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AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY

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AND

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1906.

"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exculta; malè doctis et barbaris semper inimica fuit."—Linnæus.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—Bruckner, *Théorie du Système Animal*, Leyden, 1767.

. . . . . The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. Taylor, *Norwich*, 1818.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circùm vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Crateridès, ite sub undas;
Ite, recurvato variata corallia truneo
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasi, Ecl. i.

No. 103. JULY 1906.

I.—*On a Tooth of* Ceratodus *and a Dinosaurian Claw from the Lower Jurassic of Victoria, Australia.* By A. Smith Woodward, LL.D., F.R.S., of the British Museum.

[Plate I.]

The Jurassic Vertebrate fauna of the Australian region is still almost unknown, some Ganoid fishes * and, perhaps, a few small Dinosaurian bones † being the only fossils representing it hitherto described. A tooth of *Ceratodus* and a Dinosaurian claw discovered by Mr. W. H. Ferguson in the Lower Jurassic cliffs of Cape Patterson on the south coast of Victoria are thus of special interest. I am indebted to Prof. J. W. Gregory, F.R.S., for the opportunity of studying these specimens.

* A. S. Woodward, "The Fossil Fishes of the Talbragar Beds," Mem. Geol. Surv. N. S. Wales, Palæont. no. 9 (1895); T. S. Hall, "A new Genus and a new Species of Fish from the Mesozoic Rocks of Victoria," Proc. Roy. Soc. Vict. n. s. vol. xii. (1900) art. xvi.

† H. G. Seeley, "On *Agrosaurus Macgillivrayi* (Seeley), a Saurischian Reptile from the N.E. Coast of Australia," Quart. Journ. Geol. Soc. vol. xlvii. (1891) pp. 164–165, with figs.

The tooth of *Ceratodus* (Pl. I. fig. 1) is firmly fixed to a recognizable piece of the splenial bone, and is therefore proved to belong to the left side of the lower jaw. It unfortunately lacks the foremost denticle, but clearly agrees with the majority of the Mesozoic teeth of *Ceratodus* in possessing only four denticles altogether. It is thick and robust, with the grinding-surface slightly convex, but wavy, and marked by a very prominent coarse network of ridges (fig. 1). It is specially remarkable for the long and narrow shape of its crown, which is bounded on the inner side by a nearly straight margin, not angulated opposite the second or third denticle. So far as can be determined from a fragment, the foremost denticle of the tooth appears to have been relatively large, while the others rapidly decrease in size backwards. The second and third denticles are sharply compressed to an acute outer edge, and are separated by deep notches at the outer margin (fig. 1 *a*), though not continued as conspicuous ridges on the crown. Their long axes are not oblique, but directed nearly at right angles to the inner margin. The fourth or hindmost denticle is comparatively blunt. Fine horizontal lines of growth are seen on the flattened inner (fig. 1 *b*) and outer faces of the tooth.

The specimen thus described differs from all the known Mesozoic teeth of *Ceratodus* in its narrowness, combined with the straightness of its inner margin and the direction of its second and third denticles. In these respects, it is interesting to observe, the tooth more nearly approaches that of the existing *Ceratodus* or *Neoceratodus* of Queensland (fig. 2), and its only striking difference from the latter consists in its having four denticles instead of six. The multiplication of the denticles has already been observed in the teeth of certain sharks as they are traced onwards in time*; the same phenomenon obviously occurs in *Ceratodus*.

There is, therefore, no doubt that the tooth from Cape Patterson represents a new species, which may be named *Ceratodus avus*. The fossil proves for the first time that the remarkable Dipnoan genus to which it belongs had already reached the Australian region so long ago as the early part of the Jurassic period. At that epoch *Ceratodus* was still living both in Europe † and in North America ‡, while it survived

* A. S. Woodward, "On the Palæontology of the Selachian Genus *Notidanus*, Cuvier," Geol. Mag. [3] vol. iii. (1886) p. 257.

† *Ceratodus Phillipsi*, Agassiz, 'Rech. Poiss. Foss.' vol. iii. (1837) p. 135, pl. xix. fig. 17; A. S. Woodward, Proc. Geol. Assoc. vol. (1890) p. 292, pl. iii. fig. 5.

‡ *Ceratodus Guentheri*, O. C. Marsh, Amer. Journ. Sci. [3] vol. xv. (1878) p. 76, woodc.

in the African and South American regions at least until the Cretaceous period *.

In the same rock as that from which the tooth of *Ceratodus* was obtained at Cape Patterson Mr. Ferguson found the terminal phalangeal bone shown in fig. 3. Among Jurassic fossils this specimen can only be compared with the claw of a carnivorous Dinosaur, and there is little doubt that it represents a genus more or less related to *Megalosaurus* †. The bone has decayed somewhat in the upper part of its proximal end, but is otherwise well preserved and displays its principal characters. The phalangeal is laterally compressed, so that its greatest transverse diameter is somewhat less than its original depth at the proximal end. The distal tapering half of the bone is only gently curved downwards, but at the same time bends slightly to the left side. The distal half of the lateral face is marked with the usual deep longitudinal groove connected with the fixing and nourishment of the horny claw which originally ensheathed the bone. The proximal end (fig. 3 *a*) is divided, as usual, by a median vertical ridge into two facettes, which are nearly flat. For comparison with this specimen one of the finest known Megalosaurian claws from the English Wealden is shown in fig. 4. The latter is shorter and stouter than the former, and its deep lateral groove extends further backwards; but the general resemblance between the two fossils is very striking.

