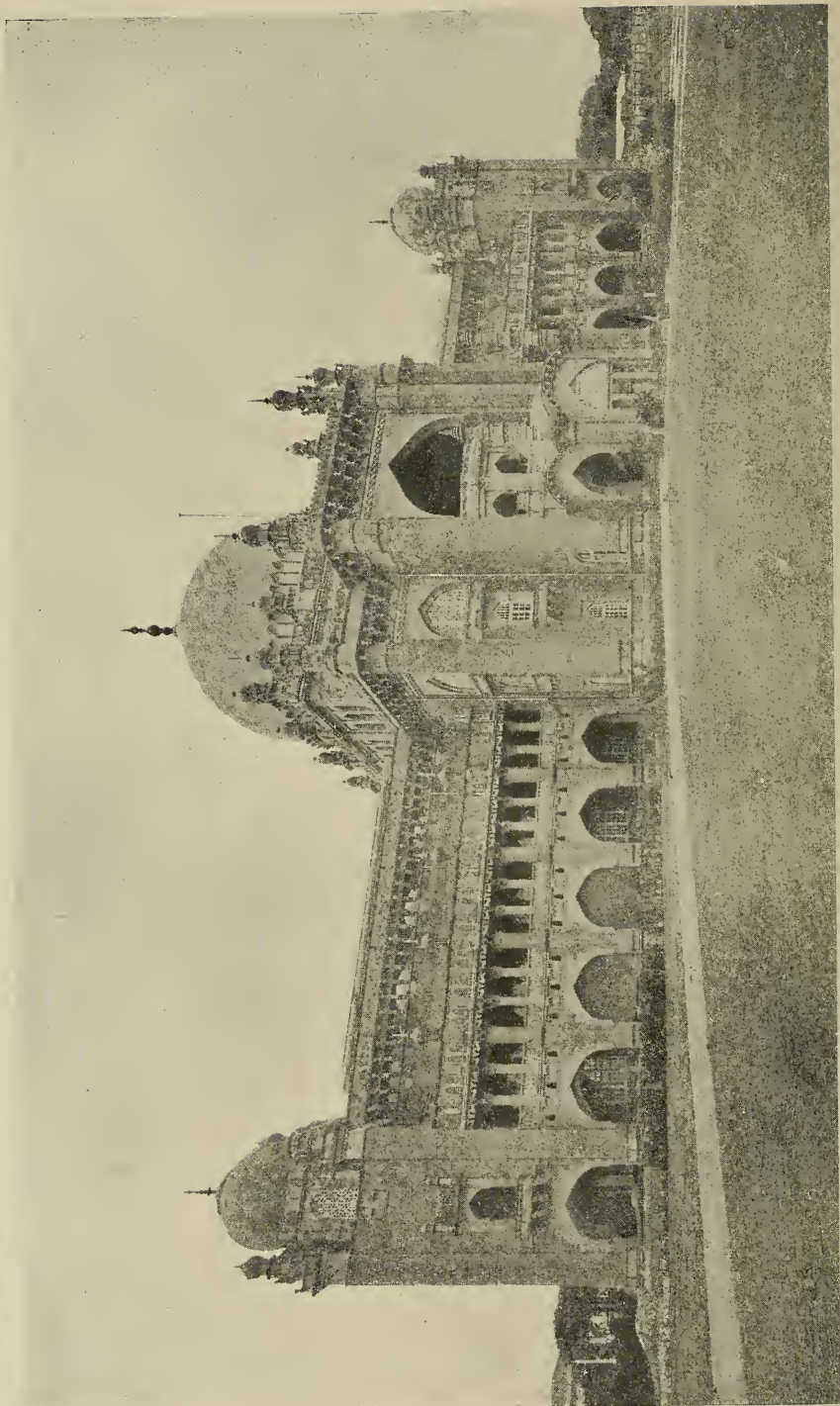
The Editors are prepared to accept small advertisements from members, after the manner of the advertisements of polo ponies in the "Pioneer." Communications should be sent to the Honorary Secretary.

Mr. B. C. Ellison, the Society's Curator, is prepared to arrange for teaching skinning and the preserving of specimens to men sent down by members for the purpose. The charge made would be the cost of materials used and a douceur to the man who gives the instruction. The course of instruction

should not exceed a month. Members wishing to send shikaries or boys to be trained should communicate with the Honorary Secretary.

In the Committee's report on the work of the Society published in No. 2 of this volume mention was made of their desire to encourage the study of Natural History in schools. We are glad to report that the Government of Bombay are entertaining the idea and a Committee is being appointed by Government to arrange a scheme of training for masters and mistresses in our schools out here, who will in their turn instruct those in their charge. In this connection we should like to give a word of praise and commendation to the little illustrated books on Natural History and Plant Life for schools written by F. M. & L. T. Duncan and published by the Oxford University Press. We are also glad to learn that a member of the Society has founded special prizes for the practical and theoretical study of Natural History at the schools of the Bombay Education Society.

Since the above was written we have learnt with great regret of the death of Mr. A. M. Kinloch. The late Mr. Kinloch was an old member of the Society and a constant contributor to the Museum. A friend writing in reference to his death says : " His death occurred here at Kotagiri under the most tragic circumstances. He was on holiday and having wounded a big boar in a beat, followed it up alone through thick scrub, was charged by the boar at close quarters and killed instantly, the boar's tusks severing the femoral artery." He was the eldest son of the late Major General A. A. Kinloch, the well known sportsman and author of "Large Game Shooting in Tibet, Himalayas and Northern India". Our sincerest condolences go out to Mrs. Kinloch and her family in their sudden and tragic loss.



THE EXISTING BUILDING OF THE PRINCE OF WALES MUSEUM OF WESTERN INDIA.

(Note :—The Natural History Wing will be accommodated temporarily on the ground and first floor of the left wing—as one faces the building).

THE SCHEME FOR THE ARRANGEMENT OF THE
COLLECTIONS OF THE BOMBAY NATURAL
HISTORY SOCIETY IN THE PRINCE OF
WALES MUSEUM OF WESTERN INDIA.

BY

BERNARD C. ELLISON,

Curator of the Museum.

(With two plates.)

FOREWORD.

This is intended to be a synopsis of the proposed scheme brought out on March 1st and it is printed to give our members a general idea of what has been mooted during the past few months. It was originally written in greater detail and scientific terminology was made use of, but it has been thought advisable to simplify it for the general reader, bringing out only the salient points of the scheme, thereby curtailing its length to a great extent.

SCOPE OF THE MUSEUM.

It is our hope that when the Natural History Wing is built we shall be able to include a world-wide Fauna, but for the present we are governed entirely by conditions of space. We believe therefore the best policy would be to confine ourselves to the Fauna of India, Burma and Ceylon. It may be noted, however, that this scheme makes provision and allows for the future enlargement of the Museum.

The proposals here put forward are intended as a very general preliminary scheme embracing the general lines on which it is proposed to conduct the Natural History Branch of the Museum.

SECTIONS TO BE REPRESENTED IN THE MUSEUM.

The sections to be represented in the Natural History Museum are as follows :—

1. Teaching alcoves (General Zoology).
2. Mammals.
3. Birds.
4. Reptiles and Amphibia.
5. Fishes.
6. Invertebrates.

Each of the above sections will be illustrated respectively by means of mounted and spirit specimens, casts, photographs, maps showing distribution, etc.,—all demonstrating the Fauna of the Oriental Region. Apart from the special sections dealing with these particular classes it is proposed to prepare a general section comprising all the various orders. This section would constitute what would be the teaching gallery of the Museum. The Museum

has to adapt itself not only to the laymen generally interested in Zoology but also to the needs of the student. The idea is partly my own and partly Mr. Kinnear's. What we propose to do in the matter of this gallery is to copy in general the teaching gallery in the South Kensington Museum. A visitor to the Natural History Museum at South Kensington, on entering the Central Hall will find, on either side, alcoves devoted especially to teaching and instructional cases of the different orders of Mammals, Birds, Reptiles and Amphibians, Fishes and Invertebrates. He is supposed to examine these special galleries devoted to particular orders before proceeding further. Here, before examining the general museum, he receives what is meant to be a preliminary instruction as regards the various orders of the Animal Kingdom which will enable him to examine the main galleries with profit and understanding.

The proposals for the allotment of space are as follows:—

| | | |
|-----------------|---|--|
| Ground Floor. | { | Gallery (α) Mammals. Rough measurement
78' × 29'-6". |
| | | Gallery (β) Teaching Alcoves. Rough measurement 78' × 15'. |
| Mezanine Floor. | { | Gallery (γ) Fishes, Reptiles and Amphibia, Invertebrates. Rough measurement 78' × 12'. |
| | | Gallery (ε) Birds. Rough measurement 78' × 12'. |
| | | Room I. Extensions of Bird Gallery. Rough measurement 16' × 16'. |
| | | Room II. Extension of Invertebrate Gallery. Rough measurement 11' × 11'. |
| | | Gallery (δ). Offices. Rough measurement 29'-8" × 12'. |

We will now proceed to take up the various galleries with a view to showing the general lines on which they would be arranged.

1. TEACHING GALLERY.

This being the first gallery the visitor to the Museum should use we will discuss it first in our scheme.

The gallery we propose to have here would entail much scientific work and would take a long time before completion. It is proposed to divide the whole of the gallery into separate alcoves, each would represent one of the great classes of the Animal Kingdom, *i.e.*, Mammals, Birds, Reptiles and Amphibia, Fishes and Invertebrates. A visitor is supposed to examine these alcoves



Proposed Bird Gallery.
(E)



Proposed Mammal Gallery (A)
Proposed Teaching Alcoves (B)
(ex RIGHT)



Proposed Reptile, Amphibia,
Fish & Invertebrate Gallery.
(Y)



Proposed Teaching Alcoves
(B)



Proposed Work Room of Staff.
(S)

Interior view of the galleries allotted to the Bombay Natural History Society in the Prince of Wales Museum of Western India.

before proceeding to inspect the general Museum. Here he sees the Zoological world 'in breve' before examining the general museum 'in magnitudine'.

It is difficult to explain in detail the proposed arrangement of the various alcoves but we would here remark that our policy would be to model this gallery on the lines followed at the British Museum, adapting it in particular to the needs of the Indian student. The first of the series of alcoves would be the Mammal alcove; this would be situated at the entrance to gallery (β). It would be enclosed on all sides except the side facing the Mammal gallery in (α). In this alcove we would have cases all round dealing with Mammalia. The cases would be arranged to explain the various terms used in the general anatomy and physiology of Mammalia, spirit dissections illustrating the respiratory, alimentary, vascular, and urogenital systems of Mammals. Cases would be prepared here to illustrate the skeletal system with special reference to explaining the technical terms used in connection with the various parts. Similarly we would have cases illustrating the external integumentary features and comparative dentition. The general policy in this alcove would be to include such features as pertain to Mammalia in general, leaving the particular features to the general mammal gallery. In addition to actual specimens we would have charts and drawings, the whole aim being to give the visitor what would comprise a general introduction to the study of Mammals.

BIRD ALCOVE.

The next alcove would be devoted to Birds. We would go into the Birds in much the same manner as the Mammals, by using spirit specimens, dissections, skeletons and drawings, and availing ourselves of ideas culled from books, etc., illustrating the principal characteristics of the order.

Cases would be prepared to illustrate the structure of the feathers and glands, the respiratory, digestive and circulatory system, and the muscular and nervous system as exemplified in this order. Further characteristics as regards the adaptations and modifications in respect to the various types of beaks, wings and quills would be shown. Moreover we would endeavour to illustrate by drawings, charts, etc., the phylogeny of the class Aves showing their special position in the Animal Kingdom, their relationship to the Reptilia and the evidence thereof.

AMPHIBIA AND REPTILIA.

The next alcove would be devoted to Amphibia and Reptilia. Using the same principles in this alcove as in the preceding one,

and applying them to the main features in reference to these orders, we would here illustrate in a similar manner the chief characteristics in reference to them.

In like manner we would display the Reptilia, using the general principles to illustrate the general characteristics of the Crocodiles, Tortoises, Lizards and Snakes, explaining the technical terms used in connection with the scaling and other internal and external features.

The composition of the vertebræ, modifications and principal characters of the various classes of Reptiles would be exemplified in this alcove.

PISCES.

The next alcove would be given over to the remaining classes of the Phylum Chordata, *i.e.*, Fishes, Cyclostomata, Lancets and Ascidians. On lines adopted in the preceding galleries, we would illustrate the main features of this class. By means of specimens, charts and diagrams would be shown their external and internal structure.

INVERTEBRATES.

The last of our series of alcoves would be devoted to Invertebrates. A number of Phyla would need representation, and the space we would devote to each would necessarily be restricted. In this alcove we would illustrate points in regard to the structure and physiology of animals, *i.e.*, the animal cell, karyokinensis, maturation, impregnation and segmentation of the ovum, tissues, organs, and features, in connection with the reproduction and symmetry. We would take up the various Phyla and specialize in the different "types" as prescribed by the University, *i.e.*, the Amoeba, Paramoecium, Vorticella, Trypamozoma and Herpetomonas, as our types of protozoa, and similarly illustrating by drawings and diagrams, and actual specimens where possible, the Coelenterata, Platyhelminthes, Nematelminthes, Trochelminthes, Molluscoidea, Echinodermata, Annulata, Arthropoda and Mollusca.

GALLERY (a).

Mammals.

The general lines to be followed in this gallery would be to show an exhibit of mounted specimens arranged according to the latest systems of classification, and to supplement these by diagrams, photographs and maps.

We have a large stock of Indian Mammals comprising what is undoubtedly the finest collection in India and is unequalled for its completeness anywhere—except perhaps at the British Museum

We should make the most of them by showing an as complete as possible representation of Indian Mammals. From the material in stock we could select the specimens we require for mounting.

Horns and Skulls.—The Society's admirable collection of big game trophies in respect of horns and mounted heads of game animals would make a remarkable addition to the Mammal Gallery. A selection could be taken to the new Museum, where they could be suspended on the walls of the Mammal Gallery arranged according to species with enlarged photographs of the animals themselves hung at the bottom of each group. Some method should be arrived at for hanging them without disfiguring the wall surface. As regards the mounted specimens the larger could be arranged in cases on interchangeable shelves.

Cases.—We suggest the advisability of copying the cases in the British Museum where possible.

As in the arrangement of the cases in the Hall we would put the mounted exhibits in uniform cases along the walls of the Gallery, devoting the central space to mounted specimens of larger animals, *i.e.*, the Indian Lion case now in the Museum, and Instructional cases. Cetacea we would suspend from the ceiling as at Oxford. Animals not represented in the Fauna of India would be shown by the best enlarged photographs that could be procured or presented.

PREHISTORIC MAMMALS.

Regarding Prehistoric Mammalia we could never hope to get many of the original things but these could be represented in many instances by photographs and miniature models of the principal examples of Mammoths, Mastodons, etc., showing relative proportions of size.

GALLERY (ε) MEZANINE FLOOR.

Birds.

We propose to devote the whole of this gallery to birds.

When the detailed scheme of arrangement of this gallery is prepared the material for the same will be taken from the Society's collection. We would here point out that though the Society possesses a magnificent collection of bird skins, comprising some six thousand specimens, it will probably be found that a great number of these skins will not lend themselves to relaxing and re-mounting and it will probably be found necessary to collect the large majority of skins required expressly for this purpose.

Mounting of Specimens.—We know of nobody in India who could successfully undertake the mounting of birds and it is our opinion that the whole of the material, after being collected here, should be

sent to England for completion together with our drawings and specifications as to the manner in which we want the material mounted. We believe that we could obtain assistance from Mr. Kinnear in regard to the bird gallery and his advice and assistance might be sought in reference to the general design and arrangement in this gallery.

Cases.—The cases would be uniform with those in the Mammal Gallery.

The mounted exhibits would, as in the case of the Mammal Gallery, be supplemented by paintings, photographs, maps, etc. In this instance we can make use of copies of the beautiful series of coloured plates which have appeared in the Society's Journal.

EXTINCT BIRDS.

We might get some enlarged photos of some of the extinct Birds, such as *Archæopteryx*, *Hesperornis*, *Ichthyornis*, from the British Museum or the American Museum. Similarly we might ask Oxford University for permission to have a copy made of their beautiful oil painting of the Dodo.

GALLERY (γ) MEZANINE FLOOR.

Reptiles and Amphibia.

The space remaining at our disposal after allowing for Birds and Mammals is extremely limited, there remaining only one gallery, *i.e.*, (γ) and the rooms adjoining it. This space is to be divided among the Reptiles, Amphibia, Fishes and Invertebrates. The last including a whole series of important Phyla which would need to be represented. The allotment of space therefore in this gallery to each of the sections requiring representation is a problem which will require very careful consideration, and the three rooms adjoining it, which we temporarily propose to use as office premises, would be reserved for an overflow from this gallery. One method of dividing the gallery into different sections would be to place, where required, cases, horizontal to the walls, or as an alternative, to erect partitions keeping the different orders separate.

The policy to follow with the Reptiles and Amphibia gallery would be similar to the others, *i.e.*, an exhibit as far as possible complete in reference to the general Fauna, and special cases showing structural differences, etc. In regard to Snakes there would be cases illustrating the identification of poisonous species, colour resemblances and other features which would be useful and instructional to the public. The exhibits of Snakes would consist of plaster casts interspersed with enlarged models of heads and tails, poison apparatus, etc. As regards skeletons and skulls we would be able to arrange with the taxidermist of the Madras Museum who understands the preparation of Reptiles and skeletons of Fishes and who

is allowed to undertake private work of this nature. Colonel Wall would also be willing to help in this connection. The exhibit collection of Lizards, Crocodiles, Turtles, Amphibians would include spirit specimens and casts, where possible displayed on lines similar to the snake exhibit. In regard to the Tortoises, for instance, it is quite possible to obtain a giant specimen of the large Sea Turtle *Chelonia mydas* found on the Bombay coast which could be cast entire, the shell and skeleton afterwards being used for exhibition purposes. It may be mentioned that Colonel Wall has seen our plans in connection with this gallery and is in thorough agreement with them.

Preparation of plaster casts.—As regards the preparation of plaster casts, it would be necessary (when his services are required) to engage a Modeler who would work either in papier-mache, plaster, or clay.

Immediately we move into the Museum we could deposit our present show cases of Reptilia and everything else we have in this connection, excluding of course the reference collections. The larger Reptilia could be placed on top of the cases or suspended from the ceiling.

Extinct Reptilia.—Extinct Reptilia could be represented by photographs or models in miniature of the reconstructions of extinct forms as exhibited in the Museums in Europe and America.

GALLERY (V) MEZANINE FLOOR.

Fishes.

On moving our collections we will transfer what we have to this gallery. We have a few mounted specimens which could be supplemented by casts, etc. As regards our collection of Fishes we have practically nothing for display purpose.

In the case of modelling and the preparation of casts we would be inclined to entrust the whole of the work to some one in Bombay, but this seems to be impossible.

INVERTEBRATES

It would be impossible in the Indian climate to have wax models made illustrating segmentation of the ovum, karyokinesis, etc. But it may be possible in many instances to obtain models in papier mache of the various protozoons as exemplified in the Rhizopoda, Foraminifera, Heliozoa or Radiolaria. Similarly an opportunity might here be taken to illustrate by diagrams, charts, etc., and models, where procurable, the life cycles and histories of organisms which are parasitic on man and beast in India, *e.g.*, life history of the Malaria Parasite. In regard to the Sponge Phylum we may be able to obtain a large selection of sponges for exhibition

purposes and these could be further supplemented by drawings and diagrams of the microscopic structure of the skeletons in various sponges. The Phylum Coelenterata which includes Corals, Sea Anemones, Jelly fish and Freshwater Polypes could similarly be illustrated largely by actual specimens. Our collection of Marine Invertebrates is practically nil, but it would be possible to obtain specimens from the Indian Museum at Calcutta, as the Director is willing to assist us in this direction on condition that somebody responsible is sent to Calcutta to superintend the packing. The microscopic Coelenterates we would leave to be illustrated by drawings, diagrams, and models where procurable. We have a few Corals in our collection at present which would form the nucleus of our collection illustrating the Actinozoa. The Phylum Platyhelminthes would follow next in order. In this Phylum we could once more specialize and elaborate, with particular reference to displaying the life histories of organisms especially harmful to men and animals such as the liver fluke, and the common tapeworm, *Taenia solium*. The next Phylum, Nematelminthes, similarly includes several classes that are parasitic on man such as the Nematoda, which includes the common roundworm, *Lumbricoidea*, which is parasitic in the human intestines, and the Acanthocephala which includes the formidable "hookheaded worms" all of which could come in for special notice in regard to the arrangement of this section. In the illustration of these Phyla we should have to make an effort to obtain specimens from other Museums, wherever possible, as our collections in this respect are very meagre and in some respects practically nil. The Phylum Echinodermata, comprising the Star fishes, Sea Urchins, Brittle-stars, Feather-stars and Sea Cucumbers, offers a wide field for illustration. But here again we must depend entirely on outside assistance as with the exception of a few Asteroidea and Echinoidea our collections contain practically nothing. The Phylum Vermes comprising Earthworms, Freshwater worms and Marine Annelids and Leeches could be illustrated by spirit specimens, diagrams, etc. The next Phylum, the Arthropoda, contains five classes each of which would require considerable space for successful illustration. Take for instance the Crustacea, Myriapoda, Insecta and Arachnida, each of these offers a wide field. In reference to the Insecta we do not think we could do better than follow the lines taken by Dr. Gravelly in the arrangement of the Insect gallery in the Indian Museum. We have a large collection of insects to work upon. In connection with exhibits in our Insect section we would need the services of an artist for preparing the illustrations to be employed in supplementing the exhibits.

In reference to the Marine Arthropods we should be able to obtain valuable assistance from the Fisheries Department

in Bombay and Mr. Hefford would probably help us considerably in obtaining examples of Crayfishes, Crabs, Shrimps, Barnacles, etc. In the Phylum Mollusca we could for a start use the cabinets illustrating the Mollusca which are at present in the Society's Museum, and which could be developed and added to. Dr. Bani Pershad of the Indian Museum has promised to help us with a scheme for the arrangement of our Mollusca section and has promised further to assist us with specimens where necessary. Besides actual specimens we could employ plaster casts in illustrating some of the orders of this Phylum particularly as regards the Decapoda and Octopoda.

LABELLING OF SPECIMENS.

Regarding the question of labelling, besides the use of the English and Scientific names, it has been suggested we should also include a label giving the name of every specimen in the vernacular (Urdu, Guzerathi and Mahratti) where possible.

PROPOSED FUTURE DEVELOPMENT.

The above was written on March 1st, and since then the Trustees of the Museum have brought out a splendid scheme in regard to which we append some extracts from *The Times of India*, dated 21st April 1921 :—

“ The Trustees of the Prince of Wales' Museum in Bombay have decided that the accommodation provided by that massive block of building is insufficient.

They therefore propose to raise a loan extended over a period of twenty years for the purpose of carrying out extensive additions. Two-fifths of the additional accommodation will be used for Museum purposes and the remainder will be available for office and business purposes.

Details of the scheme are to be found in the statement published below:—

Inquiries have appeared in the press as to when the Prince of Wales' Museum would be opened. The Trustees desire to inform the public as to the cause of the delay and the progress to date. The building was only vacated by the military in the spring of 1920. Re-painting has been done. Removal of hospital fittings and of most of the temporary buildings will be completed before long. Though formal charge of the building has not yet been taken from the Public Works Department the Trustees have gone ahead with the work of organisation. A Secretary and staff have been appointed. The Museum will at first consist of Archeological, Art, and Natural History Sections.

An agreement has been effected whereby the Natural History Society will, after sufficient funds are obtained, place their valuable collections in the Museum as a Natural History Section. The Trustees will get the benefit of the services of the Society's Curator and Assistant Curators. The connection of the section with a zealous Society numbering many eminent scientific men will undoubtedly

enhance its efficiency. These collections have hitherto not been exhibited to the public. This section should be a specially popular one.

Lastly some space has been allotted for a forest Museum where valuable timbers and other forest products will be seen by business men and an important stimulus to forest development thus afforded. The requirements of the various sections necessitate various adaptations to the building, which along with the construction of show cases, will take time. It is very difficult to obtain suitable plate glass at present. It is hoped however that the museum can be opened on a modest scale in the latter part of this year, or early in the next.

FUTURE DEVELOPMENT.

The museum building is not large and it has become clear that as three major sections have to be housed in it the building will be full in a short time. There is no room for an Industrial and Economic section which is of the utmost importance for a city like Bombay. The original intention was to build two extra wings, one for Natural History and the other for Industry; but as the funds are quite insufficient to erect buildings, Natural History will have to be accommodated in the main building which was intended for Art and Archaeology only. A special contribution of 3 lakhs was given by Sir Currimbhoy Ebrahim, Bart. The present state of public finances and the pressure of more urgent public needs make it unlikely that Government could provide the very large funds required for the erection and maintenance of additional buildings. Nor in the present condition of trade and industry is an appeal to the public likely to produce the required funds. The cost of building is now very high. The income of the museum from Government and Municipal grants and from securities is only adequate to maintain the Art and Archaeological sections on a modest scale without providing the means of expanding these sections.

WHAT A MUSEUM SHOULD DO.

The old idea of a museum was one of a building containing antiques and curiosities, interesting no doubt, but of no special bearing on modern life. A modern museum however should form an important factor in the life and growth of a nation. It should illustrate by its exhibits all important aspects of the varied activities of the community whether in Art, Archaeology, History, Natural History, Sociology or Industry, and thus be a pleasure, inspiration, and stimulation, both to adults and especially to the Youth of India. The educative value to the young of such a museum can well be realised by those familiar with the great museums of London and the Continent. The Art student there views pictures by the great masters, the Archaeological student sees the mighty work of ancient times, the Natural History student has before his eyes the whole vast phenomena of the animal, vegetable and mineral kingdoms arranged and classified on scientific lines, the Industrial student can by a touch of an electric button set in motion miniature models of the intricate machines of modern industry. Such a museum, however, to be worthy of this Presidency demands very large accommodation and also a very large income to obtain and maintain the exhibits, and a specialist staff in all the branches. The Trustees consider that Bombay must have such a museum at the earliest opportunity.

FUNDS ARE WANTED.

To sum up, funds are required to provide the extra accommodation and to maintain the expanded museum. The Trustees see only one means of obtaining these funds. The Museum site is six and a half acres. Government in allotting the site to the Museum made an extremely valuable gift. The site is for business purposes a very central and valuable one. The trustees are contemplating the erection of extensive building on the site from loan money to be obtained from an amendment of the Museum Act, either from Government or the public, on the security—a first class one—of the land and buildings.

The greater part of the accommodation would be let out at first for business purposes and will fetch a very large rental. The demand for office and business accommodation in the Fort is far in excess of the supply. Even when the Back Bay Reclamation is effected buildings on the museum site will always command a high rental. Part of the new buildings, a part small at first but gradually increasing, would be used for the expanded museum. All the buildings will be so designed that any part of them can be resumed and used at any time for Museum purposes as the Museum gradually is enlarged. It is anticipated however that two-fifths of the additional accommodation would be the utmost future requirement of the Museum. The remaining three-fifths would always be used for business, *i. e.*, revenue producing purposes.

THE BEST IN ASIA.

The additional buildings would be in harmony with the existing Museum building and the adjoining public buildings, and be a fine piece of architecture. As the land costs nothing and the value for business purposes of the site is so high, the building enterprise cannot fail to be extremely remunerative. Assuming that money is borrowed at 8 per cent. and repaid in a twenty-year period and that part of the building is used for Museum purposes it is calculated that the net income will be $7\frac{1}{2}$ lakhs a year when the buildings are completed and $13\frac{1}{2}$ lakhs when the loan is repaid twenty years thereafter. With this revenue it will be possible to equip and maintain a Museum on a magnificent scale, which it is hoped will become one of the best in Asia. The Trustees, if their scheme is carried out, will have achieved the creation of such a Museum by developing their own resources and without drawing upon the funds of Government or the public. Instead of slowly accumulating funds by subscriptions and grants, a process which might take decades, construction by loan money will provide ample accommodation and revenue and therefore a well equipped Museum within a few years.

MEETING A CITY NEED.

Another advantage will be the early provision of a large extent of first class business and office accommodation of which there is a famine and the absence of which must be seriously retarding the development of Western India. The possible objection that use of part of the building for business purposes would not be in harmony with a Museum is met by the fact that the design of the buildings will be one suitable to a Museum while the business part will not be allowed to interfere with the amenities of the Museum. If in the distant future Government or the public were to provide sufficient income there would be nothing to prevent the whole of the buildings being converted into a Museum.

Looking however at the problem practically, it is a choice between a Museum developed and supported as described above and the being content with a Museum having wholly inadequate accommodation and funds. The Trustees have little doubt but that public opinion will endorse the larger view taken by themselves in the matter. The Trustees, however, wish to bring their general scheme to the notice of the public with a view to invite suggestions and expressions of opinions."

CONCLUSION.

As mentioned before, this is printed more as a summary of the general scheme for the planning out of the collections, and to let our members—particularly those outside Bombay—know the movement that is afoot and what we propose to-day to carry out in the future. There are many problems to be considered into which we have not entered here. Chief of these is certainly the financial aspect of the scheme, which is indeed the veritable crux. It will be noted also that nothing has been said of alterations in the Museum, donations, presentations, taxidermists and mounting of specimens, the position in regard to Botany, Geology and Forestry, all of which are by no means light problems for consideration.

If the whole of these far-seeing schemes for the Museum materialise, our plans for housing the collection of the Bombay Natural History Society may have to be changed. But substantially the general ideas will hold throughout. In bringing out the scheme I am much indebted to my colleague, Mr. Praier, who has helped me with all his valuable ideas culled from the Museums of India and twelve years' work with the Society, both in the Museum and the field. Also to Mr. R. A. Spence, M.L.A., Mr. Millard, Mr. Kinnear, Rev. E. Blatter, S.J., F.L.S. and Mr. Hefford. To these and all who have helped me I tend my sincerest thanks.

BOMBAY NATURAL HISTORY SOCIETY,

3rd May 1921.

OBITUARY.

ROBERT CHARLES WROUGHTON.

It is not given to many to do their most widely known and enduring work after they have retired from their life's profession, but such was the happy lot of R. C. Wroughton, whose death, in his 72nd year, occurred recently. In sympathy with those of us who have had the pleasure and advantage of working with him in London of recent years, every member of the Bombay Natural History Society will hear of Wroughton's loss with regret.

Born at Nusserabad in 1849, the son of Major-General R. C. Wroughton, himself an ardent sportsman and naturalist, Wroughton spent his early boyhood in India, where he imbibed his lasting taste for Natural History. In due course he obtained a position in the Indian Forest Service, served there with distinction, and finally became Inspector-General of Forests, with which rank he retired in 1904. During his period of service he was always a collector of Natural History objects, giving his attention mainly to ants* of which he obtained a very considerable knowledge working in conjunction with the well known formicologist, Forel of Switzerland, to whom he sent the abundant material he obtained. Then, towards the end of his official career, he took to collecting scorpions and myriopods† for the benefit of R. I. Pocock of the Natural History Museum, and partly through the latter's influence, he was induced to turn his attention to small mammals, which in the end proved to be the group on which his permanent reputation will stand.

He began by collecting the series of bats on which his first mammal paper "Some Konkan bats" (1899)‡ was founded, and it was in working out these at the Museum in South Kensington, during a visit home on furlough that he found his metier as a mammalogist, in which capacity he later did so many years admirable work.

After his retirement in 1904, he settled at Chiswick, and as a method of life found it suited him well to golf two days a week and work at the Museum the other four, thus carrying on a sporting and scientific life well suited to his tastes and character.

His services he gave to the Museum freely and without stint, and it is quite impossible to estimate how great was the benefit of that work to the authorities of the Museum. The study of mammals was then taking on the modern phase of the collecting and arranging of skins and skulls in large series, and the help he gave in stimulating, collecting and in handling the material obtained was of especial value at that time.

Owing to the fact that, then as always, African material was the most abundant in the accession-list, Wroughton took up to begin with the study of the mammals of that continent as a speciality, and wrote quite a number of useful papers on such collections as came in. He took a particular interest in the mammals of South Africa, partly owing to the successful outcome of the Rudd Expedition, which gave a stimulus to work in that part of the world, and partly to a visit he made himself to relatives living in Natal.

But he never had India far from his thoughts, and bitterly deplored the very inferior state of the National collection so far as our greatest dependency was concerned. He was always on the look out to improve this state of things, and at last his opportunity came with the accession of W. S. Millard to the management of the Bombay Natural History Society.

For these two kindred spirits, the one in England and the other in India, conceived and carried through the splendid idea of the Bombay Society's Mammal

* Our Ants; R. C. Wroughton. *Journal, Bombay Nat. Hist. Soc.* Vol. VII, pp. 13, 175.

† Two collections of Myriapoda from Ceylon and S. India; R. I. Pocock, *ibid.*, Vol. VII, 131. On a collection of Scorpions. *ibid.*, Vol. VII, 295

‡ Some Konkan Bats; R. C. Wroughton. *ibid.* Vol. XII, p. 716.

Survey of India, in the course of which some half a dozen trained collectors were sent in succession to selected parts of the Indian Empire, and collections formed of perfectly prepared specimens, to a number now approaching 20,000, while at the same time a series of systematic reports on the material so obtained were prepared in London and printed in the Society's Journal. This Survey is undoubtedly the finest thing of the sort that has ever been done, if we except the American Survey of their own Territories, done out of Government funds, while the Bombay Survey has been mainly carried out by private generosity.

Altogether the Survey, the materials obtained by it for the benefit of the National and Bombay Museums, and the papers written on this material, together form a monument to Wroughton's memory which will remain as long as Zoology exists.

The number of papers, mostly in the Society's Journal, that Wroughton wrote, is very considerable, and he described something like 200 new species and subspecies of African and Indian Mammalia.

When, owing to the war, material began to fall off in quantity Wroughton took the opportunity of preparing a summary of the work done in Indian Mammalogy during the course of the Survey. This was fortunately completed before illness overtook him, and would have been the precursor to a new edition of the mammals of British India, which it was arranged that he should prepare in conjunction with M. A. C. Hinton of the Natural History Museum.

It was typical of Wroughton's indomitable energy of spirit that he should, after 70, and suffering already from the grave illness of which he died, have light-heartedly planned and started on such a monumental work as a new *Blanford*.

But this was the key to the character of the man. No work was too laborious, too great or too difficult for him to start on, and, if life were given him, to carry through to a successful conclusion. His mental energy was astounding, and he never recoiled from any task on account of the labour it would involve, whether it were the writing of a book, the preparing of reports, the handling of any amount of specimens, or the taking of unending measurements in groups that he was working out. And the readiness with which, to the end of his life, he assimilated new ideas, whether of nomenclature, storage-methods, or anything else was quite unusual for a man of his age.

The following are formal details of his life :—

Born at Nusserabad, 15th August 1849. Educated at Bedford School and King's College, London. Trained at L'Ecole Forestiere, Nancy, France. Appointed to Indian Forest Service, 10th December 1871, as Assistant Conservator of Forests, Bombay Presidency, eventually becoming Inspector of Forests for India. Retired 1904.

Married in 1877 Mary, daughter of Captain Freeman of the Indian Navy. Died at Chiswick, Middlesex, 15th May 1921.

Of his personal characteristics it is difficult to speak in unexaggerated terms. Of a splendidly robust physique, he was as keen and energetic over games as over work and was the greatest favourite with everyone with whom he came in contact. Most striking were his simplicity of character, his keen humour and his power of attracting volunteer help, such as that so willingly given him by Miss Kathleen Ryley, and above all by Mr. Thomas Fry. During the 17 years that he worked in London he earned the affection of all the mammal staff though his modesty and retiring disposition prevented his taking any prominent part in the general scientific life of London. But to those, young and old, who were in touch with him his loss is a very severe blow and as a friend and helper he will be deeply missed by all of us at the Natural History Museum, where he was so regular an attendant.

OLDFIELD THOMAS.

AN APPEAL.

May I make an appeal through the Journal to the members of the Society to help me in an investigation of a hitherto quite neglected branch of Indian Ornithology, and that is the study of nestling birds. I have for many years made a study of this subject and described for the first time this stage in many of our common European birds, and whilst recently in India I made a start on Indian birds with the kind help of Messrs. H. Whistler and A. E. Jones, but time and opportunities did not carry me very far.

It is an important subject, particularly in India, as I think it may give us a clue to the relationships of various birds, or groups of birds, whose affinities are doubtfully, or not at all known. As an example of this I might quote that extraordinary assemblage which in the "Fauna" is called the *Crateropodidae*, Babblers, Laughing Thrushes, etc. ? Again, most of the European *Sylviidae* lack down entirely, but the *Phylloscopi* have it; what obtains in Indian genera such as *Suya*, *Prinia*, *Franklinia*, *Horornis*, etc. Again how do the various genera of Flycatchers compare with the European *Muscicapa* ? Or again, European finches are fairly well clothed with down, except Sparrows (*Passer*), how does the Yellow-throated Sparrow (*Gymnorhis*) compare? and so on—one might go through the entire Fauna.

To make my meaning quite clear I must state that a nestling bird is one that is just hatched and up to the time feathers sprout; some are entirely clothed with down such as Waders, Game Birds, etc., others have a varying amount of down or none at all.

1. Every sort of bird is required, however common, and whether it has any down on it or not.

2. One specimen suffices; it should be taken as soon after hatching as possible.

3. The only knowledge required is the knowledge of the specimen, so that nearly all can help.

4. The specimen must be labelled with name and locality (in pencil), wrapt in wool or linen and dropped into spirit; chicks of large birds should be opened down the abdomen. Several can be put into one bottle but if so the spirit must be changed once a week.

5. Any time after 4 weeks in spirit they can be taken out, wrapped in cotton damped in spirit, packed in a tin and despatched to the Honorary Secretary of the Society.

The results of this investigation, which will extend over many years, will be published in the Journal from time to time. I hope to give soon a resume of what I have already done.

LOWESTOFT, ENGLAND,

April 20th, 1921.

C. B. TICEHURST.

MISCELLANEOUS NOTES,

No. I.—A WHITE TIGER IN CAPTIVITY.

(With a photo.)

We publish the photograph of a White Tiger which is at present in captivity in the Maharaja's gardens at Rewa. The photo was forwarded to the Society through the agency of Capt. K. Evans Gordon. Mr. Janki Prasad, Home Member, Council of Regency, Rewa, when sending the photo, supplied Capt. Evans Gordon with the following details :—

"The white tiger in captivity in Rewa was caught in December 1915 in the jungles of the State near Sohagpur. He was about two years of age at the time. There were two more white tigers at the time in Southern Rewa related to this tiger but it was believed that the mother of this animal was not white.

A big cage was kept for months in the jungle in which live pigs were placed to attract the tiger. The Shikaries concealed themselves on a tree above the cage and by a contrivance, a sort of door could be let down as soon as the tiger was inside. The tiger was accordingly caught when inside the cage killing the pig. A white tiger was killed by a Sardar in Sohagpur Tahasil, Southern Rewa, about 10 or 12 years ago. Two other tigers appeared in the beat near the Shahdol and Annuppur, B. N. Ry., but His late Highness' orders were that these should not be shot. The one at Annuppur (Bhilam Dungari Jungle) was said to be brother of the white tiger in captivity. These white tigers roam in the neighbouring British Districts of the Central Provinces and seem to be living in the Maikal ranges of mountains."

Mr. A. E. Scott of the Indian Police has very kindly furnished us with the following description and notes in connection with the animal :—

Description. (From examination of tiger on December 3rd, 1920.)

Body Colour

.. Pure white. No cream colour was visible. The 'Creamy-white' as described by Mr. Janki Prasad was probably due to the dirt of the cage. (The tiger is now better cared for than formerly.)

Stripes

.. Indistinct or light *black*, not brown as stated by Mr. Janki Prasad. While some of the stripes, particularly the face markings, are quite black, the majority are ash-coloured owing to white hairs being mixed with the black. In the *hot weather*, the hair, as is the case with all felines, goes a lighter colour, and the black stripes take on a slightly brownish tinge, but this is never pronounced.

Nose

.. Mottled grey-pink (instead of pure pink as in normal tigers).

Lips

.. Grey-black on hair-line but quickly merge to pink (instead of being quite black and gradually merging to pink well inside the mouth as in normal tigers).

Eyes

.. The colourings of the eyes are very indistinct. There is no well-defined division between the yellow of the comex and the blue of the iris. The eyes in some lights are practically colourless merely showing the black pupil on a light yellow back ground.

Eyelids

.. Pinkish-black.

Ears

.. Practically normal in colour and markings. The ground black is however slightly ashy.

General description and Discussion regarding identity. The tiger is of course underdeveloped owing to years of captivity, but in height he is probably slightly above normal and in a wild state would undoubtedly have been an exceptionally large animal.



A WHITE TIGER IN CAPTIVITY.

I, myself, when stationed in Bilaspur District in 1919, did my best in the hot weather to come up with a white tiger, which must have been a very large and heavy animal, judging from the size of the pug-marks which I tracked on many occasions. This tiger was however very shy and would not look at tied 'kills' but was especially fond of bison cows and calves. He was constantly seen by herdsmen in the jungle, but never made an attempt to take an animal out of the herd. The above would seem to indicate that these white tigers run large, which suggests a theory that they are not mere albinos but a distinct variety of *Felis tigris*. These white tigers have been known for years in the neighbourhood where the Bilaspur and Mandla Districts of the C. P. join with Rewa State. One was shot by a villager in the north of Bilaspur District, about 15 years ago, and another in the Rewa State some years later. There are at present to my knowledge three white tigers in the jungle and it is quite probable that there are many more, as the area in Maikal Hills, which they inhabit is large, wild, and hilly, and, since the beating for or killing of tigers is prohibited in the State, it is possible that these shy white tigers might roam in this secluded jungle for years undetected and unmolested. Last year in the hot weather two of these white tigers, full grown, were seen taking a sand bath in the bed of a stream in the South of this State. They may of course have been born of the same mother but the observed constant association of white tigers with one another tempts one to believe that they do not interbreed with the ordinary variety of tiger.

EDITORS.

No. II.—RECORD PANTHER SKULL (*F. PARDUS*).

(*With a plate.*)

Through Mr. Eugene J. Van Ingen, the Society recently received the skull of a Panther which in dimension easily establishes a record for India. The animal was obtained by Mr. E. E. Limouzin of Dunsandle Estate, Ootacamund, in the Water Fall Shola.

In forwarding the skull Mr. Van Ingen writes :—

"I send herewith the skull and ribs of a Panther (?). As the skull seems abnormally large and more like a tiger's, I should be extremely obliged, if you would examine it and tell me whether it is a tiger's or panther's.

I may mention that the owner, Mr. E. E. Limouzin of Dunsandli Estate, Ootacamund, declares it to be a Panther's but yet is not quite sure about it. While out shooting he caught a glimpse of the animal, late in the evening about dusk, and wounded and lost it. It was found some days afterwards but by then decomposition had set in and vultures and jackals had destroyed the skin; the skeleton and skull remained together with strips of skin, and Mr. Limouzin examined what he found of the latter carefully and is positive that the animal is a panther.

Yet I think the skull seems to be quite out of proportion with the ribs and Mr. L. remarked the same. He tells me that he had seen this panther previously on several occasions. and had examined him through his glasses, and though his head and fore quarters seemed to be extremely large and powerfully built, the body and hind quarters seemed to dwindle away! Before this, in fact almost a year ago, Col. W. told me that he had seen a panther a few miles from Dunsandli, and he described its head, chest and forearms to have been enormous. It was standing on a rock about 20 yards away looking down at him, and Col. W., who has shot many panthers, claimed it to be the largest he had ever seen. He quite believes this animal of Mr. Limouzin's to be the one seen by him.

Another reason Mr. Limouzin gives by which he is positive is that a few minutes previous to coming on to the Panther he heard the unmistakable call of a panther.

I much regret that I did not send you one of the claws, nearly all of which Mr. Lisonzin recovered. They are quite the size of a large tigress. As regards the skull, in the course of my profession I have seen many panther skulls; many of them belonging to animals well over 7 ft. but none anywhere approaching this one in size."

Writing later Mr. Limouzin says: "By to-day's Mail I have sent the entire skeleton of the panther to your care (with the exception of one rib, smashed to bits by the bullet, and another rib, broken, possibly by the explosion, internally). Before I fired at the panther I was very much struck with the extraordinary size of his head and shoulders, he appeared to be immense, but unfortunately he jumped aside and I was only able to get a "snapshot" at his side going down hill, from me."

The skull sent is undoubtedly that of an adult Panther. The skull sent in by Mr. Van Ingen measures as follows:—

| Basal Length. | Breadth. | Weight. |
|---------------|----------|---------------|
| 11·3" | 7·9" | 2 lbs. 4 ozs. |

The largest specimen in Rowland Ward's "Records of Big Game" is one obtained by Sir Edmund Loder in Gabun (W. Africa).

The measurements are as follows:—

| Length. | Width. | Weight. |
|---------|--------|--------------|
| 11·25" | 7·125" | 1lb. 12 ozs. |

The largest Indian Panthers' skulls measure:—

| Length. | Width. | Weight. | | |
|--------------------|-------------------|---------|------------------------|-------------------------|
| 10 $\frac{1}{4}$ " | 6 $\frac{5}{8}$ " | .. | Bijnor, U. P. | A. M. Markham. |
| 10 $\frac{3}{4}$ " | 6 $\frac{1}{4}$ " | .. | Gir Forest, Kathiawar. | Lt.-Col. L. L. Fenton. |
| 10" | 6 $\frac{1}{2}$ " | .. | Belgaum. | Sir Edmund Loder, Bart. |

The largest specimen in the Society's collection measures 8·3" in basal length and is 5·9" wide across the zygomata. This animal taped 7·3".

Blanford in his Mammalia, writing on the points of distinction between the skulls of Tigers and Panthers say:—

"The upper surface of the skull (Panther) is arched as in the Tiger, but the lower jaw is convex beneath, as in the Lion, the cordyle being proportionately nearer the angle even than in the latter. When a Leopard's skull, with the mandible attached, is placed on a flat surface, the hinder part of the skull almost always touches that surface."

We publish for comparison a photograph of Mr. Limouzin's panther together with a photo of a tiger's skull and that of the largest Panther skull in the Society's collection. Also a Lion's skull.

S. H. PRATER.



SKULL OF INDIAN LION.
Length 14.4". Breadth 9.9"

SKULL OF TIGER.
Basal Length 14.5". Zygomatic Breadth 10.1"



Recent Panther Skull shot by Mr. Limmouzin
Length 11.3" Breadth 7.9"

Largest Panther Skull in the Society's Collection.
Length 8.3". Breadth 5.9"

Note how the hinder part of the Skull in the Lion and Panther is in contact with the flat surface of the table; in the case of the Tiger the occipital condyles are about an inch above this level.

No. III.—NOTES ON PANTHERS.

In accordance with the wishes of some members of the Society for letters from individual members recounting their personal experiences in connection with beasts of the field, or rather jungle, I give you the following account of what panthers, accustomed to lights and sounds connected with a tea planter's bungalow and the surrounding coolie lines, will do. During the rains a pair of these animals invaded the compound of the Superintendent's bungalow one night and kept himself and his servants practically confined to the bungalow from 8 p. m. until midnight. A hedge of quickset thorn surrounds the bungalow and behind this they chased each other round regardless of lights and shouting. At last in desperation my Superintendent fired his gun off in the direction they appeared to be. This eventually drove them off. A fortnight ago I happened to be calling up at his bungalow on business and on stepping out of the verandah preparatory to proceeding to my own residence I received a blow which included the whole of the left side of the face and left a gash under my eye. This laid me out senseless for half an hour. No one was an actual witness of the occurrence but there could have been no doubt that a panther had given the blow as the pug marks and those of two cubs were very distinct all round the bungalow. That my face was not torn away I put down to the fact that the animal only wanted to give me a knock down blow and I did not use her claws. The fact of a tiger or panther using its claws would do away with the effect of a blow given by the pad when hardened. I saw a tigress give such a blow to a tiger in the Calcutta Zoo. It would have certainly killed a man but only staggered his majesty without drawing blood. Both the above incidents occurred on very dark nights, and I presume in the first case the panthers were love making. In my twenty-five years' experience of Cachar I have had many experiences with panthers some of which I may give you later.

CACHAR,
29th January 1921.

A. G. McARTHUR.

No. IV.—PANTHER IN A TREE WITH A PIG.

I was out on an elephant in the Mudumalai forests (Nilgiri Wynaad) one afternoon last month and about 5-30 p. m. heard a confused noise of animals giving tongue. Mahout and Shikari declared this to be bears fighting. So the elephant was hurried to the spot at its best pace. A herd of pig were found to have treed a panther which lay fully extended along a horizontal branch about 15-ft. above the ground. In its grasp the panther had a small pig. At about 35 yards the elephant was pulled up and I fired. The pig dropped like a stone and lay as dead for several minutes. In fact until some minutes after the elephant had been walked up to it, though apparently unseathed. Then with the elephant standing beside it, it suddenly jumped up and scuttled off, much to the alarm of the elephant, who threw off the Mahout and my rifle, trumpeted twice and stamped his forefeet. To return to the panther; after being struck he dropped the pig instantly, there followed a pause, very brief but distinct, and then he reversed his direction on the branch and shot diagonally into the grass like a flash. Now this animal had been struck in the back of the neck, the bullet (.405 solid) coming out through his left eye. Yet he performed the difficult feat of turning to face the tree trunk from having been fully stretched out in the opposite direction. After the slight pause referred to, this 'about turn' movement was done so extraordinarily quickly that I did not follow it. Yet it must have been so for the pig dropped from the forepaws which were outwards from the tree trunk, and the panther shot into the grass in the opposite direction. He lay invisible in high grass (there was only short grass on the side from which I had approached), invisible to a 6' man standing erect on the pad of an 8' elephant at 10 yards distance. However after a wait

we advanced and found him dead within 10 yards. He measured 6'-6" between pegs, being 3'-10" to root of tail.

This panther's behaviour illustrates well what Mr. Brook Fox wrote in the December 1920 issue and which I should like to quote "When a panther receives a wound, mortal or otherwise, he invariably makes a mad rush for the nearest heavy cover. It is astonishing how their instinct leads them to the most difficult and inaccessible cover in the vicinity". Panthers in South India go up trees commonly, as in beats, or for the purpose of dropping on sambhur, chital, etc. (there was an instance of this in the same forest this year) but I have not previously heard of a panther escaping (from pigs in this case) up a tree and taking its prey with it, though there was nothing very strange about it, the pig being quite a little one.

COIMBATORE,
7th March 1921.

J. H. LONGRIGG, I.F.S.

V.—MEASUREMENTS OF TIGERS AND PANTHERS.

Reference Editorial note, page 394 of the Journal of the Society, Vol. XXVII, No. 2, on the measurement of tigers. I have been through my shikar book of the past 28 years and it is very regrettable that on so many occasions no measurements were recorded. I have however extracted the following, all made myself on the spot immediately after the animal had been killed. They may or may not be of any value.

| TIGERS. | | | | | |
|------------|-------------------|--------------------------|-------|------------------|-----------------------------------|
| No. | Length on curves. | Length between uprights. | Tail. | Skull in inches. | Remarks. |
| 1 | 10' | 9'.5" | .. | 14 x 10 | immense. |
| 2 | 9'-9" | 9'-2" | .. | 13½ x 9½ | very large. |
| 3 | 9'-9" | .. | .. | .. | .. |
| 4 | 9'.7" | .. | .. | .. | large. |
| 5 | 9'.6" | 8'-10" | 30" | 13 x 9 | very heavy; stumpy tail. |
| 6 | 9'.6" | 8'-10" | 36" | 12½ x 9¼ | lanky. |
| 7 | 9'.2½" | 8'-8" | 36" | .. | " |
| 8 | 9'.2" | 8'-2" | .. | .. | " |
| 9 | 9'-2" | 8'-0" | .. | .. | young. |
| 10 | 9'-0" | .. | .. | .. | heavy tiger. |
| TIGRESSES. | | | | | |
| 1 | 9'-0" | 8'-0" | .. | .. | thin; lanky. |
| 2 | 8'-11" | 8'-0" | .. | .. | .... |
| 3 | 8'-8" | .. | 32" | .. | .... |
| 4 | 8'-7" | .. | .. | .. | .... |
| 5 | 8'-6" | .. | 26" | .. | .... |
| 6 | 8'-2" | .. | .. | .. | smallest shot. |
| PANTHERS. | | | | | |
| 1 | 8'-0" | 7'-10" | .. | .. | biggest shot; an immense panther. |
| 2 | 7'-8" | 7'-2" | .. | .. | very heavy. |
| 3 | 6'-9" | .. | .. | .. | female. |
| 4 | 6'-6" | .. | .. | .. | " |

All the above were shot in Central India where the tigers are as a rule thick-set, heavy animals with short tails.

STEWART CAPPER,
Lt.-Colonel.

GUNA CANTONMENT,
28th January 1921.

No. VI.—HYÆNAS IN MESOPOTAMIA.

Reference Journal of the Society, Vol. XXVII, No. 2, pages 332 and 333, Item 16. On two occasions I saw a hyæna on the Tigris, both occasions on the left or Persian bank, and between Amarah and Sheikh Saad.

STEWART CAPPER,

Lt.-Colonel.

GUNA CANTONMENT, C. I.,

31st January 1921.

No. VII.—A LARGE BEAR (*U. LABIATUS*) SHOT NEAR GUNA.

A very big male bear (*Ursus labiatus*) was shot close to this Cantonment a few days ago. Weight 276 pounds, measurement round curves 6'-3". All present agreed that it was quite the biggest specimen they had seen. He was a very old animal that had been in the local jungles for the past three years but had always broken back through the beat till this occasion.

STEWART CAPPER,

Lt.-Colonel.

GUNA, C. I.,

31st January 1921.

No. VIII.—“SORE NECK” IN SAMBHAR.

We have had several enquiries from members in reference to the prevalence of ‘sore neck’ in Sambhar and would be very glad if members could send us any information in regard to the above.

In this connection a note appeared in the Journal of the Natural History Society of Siam under signature of Mr. P.R. Kemp, who was engaged on survey work in the district lying approximately between lat. 14°00 & 16°00 N. & long. 93°30 E. Mr. Kemp shot several Sambhar in this district during the months of December and June and observed that they were all affected by a peculiar sore upon the neck situated in the middle line in front. The actual sore was round about 1½ inches in diameter and the skin around it was devoid of hair which had apparently been rubbed over an area about 8 inches long by 6 wide. The sore was superficial and did not extend deeply. Mr. Kemp states that the disease is recognised among the Siamese as the Khi-Ruon-Kwang or the Leprosy of the Sambhar and is believed to be due to the animals eating the fruit of the Ma-Kawk tree, a kind of wild plum generally known as the wild olive. The appearance of the sore in these animals is stated by the Siamese to synchronize with the time of the appearance of the fruit on the Ma-Kawk trees.