It is to be hoped that further diligent search may be made at Cape Patterson to recover the Vertebrate fauna indicated by these fragmentary fossils. The discovery of the terrestrial and freshwater life of the Australian region during the Jurassic period would supply a most important deficiency in palæontological knowledge.

EXPLANATION OF PLATE I.

Fig. 1. *Ceratodus avus*, sp. n.; left splenial with lower tooth, from the upper, outer (*a*), and inner (*b*) aspects.—Lower Jurassic; Cape Patterson, Victoria, Australia. *spl.*, splenial bone.

Fig. 2. *Ceratodus Forsteri*, Krefft: left lower tooth from the upper and outer (*a*) aspects.—Recent; Queensland.

Fig. 3. Ungual phalange of carnivorous Dinosaur; lateral and end (*a*) views.—Lower Jurassic; Cape Patterson, Victoria.

Fig. 4. Ungual phalange of a Megalosaurian: lateral and end (*a*) views, two thirds nat. size.—Wealden; Sussex. [Brit. Mus. no. R. 3176.]

Figs. 1–3 are of the natural size.

* *Ceratodus africanus*, E. Haug, 'Comptes Rendus,' vol. cxxxviii. 1904) p. 1529; from Djoua, Timassânine, Sahara. *Ceratodus Iheringi*, . Ameghino, Public. Univ. La Plata, no. 2 (1904), p. 10, fig. 1; from Patagonia.

† R. Owen, "Fossil Reptilia of the Wealden and Purbeck Formations," pt. iii. (Mon. Palæont. Soc. 1855 [1857]), p. 19, pl. x.

II.—*Notes on Irish Hydrachnida; with Descriptions of a new Genus and Two new Species.* By J. N. Halbert.

[Plate II.]

The following paper contains records of some species of new or rare Hydrachnida selected from a large amount of material found in various localities in Ireland during the last five years. Of these species two appear not to have been previously described; one of them proves to be the type of a new genus, while of the remaining species eight are here recorded for the first time from the Britannic * area.

It was originally intended to reserve the new mites for description in a general list of the Irish Hydrachnid fauna which is being prepared. Before such a list can be completed, however, it is necessary to carry out some further collecting in certain parts of the country, and it seems more satisfactory to record the new species without further delay.

The most interesting of the new mites is one of which I was fortunate enough to find fully developed specimens when collecting last May in the south-west of Ireland. The species in question seems to be an extremely isolated form, possessing a combination of characters which at once distinguish it from any of the known genera. It would be easy to briefly define a new genus for the reception of this mite by referring to the structure of a very few organs, such as the palps, legs, &c.; in a group like the Hydrachnida, however, where there is such a great variety of structural detail, it seems especially necessary to rely on a combination of various characters in the formation of new genera.

I have to acknowledge the assistance of the Irish Fauna and Flora Committee supported by the Royal Society, and also of the same Committee when acting under the auspices of the Royal Irish Academy: several grants enabled me to collect in distant parts of the country.

The nomenclature used in the following list is that of the 'Tierreich' ("Hydrachnidæ und Halacaridæ," Piersig and Lohmann, Lieferung 13, 1901).

* The use of the word Britannic instead of British for faunistic purposes has been proposed by Professor G. H. Carpenter, as the latter term is now so frequently used to distinguish records referring to Great Britain alone ('Irish Naturalist,' vol. xv. p. 13).

Momonia *, gen. nov.

Diagnosis of Genus.—An Hydrachnid of the family Hygrobatidæ (Kramer, Wolcott, &c.), with a highly chitinized integument modified into chitinous plates. In shape resembling the genus *Midea*, with a convex dorsal area separated from a larger ventral field by a groove in which are a number of paired gland-openings. Epimeral groups close together, occupying most of the underside of the body. Genital area situated between the fourth epimera, flanked on each side by a triangular plate, in which are imbedded three genital suckers of the *Hygrobates* type. Palps with the penultimate segment angularly swollen on the ventral surface and armed with two stout chitinous teeth; fifth segment ending in an exceedingly fine point. First pair of legs modified, the terminal segment deeply excavated on its upper margin, with a broad-shanked bifid claw articulating deeply in the segment, and, in the type species, with a terminal membrane. The three posterior pairs of legs are provided with swimming-hairs.

It will be seen from this short diagnosis that the genus *Momonia* possesses a very anomalous combination of characters which renders the placing of it in a satisfactory position in the Hydrachnid series a matter of some difficulty. On the whole, however, it shows affinities with the genera *Midea*, *Mideopsis*, &c., and it seems to me that it should be placed in an intermediate position between these genera and the *Hygrobates* group.

Momonia falcipalpis †, sp. n.
(Pl. II. figs. 1–4.)

Male.—Body slightly longer than broad, evenly rounded posteriorly, and narrowed towards the front margin, where there are two hair-papillæ. Seen from the side the dorsal outline is moderately convex and the ventral surface flat over the epimeral area; thickness of the body dorso-ventrally about three fifths of the total length. Integument highly chitinized, with a dorsal groove running round close to the body-margin; in this groove are placed at least six pairs of

* Momonia, or Mumonia, the ancient Latin name of the province of Munster. This name has also been used by Mr. R. Lloyd Praeger, M.R.I.A., to indicate the group of plants with a southern range in Ireland (see 'Proceed. Royal Irish Academy,' vol. xxiv. 1902–1904).