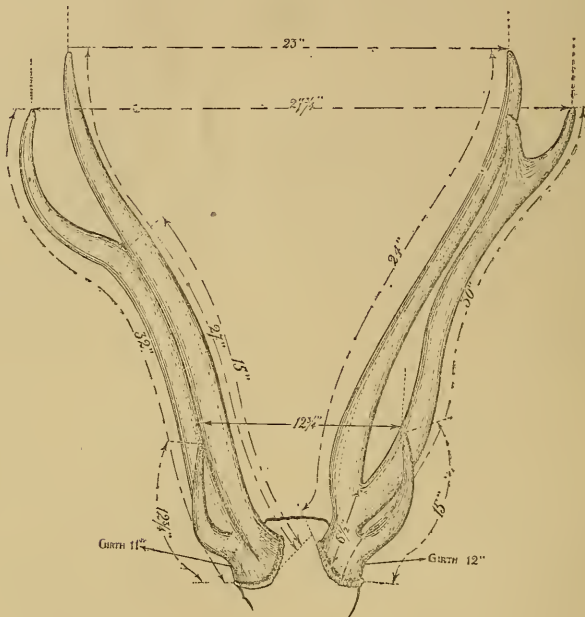
The same disease has been observed by members in Assam and it would be interesting to know if this has been the case in other parts of India. Mr. Dunbar Brander, I.F.S., to whom we applied for information in regard to the above, writes as follows:—

“I was much interested in the notes *re* the mark or disease observed in the throats of Sambhar. I have several times observed the same thing on Sambhar in the United Provinces, always during the period that hair and horn were undergoing a change. At this period Sambhar do not come under much observation and I am inclined to think the wound is more common than is generally thought. The wound has always emanated from the centre of a whorl of hair on

the throat and as it has only been observed by me during the time when the animal was changing coat or horn I naturally connected the two and came to the conclusion that the sore or mark was the result of the changes taking place. I can only throw this out as a suggestion."

EDITORS.

No. IX.—DOUBLE GROWTH OF HORNS IN SAMBHAR.



Double growth of Sambhar Horns.

As per my promise I am sending sketch of a sambhar head.

You will see that nearly all freak or deformed heads are generally ugly but this was an exceptionally well balanced head pleasing to the eye. Unfortunately I was unable to get a photograph as the head was packed up ready to go to England. It was shot by Major G. Turner in Narhar Bloek, Nagpur District, March 1920.

It would be interesting to hear any theories put forward to account for this exceptional growth of horn, as there is no sign whatsoever pointing to abnormal growth owing to obstruction or accident occurring during the early stages of growth, as both horns have double shafts.

Also I have never seen or read of a proved case of horns not being shed and a double growth being produced the second year, although I have seen a great number of red deer from Scotland, Austria and Asia Minor, also Cariboo and Reindeer. Perhaps some of your experienced members will give their valued opinion.

HUGH COPLEY.

NAGPUR,
16th March 1921.

No. X.—BLACK BUCK *v.* MOTOR.

I expect many of your readers who have motored through black buck country have noticed the interesting habit the latter animal has of racing a motor car. One drives along a road through open country and sees buck, perhaps a small herd, say one hundred yards off to the left of the road. The buck have the whole country on that side of the road to retreat into but they apparently never seem safe until they have crossed the road in *front* of the car. They gallop alongside the car (I have taken a doe up to 33 miles an hour) and edge closer and closer to the car when, choosing their time, they clear the road in front of the car with one delightful bound, sometimes with only a yard or so to spare. I have seen many scores of black buck behave as described but never a chinkara. There seems to be a sort of fatal fascination about a car. I wonder whether buck do it with a motor cycle. Once across the road they go straight away across country never taking up the race again on the other side of the road. It is an interesting habit and the reason for it I have never yet fathomed but perchance some members of the Society have a simple explanation.

JOHN BUDDEN.

5th March 1921.

No. XI.—ROUGH NOTES ON THE AVIFAUNA OF THE NELLIAMPATHY HILLS.

1. *Geography of the Hills.*—The Nelliampathy Hills form the Northern boundary of the Western Ghats in their Southern Division. These Ghats are broken by a level cultivated plain some 15 miles wide from N. to S. known as the Palghat Gap. The Northern boundary of this gap is formed by the Palghat Hills and the Southern by the Nelliampathies. These latter join into the Anamallies which in turn extend southwards into the Travancore High Range and so through the Peermade Hills, the Cardamom Hills, etc., to the final Southern limit of the Western Ghats, the Asambu Hills, some 15 miles North of Cape Comorin.

The general character of the Nelliampathy Hills may be summarised as follows :—

I. The Northern slopes, which rise precipitously from the plains, the cliffs, cut by an occasional gully, clothed in deciduous jungle.

II. The Plateau Country, undulating land covered with dense evergreen forest, varied by patches of coffee cultivation, lemon grass and lantana.

III. The Higher Ranges, which rise from the Plateau Country up to an elevation of some 5,000 feet above sea level. These peaks and downs are composed of grass land interspersed with small evergreen sholas.

IV. The Southern slopes. The Hills drop away gradually to the South into the huge forest clad Nelliampathy Valley. These slopes are covered with evergreen forest almost down to the Valley especially towards the centre and western parts of the Hills. To the East the forest is more deciduous.

2. *General.*—This list of the birds of the Nelliampathies is by no means exhaustive. It is merely a list of such birds as I have personally observed on these hills at various times during the past ten years. I have so far not touched the warblers and noted very little as regards the nightjars and the owls.

The following common birds, however I know, do *not* occur on the Hills at any time* :—

1. *Corvus splendens*.—Common Crow.
2. *Corvus macrorhynchus*.—Jungle Crow.
3. *Eudynamis honorata*.—The Koel.

*The scientific names are from Blandford's notes.

4. *Hierococcyx varius*.—Common Hawk Cuckoo.
 5. *Centropus sinensis*.—The Crow Pheasant or Coucal. May come up the Northern slopes as a very occasional straggler in the hot weather.
 6. *Streptopelia suratensis*.—Common Indian Dove.
 7. *Xantholæma hæmatocephala*.—Crimson-breasted Barbet or Copper-smith.
 8. *Ceryle varia*.—The Pied King Fisher.
 9. *Halcyon smyrnensis*.—Common King Fisher.
 10. *Molpastes hæmorrhous*.—Madras Red-vented Bulbul.
 11. *Oriolus melanocephalus*.—Black-headed Oriole.
3. In the following list of birds observed up here, I have noted a few points wherein our birds differ from their descriptions as given in the "Fauna of India" volumes.

1. *Dendrocitta rufa*.—Tree Pie. Very rare.
2. *Dendrocitta leucogaster*.—Southern Tree Pie. Very common.
3. *Parus atriceps*.—Black-headed Tit. Rare.
4. *Macdolorphus haplonotus*.—Southern Yellow Tit. Extremely common. Recently found several nests.
5. *Garrulax delesserti*.—The Wynaad Laughing-Thrush. Common. Iris maroon brown, not crimson.
6. *Pomatorrhinus horsefieldii*.—The Southern Scimitar Babbler. Extremely common. A very pleasing liquid, gurgling note. Ear coverts chestnut. Bill yellowish white, lower mandible paler at base. Upper mandible dark horn at base, the dark colour extending half way down the culmen. No black border to white of chin, breast, etc. Length only 9".
7. *Pelorneum ruficeps*.—The Spotted Babbler. Common.
8. *Rhopocichla atriceps*.—The Black-headed Babbler. Very common, both this species and No. 7. Found six young last week (February). Are usually found in the thick greenery bordering a stream at the edge of a shola. I have always found both in large flocks of 12 to 24 birds often in company with other babblers.
9. *Myiophonus horsefieldii*.—The Malabar Whistling Thrush. Common.
10. *Larvivora brunnea*.—The Indian Blue Chat. Somewhat rare.
11. *Zosterops palpebrosa*.—The Indian White Eye. Very common.
12. *Ægithinia tiphia*.—The Common Iora. Rare.
13. *Chloropsis malabarica*.—The Malabar Chloropsis. Common. I think there is only this one Chloropsis found here.
14. *Irena puella*.—The Fairy Blue-bird. Extremely common. Goes about in pairs usually, but often in small parties, especially in the early morning.
15. *Hypsipetes ganeesa*.—The Southern Indian Black-Bulbul. Extremely common. Usually frequents the tops of trees. The lowest I have seen these birds descend, except to bathe, has been to drink the nectar from the red flowers of the thorny wild Erythrina. As a rule they seem to stick to the higher trees. The flocks have broken up (February) and these birds are generally now in pairs.
16. *Otocompsa fuscicaudata*.—The Southern Red-Whiskered Bulbul. Extremely common.
17. *Iole icterica*.—The Yellow-browed Bulbul. Extremely common. Also now going in pairs instead of the usual noisy flocks.
18. *Sitta frontalis*.—The Velvet-fronted Blue Nuthatch. Common.
19. *Dicrurus longicaudatus*.—The Indian Ashy Drongo. Extremely common. I do not think we get *D. ater* or *D. caerulescens*.
20. *Chaptalia ænia*.—The Bronzed Drongo. Not uncommon.
21. *Dissemurus paradiseus*.—The Larger Racket-tailed Drongo. Very common. I have heard it imitate, among many others, the great Malabar Black Woodpecker and the Malabar Grey Hornbill.

22. *Lanius erythronotus*.—The Rufous-backed Shrike. Common.
23. *Pericrocotus flammeus*.—The Orange Minivet. Very common.
24. *Pericrocotus perigrinus*.—The Small Minivet. Rare.
25. *Hemipus picatus*.—The Black-backed Pied Shrike. Common.
26. *Tephrodornis sylvicola*.—The Malabar Wood Shrike. Very common.
27. *Oriolus kundia*.—The Indian Oriole. Very common.
28. *Eulabes religiosa*.—The Southern Grackle. Very common.
29. *Stoparola melanops*.—The Verditer Fly Catcher. Very common. According to Blandford this species should not occur so far South. It does not return to its old perch after a flight in the usual manner of flycatchers, as a rule at any rate. I obtained a ♂ specimen of the Verditer Flycatcher (*Stoparola melanops*) on these Hills at 3,300 ft. elevation the other day. Blandford places its Southern limit of occurrence at the Nilgiris, whereas these Hills are far South of the Nilgiris and moreover separated by the Palghat gap from any connection with the Northern Range of ghats to which the Nilgiris join. These remarks also apply to the common Rose Finch (*Carpodacus erythrinus*) which is of common occurrence here. Blandford, again, limits the occurrence of the Nilgiri Blue Flycatcher (*Stoparola albicaudata*) to the Nilgiri and Palni Hills, whereas this species is our commonest flycatcher up here.
30. *Stoparola albicaudata*.—The Nilghiri Blue Flycatcher. Very common. This bird also occurs much further South than Blandford thought.
31. *Terpsiphone paradisi*.—The Indian Paradise Flycatcher. White cocks appear to be much more numerous than hens or young cocks and moreover appear to lead a bachelor existence.
32. *Culicacapa ceylonensis*.—The Grey-headed Flycatcher. Common.
33. *Merula nigripilus*.—The Black-capped Blackbird. Very common. Generally terrestrial in habits and occurring in pairs but I have seen large flocks in *lantana*.
34. *Geocichla cyanonotus*.—The White-throated Ground Thrush. Very common.
35. *Petrophila cyanus*.—The Western Blue Rock Thrush. Common where open spaces of sheet rock occur.
36. *Petrophila cinclorhyncha*.—The Blue-headed Rock Thrush. Common. Arrives early in October and leaves about the first week in March.
37. *Carpodacus erythrinus*.—The Common Rose Finch. Fairly common.
38. *Arachnecthra zeylonica*.—The Purple-rumped Sunbird. I believe this to be our only Sunbird. Very common.
39. *Arachnothera longirostris*.—The Little Spider-Hunter. Decidedly rare.
40. *Pitta brachyura*.—The Indian Pitta. Common.
41. *Motacilla melanope*.—The Grey Wagtail. Arrives early in October and leaves early in March.
42. *Limonidromus indicus*.—The Forest Wagtail. Quite a common bird. I think the most distinctive thing about the Forest Wagtail, besides its marking, is its habit of swaying both body and tail from side to side, instead of the usual wagtail habit of jerking the tail up and down. It is very common on the Estates, feeding on insects which infest the thick mulch of dead leaves under the coffee.
43. *Galerita malabarica*.—The Malabar Crested Lark. Common on grass lands especially above the Northern slopes.
44. *Brachypteryx nusaurantinus*.—The Golden-backed Woodpecker. Very common.
45. *Chrysocolaptes gutticristatus*.—Tickell's Golden-backed Woodpecker. Very common.
45. *Thriponax hodgsoni*.—The Malabar Great Black Woodpecker. Common. As I believe that the nidification of *Thriponax hodgsoni* has not previously been recorded, the following note may prove of interest. On the 24th January of this year I found a pair of these Black Woodpeckers at work inside a hole

about twenty feet up in a dead *Erythrina lithosperma*. The entrance hole was about 6" in diameter I observed the birds at work for a few days but they unfortunately abandoned the nest.

Early on the morning of the 7th March I noticed a female Black Woodpecker emerge from a hole in a dead *Grevillea robusta*. Hoping to get the eggs (or egg) I told a cooly to go up and if there were any eggs to bring them to me. On my return in the evening from a distant Estate which I visited, I found two half dead naked nestlings the man had brought to me, much to my disgust. However it was useless putting them back so I have made a spirit specimen of one and carbolized the other and send them to the Society. The nest was some twenty feet up the tree again and the entrance hole had a diameter of over 6". The hole was 2½" deep and unlined. There were two nestlings, it will be noted. The "Fauna" thought only one was likely to be found.

These grand woodpeckers are quite common up here. They move about as a rule only in the early morning and late evening. They appear always in pairs and call to one another in a curious, plaintive, metallic clang, which is remotely reminiscent of a seagull's note. They also possess a laugh, only uttered in flight.

46. *Hemicercus canente*.—The Heart-spotted Woodpecker. Common.
47. *Thereiceryx viridis*.—The Small Green Barbet. Very common.
48. *Xantholema malabarica*.—The Crimson-throated Barbet. Very common.
49. *Merops philippinus*.—The Blue-tailed Bee-eater. Very common on the Northern slopes.
50. *Mellitophagus swinhœii*.—The Chestnut-headed Bee-eater. Common on the Northern slopes.
51. *Dichoceros bicornis*.—The Great Hornbill. Very common. Occasionally flies at a great height for very considerable distances.
52. *Anthracoceros coronatus*.—The Malabar Pied Hornbill. Very common.
53. *Lophoceros griseus*.—The Malabar Grey Hornbill. Very common.
54. *Alcedo ispida*.—The Common Kingfisher. Very rare. The few perennial streams of the plateau country are the only places where an occasional Kingfisher may be seen.
55. *Upapa indica*.—The Indian Hoopoe. Not common, they usually haunt certain favoured localities, in pairs.
56. *Cypselus melba*.—The Alpine Swift. Common during the cold weather.
57. *Chætura indica*.—The Brown-necked Spine-tail. Common during the cold weather.
58. *Macropteryx coronata*.—The Indian Crested Swift. I have found it during the cold weather.
59. *Harpactes fasciatus*.—The Malabar Trogon. Common. I notice that the Malabar Trogon has a curious habit while perched, of expanding and elevating its tail giving voice the while to a low twittering creak. As I have not observed this before it is possibly a courting display. The tail of course is often expanded in flight. I noticed this bird the other day pecking some insect off the leaves of a jak (*Artocarpus integrifolia*), while so employed, it hovered for a few seconds like a huge honey-sucker and was a glorious sight.
60. *Palæornis colomboides*.—The Blue-winged Paroquet. I believe the only paroquet up here.
61. *Loriculus vernalis*.—The Indian Loriquet. Very common.
62. *Asio accipitrinus*.—The Short-eared Owl. Very rare indeed. We have an owl which I have been unable so far to indentify, known to the coolies as the Pisasi or devil. It's shrieks are indeed diabolical and heard for the first time are truly terrifying.
63. *Ictinaëtus malayensis*.—The Black Eagle. Very common.

64. *Spizætes cirrhatu*s.—The Crested Hawk Eagle. Very common. Feeds on jungle fowl.
65. *Spilornis cheela*.—The Crested Serpent-Eagle. Common.
66. *Falco severus*.—The Hobby. Not uncommon.
67. *Accipiter virgatus*.—The Besra Sparrow-Hawk. Very common.
68. *Astur badius*.—The Shikra. Common.
69. *Falco peregrinus*.—The Peregrine Falcon. Common. Breeds on the precipices of the Northern slopes.
70. *Elanus caruleus*.—The Black-winged Kite. Somewhat rare. Occasionally comes up from the plains and returns to them at night.
71. *Lophosphizias trivirgatus*.—The Crested Goshawk. Common.
72. *Milvus govinda*.—The Common Pariah Kite. Common, during fine weather when it comes up from the plains. I do not believe this bird roosts up here.
73. *Haliastur indus*.—The Brahminy Kite. Occurs in the same way as the Pariah Kite.
74. *Tinunculus alaudarius*.—The Kestrel. Common.
75. *Ducula cuprea*.—Jerdon's Imperial Pigeon. Very common.
76. *Carpophaga ænea*.—The Green Imperial Pigeon. Rare and only occurs towards the foot of the Southern slopes. Probably common in the immense forests of the Nelliampathy Valley.
77. *Chalcophaps indica*.—The Bronze-winged Dove. Very common.
78. *Crocopus chlorogaster*.—The Southern Green Pigeon. Very common in October, November and December, begins to leave the Hills about the middle of January and none are seen after the middle of February. Occasionally however a few birds remain and breed up here. On the Nelliampathy Hills, the Southern Green Pigeon comes up from the plains towards the beginning of October. In November and December they are everywhere. Towards the middle of January they start disappearing, presumably to the plains and they gradually diminish in numbers till the middle of February when the last stragglers depart. Occasionally a few birds remain till the burst of the S. W. monsoon and breed here. They have a habit of perching, in couples or small parties, on dead and leafless trees, more especially in the evening but also, occasionally, at midday.
79. *Osmotreron affinis*.—The Grey-fronted Green Pigeon. Becomes increasingly common as the previous species becomes rare. Extremely common in February and March but also goes down before the burst of the S. W. monsoon.
80. *Galloperdix spadicea*.—The Red Spur Fowl. Very common everywhere.
81. *Gallus sonnerati*.—The Grey Jungle Fowl. Very common everywhere, especially when the *Strobilanthus* or bamboos are in seed.
82. *Scelopax rusticola*.—The Wood Cock. Very rare. Visits the Hills, during migration presumably at the end of September to the beginning of October and again early in March.
84. Since writing the previous list I have identified *Butorides javanica*. It was fishing among the boulders of the Manalora stream.
A common bird that does not occur up here is *Passer domesticus*.
85. *Pseudogyys begnalenensis*.—The Indian White-backed Vulture. Comes up from the plains in the same manner as the kites. Only roosts up here when gorged.
86. *Alsocomus elphinstoni*.—The Nilgiri Wood Pigeon. Much rarer than the Imperial pigeon but occurs sparingly on the higher hills.
87. *Alseonax latirostris*.—The Brown Flycatcher. Was not sure of the species before. *A. ruficaudus* and *A. mutui* probably also occur.
88. *Orthotomus sutorius*.—The Indian Tailor Bird. This is the only warbler whose species I am certain of. Common.

89. *Eurystomus orientalis*.—The Broad-billed Roller. I saw this bird for the first time yesterday. A pair of them were sitting on a dead tree in a young coffee clearing. One or the other kept flying to another dead tree where they have their nest in a hole some 12 feet up. It contains young. While perched they emitted a note curiously reminiscent of an eagle's scream.

90. *Totanus glottis*.—The Green Shank. I saw a solitary bird beside the Manalora stream the other day.

NELLIAMPATHY HILLS,

A. P. KINLOCH.

March 1921.

No. XII.—OCCURRENCE OF THE PIED GROUND THRUSH (*GEOCICHLA WARDI*) ON THE NELLIAMPATHY HILLS.

Some time ago I noticed a ♂ Pied Ground Thrush up here. This is the first time I have seen this bird on these hills and I do not think I would have passed over such a conspicuous species had it been of regular occurrence. I therefore believe that this bird merely breaks its journey here on its migration from more Southerly latitudes in the same manner as does the Wood Cock (*Scolopax rusticola*).

NELLIAMPATHY HILLS,

22nd March 1921.

A. P. KINLOCH.

No. XIII.—EGRET FARMING IN SIND.

The following extract from the *Daily Gazette*, Karachi, has been sent to us by Mr. G. Birch who contributed an article to the Journal on the above subject:—

In 1913-14 an article was contributed by Mr. Birch of Karachi to the Journal of Bombay Natural History Society on the subject of Egret farming in Sind.

According to Mr. Birch, who had spent some considerable time in personal investigations, the Lesser Egret (*Herodias garzetta*) had been domesticated and was being bred and reared with marked success by Mirbhahars (the generic term by which the fisher folk of the inland waters of the province of Sind are known) who had built up a lucrative trade in osprey feathers plucked from the dorsal plumage of the egret in the same way as feathers are plucked from the ostrich. A series of photographs taken personally by the author accompanied the article, and illustrated the "modus operandi" of the breeders and the construction and condition of the farms. In particular it was stated—

(i) that the birds were bred under humane conditions,

(ii) that the breeding system, so far as these particular birds were concerned had superseded the barbarous system which formerly prevailed in Sind of slaughtering egrets for osprey plumes,

(iii) that when thus domesticated in these farms the birds bred and assumed their nuptial plumage, *i.e.*, the dorsal plumes, three or four times a year.

In conclusion the author pointed out the necessity for the modification of the drastic orders issued by Lord Curzon's Government in 1902 under the Customs Act which "prohibits the taking by sea or land out of British India of skins and feathers of all birds other than domestic birds except

(a) feathers of ostriches, and

(b) skins and feathers exported *bona fide* as specimens illustrative of natural history."

The result of these orders has been to create a large industry in the smuggling out of the country, even where destruction of and cruelty to birds are not involved, of feathers that have a distinct commercial value. The article attracted much attention at the time. It was reproduced, with the permission of the author in "Bird Notes" the Journal of the Foreign Bird Club, Surrey, and in the *Scientific American*. Many enquiries were received from other

Local Governments, particularly the Punjab and Assam. Societies, traders and individuals in North and South America with a view to introducing the system in those countries. The facts mentioned in the articles received independent corroboration from many officers, several of whom are close observers of bird life. The only public criticism which appeared at the time was by Major Lindsay Smith who, while expressing doubt as to the possibility of breeding egrets, said that if the writer of the article could state that he saw the birds incubating the eggs and took the photographs himself, the matter would be placed beyond doubt. This criticism was answered by Mr. Birch in the following letter, dated 13th August 1914, to the Bombay Natural History Society:—

“The photographs printed in the Journal were all taken on surprise visits to different farms. Plate A at a place 7 miles from Rohri on the bank of the Western Nara. Plate B at a village 6 miles from the town of Larkana. Plate C at Rahuja on the Sukkur canal, three miles from Sukkur. The first two photographs were snapshots by myself. I had to procure the help of the professional photographer to take Plate C as my kodak was not large enough to get an interior view but I visited this farm myself also. The other photographs sent to you which were not published were taken by me personally.”

The question of egret farming was discussed shortly afterwards at a conference of Naturalists in London who succeeded in convincing the House of Commons Committee that egret plumes can be taken without any cruelty and that it is unnecessary to hurt the birds, that in the wild state the birds are killed as the only way of getting the plumes; but in farming this is of course not done. Owing to the war no action was however taken.

Last year when the Plumage Bill was the subject of violent controversy at home the existence of egret farms in Sind was strenuously denied. The facts stated in Mr. Birch's article have been hotly debated in Parliament and in particular the tale of four moultings of the plumes per year is regarded as incorrect and impossible. The latter point is always cited by excited opponents as showing the falsity of the evidence of the existence of the farms. No words are minced in the controversy and charges of corruption and perjury are hurled about wholesale. Enquiries have again been made this year regarding the following points:—

- (i) How many farms exist in Sind at present?
- (ii) Are such farms migratory according to the supply of water or fish or according to the movements of the Muhanas?
- (iii) Are the birds well treated or is such cruelty as blinding practiced upon them.
- (iv) What is the dietary of the birds?
- (v) What is the growth of the plumes and how many moultings take place in the year. Is it possible that artificial feeding and restraint may lead to special moultings?

The following are the answers to these questions:—

- (i) The existence of about at least 100 farms has been verified. The average number of birds in each farm is about 100.
- (ii) The farms are migratory only according to the supply of water and fish, *i.e.*, the fishing stations. If the water and with it the fish supply of a particular lake dries up, the farm is moved to another place where water and small fish, the food of the birds, are available. Where a supply of fish and water is permanent the farm remains permanent.
- (iii) The birds are well treated; of this there can be no doubt. They are comfortably housed in well ventilated structures, well looked after and well fed. Amongst 1,700 birds personally seen by the Collector of Thar and Parkar in 19 farms no case of blinding or ill-treating was

discovered. The birds have a high market value and the owners would not wilfully ill-treat valuable property. It is stated that the eyes of some-birds used to be sewn up when they were transported in crates from one place to another to prevent them from fighting. The procedure now followed is to blindfold the birds by means of blinkers. The farmers now use every possible means of keeping their valuable property in the most favourable conditions. Decoy birds with their eyes sewn up used to be employed in decoying wild egrets to a place where by an arrangement of nets they were caught but this method of catching birds has fallen into desuetude since the introduction of the farming system.

- (iv) The food of the birds is small fish. If small fish are not available large fish are cut up into small pieces. The birds are usually fed twice a day. A supply of water is always kept in the pens. The space allowed to each bird on a farm is about 30-40 cubic feet. Compared with the size of the average cage of the tame parrot this is ample. The cages are moreover in the open and accessible to air and light. In each pen each bird has its own beat or stand and keeps off intruders therefrom. The birds required for starting farms are not now caught by decoys. They are purchased from breeders from other farms. During the summer the farmers are careful to keep the pens cool by frequent sprinklings of water.
- (v) Reports are unanimous that moultings take place four times a year though it is stated that the birds only breed twice a year. The moults are twice in summer and twice in winter. The two summer moults give a light return. The way in which the dorsal plumes are pulled out is not at all cruel. The bird is held in one hand and the feathers are pulled out with the other. At the very most there is not more than a momentary twinge of pain. An officer who is a keen ornithologist asserts that the abstraction of such plumes in season causes no more pain than the pulling of a hair out of one's head.

The trade in the plumes of farm bred egrets is not really affected by the provisions of the Wild Birds Protection Act VIII of 1912. The possession of egrets during the close season is not prohibited under that Act provided they are not captured or killed during such season. The law says it is an offence only in respect of those animals which had not been captured before the commencement of the close time. It clearly therefore permits egrets to be captured in the cold weather and allowed to breed on a farm and it also permits the trade in the plumage of such birds in the farm.

The only real difficulty is the prohibition of the export of plumes. If this prohibition could be strictly enforced, the trade would be absolutely extinguished. The smuggling of feathers out of India still proceeds on an extensive scale in spite of the vigilance of the Customs Authorities and as the demand since the close of the war has revived, smuggling is again rife.