† The specific name is suggested by the shape of the terminal palp-segment.

chitinous hair-bearing glands. The greater part of the dorsal area is covered by a large shield with sinuous side-margins bounded by the dorsal groove, the rounded posterior margin reaching to the end of the body. This plate is wrinkled longitudinally, and under a high magnification it is seen to have a finely shagreened appearance as well as polygonal reticulations. In front of this large shield lies a short broad plate, emarginate anteriorly, and rather less than half the breadth of the dorsal shield. The dark-pigmented eyes, separated by an interval of about 176 μ, are situated close to the front margin of the body. On the inner side of each eye-group stands a conspicuous hair-papilla.

The greater part of the ventral side is occupied by the *epimeral plates*; the first and second epimera are of the usual shape—except that the first epimeron is very narrow and tapers inwardly into a rather fine point—separated by an extremely narrow interval from the third epimera. The last are quadrilateral in outline, with the front and hinder margins sloping downwards. The fourth epimeron is extremely large and characteristic; the inner margin is continued for a short distance in a line with that of the third epimeron, it then bends suddenly outwards and downwards in a sinuous line to near the hinder margin of the body, fusing with the chitinous integument of the sides of the body. Near the middle of the fourth epimeral area on each side is a group of long hairs. The epimera are all finely shagreened and reticulated in the same way as the dorsal shield.

The *genital area* lies in the anterior space between the fourth epimera; it is flanked on each side by a long triangular plate, which carries three genital suckers, placed one behind the other, similar in structure to those found in *Hygrobates* and allied genera. A transverse chitinous plate, in which is imbedded the anal opening, occupies the remaining inter-epimeral space.

The *capitulum* is rather small, projecting downwards for part of its length beyond the ventral outline of the body; maxillary shield measuring about 110 μ in length (not including subcutaneous process) and 77 μ in breadth.

The palps are small, the five segments measured along their dorsal margins are 30 μ, 75 μ, 50 μ, 85 μ, 55 μ respectively; segments 1, 2, and 3 may be compared with those of *Mideopsis*; 2 and 3 are furnished with a number of rather stout hairs on the dorsal surface; 4 is the longest palp-segment, it is slightly convex dorsally, with two long fine hairs, ventral surface produced beyond the middle into a well-marked angular prominence, on which are two short stout

teeth placed close to the inner side of the segment; 5 is nearly as broad at base as the distal margin of 4, tapering gradually into a long sharp point; the upper and lower surfaces are each armed with a long hair and a sharp spine; on the outer side close to the base is another spine.

First pair of *legs* (length about 814 μ) modified, without swimming-cilia, slightly longer than the body, the segments gradually increasing in length from 1 to 5. Segment 1 very short, 2 and 3 straight, with a number of long bristles; 4 curved, with the ventral distal margin notched; 5 straight (length 260 μ), broader than preceding segments, and narrowing towards the distal extremity, on which are seven or eight long hairs. Segment 6 (fig. 3) articulates with a conical projection on the penultimate segment, short, with convex sides, very deeply hollowed out on its upper distal margin; a powerful claw-like structure with a broad shank and sharply bent bifid extremity articulates with the inner part of the excavation; a few long hairs and a peculiar cone-shaped membrane project from the extremity of the segment. The last three pairs of legs do not present any remarkable characters; they increase in length from before backwards and are provided with long swimming-cilia; the terminal segments are armed with two recurved tridentate claws resembling those of *Brachypoda*.

During life the *colour* was a pale yellowish green, marked on the dorsal surface with reddish brown; Malpighian area yellow, indicated anteriorly by four lobes arranged across the body.

Measurements.

	μ.
Length of body	768
Breadth of body	691
Length of palp	about 270
Length of leg i.	814
Length of leg ii.	704
Length of leg iii.	792
Length of leg iv.	858

Locality.—Two fully developed examples of this species were found amongst a thick growth of *Callitriche* in Looscaunagh Lough, about ten miles from Killarney, May 1905. From the peculiar modification of the first pair of legs there is no doubt that the specimens are males.

The type specimens are in the Dublin Natural History Museum (register no. 179, 1906).

Arrhenurus octagonus, sp. n. (Pl. II. fig. 5.)

Male.—Colour during life red, with ill-defined darker markings on the back. In dorsal view the body is roughly octagonal in shape, the posterior half being somewhat similar in outline to the anterior. Front margin almost straight, about equal to half the width of the body; all other margins very slightly emarginate. There are no conspicuous dorsal humps, but in the middle of the posterior margin there is a deep excavation, with a prominence on each side on which is a long hair. Dorsal furrow roughly circular in form, enclosing a comparatively small area (length 537 μ) of the middle of the back.

The *appendage* is short, measuring about a sixth of the entire length of the animal and about four fifths as broad; in dorsal view mostly covered by the hinder part of the main body; sides of the appendage hardly constricted at base, gradually narrowing inwards and blending with the hinder margin. Posterior dorsal margin with a wide excavation reaching from side to side; posterior ventral margin slightly sinuate, pierced in the middle by a narrow deep indentation, which widens noticeably at its deepest part and reaches the base of the appendage. The *petiolus* is composed of two finely pointed pieces, which are closely approximated in the living mite, and project in the middle line very slightly beyond the margin of the appendage. There are five or six pairs of very short hairs on the end of the body.