It is incontestable that before the inception of the system of breeding egrets the birds were ruthlessly slaughtered for their plumes and that this barbarous practice has now practically ceased as a direct result of the far more economical and lucrative process of the production of plumes by means of egret farms. In Sind it would be an easy matter to ensure that the relaxation of the embargo on exports was confined to the feathers of the particular species of egrets which are farm-bred, viz., the Little Egret or *Herodias garzetta*. The plumes of this species are at present collected in Sind almost exclusively from farm-bred birds. But as the farming system may not exist to a similar extent in other parts of India, the best method of controlling the trade would be to require all farms to be licensed and to allow the transmission of feathers under a pass.

The embargo on the export of the plumes of farm-bred egrets is an antiquated measure which has outlived its original *raison d'être*. It can no longer be justified even for humanitarian reasons. The industry of breeding egrets has been built up in the face of highly adverse conditions. On the other hand the clandestine export of feathers has been proceeding on an extensive scale which it does not appear to be possible to suppress and it is important to distinguish between the export of feathers of farm-bred birds and feathers of slaughtered wild birds.

The system of breeding egrets which has grown up in Sind has now been extended, on information obtained from Sind, to the Punjab and Assam. Plumes are now available in fairly large quantities and especially prepared aigrettes are being hawked about in the streets of Calcutta and sold at very high prices.

No. XIV.—SNARING QUAIL IN NORTH BEHAR.

(With a plate.)

In the Dharbanga District the quail catcher makes use of a slightly different method to that given by Sterndale and quoted by Hume in his *Game Birds of India* (Vol. II, p. 143). It is probably the method Jerdon writes about as follows:—"The Nepalese have an ingenious way of catching Quail. They put a pair of imitation horns on their heads, and walk slowly about the stubble fields twisting some blades of grass in their hands in a way to imitate the champing of grass by cattle, and as these birds are not alarmed by cattle, they succeed in driving any quail they see under a small net, which they then drop and secure the bird." This account does not quite correspond with the method employed here. The quail catcher as described by Hume made use of a bullock to drive the birds up to the net and "his traps consisted of a series of rectangular frames, made of laths, about two feet long by one foot broad (a tightly stretched net occupying the interior of each frame) joined at the ends and folding up like a long map. There were about a dozen of these frames and the centre one had an aperture in the net large enough to admit a Partridge." Here the man, as described by Jerdon, is both bullock and snarer and he only uses a single net.

In this District quail are snared by several castes of people but principally by the *mallahs* (fishermen) and it is only some of them who go in for it. The birds caught are practically all the Common or Grey Quail (*Coturnix communis*) with very occasionally a Rain or Black-breasted (*Coturnix coromandelica*) one or else the Little Button Quail (*Turnix dussumieri*): although the Indian Button Quail (*Turnix t. tanki*) is also got here, I have had none brought to me by these men. The following is the proportion of each species, out of a total of 128 brought to me by the snarers up to the time of writing:—Grey Quail 120, Black-breasted Quail 1 and Little Button Quail 7.

In the paddy stubble and where the Khesari (*Lathyrus sativus*) is small, the snarer only goes after the quail in the early morning and in the evening as these are their feeding times and the birds move about freely then; but where the Khesari or gram (*Cicer arietinum*) is higher, he snares till later in the morning, as there the cover is shadier and the birds will scuttle about a bit and are not so frightened of birds of prey as they are in the thinner cover in the late morning.

On reaching the spot he intends to work, the catcher first of all takes a sheet and rolls up two corners of it for about six inches, these he ties with a piece of straw or grass to keep them from unrolling; the rolled up corners are meant to represent a cow's horns; then he gets two thinnish pieces of bamboo about two feet seven inches long, and about five inches from the ends he ties them together

crossways ; the long ends are inserted into the " horns " and the short ones rest against his chest ; the sheet is now thrown over his head and down his back reaching to his ankles and the end with the horns sticks out like a canopy in front of his head ; he ties the sheet round his neck and this keeps the canopy taut ; the rest of the sheet is wrapped round his body.

The net he uses is made of six strands of cotton twisted into thread and is six feet long by two feet seven inches broad and its mesh has a diameter of about an inch ; it is weighted with baked clay fillets along one side of its length and at the ends of the opposite side a couple of pointed sticks, about eighteen inches long, are tied ; another stick of about the same length being fastened midway between these two.

This net is slung over his shoulder and he draws the sheet round him, covering his arms. He is now ready and the sport begins. With the cloth well wrapped round his body, the snarer stalks, with short steps and very slowly, through the field, every now and then bowing so as to imitate the motion of a cow's head. When a quail is seen he heads it off and at a short distance in front of it fixes his net the weighted end lying flat on the ground, the opposite side being raised about one foot in the middle and rather lower at the sides, and kept in this position by the three sticks ; this open side is set facing the direction in which the quail is to be driven. The man now circles round the bird so as to get behind it and then the driving commences. Now he moves slowly forward, now sideways, bowing at intervals and very quietly working the quail towards the net. If the bird appears rather wild, he slowly assumes a crouching position and crawls along with his head towards the ground to represent a cow grazing ; in this way he guides the quail to the net. Should the quail be fairly tame he does not require to crouch but can work the bird into the net in an erect position. When under the net the quail tries to burst headlong through the meshes instead of running to the side where it could easily escape as the net does not drop. As soon as the snarer sees the bird is inside he rushes forward and captures it and ties it up in his loin cloth. Should the bird pass by the net, it is headed back again or else the catcher takes up the net and fixes it in another position. It is wonderful seeing the quail being worked up to the net, this being done in a most skilful manner. Occasionally more than one bird is captured at a time but as a rule the snarer contents himself with working one unless several keep well together. The birds seldom seem to rise, except in newly worked fields where no cattle are grazed, and if one does fly off the catcher does not as a rule follow it up unless birds are scarce. While stalking, the men have a most weird and ghost-like appearance.

In Hume's day quail sold even in cities like Lucknow for Rs. 2 to Rs. 2-8-0 a hundred and he bought them in small stations for Re. 1 per hundred. Those days have now gone and like everything else the price of quail has more than doubled. Here in the mofussil they now sell for Rs. 6 to Rs 11 a hundred.

BAGHOWNIE FTY.,
LAHERIA SARAI,
7th March 1921.

CHAS. M. INGLIS, F.Z.S., F.E.S., M.B.O.U.

No. XV.—FURTHER NOTES ON INDIAN NIGHTJARS.

I have read with much interest Mr. Hugh Whistler's article on Punjab Nightjars which appeared in a recent number of the *B. N. H. S. Journal* (Volume XXVII, No. 2) and I venture to add a few additional notes of my own on the subject of the Indian Nightjars of which I have experience.



Quail Snarer commencing
his stalk.



Guiding a shy bird towards the
net.



The net 'in situ.'
SNARING QUAIL IN NORTH BEHAR.

The Jungle Nightjar, *Caprimulgus indicus*.—This is not a common species as far as my experience goes. I did not come across it in the United Provinces, not even in the lower Himalayas. It is, however, the common species at Pachmarhi in the Satpura Hills of the Central Provinces, where it breeds. Its call is of two kinds. Firstly, a monosyllable, chuck, chuck. chuck. . . . repeated about half a dozen times at the rate of 5 "chucks" in 2 seconds. It has a second call, not so commonly heard, which is made up of disyllables "chucker—chucker—chucker" repeated at the same rate as the first call. The eggs which are pale salmon pink marked in the usual manner are laid among stones or even on rock in open forest. The eggs are laid chiefly in April and May.

Unwin's Nightjar, *Caprimulgus unwini*.—This is the common Western Himalayan Nightjar being found at elevations of from 5,000 to 9,000 feet in the forests of Oak, Deodar and Blue Pine, especially on warm southern aspects. It is particularly fond of steep rocky slopes in forests of Ban Oak (*Quercus incana*) and it is the only Nightjar, as far as my experience goes, which habitually frequents these altitudes. The eggs resemble those of *C. europæus* and are laid in May. The call of this bird with which I am very familiar is entirely different to that of *C. europæus*. It consists of a note chuck—chuck. . . rapidly repeated, usually about 8 times, in a series at the rate of 5 chucks in one second, or in other words twice as fast as that of the previously described species. Unwin's nightjar is common throughout the middle hills from Naini Tal westwards. I do not know if it extends east of Naini Tal.

The Common Indian Nightjar, *Caprimulgus asiaticus*.—Not common in the Sub-Himalayan Forests of the United Provinces—very common in the dry open scrub stoney forests of the Central Provinces. The note is as described by Marshall, or Chak—Chak—Chak—Char—r—r—r.

Franklin's Nightjar, *Caprimulgus monticola*.—This is the common nightjar of the thin jungle on the edge of the forest. It is extremely common in Dehra Dun and in fact in the whole submontane tract from Nepal westwards. The only note of this bird which I am sure of is a rather sharp penetrating note like "choo-ee" uttered on the wing.

Horsfield's Nightjar, *Caprimulgus macrurus nipalensis*.—This is the common nightjar of the submontane sal and mixed forests of the United Provinces. It is extremely common in such forests and its loud reverberating call Chouck, Chouck. repeated any number of times from 1 to 50 may be heard after dark from the middle of March to the end of April. This call is repeated at the rate of 5 in 4 seconds. The eggs are generally laid in very densely shaded deep ravines in the forest.

One important point about the Nightjars which I think requires studying is the question of seasonal migration. My observations so far would lead me to believe that all Nightjars which are found North of North Latitude 19° are migratory and go South about October returning about the end of February in the Central Provinces and in March in the United Provinces. It would be interesting to know if any observers could quote authentic instances of Nightjars having been seen in the Central Provinces, in Northern India or in the Punjab in the winter months. Lastly there is a point I should like to mention in connection with the useful key to the Punjab Nightjars given by Mr. Whistler. He has omitted the female of *C. macrurus*. Could this not also be included in the key which is otherwise complete.

NO. XVI.—NOTES ON THE “HABITS OF *ANTHRACOCEROS ALBIROSTRIS*, THE INDO-BURMESE PIED HORNBILL IN CONFINEMENT.”



Indo-Burmese Pied Hornbill.

(*Anthracoceros albirostris*.)

The Mikirs brought me in a nestling of this bird in May last (1920) but, at the time being almost wholly featherless, I told them to bring it back when better able to fend for itself. This they did at the end of June and a very different looking bird it was by then. I may mention since the bird came into my possession it has not been confined in any way being quite free to go and come as it pleases. In temperament this Hornbill is the tamest of bird pets one could come across, in fact at times is a decided nuisance (as at the moment of writing) owing to its somewhat mischievous playfulness and partiality for human company.

Food when young.—The bird was reared by hand on boiled rice, plantains and bread, but since reaching months of discretion or perhaps to be more truthful we might say indiscretion it seems to eat anything except offal (?) The following are a few items I have observed in the Menu:—bread, boiled rice, plantains, radish, lettuce, and other vegetables such as peas and beans, chrysanthemum buds, many English flower buds, *vide* Sutton's list for cold season's flowers, Insects, an endless variety from wasps to beetles, etc., etc., to say nothing of such titbits as snakes, frogs, lizards, fish, crabs, millipeds, scorpions, and galleodes.

Of birds I have observed him catch the swallow and make a bag of four *Munias*; the former were caught as they passed him while seated on a dead branch and after being beaten about for a short time were gulped *holus bolus* "fur, feet and feathers" with great gusto. Of inanimate objects anything bright and glittering has a great attraction for the bird and it sometimes even attempts to swallow these. I may mention that any food actually distasteful, and there is mighty little, is almost immediately ejected, the same often follows if it be forcibly fed. Some items however such as table salt which cannot be thrown up and do not agree with the bird's digestion make him wear a thoughtful expression for some hours.

The bird bathes itself by jumping from one leafy branch to another in the early morning and shaking the dew off the leaves on to its feathers; this it does roughly at intervals of a week. I have hitherto not observed it taking a dust bath as this Hornbill in the purely wild state so delights in doing.

On the whole now that the bird is more or less adult it is fairly silent and though numbers of its fellows in the heavy forest some 200 yards distant may be uttering their harsh cackle it seldom responds.

As regards eyesight this is a highly developed sense and it can spot a hawk or other bird of prey (all of which are held in the greatest dread) at distances beyond the range of human vision; it can also see small insects at, in proportion, an equal distance.

Water or other liquids are not partaken of so in this respect my pet can give the Pusyfoot and pump-puritan tribe points and a beating.

To accurately distinguish sex in the very young bird by appearance and form of bill would take a much keener observer than myself as the colour and shape changes much during the first six months of growth. The one I am at present writing of now proves to be a male; when first brought in I thought it might be of this sex, in another two months I was convinced it was a female and so on until now, this time however I think there is little mistake.

The bird with a little trouble and care is easily reared and proves a most interesting and comical pet. I enclose a photo. The following members of this family occur here:—

Dichoceros bicornis, Great Hornbill.

Anthraceros albirostris, Indo-Burmese Pied Hornbill,

Rhytidoceros undulatus, Malayan Wreathed Hornbill.

Ptilolæmus austeni (Uncommon.) Godwin-Austen's Hornbill.

MURPHULANI, T. E.

ALEX. M. PRIMROSE.

GOLAGHAT P. O., ASSAM,

5th March 1921.

NO. XVII.—NIDIFICATION OF THE HIMALAYAN LONG-BILLED VULTURE (*GYPS TENUIROSTRIS*).

As the nidification of the Himalayan Long-billed Vulture (*Gyps tenuirostris*) does not seem to have been previously recorded from within the limits of the U. P. it might interest you to know that I have this day taken a nest of this species which unfortunately contained a young one about a week old.

The nest was on a Peepal tree (very high up) standing alone at the foot of a spur of the Vindhya, about four miles west of Chakia, in the Benares State; and was simply a huge collection of coarse sticks without lining of any sort. It differed from the nest of *Pseudogyps bengalensis*, in that there were no leaves incorporated in its structure. The young bird was a gosling-like creature, covered with yellowish brown, and was being fed by the parent by what looked like a process of regurgitation.

Gyps fulvus is common in these parts, but I have never come across their nests. It is unusual, therefore, that *G. tenuirostris*, which is uncommon, should be found breeding here.

I must also record having observed a pair of Lapwings (*Vanellus vulgaris*) at the South-West corner of the Chunar Tehsil, Mirzapur District, U. P., on the 16th December 1920. They were feeding on a small village tank, and though I wanted very much to send the Society at least one of the skins, I must confess to some extraordinarily bad shooting on my part.

When touring on an extensive plateau of the Vindhya, about fifty miles South of Mirzapur, I came across the Indian Hobby (*Falco severus*) on two occasions in November. Unfortunately I had no gun with me on either occasion, but the bright grey and red colouring of the birds was too conspicuous to be mistaken.

BENARES,

14th January 1921.

E. H. GILL.

No. XVIII.—THE LÄMMERGER (GYPAETUS BARBATUS) AND THE GOLDEN EAGLE (AQUILA CHRYSÆTUS).

In the review of Blanford's Fauna of British India, which appeared in Vol. X, pp. 507 to 524, and which I happened to look up the other day, I came across the following with regard to the Lämmerger:—"One comparatively respectable habit is that of carrying up large bones and letting them fall from a height in order to break them, and it is said in the Levant to treat tortoises in the same manner." This the writer of the review, of course, quotes from the Fauna of British India, and he then goes on to say, "As far as the present writer has been able to observe, the carrying of anything *in their claws* is very uncommon with the vultures proper, at least in Western India. . . . But, at any rate, they do not go carrying bits of corpses about, and dropping them into tea-cups and tumblers, as related to new-come visitors on Malabar Hill.

"Mr. Blanford does not delate upon this matter, and Jerdon (Vol. 1, p. 6) is very brief about it. But it has some interest in Bombay, where the "Yarn" in question is as old as it is silly, and to some of our citizens, offensive. It is a very reasonable function of this Society to put a good big stone over it."

The writer of the above is, of course, perfectly right in stating that the carrying of anything in their claws is very uncommon with the vultures proper, but as the "yarn", in this case, originates with the Lämmerger and his habit of dropping bones from a height to break them, it would appear as though he is included, and that a good big stone had also been placed over his curious habit. If so, having been buried for the last 22 years, exhumation might be resorted to with advantage in the pages of the B. N. H. Society journal and the "yarn", so far as the Lämmerger is concerned, brought to life. It is no yarn but an absolute fact that the Lämmerger takes up bones, *in his claws*, and drops them from a height on to rocks to break them. This has been witnessed over and over again by me, and many others besides.

With regard to the Golden Eagle the writer of the review in question (top of page 508) says:—"They were on the ground, near a village (where carrion used to be thrown out), and allowed of approach to about 40 yards distance, when they rose, and the light shot rattled vainly on their quills. The broad white base and dark tip of the young bird's tail were then very distinct and the mother's great size noticeable. These birds had been carefully examined with a glass before going near them, and the young one's tail specially noted for

observation on its rising. *In such a case this is needful*, as the young of the next species (*Aquila heliaca*, the Imperial Eagle) have, in the "lined stage", the tail broadly tipped with fuvous white, remainder of tail uniformly dull white" (the italics above are mine).

Then again, speaking of the Imperial, the reviewer says:—"It is very commonly called and taken for a Golden Eagle, and the mistake is an easy one to make in old birds flying overhead. If one can see the back, the white markings of the Imperial Eagle, though very variable, will often be conspicuous enough to distinguish him by."

From the above it would appear that both the young of the Golden Eagle and that of the Imperial Eagle are very similar in colour, and therefore it is very necessary to note the difference in the tail marking. This, however, is not the case and any possibility of confusion between the young plumages of these two species is absolutely impossible. In the young of the Golden Eagle the entire plumage is practically black, with the exception of the head, a tail bar, and very conspicuous moons on each wing, which are white. In the Imperial Eagle, the young or "lined" plumage is of varying shades of brown above and much lighter below, so any confusion in this respect is impossible.

In the adult plumage a mistake is very possible and the white irregular markings of the Imperial Eagle on the back are no criterion, as a Golden Eagle, especially when flying in a strong wind, shows white bases to scapular and back feathers, which resemble the white marks on the back of the Imperial.

In the above case it would appear that the writer of the review himself mistook the Imperial for the Golden, for no young Golden Eagle ever resembled an Imperial in its lined stage.

DHARMSALA,

C. H. DONALD, F.Z.S., M.B.O.U.

March 1921.

Mr. Willoughby Verner in his book the "Wild Birds of Spain" gives a very interesting account of the "bone breaking" habit of the Lammergeyer which is known locally as *Quebranta-huesos* or 'Bone-smasher' (from *huesos* a bone, *quebrar*, to break). He illustrates his description with a sketch drawn while observing the bird "sailing around perhaps 2000' above, carrying some long object" which was made out to be the hind limb of some large animal. The bird was clutching it with his right foot. After a while the bird let it go when it whirled down and struck with a sharp crash on some rocks below. The bird immediately dived and alighted close to the object. It was observed pulling at the limb, for a few minutes feeding off it. Then it seized it, this time with the left foot, again just below the fetlock, and took wing. The author took a second sketch of the bird in flight and it was observed that the limb was much shorter than before, appearing as though the femur had been torn from it.

EDS.

No. XIX.—ABNORMAL EGG OF THE MONAL (*LOPHOPHORUS REFULGENS*).

I have read, with much interest, the short letter from Mr. Chas. M. Inglis, F. Z. S., in the last number of the Journal to reach me, concerning the "Abnormal Coloured Egg of the Pheasant-Tailed Jacana" and think the following few remarks may prove of interest to your readers.

When shooting in Chamba State in 1914, whilst climbing down a khud, I was nearly dislodged by a hen Monal pheasant, whose nest was in a hole into which I placed my foot.

The nest contained four eggs, three were of the usual colour, pale yellow with reddish brown spots, the fourth was however totally different, being deep olive brown without any spots. Owing to this peculiarity I took the eggs, intending to send them to the British Museum (N. H.) on my return to England. The war commenced, and I had to leave India in a hurry, the result being that when I unpacked my collection recently, this one particular egg was broken. I have patched it up to a certain degree, but it is not worth sending to the National Collection.

I also remember, when I was at school at Westward Ho in Devon, finding a thrush's nest, one egg in which was without spots; this caused so much admiration amongst my school fellows, that it soon went the way of most (school boy) eggs, and was broken.

J. E. M. BOYD, Major, R.A.M.C.

BIRCHINTON-ON-SEA,
14th February 1921.

No. XX—EGGS OF THE PHEASANT-TAILED JACANA
(*H. CHIRURGUS*).

A letter from Mr. Inglis in your issue of December 1920 called attention to an abnormally light coloured egg of the Pheasant-tailed Jacana.

It may interest him to know that I found a similar pale sea green egg, of this species last June in Kashmir. I would not look upon such a variety—showing as it does most probably an absence or poverty of pigment—as rare—I would be inclined to look upon it as the most usual form of variation.

I found several dwarf eggs last year in Kashmir. Such eggs are of interest to Oologists and are often curious in colour and marking. I found one dwarf egg of each of the following species:—Rufous-backed Shrike, Little Bittern, House Crow, Pheasant-tailed Jacana, and Snipe, the latter a very handsome egg clouded and marked at the pointed end.

I also found a Waterhen's egg and a Little Bittern's egg in the same nest.

KOTAH, RAJPUTANA,
February 1921.

T. R. LIVESEY.

No. XXI.—WHITE-HEADED DUCK SHOT NEAR QUETTA.

As the White-headed Duck (*Oxyura leucocephala*) is a rare visitor to India, the following notes, kindly furnished by Brevet-Lieut.-Colonel M. Henderson, D.S.O., Royal Scots, seem worth recording. On December 14th, 1919, he shot an immature male of this species at Khushdil Khan, about 40 miles North-West of Quetta. Another bird (also a drake) but in adult plumage, was also killed by another gun on the same day. Lieut.-Col. M. Henderson also informs me that he saw a small party of duck with conspicuous white heads on the same day, but they were poor risers and he was unable to get a shot at them. There can be little doubt that these also belonged to the same species.

APPLETON RECTORY, ABINGDON, BERKS,
December 27th, 1920.

F. C. R. JOURDAIN.

No. XXII—AN ENCOUNTER WITH A HAMADRYAD
(*NAIA BUNGARUS*).

On 4th November 1920, Mr. Rennie and I, accompanied by six dogs, started at about 11 a.m. for a walk in the jungle. We were some two miles from Kalaw at an elevation of about 4,800' and were following a path which, at a certain spot, runs along the lower boundary of a jungle clearing for potatoes and also close to the head of a small, well wooded, ravine. The country round about for some 80 or 100 yards is, excepting for some bushes and odd trees, open. At this place some of the dogs, which were some 30 yards ahead, started barking. We could see nothing but it was evident they were watching something with no little curiosity. We suspected a snake. On getting nearer Mr. Rennie said he distinctly heard hissing from some bushes around which the dogs had taken post. I approached the bushes cautiously but retired very hurriedly. There was a fine hamadryad coiled up with his head on top and his coils moving to and fro as is the custom with snakes when irritated. His markings were pronounced and his skin so fresh and bright as to suggest his having recently sloughed. All we did was to try and keep the dogs from being too inquisitive. Two Shans happened to be coming along from the opposite direction. We called to them and mentioned that there was a good sized hamadryad lying in the bushes where the dogs were. They said 'come away, take care, he will attack you'. We knew there was a chance of trouble; however we asked them to get some long sticks, which they did. We all advanced towards the bushes and the hamadryad was exactly in the place where I first saw him. The Shan near me at once had a smite at him with his pole, the snake rolled over and got into another place. Unfortunately the stick having to go through some of the bush broke the force of the blow. As soon as we again got a view of him the other Shan had a go at the snake and I think he missed him. The snake moved to another spot, and while we were trying to see exactly where he was, he suddenly came out, dogs after him, and headed for the nullah some ten or twelve yards away. He was, however, so intent on getting away that he started to climb a tree between the bushes and nullah and went up in great style. We estimated his length between 11' and 12'. Something, however, went wrong, I think myself due to injury, as he seemingly lost all control and fell down. Had we been bold enough we might have gone for him, on the other hand though he had shown no inclination to be nasty there was no reason why he might not think he had had enough and turn the tables. He made for the nullah with all the dogs in attendance. They were very nervy and one dog, a Shan, seemed to be very interested. No one can deny that if ever a hamadryad had good reason to attack this one had, he had heaps of provocation and lots of time to make up his mind. I am more than ever convinced that hamadryads as a rule are as glad to escape as most other snakes. It is possible he may have lost his head when surrounded by the pack, be this as it may he never once showed the faintest attempt even to defend himself. The Shans informed us that some three weeks previously they had found a hamadryad lying in a hole at the top end of the field. Of course they said it was the same one.

RANGOON,

G. H. EVANS, COL., C.I.E., C.B.E.

21st Feb. 1921.

[We published an instance of an unprovoked attack by a King Cobra in Vol. XV., p. 358. EDITORS.]

No. XXIII—THE FOOD OF THE BURMESE ROLLER (*C. AFFINIS*)
AND OF THE ASHY DRONGO (*D. NIGRESCENS*).

Writers on Indian Ornithology generally mention the fact that Rollers take food other than insects. Several of these birds visit my compound but one in particular seems to be resident as he is to be seen from early dawn to dewy eve.

I have constantly watched what I have taken to be this bird. On one occasion he pounced on a small frog which on return to his perch he promptly swallowed. On another occasion he dropped into some grass and came out with a field mouse. This he seemed to swallow with no very great effort; negotiating the tail seemed to be a trifle trying. I noticed the same thing when he got a lizard, a small specimen of, I should say, *C. versicolor*. Apparently nothing comes amiss.

On the 2nd February 1921, I saw an Ashy Drongo sitting on a railway busy pecking at something—a lizard—I presume he must have caught it and killed it. He seemed very hungry or found the meal extra nice, as I went up within a few yards of him.

RANGOON,
21st Feb. 1921.

G. H. EVANS, COL., C.I.E., C.B.E.

No. XXIV—BREEDING HABITS OF THE GREEN TURTLE
(*CHELONIA MYDAS*).

Some time ago I witnessed a Green Turtle laying her eggs and as my notes may be of interest I give a brief account of what I saw.

It was a bright moonlight night during the monsoon, just one of those nights when a stroll along the beach is most enjoyable. The beach, during this period of the year, is patrolled by the villagers in search of turtle eggs.

My husband and I accompanied a group in search of these luxuries and it was not long before a turtle made its appearance. We had then to call a halt, for if they see they are observed there is every chance of them going back into the water again. The moon shone on the turtle's large black wet back and her every movement could be discerned. She made quite sure that no one was watching and then proceeded slowly up the beach towards the high sand banks, at the foot of which she met with an obstruction in the way of a steep ascent, but this difficulty was soon got over and after two or three efforts she eventually landed on the firm bank where she halted and commenced to dig.

It was now our time to go forward and witness the sight and we all sat down in a group at the back of her, close by. Her large fins were busy scraping out the sand with a sort of backward motion and in a remarkably short time she moved a quantity of sand. I was anxious to find out whether what I had been told was true, namely, that once she started to dig it would take a great deal to upset her. I therefore seized one of her fins with which she was digging but with remarkable ease she drew it free and I was astonished at the strength she possessed. This playfulness on my part did not in any way upset her and she went on digging as if nothing had happened. Meantime one of the villagers was busy tunnelling a little hand hole at the back of the one she was making and I very soon saw what this was for.

As soon as she had finished digging she settled down comfortably to lay her eggs, ignorant of the fact that as she was laying them the villager was carefully picking them out from the bottom of the nest, thrusting his hand down the little tunnel which he had made, and removing them two or three at a time and throwing them behind him, while others were busy picking them up and putting them into a large sack which they had brought for this purpose. We counted in all 144 eggs, not bad for one sitting!