Genital plates large, sinuate anteriorly, and gradually narrowing towards the sides of the body, which they do not overreach. *Epimeral plates* remarkably long and narrow, rather closely resembling those of *A. sinuator*, Müller.

Palps stoutly built, with prominent distal angles to the segments. The inner surface of the second segment seems to be without a hair-pad, but carries a few stout unfeathered bristles. Fourth segment with a long straight spine near the inner distal corner and a widely forked tactile hair on the apical margin.

The *legs* do not present any unusual characters; they are rather stout, of moderate length, and the fourth segment of the last pair is without a spur.

Measurements.

Length of body (including appendage)	1·28 mm.
Breadth of body	about 1·00 mm.
Breadth of appendage at base.....	about 870 μ.
Length of palp	about 430 μ.

Locality.—Found in a pond at Fenagh, Co. Carlow, by Mr. Denis R. Pack-Beresford, M.R.I.A., during the month of August 1903.

Type specimen deposited in the Dublin Natural History Museum (register no. 180, 1906).

Arrhenurus Leuckarti, Piersig.

Both sexes of this mite were collected in the same locality as the preceding species by Mr. Beresford. It is apparently one of our rarest *Arrhenuri*, these being the only Irish specimens that I have seen. Dr. George includes it in his Lincolnshire list, and Mr. Soar reports it from the Norfolk Broads.

Arrhenurus Neumani, Piersig.

This is another addition to the list of Irish *Arrhenuri* published a few years ago*. I found several specimens (♂ and ♀) last year in Looscaunagh Lough in May, and also in Glendalough Lake, Connemara, in the following autumn. Mr. W. Williamson has taken it in Scotland (Trans. Edinb. Field-Nat. and Micros. Soc. Session 1905–1906).

Arrhenurus Stecki, Koenike.

1894. "Zur Hydrachniden-Synonymie," Zool. Anz. xvii. p. 274, fig. 5.

A male of this rare species occurred in a bog-pool almost filled with *Sphagnum* near Ross, Co. Galway, in September 1905. This is the smallest species of the genus as yet found in Ireland, my specimen measuring but 572 μ in length. The colour was pale yellow, with two black blotches showing through behind the epimera.

Localities.—Up to the present time this species has been recorded from Switzerland, where it was found in a similar kind of locality (Moosseedorf-See bei Bern), Germany, and Norway (1899). Dr. George has recorded it from Lincolnshire ('The Naturalist,' 1905, p. 25).

Medeopsis crassipes, Soar.

1904. "Two new British Water-Mites," Journ. Quekett Micros. Club, p. 107, fig. 2.

Specimens of this interesting species were sent to me by Mr. W. F. de Vismes Kane, who collected them, as long ago

* 'Zoologischer Anzeiger,' xxvi. 1903, p. 272.

as September 1899, in Upper Lough Erne, Co. Fermanagh. The specimens were mixed with the commoner *Mideopsis orbicularis* and were so overlooked. I have since taken the species in Lough Gill, Co. Sligo.

**Sperchon brevirostris*, Koenike.

1895. "Neue *Sperchon*-Arten aus der Schweiz," Rev. Suisse Zool. iii. p. 416, pl. xiii. figs. 1–2.

Pool by the Glenshelane River, near Cappoquin, in the county of Waterford, May 1900.

Localities.—A local though widespread species in the west of Europe, having been recorded from Norway, Switzerland, Saxony, Alps (Rhätikon), and the Azores.

**Sperchon longirostris*, Koenike.

1895. "Neue *Sperchon*-Arten aus der Schweiz," Rev. Suisse Zool. iii. p. 420, pl. xiii. figs. 3–6.

Two specimens were found in a stream at Ballysadare, Co. Sligo, in company with *Panisus Michaeli*. A third specimen was taken by my friend Mr. Dudley Westropp near Mullingar in April 1903.

Localities.—Recorded from Germany (Erzgebirge), Switzerland (Rhätikon), and Italy.

**Hygrobates calliger*, Piersig.

1896. "Einige neue Hydrachniden Formen," Zool. Anz. xix. p. 439.

Occurs on the River Nore, near Thomastown, June 1901.

Localities.—Recorded from Norway, Saxony (Erzgebirge), Italy (Ticino), and Germany (Thüringen).

**Laminipes bullata* (Sig. Thor).

1899. "Norske Hydrachnider, III.," Arch. Naturv. Christian. xxi. p. 40, pl. xiii. figs. 129–137.

Pool by the side of Lough Leane, Killarney, June 1905.

Fortunately the single specimen taken is a male and shows the characteristic modification of the fourth pair of legs, as described and figured by Dr. Thor. This appears to be the first record of the species since the original record from Norway, and it seems to have been omitted from the volume of the 'Tierreich' (1901) treating of the Hydrachnida.

* Species marked with an asterisk are recorded for the first time from the Britannic area.

**Laminipes scaurus* (Koen.).

1892. "Anmerkungen zu Piersigs Beitragen zur Hydrachnidenkunde," Zool. Anzeiger, xv. p. 266, fig. 1.

Several males taken in bog-pools on lower slopes of Bragan Mountain, between the counties Monaghan and Tyrone, by Mr. W. F. de Vismes Kane in July 1900.

Localities.—Norway and Germany ('Tierreich').

**Tiphys mutatus* (Piersig).

1893. *Acercus brevipes*, Zool. Anz. xvi. p. 394.
1901. *Tiphys mutatus*, Piersig (nom. nov.), Tierreich, p. 241.

Two specimens (♀) taken at Glenavy, on the shore of Lough Neagh, June 1902. The male appears to be unknown.

**Piona stjordaliensis* (Sig. Thor).

1900. "Hydrachnologische Notizen, V.," Nyt Mag. Naturvid. xxxviii. pp. 375–378, pl. xvii. figs. 21–24.

This species is allied to *P. nodata*, Müller, and *P. controversiosa*, Piersig, but differs sufficiently from both in the structure of the genital area, palps, and especially in the armature of the terminal segment of the third pair of legs in the male. The species was first described in 1896 by Dr. Thor, and was supposed by Dr. Piersig to be synonymous with *P. controversiosa*, but the more detailed description published in the above reference clearly shows the distinctions between the species.

The only Irish specimens examined were taken by Mr. W. F. de Vismes Kane in Drumreaske Lake, Co. Monaghan.

**Panisus Michaeli*, Koen. (Pl. II. fig. 6.)

1896. Zool. Anzeiger, xix. p. 356.

When in the west of Ireland in the spring of 1901 I found an Hydrachnid of the genus *Panisus* amongst water-plants in a small stream which flows into the sea at the head of Ballysadare Bay. On examination it agreed closely with the description of *P. Michaeli*, Koenike, except that the chitinous marginal plates of the dorsal surface numbered four on each side in my specimen, instead of five, as recorded for *P. Michaeli*. On sending drawings of the mite to Dr. Koenike, he was good enough to assure me that my species is identical with *P. Michaeli*. There are in reality only four marginal plates on each side in that species; the statement that there

were five was due to the outlines of the plates not being clearly visible at the time the preliminary description was made. There are sixteen chitinous plates on the dorsal surface, arranged as follows:—A middle series, consisting of a large plate between the eyes; behind this are three small circular plates, arranged on each side of the middle line; and, finally, a large terminal plate, sinuate in front, with the postero-lateral corners produced into pointed processes. The eight marginal plates are arranged in a line on each side of the body; the most anterior of these sends forward a long narrow prolongation on the outside of the eye. All of the dorsal plates are coarsely areolated towards their margins and more finely in the centres; they are also very irregular in outline, differing considerably on each side of the body.

The species seems to be very local, and as I have seen no reference to figures, a drawing (fig. 6) of the dorsal surface is given; the areolation of only the terminal plate is indicated.

Localities.—Panisus Michaeli was first recorded from Switzerland, where it was discovered by Dr. A. D. Michael at Davos; and Dr. Sig. Thor has recently recorded it from Norway. I have also seen a specimen collected by Mr. William Evans near Bolerno, Scotland, in the autumn of last year.

Thyas longirostris, Piersig.

This very distinct species is of local occurrence in Ireland. I once found amongst *Callitriche* in a small pool near Kenmare many specimens, some of which were very large, measuring nearly 3 mm. in length. In his paper on the British species of *Thyas* ('Science Gossip,' viii. p. 46) Dr. George refers to the occurrence of this species in Ireland, and Mr. C. D. Soar has since found it in the Norfolk Broads.

EXPLANATION OF PLATE II.

Fig. 1. *Momonia falcipalpis*, sp. n. Dorsal view; legs and palp not drawn. × 60.

Fig. 2. *Momonia falcipalpis*, sp. n. Ventral view, showing structure of epimera &c. × 60.

Fig. 3. *Momonia falcipalpis*, sp. n. Terminal segment of first leg, seen from below. × 224.

Fig. 4. *Momonia falcipalpis*, sp. n. Fourth and fifth palp-segments. × 224.

Fig. 5. *Arrhenurus octagonus*, sp. n. Dorsal view of male. The two pieces of the petiole are closely approximated in the living mite. × 35.

Fig. 6. *Panisus Michaeli*, Koenike. Dorsal surface, showing arrangement of chitinous plates. × 60.

III.—*Preliminary Descriptions of new Species of Amphipoda from the 'Discovery' Antarctic Expedition*, 1902–1904.

By Alfred O. Walker, F.L.S., F.Z.S.

[Continued from vol. xvii. p. 458.]

Proboloides antarcticus, sp. n.

W.Q. from Feb. to Dec. 1902: in sponges &c.

General characters as in *Proboloides* (*Probolium*) *gregarium* (Sars).

First gnathopods.—Female: wrist subequal in length to, but wider than, the hand, the hind margins of both convex and setose. Male: wrist considerably longer and but slightly wider than the hand; otherwise like the female.

Second gnathopods.—Female: carpal process rounded, setose; hand with subparallel margins; hind margin subequal to the palm, which is defined by a small tooth and two spines. Male: *hinder part of the lower margin of the side-plates irregularly serrate. Hand as long as the three preceding joints, the hind margin shorter than the front and terminating in a sharp tooth, forming the palmar angle; palm deeply excavate, with a central tooth and a denticulate ridge near the base of the dactylus.* In a younger male the palm is less deeply excavate, the central tooth wider, blunter, and denticulate, and the ridge as wide as the excavation.

Third peræopods: the concave hind margin of the narrow first joint is produced almost to the end of the second, *terminating in a divided lobe.*

Fourth and fifth peræopods as in *P. gregarium* (Sars).