Apparently fully satisfied with her evening's work she commenced to rake back the sand which she had excavated and soon completely filled the hole, which with marvellous instinct she seemed to realize would be noticed by passers-by, so she promptly patted the same down carefully all round with her belly, making an audible noise on each occasion. She then carefully readjusted the creepers she had removed, thus making the nest practically imperceptible.

The whole time she had been laying she had been facing inland. She now turned round and returned to the sea.

After performing so arduous a duty, being a very large turtle my husband thought he would like to try her strength and see if she would carry him down to the sea. Two bamboo sticks placed in front made her halt and he got comfortably seated on her back. The moment the sticks were removed she continued her walk as if nothing had happened. Near the water's edge he slipped off her back and she quietly disappeared in the water and we did not see her again.

I observed that the whole of the digging was done with her hind fins to the full extent to which they would reach. These fins, as I have mentioned before, are remarkably strong.

The eggs are round and about the size of a golf ball, and in place of a shell have a tough but pliable covering, like parchment.

Another peculiarity which I have noticed is that they never come up the beach in an absolutely straight line. Their tracks are always on a slight curve and in returning to the water the track is similarly curved but in the opposite direction, giving one the idea that their fins are longer and stronger on one side than the other.

The eggs are very nice to eat if fresh, but the inhabitants round these parts seem to prefer them salted.

I have reared these eggs very successfully; all that is necessary is to take a few of the eggs out of the hole surrounded by the actual sand in which they are laid while the eggs are still warm, place these in a tin and bury them deep in sand, and you will after exactly eight weeks find your little turtles putting their heads out of the sand and walking in a direct line to the sea, but I have found it of no use trying to set turtle eggs surrounded by sand other than that from the actual nest and I have not been successful in setting them sometime after they have been laid.

The little ones are interesting. When the first one appears above the ground it is quite safe to commence carefully removing the sand and you will come across the others at varying depths, all making their way to the surface, while the shells you will find neatly rolled up at the bottom of the hole. The little ones are a perfect miniature of the parent and have, as soon as they come to the surface, a hard shell and all their faculties fully developed.

MARVA MALAD,

N. MAWSON (Mrs.).

SALSETTE, January 1921.

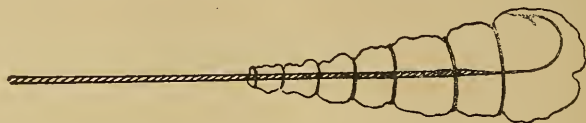
NO. XXV.—ANGLING FOR *BARBUS HEXAGONOLEPIS* IN ASSAM.

There was a man who bought a rod
 A Farlow's double jointed
 He thought he'd catch this wily carp
 But he was disappointed.

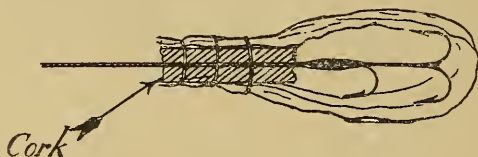
The river to which our fishing notes refer is a very small one adjoining the Garden I am at present on and known as the Daigurung. It is a typical small bill stream running through forest and taking its rise in the Mihir hills in the rains. When these are heavy it is a turbulent torrent filling its bed from bank to bank to a width of about 50 or 60 yards and a depth of 15 to 20 feet; it is very seldom however that this high level is maintained for long and the stream, like all others of its class, falls as rapidly as it rises. The stream is considered by the strictly orthodox Assamese a very sacred one, hence this class do little or nothing to disturb its waters or destroy trees on its banks, and consequently fish of at least five species swarm in it, but the circumventing

of these is a very delicate matter and more especially the one we write of—*Barbus he.ragonolepis* is here an almost strict vegetarian, though we have at times noticed him rising freely at a tiny yellowish midge and he will at very rare intervals rush at a small fly spoon, the conclusion we have arrived at is that this last is out of mere curiosity.

Fish of this species, actually weighed by ourselves, run to six pounds though there is little doubt that they run to double this weight, the same being borne out by Native confirmation. After this preamble it is best to come to the mode of capture, which by the way is no easy task so much so that the usual unobservant European says "Oh there are no fish in the Daigurung". This I saw to be an utter fallacy the first day of my arrival, though I must admit it has taken me the best part of two seasons to get even with our friend.



1. Assamese method of binding petals.



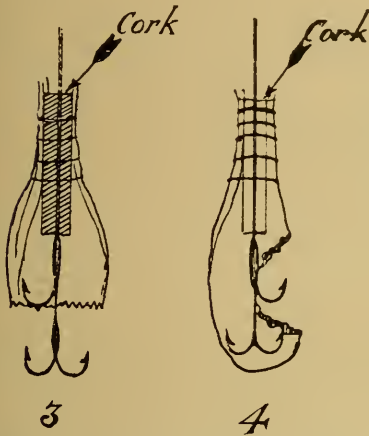
2. Our method of tying petals.

Having ascertained, through Assamese ryots who fish for this wary carp, that his favourite food was the white petal of the *Bauhinia purpurea*, Camel-foot tree, (which comes into flower in early October and continues in bloom till about the end of November) taken while floating on the surface of the water, irrespective of how discoloured that may be provided the stream is not in spate, I asked the Assamese to show me their tackle and to demonstrate their method of using the same. Their rod is the usual Indian light bamboo, the line 12 to 15 feet of stout moongha silk, hook a No. 6 Limerick, their method of binding petals to the hook is a crude one and not as efficient as might be, see diagrams Nos. 1 and 2; reels and such like adjuncts they know not and care less for. I noticed as soon as I saw the tackle in use that one of the great drawbacks to the Assamese outfit was the want of a floating cast, as the moment the flower shows the least sign of drag, the fish is off like a twopenny rocket.

Now during the rains I pondered these things over, and my brother and I devised a tackle which we proved conclusively in the verandah to be the most deadly used on this most sacred river, so much so that we showed each other with great glee how not a fish could possibly escape; how they did, and do, we will now proceed to explain with the help of further diagrams, trusting that all brothers of the rod will read, mark, learn and inwardly digest in case they should ever find themselves situated in a spot where similar waters flow.

If the following points, which have actually been observed by ourselves on the spot, be carefully noted it will not be difficult to realize how this fish, in taking the bait, effects a seemingly miraculous escape. Firstly regarding the fish, the

two main points in his favour are the lightness and exceeding brittleness of the petal used, causing it, if the fish be of any size, to float out of his reach in the swirl caused on his rising, hence in two attempts out of three with the unbaited flower he either misses it in toto or at most takes a chip out of it; exactly the same thing occurs with the baited hook, only in this instance if the line be slack the utterly impossible seems to happen as the flower is removed in a circle all round the tail hook (we use two) or a biggish chip is cut out of one side, see diagrams 3 and 4.



At this story I can see even that prince of cheerful liars, the Golfer, open his eyes, but cold fact it remains. We have found the most successful method of fishing to be:—allowing the bait to float down ahead of one on a taut line and following it by wading very quietly at the speed of the current, and the moment the slightest drag occurs to recast, as no matter what colour the water the shoal is immediately put down by this and if the water be clear the sight of the line equally effective in doing so.

We will now imagine that we have arrived at the stream's bank, time being 9 a. m., day bright and clear and water likewise, an intelligent man having preceded us in order to cut flowering branches so that all advantage may be taken of fresh and unbruised petals. Rods being put together our poaching instinct comes uppermost as we now consider with this fish "all's fair in love or war" so we cast a few petals on the water in order to see where and how the fish are taking. They float for about 15 yards untouched and are now nearing a likely looking dark swirl, "Ah what's this!" in a moment it is aboil. Our hopes are high as we cast our bait, in amongst a crowd of floating petals as they pass us, which our man has already thrown in from a little above. Suddenly there is a rise at the bait and down it goes. "Strike and strike quick" you tell yourself, remembering Thomas' notes on his near relative, *Barbus carnaticus*, read overnight, and back comes what is left of your flower, which means binding on afresh a work not conducive to improving one's temper. This will probably go on the best part of the morning with many clear misses by the fish to further irritate you, then, just as you are thinking things hopeless, away goes the line at a smart speed and you are saved in the nick of time from becoming a soured fisherman and even feel your trouble was not wasted. The end of the morning may see you, if lucky, with 6 lb. of fish varying in size and you had hoped in your innocence for 60 lbs.; still I know of many much duller pastimes when on a lonely spot.

The Assamese name for this fish is Bokha Mhao, our synonym is equally sonorous but not as polite.

ALEX. M. PRIMROSE.

MURPHULANI TEA ESTATE,
GOLAGHAT P. O. ASSAM,
1st November 1920.

No. XXVI—A NOTE ON THE INSECT-EATING HABITS OF THE
INDIAN HORNET (*VESPA CINCTA*).



I have thought that the following observations might prove worthy of being placed on record, as, from time to time scattered notes have appeared in various journals, scientific and otherwise, on wasps capturing, and often eating bees, other wasps, such as species of *Polistes*, and even small moths. On Barkuda Island in the Chilka Lake I have on two occasions seen *Vespa cincta* flying along with a dead *Polistes stigma* which it carried with the front legs, and I have witnessed a similar incident near Chandipore, Orissa.

I have never seen wasps raiding the nests of bees as they are sometimes said to do, but I once saw *Vespa cincta* capturing the solitary bee *Megachile lanata* as it emerged from its cartridge-shaped mud nest, which it builds in the backs of books, etc., on Barkuda. On another occasion while out collecting, I saw one of these hornets sitting on a leaf, with its sting inserted into the thoracic region of the bee *Nomia oxybeloides* almost exactly as shown in the illustration for which I have to thank Mr. Bagchi, the artist of the Indian Museum. I captured both the wasp and the bee and have sent it for the Society's collection.

Cases of hornets eating small moths are not very common. I have on several occasions kept an Indian Hornet and a Pyralid together in a breeding cage, and have asked several people who are keen observers if they have seen a wasp eating a moth, with absolutely negative results. On a single occasion, however, I saw this wasp capture the cosmopolitan Arctiid, *Deiopea pulchella*, denude it of its legs, wings and head, and fly off with the body, a mode of capture somewhat different from the case cited by Green.

For references, etc., see Gravely, *Rec. Ind. Mus.*, XI, pp. 493-494 (1915) and for a short description of Barkuda Island, Annandale, *Rec. Ind. Mus.*, XIII, pp. 17-19 (1917).

CEDRIC DOVER.

INDIAN MUSEUM,
CALCUTTA, December 1920.

No. XXVII—A NOTE ON CARPENTER-BEES IN THE SOCIETY'S
COLLECTION.

Through the kindness of Mr. R. A. Spence, the Honorary Secretary of the Society, I have had the opportunity of examining all the Carpenter-bees (*Xylocopa*) in the collection. As the material sent me is not without interest I have thought that the following tabular list would be useful, especially as the remarks on distribution, in many cases, add much to the *habitat* as given by Bingham; they are based mainly on the examination of the large collection of *Xylocopas* in the Indian Museum. The species mentioned in this note are described in Bingham's well-known volume on Hymenoptera in the *Fauna of British India* Series. The collection contains two interesting species collected by Mr. S. H. Prater in Castle Rock, which, if new, will be described later in this Journal.

| Genus— <i>Xylocopa</i> ,
Latr. | Represented in Society's
Coll. from | Previously recorded
from |
|--|---|--|
| <i>latipes</i> (Drury) | .. Upper Tenasserim and
Cumbum in the Madura
district. | India, Burma and Ceylon
extending to the Malayan
sub-region. |
| <i>tenuiscapa</i> , Westw. | .. Karwar, Bassein (Bombay)
and Soccoro in Goa. | Do. do. |
| <i>acutipennis</i> , Smith | .. Katmandu in Nepal | .. E. Himalayas, Assam,
Burma and Nepal. |
| * <i>attenuata</i> , Perez=
<i>pictifrons</i> Smith | Lucknow | .. Indian plains (sparingly),
Sikhim, Kumaon (com-
monly), China, Java, For-
mosa and the Malay Pe-
ninsula. |
| <i>auripennis</i> , Lepel | .. Bombay, Soccoro (Goa),
Calcutta, Kotagiri in the
Nilgiris, Castle Rock and
Nasik, 1,900 feet. | Indian plains, E. Himalayas,
Assam, Sind, Burma,
China, Borneo and Cele-
bes. |
| <i>dissimilis</i> , Lepel | .. Bombay | .. N. W. Provinces, Bombay
Presidency, E. Himala-
yas, S. India, Ceylon,
Burma, China and Java. |
| <i>fenestrata</i> (Fab.) | .. Nasik, Andheri, Karachi,
Calcutta and Kathiawar | India, Burma, Ceylon, the
Malay Peninsula, Java
and Celebes. |
| <i>amethystina</i> (Fab.) | .. Bombay, Castle Rock and
Kotagiri. | Most parts of India and
Ceylon. |
| <i>iridipennis</i> , Lepel | .. Nasik | .. India, Burma, extending
to the Malay Peninsula,
and China. |
| <i>æstuans</i> , Linn. | .. Nasik, Andheri, Inana,
Bassein, Karachi, Castle
Rock, Soccoro, Coonor
and Nagercoil. | Most parts of the world. |
| <i>verticalis</i> , Lepel | .. Karwar and Mahables-
war. | Barrackpore, (Bingham),
Sumatra and Borneo.
(<i>Maidl.</i>). |
| <i>basalis</i> , Smith | .. Warzirabad in Punjaub | .. Northern India. |

* See *Maidl. Ann. Nat. Hofmus, Wien.* XXVI, p. 287 and p. 307.

| | | |
|--------------------------|---------------------------------------|---|
| <i>collaris</i> , Lepel | ..Sikhim and Thibet | ..Himalayan, Indo-Malayan and Ceylonese sub-region occurring also in Borneo, Sumatra, Java, the Philippines and Malaca. |
| <i>refuscens</i> , Smith | ..Rangoon, Bombay, Coonor and Karwar. | E. Himalayas, S. India, Bengal, Burma, Java, Sumatra, Borneo and the Andaman Islands. |

It will be seen from the table that though the genus *Xylocopa* is fairly well represented in the collection of the Society, many species remain to be added, and diligent collecting by our members, besides adding to the collection will no doubt also reveal many new and interesting forms.

CEDRIC DOVER.

INDIAN MUSEUM,
CALCUTTA, February 1921.

No. XXVIII.—CURIOUS CASE OF PROTECTIVE MIMICRY IN A CATERPILLAR.

It is after the lapse of many years that I am once more taking advantage of your columns to bring to notice a curious case of protective mimicry in an undetermined species of caterpillar, and this I am doing in the hopes that one of your readers may assist me to its identification.

I came across the specimen in question during the rains at Ahmedabad, Guzerat. It was feeding on a shrub in the garden and was nearly ready to turn, but unfortunately I did not succeed in rearing it and I never obtained a second specimen. The creature was about $1\frac{1}{2}$ inches long, of a general transparent olive-brown tint, suffused with opaque blue-grey, the central segments darker, and the caudal segment ashy white. The forepart was thickened forming a hump tapering to a stem, terminated by a globule. There are many cases of caterpillars, moths, beetles, spiders, etc., imitating the excreta of birds for their protection, but I venture to think that a more wonderful case of such mimicry does not exist; on the assumption that protective mimicry is the result of natural selection and not of continuous acts of conscious volition on the part of the animal profiting by it it seems to me that this case raises very many interesting points.

Firstly the apparently superfluous perfection of the imitation.

Suppose a Japanese artist set to reproduce faithfully a bird's dropping, and provided with the best materials possible, one can imagine him obtaining a perfect resemblance as regards colour, shape and consistence.

But a true artist does not rest satisfied with a mere servile copy. He must introduce some incident, some point of interest and we have it in our present example.

There is the fall of the excrement on to a leaf, the splash, the drying up of the upper portion, represented by the lighter ash colour, the main blob and elongation of the lower portion into a stem with a drop at the end indicating its moist and sticky nature.

Conscious art could no further go. The work is complete. It is now for the creature to profit by it. It is obvious that a caterpillar's normal position would destroy the illusion, for the liquid drop would be standing upright. The creature therefore adopts another position and attaching itself by its tail near

the stem of the leaf, humps itself up and lies limply down the leaf. The hump now forms the bulk of the mass with the drip and drop at the lowest point, whilst the lighter coloured tail portion represents the dried portion at the top of the leaf.

But has nature in this case acted in the most intelligent way? The protection is of course against birds, which would not touch their own excrement. Could not the caterpillar obtain equal safety by simply concealing itself under the leaf during repose.

What should one think of a sentry, who, having a "better 'ole" close at hand, camouflaged himself from top to toe, as a shattered stump for example, and proceeded to stand on his head in the open. Have we here an example of the Russian proverb "Natoora doora" (Nature is a fool).

And in any case is such artistic perfection really necessary for the survival of the fittest? Are birds such intensely close scrutinizers? Would not a superficial resemblance suffice to protect the creature? Might it not even protect it better? For to be deceived by the super-excellence of the mimicry a bird would have to approach so close that an involuntary movement on the part of the caterpillar might betray the deception, whereas a rough general resemblance would be quite enough to discourage a bird from approaching.

The case presents even more matter for speculation. The mimicry is double—the actual resemblance, and the posture of the larva. Did the two evolve 'pari passu' or consecutively? If the latter, which evolved the first? Probably the resemblance to a bird's dropping, for many larvæ resemble birds' excreta in the early stages and take on assimilative coloration later. Perhaps we must assume that the head downward posture is natural to this species. And yet another difficulty presents itself. Why such an elaborate method of protection for the creature in repose, while at the same time rendering it more conspicuous when feeding?

In fact the more one considers the case the more one finds matter for puzzlement and wonder. I trust what I have written may interest some of your readers to hunt up this species, breed it out and contribute further information.

A. NEWNHAM, LIEUT.-COL.,

VILLA LANCERAY,

I. A. (RETIRED).

CHEMIN DE FABRON—NICE.

No. XXIX.—EARWIGS FROM MESOPOTAMIA AND N. W. PERSIA.

Though I am in no sense a specialist in the *Dermoptera* it seems worthwhile to put on record the following species of the group captured in Mesopotamia and N. W. Persia in order to make as complete as possible our knowledge of the fauna of these countries. My own specimens have been determined by Prof. Borelli of Torino who is unable at present to record them, and I have compared with them a number of specimens taken by Capt. W. E. Evans, R.A.M.C., at Amara, which have been lent to me for the purpose.

Forficula auricularia, L., July 1919, Qazvin, N. W. Persia; common.

Euborellia annulipes, Lucao, 13th September 1917, Baghdad, 10th March 1918, Amara, under clods of earth. Immature specimens apparently of this species, December 1918, Qizil Robat, under clods (W. E. E.).

Labidura ribaria, Pallas, 27th June to 27th August 1918 (W. E. E.), Amara, common at light 5th August 1918, Mendali. The varieties *inermis* and *mongolica* were present with the type form. This is without doubt the species referred to by Lt.-Col. F. P. Connor, in his interesting note Journ. B. N. H. S. XXXVI. No. 2, as carrying off a moth in its forceps from a mess table. 4th April to 14th July

1919, Enzeli, Caspian Sea, N. W. Persia, Var. *mongolica*, Rehn, abundant among driftwood and rubbish on the shore. On 14th July after sunset on the beach I saw a white object moving among driftwood. I found that it was a small fish, dead and dry, being carried by one of these large earwigs in its forceps. The above three species are very widely distributed and their occurrence in Mesopotamia and N. W. Persia is in no way remarkable.

Psalis femoralis, Dohrn var., 27th June to 10th August, Amara, not common at light (W. E. E. and P. A. B.). Prof. Borelli tells me that these specimens only differ from *P. femoralis*, Dohrn, in lacking a brown spot on the femur, and being without a metallic reflection on the elytræ in these particulars they agree with what Dohrn described as *P. plebeja*, which is probably a variety of *P. femoralis* and has at present only been recorded from Java. In any case the occurrence of *Psalis*, an Oriental genus, in Mesopotamia is of considerable interest.

P. A. BUXTON.

TRINITY COLLEGE, CAMBRIDGE.

March 1921.

No. XXX.—NEW LOCALITIES FOR RARE AND LITTLE
KNOWN SPHINGIDÆ (HAWK MOTHS).

I found a specimen of *Oxyambulyx canescens* (Walker) at rest on the upperside of a leaf of *Dipterocarpus tuberculatus*, Roxb. (Burmese name *Eng* or *In*) on the banks of the Chindwin River, Upper Chindwin Dist., Northern Burma, in the month of July. The species has hitherto never been found in Burma, it having only been recorded from the Andaman Islands, Penang, Cochin China, Cambodia and Borneo, and its discovery so far north in Burma is therefore an interesting fact worth recording. It is apparently a rare insect and its early stages are unknown; it is quite possible the larva feeds on *Dipterocarpus tuberculatus*, as this tree is the food-plant of another much commoner species of the same genus, viz., *Oxyambulyx substrigilis substrigilis* (Westwood) which also inhabits the same locality. I also caught a specimen of *Cizara sculpta* (Felder) hovering over flowers of *Clerodendron infortunatum* in the early morning twilight at Insein, Insein Dist., Lower Burma, in March. This is an exceedingly rare species and has only previously been recorded from Siam and South India. Its early stages which were hitherto unknown to science have recently been discovered by my youngest son; the larva was found feeding on *Gardenia sessiliflora* (*Rubiaceæ*) during the months of November to March. A description of its early stages and further particulars regarding its life-history are given under another heading.

INSEIN, LOWER BURMA,
- 3rd February 1920.

C. E. FELLOWES-MANSON.

No. XXXI—DESCRIPTION OF A NEW *GALEOMMA* FROM BOMBAY.
By J. R. LE B. TOMLIN, M.A.

(Read before the Conchological Society, 8th December 1920.)

GALEOMMA PEILEI, n.sp.

Shell very similar in general appearance to *G. indecora*, Deshayes, which was found by Cuming at Masbate, under stones at low water, but rather larger, longer, and more completely rounded at either extremity, these being practically

symmetrical; less sculptured and consequently more shining. The concentric lines of growth are strongly marked in *peilei*, but there is no trace of the strong radiating striae so noticeable in *indecora* and in the British species *turtoni*, and it is only under a high magnifying power that extremely fine and close scratches, uniform over the whole surface, become visible. The pitting is much less than in *indecora*, being close and strong in the umbonal region, but decreasing in numbers and strength, and finally disappearing a short way from the ventral margin.

Length of type specimen, 13 mm.; height, 6.5 mm.

Habitat: Bombay, under stones at low water (Lt.-Col. A. J. Peile, R.A.).

Type: In British Museum.

Superficially this species has a very similar appearance to our British *Galeomma*, but differs totally from it in sculpture.

Referring to the above, Col. Peile writes as follows:—

The members of the genus *Galeomma* are remarkable among bivalves for their structure and habits. In the first place the animal lives with its valves spread wide open and clings in this position to the surface of rocks and stones. Further, the British species is said to be capable of crawling rapidly, casting off the byssus by which it was fixed in repose and rapidly forming another on coming again to rest. The name *Galeomma* (weasel's eye) would appear to have been bestowed on account of the wide open shell: indeed, if the valves of an empty shell be approximated, there is still a wide gap at the ventral margin.

Further specimens of the new Bombay species would be most welcome.

Ebs.

No. XXXII.—NOTE ON THE COTTON TREE (*BOMBAX MALABARICUM*).

I have to-day despatched to your address a packet containing a flower and a bud of *Bombax malabaricum*, D. C. (The Cotton tree, Hindi: *Aimar*). In the description of the characters of the order *Malvaceæ* (to which this species belongs) given in Hooker's Flora of British India, the pollen grains are said to be elobose and muriculate but I have in this species found them not to be so, but to be minutely tubercled and equilaterally triangular, or 3-lobed and thick, or *tetrahedral* with triangular faces.

An examination of the pollen grains in the flower sent in the packet will bear out my observation.

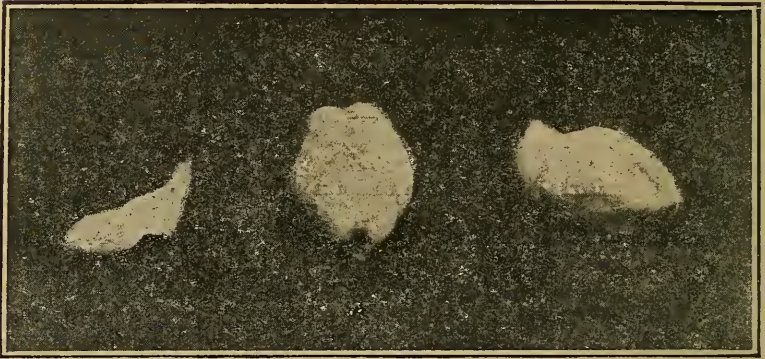
SIMULTALA, E. I. RY.,
BIHAR, March 1921.

GIRINDRA H. BANNERJI, B.A.

Prof. Halberg who examined Mr. Bannerji's specimens makes the following observations:—"The observation is correct, we have a slide of the pollen grains of the plant. They are distinctly trigonous. The shape given in Hooker should be corrected but it is to be noted that the shape of the grain may alter by the medium in which they are. The chief characteristic feature of the pollen grains of the *Malvaceæ* is their shining appearance."

Ebs.

No. XXXIII.—ON SOME UNUSUAL CONTRIBUTIONS TO THE SOCIETY'S MUSEUM.



Air or swimming bladder enclosed in osseous capsule.

Quite recently the Society received from Major C. H. Stockley a parcel containing what was described by him as four bony bodies extracted from the dorsal flesh of a fish. Major Stockley writes: "These were embedded in the post median part of the back. My cook who cut them out and brought them to me says they were in no way attached to any bone. There were four of them. I would be much obliged if you would inform me what these bony objects are. I am no ichthyologist but in the course of a long and varied angling experience I have never seen anything corresponding to them." We sent the specimens to Mr. A. E. Hefford, Marine Biologist with the Government of Bombay. Commenting on them Mr. Hefford replied: "At first I did not recognise the bony substances as anything I had seen or read of before. I find however that certain Indian fresh water fishes have the air bladder (or swimming bladder) more or less completely enclosed in an osseous capsule which is formed by the vertebrae (Gunther, Int. to Study of Fishes, p. 143). The genera in which this character occurs are the whole of the *Gobitina* and many of the *Siluroids*. If the fish from which the specimens were obtained belonged to the former subfamily they might have been either *Botia geto* (Sind, *Sheenharo*) or *Lepidocephalichthys guntea* (Oorlah, Kondatu and Jupkari). Among the *Siluridae* (Catfish family) it appears that most of the species inhabiting the fresh water of the hill country (Himalayas) possess a bony covering to the swimming bladder (*vide* fishes, Vol. I, Fauna of British India series, p. 100)."

THE CROSS AND THE CRESCENT.

Among the exhibits in the Society's Museum is a curious crab which was obtained from a local fisherman. The crab when alive was a handsome specimen measuring six inches across the carapace. It was a brilliant vermilion with pale buff markings. The centre of the carapace is marked with a cross. The delineation is wonderfully graphic and distinct. The local Christian fishermen hold this particular crab in great veneration and explain the presence of the cross by the following legend:—St. Francis Xavier, the apostle of the Indies, while preaching on the sea shore accidentally dropped his cross in the water and was in the danger of losing it but for the timely intervention of this obliging crab who rescued it for him



Note the "Arabic Script" on the tail of the Fish and the 'Cross' on the Crab's Carapace



swimming ashore with it in his claws. In gratitude the saint blessed the crab and the crustacean was rewarded by being destined to carry the sacred symbol on his carapace ever afterwards.