Third uropods: peduncle shorter than the ramus, with 5 spines; first joint of ramus subequal to second, with 3 spines.

Telson reaching the end of the peduncle of the third uropods, with 3 spines on each margin.

Length of female 3·5 mm.; the male considerably larger.

Proboliella, gen. nov.

Mandibles with a *two-jointed palp.*

First maxillæ with a *two-jointed palp.*

Maxillipeds with the *inner plates divided to the base*, the outer more or less developed.

Second peræopods *not stronger than the first.*

Third peræopods with the first joint *narrow*; fourth and fifth pair with the first joint *expanded.*

Differs from *Probolium*, Sars, in the absence of the small third joint of the mandibular palp and the equal strength of the first and second peræopods.

Proboliella typica, sp. n.

W.Q. Hut Point, 11/11/02, one; 13/9/02, one; 13/2/04, one. All females.

Lower part of the hind margin of the *third pleon-segment* produced backwards and rounded. *Eyes* small, round, colourless in spirit.

Upper antennæ without an appendage, reaching the middle of the flagellum of the lower, the third joint half as long as the second. Flagellum 7-jointed, as long as the last two joints of the peduncle. *Mandibles* bent downwards from the base of the palp to the coarsely toothed cutting-edge; palp more than half the length of the mandible, the first joint less than one fourth the length of the second.

Maxillipeds: inner plates divided, outer distinct but narrow; first and second joints of the palp subequal, the third longer.

First gnathopods: wrist shorter and narrower than the hand, the latter wider in the middle than in Proboloides, the palm very oblique, subequal to the hind margin, spinulose and defined by 2 or 3 spines.

Second gnathopods: first joint as long and more than half as wide as the hand, margins setose; third joint produced in an acute point extending beyond the carpal process; wrist produced in a narrow setose process. Hand similar to but much larger than that of the first pair, subovoid, the palm longer than the hind margin, convex, spinulose, and *defined by a strong tooth, beyond which is a smaller tooth* and a group of spines.

The first and second pairs of peræopods are alike; first joint oblong, curved, almost as long as the next three, and three times as wide; third and fifth subequal, fourth rather shorter; dactylus slender, two thirds the length of the fifth joint.

Third peræopods: first joint narrow-oblong, straight.

The fourth and fifth pairs are alike: the first joint oval, deeper than wide, the hind margin smooth.

Peduncle of the *third pair of uropods* subequal to *each* joint of the ramus.

Telson not reaching the end of the peduncle of the third uropods, narrowing rather abruptly to a point, with 3 spines on each side.

Length 3 mm.

THAUMATELSON, gen. nov.

Palp of the first maxillæ *two-jointed.*

First gnathopods *distinctly subchelate*; first joints of all the peræopods narrow.

Telson large, entire, oval, *and set in a vertical plane on its longer edge.*

Otherwise like *Metopa.*

Thaumatelson Herdmani, sp. n.

W.Q. Oct. 1902, from sponges, Hut Point; one. W.Q. 13/2/04: Hut Point; one.

Body: fourth side-plates unusually large, covering the bases of the last three pairs of peræopods. Last two pleon-segments with a postero-dorsal tooth. Segments of the *urus coalesced.*

Antennæ subequal, longer than the head. *Upper antennæ* without an appendage; flagellum shorter than the peduncle. *Lower antennæ*: peduncle subequal to that of the upper.

First gnathopods: wrist triangular, about half as long as the hand, which is subquadrate, with the palm transverse, rather convex, as long as the hind margin.

Second gnathopods: wrist produced beyond the base of the hand; hand subtriangular, widening distally, nearly twice as long as wide; distal half of the hind margin slightly concave, ending in a tooth, beyond which is a long and a short spine defining the transverse spinulose palm.

Peræopods all similar, with narrow first joints.

Third uropods: ramus subequal to the peduncle, the first joint rather longer than the second.

Telson as described above.

Length 2·5 mm.

A very remarkable little species, the form of the telson being probably unique in the Amphipoda; the hand of the second gnathopods recalls *Amphilochus.*

Œdiceroides Calmani *, sp. n.

Coulman Island, 13/1/02, 100 fath; two females. Flagon Pt., 23/1/02; one young. Barrier, 29/1/02, 100 fath.; one.

Body: mesosome-segments very short, *subequal*; first pleon-segment longer than the second and much shorter than the third, which, as well as the first urus-segment, has a shallow dorsal carina and a rounded posterior margin. The

* After my friend Dr. W. T. Calman, to whom I am much indebted for his valuable assistance.

last segment of the mesosome and first two segments of the pleon have a dorsal tubercle near the middle. The first four side-plates are as deep as the segments.

Head: *rostrum shorter than the rest of the head* and reaching the end of the first joint of the upper antennæ, *lower margin almost straight. Eyes contiguous above, large, dark. Upper antennæ* not quite reaching the end of the second joint of the lower, the first joint rather longer and twice as wide as the second, *widening distally*; the second twice as long as the third; the first and second with fascicles of plumose setæ. Flagellum 10-jointed, shorter than the peduncle. *Mandibular palp* with the second joint subequal to the third in length, *but more than twice as wide near its base*, both joints with *long* spine-like setæ on the front margin.

In other respects this species resembles *Œ. rostrata*, Stebbing (*Œ. conspicua* on pls. lx. and lxi. Chall. Report), from which it differs in the conspicuous eyes, different shape of rostrum, proportions of mesosome-segments, and mandibular palp.