Very recently a venerable Syed by name Syed Mohidin held in much esteem by his brethren, visited the museum carrying with him a curious box covered over with a green cloth embroidered with verses from the Quran. He approached us with great reverence and very ceremoniously unveiled the precious casket which was adorned with further inscriptions in brass. The casket being opened with great care revealed a glass jar containing a specimen of a fish. We were rather non-plussed as to the meaning of the ceremony and devotion attached to what at first appeared to us an ordinary specimen of *Hotocanthus nicobariensis*, a fish which is not uncommon in Indian waters and occurs from the coast of Africa to the Malay Archipelago. The Syed, however, proceeded to enlighten us as to the exceeding value and sacred character of his specimen. The markings on the tail of the fish, which to us conveyed nothing unusual beyond the fact that they bore a resemblance to Arabic script, were held by the Syed to convey a far deeper meaning, and actually portrayed sacred texts from the Quran. The markings on one side of the tail were stated by him to read "*Fathahna-le-nabi-in*" which being interpreted means "SUCCESS IS GIVEN TO THE PROPHET." While on the reverse the inscription was said to read "*Bismillah*" "I AM BEGINNING WITH THE NAME OF GOD." The specimen was obtained by the Syed in Vizagapatam in the Madras Presidency, and he attested that the authenticity of his reading was vouched for by the Ulemas of Hyderabad, Deccan. The actual specimen was sent by us to the Professor of Arabic at St. Xavier's College who stated that the characters were not very clear but that they could be construed to read in accordance with the inscriptions above quoted. In this connection it is interesting to state that a similar specimen was obtained from Zanzibar by a fisherman. It was bought for food but the purchaser while preparing it for cooking noticed that the tail bore marks of writing. "The Ceylon Independent" in its account of the incident stated "To his utter amazement the purchaser read the Arabic words "*La-Ilaha Illallah*" on one side of the fin and "*Shah Allah*" on the other. The first inscription meaning "There is no deity but Allah," the second "The Majesty of Allah." This specimen is reported to have been examined by experts. The markings were said to have been quite prominent and chemicals were used to test whether they were natural or not and after a thorough examination it was definitely established that the inscription on the fin was natural. The Syed is prepared to dispose of this wonderful specimen for the best offer.

Bo. N. H. S. MUSEUM,
May 1921.

B. C. ELLISON,
S. H. PRATER.

PROCEEDINGS
OF THE MEETING HELD ON THE 2ND MARCH 1921.

The annual meeting of members took place on Wednesday, the 2nd March 1921, the Rev. E. Blatter, S.J., presiding.

The election of the following 52 new members since the last meeting was announced:—Mr. K. M. Talcyarkhan, Bar.-at-Law, Bombay; Mr. C. D. Deshmukh, I.C.S., Amraoti; Mr. C. T. Irwin, Kurseong; Mr. A. Kemm, I.C.S., Kurseong; Major R. B. Phayre, M.C., Quetta; Mr. J. T. Mulroney, Bengal; Dr. J. E. Sandilands, M.C., M.D., Bombay; Mr. B. N. Cull, Calcutta; Rev. J. Drury, Panchgani; Mr. R. Rea, Madura; The Lady Superior, St. Joseph's Convent, Panchgani; Mr. R. Thomas, Baghdad; the Director of Agriculture, Baghdad; Miss Helen Millard, Europe; Lt.-Col. S. Hunt, I.M.S., Bombay; Mr. N. D. Macnaghten, Egypt; Mr. H. C. Abraham, Kuala Lumpur; Mr. E. Zurmuhle, Bombay; Mr. E. K. Glazebrook, Rangoon; Capt. G. E. Harwood, Dera Ismail Khan; Mr. A. G. Brown, Mal. P. O.; Capt. R. O. Chamier, Punjab; Prof. V. N. Likhite, B.A., B.Sc., Poona City; Mr. H. Copley, Nagpur, C. P.; Mr. Carlton P. Brook, Singapore; Mr. L. A. Bishop, Bhadrachalam; Mr. J. B. Robinson, Sagrapur; Major R. L. Benson, D.S.O., Bombay; Mr. T. Marlow, Tharrawaddy, Burma; Mr. B. A. Hashimy, Partabgarh; Mr. J. Addyman, M.L.C., Dadar, Bombay; Mr. G. Lindley Hinde, N. Kamrup; Lt. J. Coode, Agra; Mr. A. J. Aldous, Bombay; Mr. F. T. Young, Bombay; Lt. J. E. Stirling, Meerut, U.P.; Mr. P. F. Fowke, Ceylon; the Director of Industries, Bombay; Mr. George Niederer, Bombay; Mr. Ernest A. Bringentoff, Europe; Capt. E. B. Dale, R. A., Mesopotamia; Mr. Wm. T. Nightingale, Assam; General Mohun Shumshere Jung Bahadur, G.C.B., G.C.S.I., G.C.V.O., Nepal; Major G. A. Webb, Thurbo, Mirik, P.O.; the Mess Secretary, 2-35th Sikhs, Ambala; Mr. M. Maxwell, Savan, B. and N.-W. Ry.; Mr. C. Raitt, S. Coorg; Col. V. E. Gwyer, Karachi; Mr. A. E. Hefford, Bombay; Mr. H. J. C. Millett, I.F.S., Dharkar; Mr. R. W. Morde, Jalpaiguri; Mr. B. C. Ellison, Bombay.

The following gentlemen were elected as Office Bearers for the present year:—*President*—H. E. the Right Hon'ble Sir George Lloyd, D.S.O., G.C.I.E. *Vice-Presidents*—Mr. J. D. Inverarity, B.A., LL.B., the Hon'ble Sir Norman Macleod, Kt., H. H. the Maharao of Cutch, G.C.S.I., G.C.I.E. *Managing Committee*—Mr. T. Bainbrigg Fletcher, F.E.S., Mr. T. R. Bell, C.I.E., I.F.S. (Retd.), Rev. E. Blatter, S.J., Mr. B. C. Ellison, Colonel G. H. Evans, C.I.E., F.L.S., Lieutenant-Colonel W. H. Evans, R. E., Major F. C. Fraser, I.M.S., Mr. A. E. Hefford, Lt.-Col. J. E. B. Hotson, I.C.S., Prof. V. N. Hate, Mr. C. M. Inglis, F.Z.S., M.B.O.U., Mr. F. Ludlow, I.E.S., M.B.O.U., Mr. F. M. Mackwood, Mr. P. J. Mead, C.I.E., I.C.S., Mr. H. P. W. Macnaghten, M.L.C., Mr. P. M. D. Sanderson, and Mr. John Wallace.

Honorary Secretary, Mr. R. A. Spence, M.L.A., F.Z.S.; *Honorary Treasurer*, Mr. H. F. Lodge, M. C.; *Curator*, Mr. B. C. Ellison; *Asst. Curator*, Mr. S. H. Prater.

ACCOUNTS FOR 1920.

In presenting the accounts for the year ending 31st December 1920, the Honorary Treasurer stated that he would like to draw attention to the following facts which these accounts disclosed and which proved only too clearly that the proposed raising of the annual subscription and entrance fees was an absolute necessity if the Society were to continue to work to its present standard. On the 1st of January 1919, the Society's cash balances and investments amounted to Rs. 72,968-12-11 whereas on the 31st December 1920, its investments and balances amounted to Rs. 70,419-11-9 only, including a sum of £1,876-14-0 which has been remitted to London at something over 2s. 4d. exchange against the payments that will have to be made for the various new publications that

the Society is bringing out. These figures show that the Society's assets are Rs. 2,549-1-2 less than they were a year ago. The total receipts during the year amounted to Rs. 33,622-8, Rs. 144-12-8 less than they were for the year 1919. The total expenditure for 1920 amounted to Rs. 36,171-9-2, an increase of Rs. 1,974-10-6 over the corresponding figures for the previous year. Considering the rise in the scale of wages and prices generally, this increase in expenditure is not excessive. At the beginning of the year under review there were 1,821 members on the Society's books. Since that time 112 new members have joined and two former members, who had resigned, have rejoined. On the other hand, 89 members have either resigned or died, the result being that on the 1st of January this year there were 1,846 members on the books. Included in this figure, however, are 179 members who have not paid their subscriptions for four years or over and these will now be written off. This means that the number of members at the beginning of this year is actually only 1,667. During the past few months members have received a circular from the Honorary Secretary asking for approval to the subscription and entrance fees being raised and explaining that a considerable increase in the actual cost of the Journal and the Society's proposed new publications over their estimated cost is anticipated. There is no necessity, therefore, for me to refer again to these matters.

With regard to the accounts for the Mammal Fund.—On the 1st of January 1920, the balance to the credit of the fund was Rs. 7,239-2-5 in addition to which Rs. 5,150 was held invested in Port Trust Bonds. The balance at the close of the year, in addition to this investment, amounted to Rs. 3,627-10-10 only. The receipts during the year amounted to Rs. 4,284-3-10 against Rs. 8,154-10-4 received during the year 1919. On the other hand the expenditure in 1920 amounted to Rs. 7,895-11-5 against Rs. 4,449-15-1, the corresponding figure for 1919.

Valuable work continues to be done by the survey for which this fund was raised. One collector has been working for the past year in Assam. Survey work has also been done in Persia and is now being done in Nepal. Arrangements have been made to secure the services of two other collectors in view of the decision of the Indian Government to revise the Fauna of British India series and the consequent necessity of obtaining all the information possible for the books of this series dealing with the mammalia. These arrangements cannot be carried out without money, and, as already pointed out, expenditure from the fund last year exceeded the receipts by Rs. 3,611-7-7; at this rate of progress the present balances will be exhausted in less than three months. It is, therefore, to be hoped that sufficient donations to this fund will be forthcoming to enable the present programme to be completed.

ALTERATIONS IN RULES.

The following alterations to existing rules were then passed by a majority of 555 votes to 35:—

Rule 4.—Members shall pay an entrance fee of Rs. 20, and an annual subscription of Rs. 25 payable in advance. The first annual subscription of members elected during the months of October, November and December, shall be considered to extend to the 31st of December, in the following year. If any member's subscription remains unpaid for more than six months, his name shall be liable to be removed from the list of members after due notice has been sent to him by the Secretary.

Rule 5.—Any member may, on payment of Rs. 350, become a life-member and will thereafter be exempt from any further subscriptions.

A Rider authorising the Committee to accept payment of the old life-membership subscription from members who had joined before 1st March 1921 was also passed.

A vote of thanks was passed to Mr. H. F. Lodge, the Honorary Treasurer, and also to Mr. R. C. Lowndes who acted for him for six months.

Votes of thanks were also passed to the Chairman and the Honorary Secretary.

CONTRIBUTIONS TO THE MUSEUM.

The Curators have pleasure in announcing a large number of contributions received since the last meeting, among these we would like to mention a small collection of mammals from Col. J. E. B. Hotson. These were part of a collection which was looted on the way down from Shiraz, and were discovered lying at the bottom of a well, the remainder, comprising chiefly Botanical specimens, were unfortunately destroyed.

Capt. C. M. Ingoldby continues to send in specimens from Waziristan. He has made a very representative collection of the Reptiles found in that locality and we can congratulate him as being the discoverer of a new species which is to bear his name.

Another constant contributor to the Society's Museum is Mr. J. P. Mills of Mogokchung, Assam. Mr. Mills' latest donation includes a specimen of the Brown Ferret Badger. There are two species of Ferret Badger found within Indian limits, the present example and the Burmese Ferret Badger, *Helictis personata*. Very little is known about the habits of these animals, beyond that they are nocturnal and feed on insects and reptiles. Anderson states that the creature is believed by the Sikhim Bhutias to be useful in destroying cockroaches and other insects and as such is protected by them. Mr. Mill's collection also contains a skin and skull of the Hog Badger, another uncommon species. The Society has been fortunate in obtaining a further series of skins of the Giant Squirrel through the agency of Mr. W. H. Woodhouse Adolphus. Specimens have been obtained from the Madura districts, this further establishes the occurrence of this Ceylonese species on the mainland. We are indebted to Mr. C. W. Phillips for a small collection of mammals from Ceylon. The Society received a large number of mammal skins from Nepal, from Col. Kennion, the British Resident. Col. Kennion, as previously reported in the last Journal, has arranged for one of the Society's Indian collectors to work in Nepal and a promising consignment of specimens has recently been received. 3 Hoary-bellied Squirrels and a few Bats were presented by A. M. Primrose, Assam, and a Lion-tailed Monkey, *P. silenus*, by the late Mr. A. M. Kinloch, Kollengode, S. India. This species is a shy and wary animal living in the dense forest tracts of S. India and the Malabar Coast, it has been found as far north as Kanara. A few birds' skins were received from Mr. A. P. Kinloch from the Nelliampatty hills, in addition Mr. Kinloch sent in a very handsome specimen of a large snail (*Indrella ampulla*) alive. A very fine example of the Pink-headed Duck (*R. caryophyllacea*) was shot and presented to the Society by Mr. St. George de Carteret from Kheri, Oudh and a Sumatran Green-bellied Malakoa (*R. sumatrana*) was sent in by Mr. Salim Ali.

The Curators further announced the acquisition of a young whale which was washed ashore at Juhu, a few miles from Bombay; in addition to the above a large specimen was stranded at Jaigud. About these we propose to say more in a future number of the Journal.

We give below a more detailed list :—

MAMMALS.

42 Mammals, Shiraz, Persia, Lt.-Col. J. E. B. Hotson.

1 *Acanthion leucurus cuneiceps* (The Rajputana Porcupine), 1 *Hyæna hyæna* (Striped Hyæna), 1 *Hemiechinus collaris* (Sind Hedgehog), 8 *Gunomys* sp. (Sind Mole Rats), 3 *Mus bactrianus* (Persian House Mouse), 18 *Cricetus* sp. (The Grey Hampster), 1 *Pipistrellus* (Indian Pipistrelle), Ladha, Waziristan, Capt. C. M. Ingoldby.

- 4 Bats, Colombo, Colombo Museum.
 1 *Ursus himalayanus* (The Himalayan Bear), Assam, Lt.-Col. M. E. Rae.
 1 *P. silenus* (Lion-tailed Monkey), Seetagundi, Kellengode S. I., the late Mr. A. M. Kinloch.
 14 rats, 4 squirrels and 32 bats, Ceylon, W. W. A. Phillips.
 1 *Ratufa macrura dandolena* (Hoary Giant Squirrel), Dharampur, Salem Dist. 108 Mammals, Nepaul, Lt.-Col. R. L. Kennion.
 1 *Ratufa m. dandolena* (Hoary Giant Squirrel), Madura, S. I., K. A. Chengapah Avergal, 6 skulls of *Felis*, 3 skulls of *Mustela*, 1 skull of *Petaurista*, 2 skulls of *Viverra*. Turzum Tea Estate, Oscar Lindgren.
 1 *Callos ciurus e. nagarum* (Pallas' Squirrel), 2 *Tomeutes lokroides* (Hoary-bellied Squirrels), Golaghat, Assam, C. Primrose.
 7 *Rattus* (Common Rats), 2 *Pachyura* sp. Shrew. Lacadive Islands, R. H. Ellis, I.C.S.
 2 *Funambulus palmarum* (Common Striped Squirrels), 2 *Tatera indica* (Common Indian Gerbilles), 1 *Felis affinis* (Indian Jungle Cat), all without skulls, Rutlam, C. I., V. S. Lapersonne.
 1 *Arctomys* (Badger), 2 *Viverra zibetha* (Large Indian Civet), 1 *Helictis nepalensis* (Nepaul Ferret Badger), 2 *Rattus fulvescens* (The Chestnut Rat), 1 *Mustela flavigula* (Indian Pine Martin), 2 *Pithecus brahma* (Assam Langur), 1 *Ratufa gigantea* (Giant Squirrel), 1 *Leggada*, 1 *Ratus eha*, 1 *Talpa micrura* (The Short-tailed Mole), 2 *Pipistrellus* (Indian Pipistrelle), 3 *Rhinolophus* sp., 1 *Nyctalus* sp. (Noctule Bat), 1 Porcupine (Skull only), 1 Wild Boar Tush, 2 *Viverricula malacensis* (Common Civet Cat), and 1 *Maccacus* sp., Mokokchung, Naga Hills, J. P. Mills.
 1 *Funambulus palmarum* (Striped Squirrel), Santa Cruz, B. C. Ellison.
 1 *Petaurista inornatus* (Himalayan Flying Squirrel), Ranikhet, U. P., H. G. Champion.
 1 *Vandelluria oleracea* (The Deccan Tree Mouse), Karwar, T. R. Bell.
 1 *Cervus cashmirianus* Mask only (Kashmir Stag), Srinagar, Kashmir, Col. A. E. Ward.
 1 *Mungos mungo* (Com. Mongoose), no skull, Poona, G. C. Amore. 3 *Tomeutes lokroides* (Hoary-bellied Squirrel), 2 *Cynopterus sphinx sphinx* (Indian Fruit Bat), 1 *Lyroderma lyra* (Indian Vampire Bat), 1 *Pipistrellus ceylonicus* (Kelaart's Bat), Golaghat, Assam, A. M. Primrose.
 1 Great Indian Fin Whale (*B. indica*) Juhu Island, Vile Parle, Thana District, measuring 25½ feet in total length. A portion of a skeleton of a whale, presented by the Town Hall authorities.

Birds.

14. Birds Rutlam, C. I., V. S. Lapersonne.
 1 *Mergus albellus* (The Snew), Jogawalla Jhil, near Lhaksar Junction, Major J. H. Lane.
 1 *Tephradornis sylvicola* (Malabar Wood Shrike), 1 *Garularx delesserti* (Wynaad Laughing Thrush), 1 *Petrophila cinclorhynchus* (Blue-headed Rock Thrush), 1 *Stoporola melanops* (Virditer Flycatcher), Nelliampatty Hills, A. P. Kinloch.
 20 Birds, Santa Cruz, Bombay, B. C. Ellison.
 1 *Rhodonessa caryophyllacea* (Pink-headed Duck), Palia N. of Kheri, U.P., St. G. de Carteret.
 1 *T. tranquebarica* (Turtle Dove), 1 *Podiceps albipennis* (Little Grebe), 1 *Sterna seena* (The River Tern), Poona, G. C. Amore.
 1 *Rhopodytes sumatranus* (The Sumatran Green-billed Malkoha), Thitkado, Tavoy. Salim A. Ali.

- 1 *Ægialitis dubia* (Little Ring Plover) (*albino*), Mysore, E. Van Ingen.
 2 *Chætura indica* (The Brown-necked Spine-tail), 4 *Cypselus pacificus* (The Large White-rumped Swift), Golaghat, Assam, A. M. Primrose.
 1 *E. stracheyi* (Eastern Meadow Bunting) Saphed Ko, Kurram Valley, N. W. F. P., Lt.-Col. R. B. Skinner.
 1 Scops owl, Ladha, Waziristan, Capt. C. M. Ingoldby.
 154 Birds from the collection of late Brig.-Genl. H. T. Fulton, presented by Mrs. Fulton.
 112 Birds, Nepaul, Lt.-Col. R. L. Kennion.
 1 *Terpsiphone paradisi* (Indian Paradise Flycatcher), Anmode, Castle Rock, J. Wesche Dart.
 2 *Psaraglossa spiloptera* (The Spotted Wing), Murphulian, C. Primrose.

Snakes.

- 1 *Callophis maculiceps* (Burmese Coral Snake), Moulmein, Burma, C. J. Butterwick.
 1 *Trop. platyceps* (Variable Grass Snake), 2 *Simotes albocinctus* (White-banded Kukri Snake), 1 *Trachischium fuscum* (Black Keel-tail), 1 *Polyodontophis collaris* (Collared Dwarf Snake), 1 *Coluber porphyraceus*, Darjeeling, Mrs. F. E. Jackson.
 1 *Lycodon fasciatus* (Banded Wolf Snake), Gyahari, Darjeeling, A. Wright.
 2 *Typhlops brahminus* (Common Blind Snake), Bangalore, 1 *Hemibungarus nigrescens* (The Common Indian Coral Snake), 2 *Trop. monticola* (Jerdon's Grass Snake), North Mysore Hills, 2 *Rhinophis sanguineus* (Red-spotted Shield Tail), 3 *Silybura brevis* (Common Rough Tail), Lt.-Col. F. Wall.
 1 *Hydrus platurus* (Yellow-bellied Sea Snake), Aden, Arabia, Maj. M. K. Gharpurey.
 1 *Eryx conicus* (Common Earth Snake), Salsette Islands, Bombay, E. Halliburton.
 2 Snakes, Nepaul, R. L. Raojee.
 1 *Bitis arietans*, 2 *Echis coloratus* (Arabian Saw-scaled Viper), 1 *Glaucomia macrorhynchus* (Earth Snake), 1 *Zamenis rhodorachis* (Grey Desert Racer or Dhaman), 2 *Psamophis schokari* (Variable Sand Snake), 2 *Psamophis* sp., Aden, Arabia, Major Bignell.
 1 *Homalopsis buccata* (Banded Water Snake), Siam, J. S. Campbell.
 1 *P. verus* (English Adder), England, Major F. C. Fraser.
 1 *Trop. piscator* (Checkered Water Snake), Shillong, Assam, Lt.-Col. H. R. Row.
 1 *Coluber helena* (Trinket Snake), Paclmarhi, C. P., Capt. C. D. Sanders.
 3 Sea Snakes, 2 Land Snakes, Karwar, T. R. Bell.
 1 *Dryophis mycterizans* (Common Green Whip Snake), F. T. Young.
 1 *Naia tripudians* (The Cobra), 2 *Vipera libetina* (Levantine Viper), 1 *Echis carinata* (Saw-scaled Viper), 4 *Dipsas trigonata* (Brown Tree Snake), 1 *Dipsas jollyii* (Baluchi Cat Snake), 2 *Zamenis mucosus* (Common Indian Racer or Dhaman), 1 *Zamenis rodhorachis* (Grey Desert Racer), 1 *Zamenis diadema* (Diamond-backed Rat Snake), 1 *Lycodon striatus* (Shaw's Wolf Snake), Ladha, Waziristan, Capt. C. M. Ingoldby.

Lizards.

- 1 *Calotes versicolor*, 2 *Agama caucasica*, 6 *Eublepharis macularius*, 2 *Eremias velox*, *Eumeces scuttatus*, 8 *Hemidactylus* sp., 1 *Eumeces schneiderii*, 3 *Uromastix hardwickii* (alive), 25 *Eumeces* sp., 78 Lizards, Ladha, Waziristan, Capt. C. M. Ingoldby. 1 *Ophisaurus gracilis*, Darjeeling, The late Mrs. F. E. Jackson. 1 *Varanus flavescens*, Jalpaiguri, F. Field.

Frogs.

40 Frogs, 20 Tadpoles, Ladha, Waziristan, Capt. C. M. Ingoldby.

Tortoises.

7 Tortoises, *Testudo horsfieldi*; *Testudo hardwickii*, Waziristan, Capt. C. M. Ingoldby.

Insects.

Few Beetles, etc., Shiraz, Persia. Lt.-Col. J. E. B. Hotson.

1 *Galeodes*, 1 Grasshopper, 2 Water Beetle, 1 *Belostoma indica*, Ladha. Waziristan, Capt. C. M. Ingoldby.

Few moths in papers, Secunderabad, Major A. P. Arbuthnot.

Several Beetles, Butterflies, etc., Nepaul, Lt.-Col. R. L. Kennion. 1 *Mygale* sp., Mogok, U. Burma, F. Atlay.

MISCELLANEOUS.

16 Crabs, Ladha, Waziristan, Capt. C. M. Ingoldby.

1 Crab, Mosambique. P. E. Africa, F. X. Britto.

1 Crab, Karwar, T. R. Bell.

3 Crabs, Nepaul, R. L. Raojee.

1 Spiny Lobster, Bombay Harbour, B. C. Ellison.

9 Centipedes, 10 Scorpions, 13 Earth worms, 1 Bottle of Earth worms, Ladha Waziristan, Capt. C. M. Ingoldby.

1 Snail, *Indrella ampulla* (alive) Palagapandy, Kollengode, S. I., A. P. Kinloch.

Minor contributions from W. H. Jones, Major Mosse, P. M. D. Sanderson, M. Bowen, Capt. W. S. Dodds, D. G. Cameron, T. R. Bell and Major C. H. Stockley.

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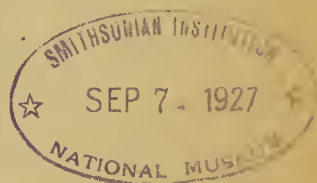
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B. C. ELLISON, C. M. Z. S. and S. H. PRATER, C. M. Z. S.

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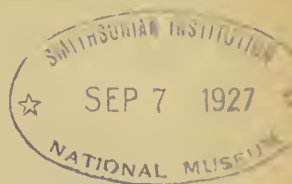
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ERRATA.

No. 1, VOLUME XXVII.

- Page 18, Sub-heading, for "Ceylon Jungle Fowl" read
"Ceylon Spur Fowl."
 ,, 113, line 13 from the bottom of page, for "more" read
"move."
 ,, 114, line 15 from the bottom of page, for "outer" read
"cuter."
 ,, 132, line 20 from the bottom of page, for "existenca"
read "existence."
 ,, 133, line 1 from the top of page, for "Jenus" read
"Genus."
 ,, 134, line 13 from the top of page, for "nest" read
"nets."
 ,, 142, line 19 from bottom of page, for "The Large
Crowned Willow Warbler, *Acanthopneuste
occipitalis*" read "The Dull-Green Willow
Warbler *Acanthopneuste lugubris*."
 ,, 172, Miscellaneous, Note No. XII, line 9 for "its" read
"it."

No. 2, VOLUME XXVII.

- Page 24, Part XXXI read XXVII.
 ,, 364, Key to Punjab Nightjars. Section 3 should read
as follows:—
 Large White Spots on 1st 3 primaries. 4
 Large White Spots on 1st 4 primaries
 macrurus ♂ ♂

No. 3, VOLUME XXVII.

- Page 431 for (Common Butterflies) Part XXVIII should read
XXVII.
 ,, 626, Miscellaneous, Note No. V. Title for *Antelope*
read *Gazelle* for "*Panthalops hodgsoni*" read
"*Gazella picticaudata*."
 ,, 629, line 5 from the bottom of page, for "Agricultural"
read "Avicultural."

No. 4 VOLUME XXVII.

- Page 651 (Game Birds) for Part XXX should read XXXII.
 ,, 778 for (Common Butterflies) Part XXIX should read
XXVIII.
 ,, 695, The serial number printed against *Pericrocotus p.
vividus* should have been No. 665. To
obviate the necessity of a change in the
subsequent numbers this sub-species may be
numbered 664-A.