Length of female 30 mm.

Epimeria macrodonta, sp. n.

22/1/02, 500 fath.; three. W.Q. 4/9/03: Hole 12; one.

Body: segments of mesosome and pleon, except the first two (of which the first is twice as long as the second), armed with lateral teeth increasing in length backwards, with longer curved dorsal teeth, those of the last mesosome and first two pleon-segments the longest. First two segments of the urus with an upright dorsal tooth; the third segment with a lateral carina ending in an upturned sharp tooth. Side-plates as in *E. cornigera* (Fabr.).

Head: rostrum much longer than the rest of the head, slightly decurved; lower margin of the ocular lobe produced forward in an acute tooth. *Eye* large, colourless in spirit.

Upper antennæ shorter than the lower; first joint with a subequal distal tooth on each side; second with two long subequal distal teeth reaching the seventh joint of the flagellum; third about half as long as the second, with a small distal tooth. Flagellum 32-jointed, slender.

Gnathopods as in *E. parasitica*, M. Sars.

Third peræopods: first joint rather longer than and twice as wide as the third; hind margin concave, with a rounded lobe at the proximal end and a large very sharp tooth, directed backwards, at the distal; front margin concave in the middle. Hind margins of the first joints of the *fourth and fifth pairs*

convex in the middle, the first joint of the fifth the widest; otherwise like the third pair.

The third uropods have the upper margins of the peduncles produced behind in an acute tooth; the outer rami are slightly shorter than the inner, which are about three times as long as the peduncle, narrowly lanceolate, with a few small spines on both margins.

Telson deeply notched, the ends of the divisions subacute.

Length 33 mm.

This species has a superficial resemblance to *Acanthozone*, Boeck, and *Acanthechinus*, Stebbing, from both of which it differs in the shape of the telson and other structural points.

Epimeriella, gen. nov.

Body without dorsal teeth on the mesosome.

Head *with a very small rostrum.*

Fifth pair of side-plates small, wider than deep, *without a projecting process.*

Mandibles with the molar tubercle imperfectly developed.

Third and fourth peræopods longer than the fifth.

Otherwise like *Epimeria.*

*Epimeriella macronyx**, sp. n.

W.Q., May and June 1903; five young. 26/2/04; one, length 25 mm.

Body: mesosome smooth; first and third segments subequal and much longer than the second, remaining segments increasing in length successively. First four side-plates as in *Epimeria*; fifth small, transverse, with rounded ends. Pleon with an obscure dorsal carina; hind and lower margins of the third segment straight and forming a right angle. Urus with the first segment depressed in front and provided with a postero-dorsal tooth.

Head slightly produced in front. *Eyes* large, prominent, round-oval, colourless. *Antennæ* subequal, unarmed. *Mandibles* with cutting-edges dentate, spine-row of about 20 spines; palp rather longer than the mandible, first joint short, second and third subequal.

First gnathopods: wrist subequal to and rather wider than the hand, which is subovate; the palm undefined and pectinate, the whole hind margin sparsely and unequally spinous.

Second gnathopods like the first, except the palm, which is more transverse.

* From the long dactyli of the third and fourth peræopods.

Second peræopods: first joint narrow-oblong, subequal to the third and fourth united. Dactylus almost straight and not flexed, as long as the third joint.

Third and fourth peræopods subequal; first joints oblong, twice as long as wide. *Dactyli longer than the fifth joint*, especially in young specimens, tapering gradually, not flexed.

Fifth peræopods shorter than the third and fourth, the first joint much wider, with the convex, obscurely serrate hind margin produced nearly to the middle of the third joint. Dactylus as long as the fourth joint, which is shorter than the fifth.

Third uropods: rami subequal, nearly twice as long as the peduncle, with fine spines on both margins.

Telson reaching to about one fourth the length of the rami of the third uropods, deeply notched at the end, with a minute notch on the tip of each division.

The description of the external characters of the body is taken from the large specimen (25 mm.) not dissected, the rest from one of 6 mm.

IV.—*Rhynchotal Notes*.—XXXVIII. By W. L. Distant.

The following descriptions and notes are preparatory to a synonymical catalogue of the family Fulgoridæ which I have now in preparation. I reserve synopses of the genera to the catalogue itself, as there are genera which I have not seen and others which have still to be described, which render the formation of such keys impossible for the present.

Fam. **Fulgoridæ**.

Subfam. *Fulgorinæ*.

Genus Eurystheus.

Eurystheus, Stål, Berl. ent. Zeitschr. vi. p. 305 (1862).

Type, *E. dilatatus*, Westw. (*Fulgora*).

Eurystheus dilatatus.

Fulgora dilatata, Westw. Trans. Linn. Soc. xviii. p. 146, t. xii. figs. 8 & 9 (1841).
Pyrops inducta, Walk. Ins. Saund., Hom. p. 30 (1858).

Eurystheus Doddi, sp. n.

Head and cephalic process, sternum, and legs greyish, mottled with piceous; abdomen pale castaneous brown, with the segmental margins ochraceous; tegmina grey, opaque, the venation fuscous; an inner claval marginal fascia longitudinally continued for a short distance beyond apex of clavus and an irregular discal longitudinal fascia on apical area piceous brown; a series of small spots of the same colour on costal margin; wings greyish hyaline, with about basal half dull ochraceous, the venation fuscous; cephalic process long, slender, from in front of eyes about as long as abdomen, apex subconvexly narrowed, upper surface undulate; posterior tibiæ with four spines; rostrum about reaching abdominal apex; anterior and intermediate tibiæ annulated with piceous.