- Page 697, For serial No. "66" *read* "666."
- „ 706, For serial number "477" *read* "774."
- „ 724, Number 960 (726) *for* "Chestnut-headed" *read*
"Chestnut-bellied". The same applies to
No. 961 (726).
- „ 948, line 8 from the top of page, *for* "fillets" *read*
"Pellets."
- „ 961, line 10 from the bottom of page, *for* "attenuata-
pictifrons Sm" *read* "attenuata-pictifrons
Bing. nec Smith."
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| Coldstream, Col. J. C. (I.A.) | ... | Punjab. |
| Colombo Museum, The Librarian | ... | Colombo. |
| Colthurst, Dr. Ida | ... | Calcutta. |
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| Colvin, Miss B. | ... | London. |
| Comber, Edward (F.Z.S.) | ... | England. |
| Conder, J. M. (I.C.S.) | ... | Rangoon. |
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| Cooper, H. L. | ... | Sadiya. |
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| Copley, Hugh | ... | Nagpur. |
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| Crosthwaite, B. M. | ... | Europe. |
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| Director, Bureau of Science ... | ... | ... | ... Manila. |
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| Donaldson, R. ... | ... | ... | ... Ajmer. |
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| Erskine, J. ... | ... | ... | .. Nilgiri. |

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| Foster, R. Guy | ... | ... | ... | England. |
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| Frei, Max | ... | ... | ... | Bombay. |
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| Frizelle, Lt.-Col. J. | ... | ... | ... | Jullundur. |
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| Fry, John T. | ... | ... | ... | Bombay. |

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| Gilbert, R. N. | ... | ... | ... | England. |
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| Glascock, L. C. (M.V.O.) | ... | ... | ... | Delhi. |
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| Hickman, R. St. J. | ... | ... | ... Cachar. |

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| Higginson, G. R. | ... | ... | ... London. |
| Hignell, S. R. (I.C.S., C.I.E.) | ... | ... | ... Simla. |
| Hiley, A. C. (I.F.S.) | ... | ... | ... Jalgaon. |
| Hill, H. Brian C. | ... | ... | ... U. Assam. |
| Hill, Sir Claude H. A. (K.C.S.I., C.I.E.) | ... | ... | ... England. |
| Hill, Major C. P. | ... | ... | ... Rangoon. |
| Hingston, Capt. R. W. G. (I.M.S.) | ... | ... | ... Bombay. |
| Histed, S. E. | ... | ... | ... Karachi. |
| Hitchcock, R. H. | ... | ... | ... Calicut. |
| Hitchcock, Major R. V. | ... | ... | ... Bombay. |
| Hitchins, C. S. | ... | ... | ... Draban. |
| Hodgkins, C. J. | ... | ... | ... Dera Ghajikhan. |
| Hodgson, Major E. C. | ... | ... | ... Bombay. |
| Hodgson, H. P. | ... | ... | ... London. |
| Hogan, J. G. | ... | ... | .. Ballia. |
| Holland, L. B. (I.F.S.) | ... | ... | ... Simla. |
| Holland, Hon'ble Mr. R. E. (C.I.E., I.C.S.) | ... | ... | ... Ajmer. |
| Holmer, Miss M. R. N. (M.A.) | ... | ... | ... Delhi. |
| Holmes, H. R. | ... | ... | ... Kamptee, C. P. |
| Homfray, Jeston (I.F.S.) | ... | ... | ... Calcutta. |
| Hood, A. F. | ... | ... | ... Bombay. |
| Hoosein Belgrami, The Hon'ble Mr. Syed | ... | Nawab | |
| Imud-ul-Mulk Bahadoor (C.S.I.) | ... | ... | ... Hyderabad, Deccan. |
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| Hopwood, S. F. (I.F.S.) | ... | ... | ... Mogok. |
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| Howell, Lt.-Col. E. Berkley (C.I.E., I.C.S.) | ... | ... | ... Baghdad. |
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| Hudson, L. S. | ... | ... | ... Bombay. |
| Huggins, J. R. | ... | ... | ... London. |
| Hughes, Major J. E. | ... | ... | ... Bombay. |
| Humm, Capt. P. S. | ... | ... | ... Kasauli. |
| Humphrys, Major F. H. | ... | ... | ... Europe. |
| Hundley, G. | ... | ... | ... Mepale. |
| Hunt, Rear Admiral A. T. (R.N., C.I.E.) | ... | ... | .. London. |
| Hunt, Dr. E. H. | ... | ... | .. Secunderabad. |
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| Husband, Major J. (I.M.S.) | ... | ... | ... Bombay. |
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| Hutchinson, L. P. | ... | ... | ... Gonda. |
| Hutton, C. H. | ... | ... | ... England. |
| Hutton, C. I. | ... | ... | ... Myitinge. |

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| Hutton, J. H. | ... Calcutta. |
| Hyderabad, The Librarian, State Library | ... Hyderabad, Deccan. |
| Imperial Library, The Librarian ... | ... Calcutta. |
| Inglis, H. A. | ... Hatanri, P. O. |
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Dists. | ... Cachar, Assam. |
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| Irwin, Capt. H. R. | ... Europe. |
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| Jacob, J. R. | ... Bombay. |
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| James, Major F. H. | ... England. |
| James, Lt. G. P. Lidiard | ... London. |
| James, H. M. | ... Shamshernagar. |
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| Jeddere-Fisher, Major H. C. ... | ... England. |
| Jenkin, R. Trevor (I.F.S.) | ... Yeotmal. |
| Jenkins, J. B. | ... Ahmedabad. |
| Jenkins, S. E. F. (I.F.S.) | ... Pegu. |
| Jennings, Major-General W. E. (I.M.S.) | ... Bombay. |
| Jermyn, Col. T. | ... England. |
| Johnston, S. E. | ... Toungoo. |
| Johnstone, R. Barton | ... Mussoorie. |
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| Jolly, E. H. P. (I.C.S.) | ... Bombay. |
| Jones, A. E. | ... Simla. |
| Jones, Lt.-Col. J. Lloyd (I.M.S.) ... | ... London. |
| Jones, Lt. W. H. C. | ... Bombay. |
| Jourdain, Rev. F. C. R. | ... England. |
| Judge, Capt. C. E. M. | ... Delhi. |
| Jukes, J. E. C. (I.C.S., C.I.E.) ... | ... Delhi. |
| Julius, Sydney | ... Colombo. |
| Junagadh, H. H. The Nawab of ... | ... Junagadh. |
| Karachi, Frere Hall (Municipal) Library | ... Karachi. |
| Karachi, Victoria Museum, The Curator | ... Karachi, Sind. |
| Kashmir, General Raja Hari Sing Saheb Bahadur
Hari Singh, of (K.C.I.E.) | ... Jammu. |
| Keays, Lt.-Col. R. W. C. | ... Madras. |
| Keighley, Capt. F. W. | ... Bombay. |

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| Kemp, S. W. | ... | ... | .. | ... | Calcutta. |
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| Kidner, Lt. W. E. (R.E.) | ... | ... | ... | ... | Bombay. |
| Kilkelly, Lt.-Col. P. P. (I.M.S., Retd.) | ... | ... | ... | ... | <i>Europe.</i> |
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| King, Capt. E. O. (I.A.R.O.) | ... | ... | ... | ... | <i>London.</i> |
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| Kingston, A. H. | ... | ... | ... | ... | Simla. |
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Hills. |
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| Kuroda, Nagamichi | ... | ... | ... | ... | Tokyo. |
| Labh Singh | ... | ... | ... | ... | Allapilli. |
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| Lahore, Curator, Central Museum | ... | ... | ... | ... | Lahore. |
| Lahore, Punjab Veterinary College, The Principal. | ... | ... | ... | ... | Lahore. |
| Lahore, The University of the Punjab | ... | ... | ... | ... | Lahore. |
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| Lake, Major E. A. W. | ... | ... | ... | ... | Rangoon. |
| Lamb, W. S. | .. | ... | ... | ... | <i>London.</i> |
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| Lane, E. | ... | ... | ... | ... | Kodarma, P. O. |
| Lane, H. S. | ... | ... | ... | ... | <i>England.</i> |
| Lane, Lt.-Col. W. H. | ... | ... | ... | ... | <i>London.</i> |
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| Latif, Sarban, C. | ... | ... | ... | ... | Sitarampur. |
| Laurie, Major J. E. | .. | ... | ... | ... | <i>London.</i> |
| Laverton, Capt. G. | ... | ... | ... | ... | <i>England.</i> |

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| Lee, Brig.-Genl. F. | ... | ... | ... | London. |
| LeMarchand, A. E. M. | ... | ... | ... | Hoshangabad. |
| Lemarchand, J. R. | ... | ... | ... | Kookila Mook,
Assam. |
| Leonard, P. M. R. | ... | ... | ... | Sinlum Kaba. |
| Leonard, Lt.-Col. W. H. (I.M.S.) | ... | ... | ... | Bombay. |
| Leslie, Major-Genl. G. A. J. (R.E., C.B., C.M.G.) | ... | ... | ... | Ootacamund. |
| Leslie, M. | ... | ... | ... | Bombay. |
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| Librarian, Students' Library, St. Xavier's College | ... | ... | ... | Bombay. |
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| LindleyHinde, G. | ... | ... | ... | N. Kamrup. |
| Lindop, Capt. K. J. H. | ... | ... | ... | London. |
| Lindsay-Smith, Lt.-Col. J. (I.A.) | ... | ... | ... | Lahore. |
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| Liston, Lt.-Col. W. G. (I.M.S., C.I.E.) | ... | ... | ... | Bombay. |
| Little, E. | ... | ... | ... | Kirkee. |
| Livesey, Capt. T. R. (I.A.R.O.) | ... | ... | ... | Kotah. |
| Lloyd, Lt.-Col. R. A. (D.S.O., I.M.S.) | ... | ... | ... | Hoshangabad. |
| Lloyd, Lt.-Col. C. R. (A.S.G., D.S.O.) | ... | ... | ... | Bombay. |
| Lloyd, J. B. | ... | ... | ... | London. |
| Lloyd, H. E. The Right Hon'ble Sir George
(G.C.I.E., D.S.O.) | ... | ... | ... | Bombay. |
| Locket, A. | ... | ... | ... | Assam. |
| Lodge, G. E. | ... | ... | ... | England. |
| Lodge, H. F. (M.C.) | ... | ... | ... | Bombay. |
| Logan Home, Major W. M. | ... | ... | ... | London. |
| Lomas, H. A. (I.C.S.) | ... | ... | ... | England. |
| Lory, F. B. P. (M.A., I.E.S.) | ... | ... | ... | Poona. |
| Love, T. E. | ... | ... | ... | Travancore. |
| Lewis, F. C. | ... | ... | ... | England. |
| Lowman, F. J. | ... | ... | ... | England. |
| Lowndes, Sir George (K.C.S.I.) | ... | ... | ... | England. |
| Lowndes, R. C. | ... | ... | ... | Bombay. |
| Lowsley, C. O. | ... | ... | ... | Ahmednagar. |
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| Lowther, E. H. N. | ... | ... | ... | Moghal Sarai. |
| Luard, Lt.-Col. C. E. | ... | ... | ... | Sehore, C. I. |

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| Lucas, Major J. de B. T. (F.R.A.) | ... | ... | ... Ambala. |
| Lucknow, The Curator, Provincial Museum | ... | ... | ... Lucknow. |
| Lucknow Public Library, The Honorary Librarian | ... | ... | ... Lucknow. |
| Luke, J. H. | ... | ... | ... Narayangauj. |
| Luke, K. J. | ... | ... | ... Barrackpore. |
| Lumsden, The Hon'ble Mr. O. F. (I.C.S.) | ... | ... | ... Montgomery. |
| Lunawada, Mabaraj Kumar Ranjit Singh of | ... | ... | ... Lunawada. |
| Lunham, Lt.-Col. J. L. (I.M.S.) | ... | ... | ... Bombay. |
| Lyll, Major R. A. | ... | ... | ... Jodhpur. |
| Lynch, C. E. | ... | ... | ... Sibsagor. |
| Lynch-Blosse, C. E. | ... | ... | ... Bombay. |
| Lynch-Blosse, H. R. (I.C.S.) | ... | ... | ... England. |
| Macaulay, F. G. A. | ... | ... | ... England. |
| Macdonald, A. St. J. (I.A.R.O.) | ... | ... | ... Sibi. |
| MacDonald, Lt. A. B. (R.F.A.) | ... | ... | ... Belgaum. |
| MacFadden, R. R. | ... | ... | ... London. |
| MacGregor, Duncan | ... | ... | ... Colombo. |
| MacGregor, Capt. R. F. D. (I.M.S.) | .. | ... | ... Bombay. |
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| Mackenzie, G. H. L. | ... | ... | ... Calcutta. |
| Mackenzie, Major L. H. L. (I.M.S.) | .. | ... | ... Gilgit. |
| Mackenzie, J. M. | ... | ... | ... Surdah. |
| Mackenzie, M. M. | ... | ... | ... Saran, Bihar. |
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| Mackinlay, Lt.-Col. Chas. | ... | ... | ... Scotland. |
| Macklin, A. S. R. (I.C.S.) | .. | ... | ... Dharwar. |
| Mackwood, F. M. | ... | ... | ... London. |
| Mackwood, F. E. | ... | ... | ... Colombo. |
| MacLachlan, R. B. | ... | ... | ... Kopergaon. |
| MacLachlan, Capt. D. (I.A.R.O.) | ... | ... | ... Karachi. |
| Macleod, The Hon'ble Sir Norman | ... | ... | ... Bombay. |
| Macleod, R. D. (I.C.S.) | ... | ... | ... Fatehpur. |
| MacMichael, N. (I.C.S.) | ... | ... | ... Adyar. |
| Macnaghten, H. P. W. (M.A., M.L.S.) | .. | ... | ... Bombay. |
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| Macphail, G. | ... | ... | ... Ireland. |
| Madan, F. R. | ... | ... | ... Kurnool. |
| Maddock, Lt.-Col. E. C. G. (I.M.S.) | ... | ... | ... Ahmednagar. |
| Madras Forest College, The Principal | ... | ... | ... Coimbatore. |
| Madras, The Librarian, Govt. Central Museum | ... | ... | ... Madras. |
| Madras, The Principal, Presidency College | ... | ... | ... Madras. |
| Madras, The Professor of Zoology, Christian College | ... | ... | ... Madras. |
| Mahomedbhoy Currimbhoy Ebrahim | ... | ... | ... Bombay. |
| Mahon, E. L. | ... | ... | ... Pollibetta. |

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| Main, T. F. (B.Sc.) ... | ... | ... | ... Karachi. |
| Makeig-Jones, J. (I.C.S.) ... | ... | ... | ... <i>England</i> . |
| Malik, Sahib Abdul Haq ... | ... | ... | ... Jullundur. |
| Malony, Capt. J. B de W. (I.M.S.) ... | ... | ... | ... Mhow. |
| Maltby, Major C. M. (I.A.) ... | ... | ... | ... Bombay. |
| Manekjee, Manek M. ... | ... | ... | ... Tavoy. |
| Mangin, Major E. B. (M.C.) ... | ... | ... | ... Calcutta. |
| Mann, Dr. H. H. ... | ... | ... | ... Poona. |
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| Marlow, T. ... | ... | ... | ... Tharrawaddi. |
| Marrs, Prof. R. ... | ... | ... | ... <i>England</i> . |
| Marryatt, N. ... | ... | ... | ... Ajmer. |
| Marshall, Major A. (D.S.O.) ... | ... | ... | ... <i>England</i> . |
| Marshall, A. W. ... | ... | ... | ... Bombay. |
| Marshall, Mrs. H. A. ... | ... | ... | ... Travancore. |
| Marshall, Dr. H. H. (L.R.C.S.) ... | ... | ... | ... Rangoon. |
| Marshall, Lt.-Col. T. E. (R.A.) ... | ... | ... | ... <i>Europe</i> . |
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| Martin, Capt. C. De. C. (I.M.S.) ... | ... | ... | ... <i>England</i> . |
| Martin, Capt. E. H. de C. ... | ... | ... | ... <i>England</i> . |
| Martin, F. A. ... | ... | ... | ... <i>England</i> . |
| Martin, Major J. ... | ... | ... | ... Chanak. |
| Martin, S. J. ... | ... | ... | ... Binsar. |
| Mason, Major L. (M.C., I.F.S.) ... | ... | ... | ... Saugor. |
| Massy, Major W. J. ... | ... | ... | ... <i>England</i> . |
| Matthews, W. H. ... | ... | ... | ... Darjeeling. |
| Maund, Lt. J. A. H. ... | ... | ... | ... <i>England</i> . |
| Maung Po Bye (K.S.M. & F.R.C.I.) ... | ... | ... | ... Myaung-Mya. |
| Mawson, Mrs. G. T. ... | ... | ... | ... Malad. |
| Maxwell, R. M. (I.C.S.) ... | ... | ... | ... Poona. |
| Maxwell, Major W. F. (R.E.) ... | ... | ... | ... Mhow. |
| Mayes, W. ... | ... | ... | ... Maymyo. |
| Mayne, Lt.-Col. H. B. (R.G.A.) ... | ... | ... | ... Bombay. |
| Mayo College, The Principal ... | ... | ... | ... Ajmer. |
| McArthur, Lt. A. G. (I.A.R.O.) ... | ... | ... | ... Rosecandy. |
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| McConnell, Lt. R. ... | ... | ... | ... Bombay. |
| McDonough, Lt. A. D. ... | ... | ... | ... Cawnpore. |
| McGlashan, John (C.E.) ... | ... | ... | ... Calcutta. |
| McIntosh, Alex. (C.E.) ... | ... | ... | ... Trichinopoly. |
| McIver, C. D. ... | ... | ... | ... Poona. |
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| McLeod, M. C. ... | ... | ... | ... Calcutta. |
| McLellan, Capt. J. S. ... | ... | ... | ... Poona. |
| McNeill, J. (I.C.S., Retd.) ... | ... | ... | ... <i>Ireland</i> . |
| Mead, Mr. P. J. (C.I.E., I.C.S.) ... | ... | ... | ... Bombay. |
| Mehta, Dr. M. V. (M.R.C.P., L.M. & S.) ... | ... | ... | ... Bombay. |
| Meinertzhagen, Lt.-Col. R. ... | ... | ... | ... <i>London</i> . |

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|---|-----|-----|-----|-------------------|
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| Menon, K. G. ... | ... | ... | ... | Trichoor, Cochin. |
| Mercer, David ... | ... | ... | ... | England. |
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| Mess Secretary, R. A. Mess .. | .. | ... | ... | Mhow. |
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| Mess Secretary, 41st Dogras. | | | | |
| Mess Secretary, 2/35th Sikhs. | | | | |
| Mess Secretary, 58th Rifles. | | | | |
| Mess Secretary, 109th Infantry. | | | | |
| Mess Secretary, Staff College... | ... | ... | ... | Quetta. |
| Milburne, Wm. ... | ... | ... | ... | Tezpur. |
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| Miller, A. C. ... | ... | ... | ... | Poona. |
| Miller, Lt. J. G. ... | ... | ... | ... | England. |
| Millett, H. J. C. (I.F.S.) ... | ... | ... | ... | Dharwar. |
| Mills, J. P. (I.C.S.) .. | .. | ... | ... | London. |
| Milner, C. E. ... | ... | ... | ... | Rangoon. |
| Milroy, A. J. W. ... | ... | ... | ... | Lumding. |
| Mitchell, F. J. ... | ... | ... | ... | London |
| Mitchell, Capt. R. St. J. (R.E.) .. | .. | ... | ... | Bombay. |
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| Montagnon, D. J. ... | ... | ... | ... | Bindukuri. |
| Monte, Dr. D. A. de (L.M. & S.) ... | ... | ... | ... | Bandra. |
| Monteath, J. (I.C.S.) ... | ... | ... | ... | Bombay. |
| Montgomerie, A. (I.C.S.) ... | ... | ... | ... | Belgaum. |
| Montgomerie, H. (I.C.S.) ... | ... | ... | ... | Sukkur. |
| McIntmorency, G. F. de (I.C.S.) ... | ... | ... | ... | Delhi. |
| Moore, H. B. ... | ... | ... | ... | Bombay. |
| Moore, J. ... | ... | ... | ... | Madras. |
| Moore, T. D. ... | ... | ... | ... | England. |
| Moore, W. G. ... | ... | ... | ... | England. |
| Morrell, A. C. .. | ... | ... | ... | Travancore. |
| Morris, Chas. F. ... | ... | ... | ... | Bombay. |

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| Morris, A. P. (B.Sc.) | ... | ... | ... | ... | Insein. |
| Morris, R. C. | ... | ... | ... | ... | Attikan, P. O. |
| Moss, Capt. E. de V. | ... | ... | ... | ... | Ali Masjid. |
| Motilal Vallabji | ... | ... | ... | ... | Bombay. |
| Moylan, W. M. | ... | ... | ... | ... | Jamtee. |
| Moynan, Dr. R. N. O. | ... | ... | ... | ... | Bilaspur, C. P. |
| Mudhol, Shrimant Malojirao Paje | ... | ... | ... | ... | Ghorpade, |
| Chief of | ... | ... | ... | ... | Mudhol, S. M. C. |
| Muir Central College, The Principal | ... | ... | ... | ... | Allahabad. |
| Muir, G. B. F. (I.C.S.) | ... | ... | ... | ... | Naini Tal. |
| Muirhead, Lt. J. M. | ... | ... | ... | ... | Bombay. |
| Mullan, Prof. J. P. (M.A., F.L.S., F.Z.S.) | ... | ... | ... | ... | Bombay. |
| Mulroney, J. T. | ... | ... | ... | ... | Siliguri. |
| Mundy, N. S. | ... | ... | ... | ... | Silchar, Cachar. |
| Munn, Leonard (B.E.) | ... | ... | ... | ... | England. |
| Munns, F. A. C. | ... | ... | ... | ... | Motipur. |
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| Murray, Lt.-Col. J. H. (I.M.S., C.I.E.) | ... | ... | ... | ... | Bombay. |
| Mysore, The Director of Agriculture | ... | ... | ... | ... | Bangalore. |
| Mysore, The Curator, Mysore Government Museum. | ... | ... | ... | ... | Bangalore. |
| Nagpur, Central Museum, The Curator | ... | ... | ... | ... | Nagpur, C. P. |
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| Nand Kumar Twari (B.Sc.) | ... | ... | ... | ... | Benares. |
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| Nevill, Humphry | ... | ... | ... | ... | Cowcoody. |
| Newcome, Lionel | ... | ... | ... | ... | Somwarpet, P. C. |
| Newland, Major W. B. M. (I.M.S.) | ... | ... | ... | ... | Bombay. |
| Newman, E. G. | ... | ... | ... | ... | Bombay. |
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| Nicholls, Major W. A. (R.H.A.) | ... | ... | ... | ... | England. |
| Nicholson, K. G. | ... | ... | ... | ... | Bombay. |
| Nicolas, Mrs. E. H. A. | ... | ... | ... | ... | London, England. |
| Niederer, George | ... | ... | ... | ... | Bombay. |
| Nightingale, Wm. T. | ... | ... | ... | ... | Shillong. |
| Nizam's College, The Librarian | ... | ... | ... | ... | Hyderabad, Deccan. |
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| Norries, J. P. | ... | ... | ... | ... | Philadelphia, U. S. |

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| O'Brien J. Riley | ... | ... | ... Bombay. |
| O'Brien, P. | ... | ... | ... Bombay. |
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| O'Connor, Dr. Francis W. | ... | ... | ... Assam. |
| O'Donel, H. V. | ... | ... | ... Hasimara. |
| O'Donnell, O. | ... | ... | ... <i>England</i> . |
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| Ogilvie, A. W. (I.F.S.) | ... | ... | ... <i>England</i> . |
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| Oliver, Major D. G. | ... | ... | ... Srinagar. |
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| Osborne, A. F. | ... | ... | ... Tuticorin. |
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| Osmaston, B. B. (I.F.S., C.I.E.) | ... | ... | ... Pachmari. |
| Ouseley, Mrs. W. | ... | ... | ... Herbertpur. |
| Owen, W. C. Tudor (I.C.S.) | ... | ... | ... <i>England</i> . |
| Page, W. T. (F.Z.S.) | ... | ... | ... <i>England</i> . |
| Palanpur, H. H. Capt. Nawab Saheb Taley Mahomed Khan | ... | ... | ... Palanpur. |
| Panchgani, Lady Superior St. Joseph's Convent | ... | ... | ... Panchgani. |
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| Panna, H. H. the Maharaja Mohendra Yadvendra Singh Bahadur | ... | ... | .. Panna, C. I. |
| Parish, N. B. | ... | ... | ... Bombay. |
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| Parker, R. N. (I.F.S.) | ... | ... | ... Dehra Dun, U. P. |
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| Parr, Major General H. O. | ... | ... | ... Delhi. |
| Parrington, Major J. W. (R.A., R.F.A.) | ... | ... | ... <i>London</i> . |
| Partridge, C. R. | ... | ... | ... Jalpaiguri. |
| Pasteur Institute of India, The Director | ... | ... | ... Kasauli, Punjab. |
| Pasteur Institute, The Director | ... | ... | .. Rangoon. |
| Patna College, The Librarian | ... | ... | ... Bankipore. |
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| Pears, S. E. (C.I.E., I.C.S.) | ... | ... | ... Peshawar. |
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| Pearson, R. S. (I.F.S.) | ... | ... | ... Dehra Dun, U. P. |
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| Peppe, Capt. F. H. (R.F.A.) | ... | ... | ... Nowshera. |
| Percival, A. P. (I.F.S.) | ... | ... | ... <i>England</i> . |

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| Perfect, E. ... | ... | ... | ... Gooty. |
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| Perry, Major S. (B.A.) ... | ... | ... | ... Maymyo. |
| Pershouse, Major Standley ... | ... | ... | ... London. |
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| Phillips, W. W. A. ... | ... | ... | ... Ceylon. |
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| Primrose, Alex. M. ... | ... | ... | ... Golaghat. |
| Procter, Sir Henry E. (C. B. E.) ... | ... | ... | ... London. |
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| Punjab Agricultural College, The Principal ... | ... | ... | ... Lyallpur. |
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| Purkis, H. Vernon ... | ... | ... | ... England. |
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| Quin, Lt.-Col. R. P. Wimys ... | ... | ... | ... London. |
| Raitt, W. Chas. ... | ... | ... | ... Kutta. |
| Rajkot, H. H. Sir Lakhajiraj (K.C.I.E.)... .. | ... | ... | ... Rajkot. |
| Rajkumar College, The Principal ... | ... | ... | ... Rajkot. |

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| Rajkumar College, The Principal | .. | .. | Raipur. |
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| Rane, K. R. (M.M. & S.P.) | ... | ... | Juven, Bombay. |
| Rane, Y. K. | .. | ... | Juven, Bombay. |
| Rawalpindi Club, Ltd., The Secretary | ... | ... | Rawalpindi. |
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| Richmond, R. D. (I.F.S.) | ... | ... | London. |
| Ridland, J. G. | ... | ... | Bombay. |
| Rimington, F. J. | ... | ... | Bombay. |
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| Ritchie, A. B. | ... | ... | Rangoon. |
| Ritchie, Major W. D. (I.M.S.) | ... | .. | Tezpur. |
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| Roberts, Dr. C. L. Digby | ... | ... | Darjeeling. |
| Roberts, Lt.-Col. Sir James (I.M.S., C.I.E.) | ... | ... | Bombay. |
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| Robertson, J. H. (I.C.S.) | ... | ... | Madras. |
| Robertson, Laurence (C.S.I., I.C.S.) | ... | ... | Poona. |
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| Robinson, H. C. | ... | ... | Kuala Lumpur. |
| Robinson, Capt. J. A. | ... | ... | Bombay. |
| Robinson, J. B. | ... | ... | Sagrampur. |
| Robinson, Hon'ble Mr. Justice Sir S. M. | ... | ... | Rangoon. |
| Rodger, A. (I.F.S.) | ... | ... | Rangoon. |
| Rogers, C. G. (I.F.S.) | ... | ... | London. |
| Rogers, Rev. K. St. A. (C.M.S.) | ... | ... | Nairobi. |
| Rogers, W. S. | ... | ... | Bombay. |
| Rondano, Rev. A. (S.J.) | ... | ... | Kankanady. |
| Rosenthal, F. M. B. | ... | ... | Secur. derabad. |
| Ross, Major E. J. | ... | ... | Quetta. |
| Routh, Lt.-Col. G. F. S. | ... | ... | Bombay. |
| Row, Lt.-Col. G. R. (I.A.) | ... | ... | Shillong. |
| Row, Dr. R. (M.D.) | ... | ... | Bombay. |
| Rowlandson, B. C. | ... | ... | Bombay. |
| Rowson, C. | ... | ... | Munnar. |
| Roy, N. | ... | ... | Dacca. |
| Royal Asiatic Society, The Honorary Secretary | ... | ... | Bombay. |
| Ruddle, W. H. | ... | ... | Madras. |
| Rudkin, Capt. B. A. | ... | ... | Bombay. |

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| Ruttledge, Lt. R. F. | ... | ... | ... | Bangalore. |
| Rutz, Fr. | ... | ... | ... | Karachi. |
| Rynd, Major F. F. (R.A.) | ... | ... | ... | Karachi. |
| Ryves, The Hon'ble Mr. Justice A. E. | ... | ... | ... | Allahabad. |
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| Sabnis, T. S. (B.A., B.Sc.) | ... | ... | ... | Bombay. |
| Sabour, The Principal, College of Agriculture | ... | ... | ... | Sabour, Bengal. |
| Salkeld, Major R. E. | ... | ... | ... | England. |
| Sanders, A. D. | ... | ... | ... | Brazil. |
| Sanders, D. F. | ... | ... | ... | Calcutta. |
| Sanderson, P. M. D. | ... | ... | ... | Bombay |
| Sandilands, Dr. J. E. (M.C., M.A., M.D.) | ... | ... | ... | Bombay. |
| Saone, G. Prier De | ... | ... | ... | England. |
| Sarangarh, The Hon'ble Raja Jawahir Singh | ... | ... | ... | Sarangarh, C. P. |
| Sardah, The Librarian Police Memorial Library | ... | ... | ... | Sardah. |
| Sarkar, Capt. S. (I.M.S.) | ... | ... | ... | England. |
| Satya Churn Law | ... | ... | ... | Calcutta. |
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| Saunders, H. F. | ... | ... | ... | Madura, S. I. |
| Savantwadi, H. H. The Sardesai of | ... | ... | ... | Savantwadi. |
| Savile, L. H. | ... | ... | ... | England. |
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| Scarlett, Lt.-Col. J. A. (R.H.A.) | ... | ... | ... | E. E. F. |
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| Scott, Major F. B. (I.A.) | ... | ... | ... | England. |
| Scott, R. P. | ... | ... | ... | Rangoon. |
| Scott-Coward, C. W. | ... | ... | ... | Bellary. |
| Scroope, Capt. C. F. | ... | ... | ... | Bombay. |
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| Secunderabad Club Library, | The | Honorary | | |
| Secretary | ... | ... | ... | Secunderabad. |
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| Segar, Mrs. W. J. | ... | ... | ... | Dharwar. |
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| Shaw, G. E. | ... | ... | ... | Piyang. |
| Shaw, G. L. | ... | ... | ... | Jalpaiguri. |
| Sheather, A. L. | ... | ... | ... | England. |
| Shebbeare, E. O. | ... | ... | ... | Dow Hill P. O. |
| Shephard, T. F. G. | ... | ... | ... | Bulsar. |
| Shepherd, W. C. (I.C.S.) | ... | ... | ... | Bombay. |
| Sheppard, S. T. | ... | ... | ... | Bombay. |

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| Shirley, G. S. | ... Rangoon. |
| Shortland, C. V. N. (A.M.I.C.E.) | ... Nagpur. |
| Shortt, Capt. H. E. (I.M.S.) | ... Bombay. |
| Shortt, D. M. | ... Villupuram. |
| Shortt, W. H. O. | ... Mongyr. |
| Shuttleworth, H. L. (M.A., F.R.G.S., I.C.S.) | ... Rangoon. |
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| Simmons, R. M. | ... Rutlam. |
| Simonds, Major M. H. | ... <i>England.</i> |
| Simons, H. B. | ... Dehra Dun. |
| Simpson, Lt.-Col. J. C. | ... Bannu. |
| Sinclair, R. L. | ... Dharwar. |
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| Sitwell, S. A. H. | ... Calcutta. |
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| Skeen, Maj.-Genl. A. | ... Kohat. |
| Skinner, Major J. M. (I.M.S.) | ... Bombay. |
| Skinner, Major R. B. (R.E.) | ... <i>England.</i> |
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| Sladen, J. M. (I.C.S.) | ... Belgaum. |
| Slater, A. F. | .. Aligarh. |
| Slater, Major A. F. M. | ... <i>London.</i> |
| Slater, J. Sanders | ... <i>England.</i> |
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| Smith, Major O. A. | ... Hazaribagh. |
| Somerville, Geo. | ... Rangoon. |
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| Stamper, Lt. W. L. | .. Roorkee. |

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| Stephens, L. B. | ... | ... | ... | ... | England. |
| Stephenson, G. C. | ... | ... | ... | ... | London. |
| Stevens, Herbert | ... | ... | ... | ... | England. |
| Stevenson, Lt.-Col. W. D. H. (I.M.S.) | ... | ... | ... | ... | Simla. |
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| Stewart, A. P. | ... | ... | ... | ... | London. |
| Stewart, E. A. | ... | ... | ... | ... | England. |
| Stewart, C. G. | ... | ... | ... | ... | Rangoon. |
| Stewart, Capt. D. M. | ... | ... | ... | ... | Poona. |
| Stewart, Lt.-Col. G. E. (I.M.S.) | ... | ... | ... | ... | Bombay. |
| Stewart, John | ... | ... | ... | ... | Scotland. |
| Stewart, R. R. (PH.D.) | ... | ... | ... | ... | Rawalpindi. |
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| Stirling, Lt. J. E. | ... | ... | ... | ... | Meerut. |
| Stirling, J. H. | ... | ... | ... | ... | Jodhpur. |
| Stirling, Col. Wm. (C.M.G., D.S.O.) | ... | ... | ... | ... | Belgaum. |
| Stockley, Major C. H. | ... | ... | ... | ... | Jhelum. |
| Stokes, H. G. (C.I.E., I.C.S.) | ... | ... | ... | ... | Madras. |
| Stokes, I. W. | ... | ... | ... | ... | Bombay. |
| Stone, Capt. F. H. S. (R.N.R.) | ... | ... | ... | ... | Bombay. |
| Stoney, R. F. | ... | ... | ... | ... | Madras. |
| Story, S. S. | ... | ... | ... | ... | England. |
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| Stuart, J. D. | ... | ... | ... | ... | Rangoon. |
| Stubbs, L. M. (I.C.S.) | ... | ... | ... | ... | Bareilly. |
| Sudan, Govt. Museum, Curator | ... | ... | ... | ... | Sudan. |
| Sullivan, Col. G. D. F. | ... | ... | ... | ... | London. |
| Sunth, Maharana Shri Jarwarsinhjee, Raja Saheb of P. O. Sunth Ram-
pur. | ... | ... | ... | ... | Bombay. |
| Suter, Dr. M. F. (D. SC.) | ... | ... | ... | ... | London. |
| Swinhoe, General C. | ... | ... | ... | ... | Vandiperiyar P. O. |
| Sylvester, Capt. E. C. (R.F.A.) | ... | ... | ... | ... | Colombo. |
| Symons, C. T. | ... | ... | ... | ... | Madras. |
| Symons, Lt.-Col. T. H. (I.M.S., O.B.E.) | ... | ... | ... | ... | Ceylon. |
| Tailyour, B. P. | ... | ... | ... | ... | England. |
| Talbot, G. W. | ... | ... | ... | ... | Cachar. |
| Talbot, R. H. | ... | ... | ... | ... | Bombay. |
| Taleyarkhan, K. M. (Bar.-at-Law) | ... | ... | ... | ... | |

| | | | | | |
|--|-----|-----|-----|-----|------------------------------|
| Tambe, Dr. Gopal Ramchandra (M.A., B.Sc., L.M. & s.) | ... | ... | ... | ... | Narsinghpur. |
| Tasker, T. J. (I.C.S.) | ... | ... | ... | ... | England. |
| Tate, Capt. A. R. W. | ... | ... | ... | ... | Quetta. |
| Tavoy Club, The Honorary Secretary | ... | ... | ... | ... | Tavoy, Burma. |
| Taylor, Lt.-Col. G. (R.F.A.) | ... | ... | ... | ... | London. |
| Taylor, Dr. W. R. (M.R.C.S., L.R.C.S.) | ... | ... | ... | ... | Insein. |
| Tenison, Major W. P. C. (R.A., D.S.O.) | ... | ... | ... | ... | England. |
| Thatcher, E. C. | ... | ... | ... | ... | Dehra Dun. |
| Theobald, Wm. | ... | ... | ... | ... | Mysore, S. I. |
| Thom, W. S. | ... | ... | ... | ... | Paletwa, Aracan Hill Tracts. |
| Thomas, E. F. (I.C.S.) | ... | ... | ... | ... | London. |
| Thomas, F. | ... | ... | ... | ... | England. |
| Thomas, Roger | ... | ... | ... | ... | Baghdad. |
| Thomason College, The Principal | ... | ... | ... | ... | Roorkee. |
| Thomson, Major D. B. | ... | ... | ... | ... | England. |
| Thomson, Lt. H. | ... | ... | ... | ... | England. |
| Thorns-Roberts, J. W. B. | ... | ... | ... | ... | Rangoon. |
| Thornton, H. A. (I.C.S.) | ... | ... | ... | ... | Lashio, Shon States. |
| Thuillier, Major-Genl. H. F. (R.E.) | ... | ... | ... | ... | England. |
| Thullier, Major L. C. (I.A.) | ... | ... | ... | ... | London. |
| Tibbs, Rev. P. G. | ... | ... | ... | ... | Bombay. |
| Ticehurst, Dr. C. B. (M.A., M.B. O.U., R.A.M.C.) | ... | ... | ... | ... | England. |
| Tietkens, A. J. H. | ... | ... | ... | ... | Darjeeling. |
| Tilden, H. B. (F.C.S.) | ... | ... | ... | ... | Calcutta. |
| Tomlinson, A. G. | ... | ... | ... | ... | Busrah. |
| Travers, W. L. (C.B.E.) | ... | ... | ... | ... | Jalpaiguri. |
| Traylen, G. D. | ... | ... | ... | ... | Bombay. |
| Treasurywala, N. J. | ... | ... | ... | ... | Bombay. |
| Trevelyan, Capt. W. R. F. | ... | ... | ... | ... | Bhamo. |
| Trevenen, Major W. B. | ... | ... | ... | ... | Poona. |
| Triggs, Bernard | ... | ... | ... | ... | Rutlam. |
| Trigg, C. T. | ... | ... | ... | ... | Jalpaiguri. |
| Trivandrum, The Director, Government Museum and Public Gardens | ... | ... | ... | ... | Trivandrum. |
| Trotter, Lt.-Col. E. W. | ... | ... | ... | ... | Bangkok, Siam. |
| Troup, R. S. (I.F.S.) | ... | ... | ... | ... | Rangoon. |
| Tunnard, T. E. | ... | ... | ... | ... | Ceylon. |
| Tunstall, A. C. | ... | ... | ... | ... | Assam. |
| Turkhud, Dr. D. A. (M.B., C.M., etc.) | ... | ... | ... | ... | Bombay. |
| Turner, Sir Montague | ... | ... | ... | ... | London. |
| Tweedie, A. G. | ... | ... | ... | ... | Calcutta. |
| Tyers, G. A. V. | ... | ... | ... | ... | England. |
| Tyler, H. H. F. M. (I.C.S.) | ... | ... | ... | ... | Masulipatam. |
| Tyrrell, Lt.-Col. J. R. (I.M.S.) | ... | ... | ... | ... | Nowgong. |
| Tyson, John D. (I.C.A.) | ... | ... | ... | ... | Calcutta. |
| Tytler, Major-General H. C. (C.M.G., C.I.E., D.S.O.) | ... | ... | ... | ... | Murree. |

| | | | | |
|---|-----|-----|--------------|-------------------|
| Ubsdell, Lt. A. R. | ... | ... | ... | Calcutta. |
| Underwood, Rev. J. E. | ... | ... | ... | England. |
| United Provinces, Educational
Government | ... | ... | Secretary to | Allahabad. |
| United Service Club, The Secretary | .. | .. | .. | Bangalore. |
| United Service Library, Hony. Secretary | ... | ... | ... | Poona. |
| Upton, T. E. T. | ... | ... | ... | Calcutta. |
| Urwin, Lt.-Col. J. J. (I.M.S.) | ... | ... | ... | Cuttack. |
| Usher, F. L. | ... | ... | ... | Bangalore. |
| U. S. Department of Agriculture, The Librarian | ... | ... | ... | Washington, D. C. |
| Vaidya, V. P. (Bar.-at-Law) | ... | ... | ... | Bombay. |
| Vakil, B. N. (B.sc.) | ... | ... | ... | Bombay. |
| Van Het Algemeen Proefstation Der, A.V.R.O.S.
De Directeur | ... | ... | ... | Medan, Sumatra. |
| Van Ingen, E. M. | ... | ... | ... | Mysore |
| Vellore Club, The Honorary Secretary | ... | ... | ... | Vellore, S. I. |
| Vernon, H. A. B. (I.C.S.) | ... | ... | ... | Saidapet. |
| Victoria College, The Principal | ... | ... | ... | Palghat. |
| Victoria Memorial Park, The Hon'ble Secretary | ... | ... | ... | Rangoon. |
| Victoria Technical Institute, The Curator and
Librarian | ... | ... | ... | Nagpur. |
| Vijayarajji, Maharaj Kumar Shri | ... | ... | ... | Bhuj, Cutch. |
| Villar, A. R. (I.F.S.) | ... | ... | ... | Rangoon. |
| Vinayak Rao, Rao Bahadur M. | ... | ... | ... | Calcutta. |
| Vincent, H. | ... | ... | ... | Poona. |
| Vincent, The Hon'ble Sir William (I.C.S., K.C.S.I.) | ... | ... | ... | Simla. |
| Vithuldas Damodhar Thakersey, Sir, Kt. | ... | ... | ... | Bombay. |
| Vitty, G. P. | ... | ... | ... | England. |
| Volkart, L. | ... | ... | ... | Bombay. |
| Wait, W. E. | ... | ... | ... | Colombo. |
| Wakefield, J. G. | ... | ... | ... | Gaya, Bengal. |
| Walker, J. S. E. | ... | ... | ... | Ryam |
| Walker, Major W. B. (R.A., F.A.) | ... | ... | ... | Rangoon. |
| Walker, Lt. Col. F. Spring (I.A.) | ... | ... | ... | Bombay. |
| Wall, Col. F. (I.M.S., C.M.Z.S., C.M.G.) | ... | ... | ... | Karachi. |
| Walsh, E. P. (I.C.S.) | ... | ... | ... | Tanjore. |
| Walsh, M. P. (Bar.-at-Law) | ... | ... | ... | Karachi. |
| Walters, O. H. (I.F.S.) | ... | ... | ... | Simla. |
| Wapshare, J. H. | ... | ... | ... | Nilgiris. |
| Warburton, A. P. | ... | ... | ... | Moulmein. |
| Ward, Capt. W. R. (O.B.C.) | ... | ... | ... | Teheran. |
| Ward, F. Kingdon | ... | ... | ... | London. |
| Warton, Major C. P. F. | ... | ... | ... | Bombay. |
| Warwick, M. | ... | ... | ... | Sat Jal. |
| Waterfield, E. H. (I.C.S.) | ... | ... | ... | Dharwar. |
| Wathen, Mrs. G. A. | ... | ... | ... | England. |
| Watney, Col. C. W. | ... | ... | ... | England. |

| | | | |
|--|-----|-----|----------------------|
| Watson, Lt.-Col. H. R. | ... | ... | ... Jhelum. |
| Watson, H. W. A. (I.F.S.) | ... | ... | ... Maymyo. |
| Watson, Lt.-Col. J. W. (I.M.S.) | ... | ... | ... Bombay. |
| Watson, Philip | ... | ... | ... Rangoon. |
| Watts, Lt.-Col. G. A. R. | ... | ... | ... <i>England</i> . |
| Weatherly, Capt. E. F. C. F. | ... | ... | ... Bombay. |
| Webb, G. R. | ... | ... | ... Bombay. |
| Webb, M. (I.C.S.) | ... | ... | ... Satara. |
| Webb, J. E. N. | ... | ... | ... Calcutta. |
| Webb, Major Geo. A. | ... | ... | ... Mirik. |
| Webb-Ware, George | ... | ... | ... Madura. |
| Weldon, Dr. R. P. (M.D.) | ... | ... | .. Lumding. |
| Wells, Dr. H. E. (M.B.) | ... | ... | ... Insein. |
| West, L. C. | ... | ... | ... Hubli. |
| Western, Miss R. H. | ... | ... | ... Sukkur. |
| Weston, A. T. | ... | ... | ... Papun. |
| Whalley, G. P. | ... | ... | ... Calcutta. |
| White, G. H. | ... | ... | ... <i>England</i> . |
| White, L. S. (I.C.S.) | ... | ... | .. <i>London</i> . |
| White, Capt. W. T. | ... | ... | ... Monywa. |
| Whitehead, John (I.F.S.) | ... | ... | ... Chakratta, U. P. |
| Whymper, S. L. | ... | ... | ... <i>London</i> . |
| Whyte, W. | ... | ... | ... Rangoon. |
| Wickham, P. F. (C.E.) | ... | ... | ... Rangoon. |
| Wilkie, J. S. | ... | ... | ... Madras. |
| Willcox, A. V. | ... | ... | ... <i>Ireland</i> . |
| Williams, Lt.-Col. C. E. (I.M.S.) | ... | ... | ... Rangoon. |
| Williams, Capt. J. K. (I.A.R.O.) | ... | ... | .. Bombay. |
| Williams, Lt. Chas. H. | ... | ... | ... Poona. |
| Williamson, A. (I.C.S.) | ... | ... | ... Shwegyin. |
| Williamson, F. W. (I.C.S.) | ... | ... | ... Motihari. |
| Williamson, P. R. C. | ... | ... | ... <i>England</i> . |
| Willingdon, H. E. Lord (G.C.S.I., G.C.I.E.) | ... | ... | ... Madras. |
| Wilson, A. F. | ... | ... | ... Madras. |
| Wilson, A. R. | ... | ... | ... Almora, U. P. |
| Wilson, Bt.-Lt.-Col. Sir A. T. (C.S.I., C.M.G.,
C.I.E., D.S.O.) | ... | ... | ... Baghdad. |
| Wilson, Major C. H. E. (R.F.A.) | ... | ... | ... Khaiaghoda. |
| Wilson, Mrs. D. W. | ... | ... | ... Bombay. |
| Wilson, J. C. C. | ... | ... | ... Papun, Burma. |
| Wilson, J. M. | ... | ... | ... Assam. |
| Wilson, R. A. (I.C.S.) | ... | ... | ... Amraoti. |
| Winch, H. J. | ... | ... | ... Shivrajpur. |
| Wise, George M. | ... | ... | ... Bombay. |
| Withers, D. S. | ... | ... | ... <i>Europe</i> . |
| Witt, D. O. (I.F.S.) | ... | ... | ... Ranchi. |
| Wood, Lt.-Col. H. (R.F.) | ... | ... | ... Mussoorie. |
| Wood, John A. | ... | ... | ... <i>London</i> . |

| | | | | |
|--|-----|-----|-----|---------------|
| Wood, Lt.-Col. W. M. P. | ... | ... | ... | Rajkot |
| Woods, D. F. | ... | ... | .. | Bombay. |
| Wordsworth, Major R. G. | ... | ... | ... | Bombay. |
| Worgan, Col. R. B. | ... | ... | ... | Camp India. |
| Wrangham Hardy, G. | ... | ... | ... | Darjeeling. |
| Wright, Revd. G. A. A. | ... | ... | ... | Coimbatore. |
| Wright, H. C. | ... | ... | ... | London. |
| Wright, J. M. (I.C.S.) | ... | ... | ... | Myaungmya. |
| Wright, Major Robert E. (I.M.S.) | ... | ... | ... | Madras. |
| Wright, Major W. D. (I.M.S.) | ... | ... | ... | Bombay. |
| | | | | |
| Yeolekar, T. G. (M.A., B.Sc.) | ... | ... | ... | Poona. |
| Young, F. T. | ... | ... | ... | Bombay. |
| Young, Lt.-Col. H. G. (D.S.O., R.F.A.) | ... | ... | ... | Lahore Cantt. |
| Young, J. V. (I.F.S.) | ... | ... | ... | Rangoon. |
| Young, R. H. | ... | ... | ... | Karachi. |
| Yule, Major R. A. (I.A.) | ... | ... | ... | Peshawar. |
| | | | | |
| Zollinger, A. E. | ... | ... | ... | Tuticorin. |
| Zumbro, Rev. W. M. | ... | ... | ... | Madura. |
| Zurmuhle, E. | ... | ... | ... | Bombay. |

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January to 31st December 1920.

| | Rs. a. p. | Rs. a. p. | | Rs. a. p. |
|---|----------------|------------|--|--------------|
| RECEIPTS. | | | PAYMENTS. | |
| Cash on 1st January 1920 | ... | ... | Bank over draft on 1st January 1920 | 8,863 15 4 |
| Subscription for 1914 (in arrears) | 15 0 0 | 77 2 11 | Journal Account | 14,684 12 1 |
| " " 1915 | 30 0 0 | | Salaries | 3,180 0 0 |
| " " 1916 | 45 0 0 | | General Charges | 1,523 12 3 |
| " " 1917 | 45 0 0 | | Rent | 951 10 6 |
| " " 1918 | 135 0 0 | | Printing and Stationery | 580 0 6 |
| " " 1919 | 1,200 8 0 | | Postage | 190 0 0 |
| " " the current year | 18,992 12 6 | | Library Account | 250 0 0 |
| " " 1921 (in advance) | 1,047 0 0 | | Furniture Account | 246 13 2 |
| " " 1922 (") | 45 0 0 | | Audit Fee | 830 12 0 |
| " " 1923 (") | 19 8 0 | | Fire Insurance Premium | 17 0 6 |
| Life " Membership | 201 0 0 | | Income Tax | 820 10 8 |
| | 21,775 12 6 | 31,691 1 6 | Charges to be recovered | 236 4 3 |
| <i>Less—Refund of Subscriptions</i> | 84 11 0 | | Sundry Expenses | 894 12 1 |
| | 5,000 0 0 | | Snake Chart | 229 9 6 |
| Grant-in-aid from the Bombay Government | 1,130 0 0 | | Gamo Birds | 530 0 0 |
| Entrance Fees | 1,680 7 5 | | Passage to India for Mr. Ellison | 15,265 15 11 |
| Sales of Journal | 98 8 0 | | Indian Ducks and their Allies | 530 0 0 |
| Sales of Flora | 1 0 0 | | Advance made to Staff during the year | 15,736 15 11 |
| " " Pigeon Book | 6 10 0 | | Remittance to National Bank of India, Ltd., London, on Current Account | 5,000 0 0 |
| " " List of Butterflies | 143 13 0 | | Bombay | 1,821 10 11 |
| Snake Charts (in advance) | 49 12 0 | | Cash on hand | 6,913 0 11 |
| Palms of India (") | 15 0 0 | | | 59,499 10 11 |
| Indian Ducks and their Allies | 30 0 0 | | | 8,800 0 0 |
| Registration fees | 328 12 0 | | | 40,000 0 0 |
| Sundries | 644 1 1 | | | 14,000 0 0 |
| Interest on Current Account | 154 15 0 | | | 16,000 0 0 |
| " " Investments | 2,245 13 0 | | | 47,800 0 0 |
| " " Fixed Deposits | 162 11 0 | | | £ 1,875 14 0 |
| Advance to staff recovered | 240 0 0 | | | Rs. 69 12 0 |
| | Rs. 50 | | | |
| | " 1919 | | | |
| | " 1920 | | | |
| | 130 | | | |
| Proceeds of Treasury Bills | 15,000 0 0 | 11,931 6 6 | I Balance on Current Account with the National Bank of India, London, on 31st December 1920 | 47,800 0 0 |
| " " of 6½% War Bonds | 10,400 0 0 | 25,400 0 0 | II Balance on Current Account with the National Bank of India, London, on 31st December 1920 | £ 1,875 14 0 |
| | | | III Postal Certificates with the Hon. Secretary | Rs. 69 12 0 |
| | | | | |

We have seen a letter from the National Bank of India, Limited, to the effect that the above Securities were held on the Society's behalf on 31st December 1920 as also a certificate from the National Bank, London, for the balance with them, and the postal certificates.

BOMBAY, 27th February 1921.
Examined and found correct.
(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

(Sd.) H. F. LODGE,
Honorary Treasurer,
Bombay Natural History Society.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

MAMMAL FUND ACCOUNT.

BOMBAY NATURAL HISTORY SOCIETY.

STATEMENT of ACCOUNTS from 1st January to 31st December 1920.

| | Rs. | a. | p. | | Rs. | a. | p. |
|--|-------|-----|----|--|-------|----|-------------|
| OPENING BALANCE OF 1ST JANUARY 1920. | | | | | | | |
| Fixed Deposit with Mercantile Bank .. | 2,000 | 0 | 0 | Salary of Mr. Wells .. | .. | .. | .. |
| Balance of Postage .. | 10 | 3 | 6 | Salary and Allowance .. | .. | .. | .. |
| Balance of Petty Cash .. | 31 | 2 | 10 | Baptista .. | .. | .. | .. |
| Balance with National Bank of India .. | 5,197 | 121 | | Nissa Prag .. | .. | .. | .. |
| | | | | Raojee .. | .. | .. | .. |
| | | | | Amore .. | .. | .. | .. |
| | | | | LaPersone .. | .. | .. | .. |
| Donations received during 1920 .. | 3,625 | 3 | 10 | Cost of Cartridges .. | .. | .. | 70 4 0 |
| Interest on Investments .. | 187 | 8 | 0 | Audit Fee .. | .. | .. | 30 0 0 |
| Interest on Current Account .. | 103 | 12 | 0 | Freight on Specimen Boxes .. | .. | .. | 47 0 0 |
| Interest on Fixed Deposit .. | 138 | 15 | 0 | Cheques purchased .. | .. | .. | 20 2 6 |
| Expenses received from Colonel Holton .. | 218 | 1 | 0 | Travelling expensess .. | .. | .. | 308 9 0 |
| Sundries .. | 9 | 7 | 0 | General expensess .. | .. | .. | 541 11 1 |
| | | | | Postage and telegram charges .. | .. | .. | 41 2 0 |
| | | | | Collecting expensess .. | .. | .. | 1,158 5 0 |
| | | | | Advance to Staff .. | .. | .. | 30 0 0 |
| | | | | | | | 2,247 11 7 |
| | | | | CASH AND OTHER BALANCES. | | | |
| | | | | Fixed Deposit with Messrs. Cox & Co., Bombay .. | 2,000 | 0 | 0 |
| | | | | On Current Account with National Bank, Bombay .. | 1,612 | 7 | 4 |
| | | | | Advance to Postage .. | 15 | 3 | 6 |
| | | | | | | | 3,627 10 10 |
| | | | | Security with the National Bank of India, Limited, Bombay. | | | |
| | | | | 4% Bombay Port Trust Bonds 1912—Rs. 5,140 | | | |
| | | | | Face value Rs. 5,000. | | | |
| | | | | | | | 11,523 6 3 |

BOMBAY, 27th February 1921.

Examined and found correct.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

(Sd.) H. F. LODGE,
Honorary Treasurer,

Bombay Natural History Society.

(Sd.) A. F. FERGUSON & Co.,
Chartered Accountants, Auditors.

We have seen a letter from the National Bank of India, Limited, to the effect that the above Security was held on the Society's behalf on 31st December 1920.

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