Var.—Tegmina without the discal longitudinal fascia on apical area and the clavus generally suffused with piceous brown.

Long., excl. tegm., 17 mm.; exp. tegm. 32 mm.

Hab. Queensland; Townsville (*F. P. Dodd*, Brit. Mus.).

Allied to *E. obscuratus*, Fabr., from which it principally differs by the more slender, longer, and apically narrowed cephalic process.

Eurystheus Clementi, sp. n.

Head dull greyish brown; pronotum and mesonotum greyish ochraceous; abdomen, body beneath, and legs pale testaceous; anterior tibiæ annulated with pale fuscous; head beneath at base paler and more ochraceous; clypeus with transverse fuscous striations; tegmina grey, opaque, the venation slightly darker and here and there tinged with fuscous, an inner claval streak, about six discal spots beyond middle, a subapical series of very small spots, and some speckles on costal margin piceous brown; wings entirely greyish white, the venation slightly stramineous; cephalic process slightly recurved, from in front of eyes about as long as abdomen, somewhat narrowly longitudinally channelled above on apical half, a little widened at apex, undulated above for a little beyond middle; rostrum not extending beyond half the length of abdomen; posterior tibiæ with four spines, the basal one small and blunt.

Long., excl. tegm., 17½ mm; exp. tegm. 34 mm.

Hab. W. Australia; Nicol Bay District (*Dr. Clement*, Brit. Mus.).

To be distinguished from *E. obscurata* and *E. Doddi* by the shorter rostrum, the uniformly pale grey wings, &c.

Eurystheus pallescens.

Allied to *E. Clementi*, but much smaller ; cephalic process from in front of eyes slightly longer than abdomen ; tegmina unspotted ; other characters as in *E. Clementi*.

Long., excl. tegm., 14 mm. ; exp. tegm. 29 mm.

Hab. W. Australia; Nicol Bay District (*Dr. Clement*, Brit. Mus.).

Genus Cathedra.

Cathedra, Kirk, Entomologist, xxxvi. p. 179 (1903).
Pristiopsis, Schmidt, Stett. ent. Zeit. lxvi. p. 332 (1905).

Type, *C. serrata*, Fabr. (*Fulgora*).

Genus Saiva.

Saiva, Dist. Faun. B. I., Rhynch. iii. p. 192 (1906).

Type, *S. gemmata*, Westw.

Saiva cultellata.

Hotinus cultellatus, Walk. Journ. Linn. Soc., Zool. i. p. 143 (1857).
Fulgora bicolor, Schmidt, Stett. ent. Zeit. lxvi. p. 355 (1905).

Saiva cardinalis.

Fulgora cardinalis, Butl. Ann. & Mag. Nat. Hist. (4) xiv. p. 131 (1874).
Fulgora cardinalis, Schmidt, Stett. ent. Zeit. lxvi. p. 356 (1905).

By a strange coincidence Herr Schmidt has not only redescribed Butler's species, but has chosen the same specific name.

Samsama, gen. nov.

Head longer than broad, vertex produced in front of eyes and anteriorly developed in a long slender filamentous appendage nearly as long as the mesonotum and abdomen together, its apex slightly widened and broadly sulcate ; face not longer than clypeus, medially bicarinate, laterally widened or ampliated towards clypeus ; rostrum slightly passing the posterior coxæ; pronotum a little shorter than mesonotum, anteriorly subangularly produced, centrally finely carinate ; mesonotum centrally finely tricarinate ; abdomen broad, moderately depressed ; posterior tibiæ (in type) with seven spines ; tegmina long, narrow, four times longer than broad, apex subacutely rounded, costal membrane broad, apical third reticulately veined, claval area broad and strongly obtusely

angulate near base ; wings about as broad as but much shorter than tegmina, reticulately veined except on basal area.

This genus may be placed near *Prolepta*, Walk.

Type, *S. chersonesia*, Dist.

Samsama chersonesia, sp. n.

Head and pronotum virescent ; anterior margin of vertex and cephalic process black, apex of the latter stramineous ; mesonotum purplish brown ; metanotum and abdomen above pale testaceous ; body beneath and legs pale ochraceous, face and lateral areas of prosternum virescent, apex of abdomen carmine-red ; tegmina pale ochraceous brown, a subbasal transverse fascia and costal membrane (its colour extending near its apex on disk of tegmina) virescent, two black spots on costal membrane near base ; wings hyaline, the venation fuscous, with a broad basal patch of carmine-red, apical half of anal area fuscous.

Long., excl. tegm. and ceph. process, 12½ mm., long. ceph. process 8½ mm. ; exp. tegm. 37 mm.

Hab. Malay Peninsula ; Perak (*Doherty*).

Genus Druentia.

Druentia, Stål, Hem. Afr. iv. p. 144 (1866).
Pyrgoteles, Gerst. in Decken's Reisen, iii. (2) p. 428 (1873).

Type, *D. variegata*, Spin. (*Enchophora*).

Druentia variegata.

Enchophora variegata, Spin. Ann. Soc. Ent. Fr. viii. p. 225, t. xii. fig. 3 (1839), excl. habitat.
Druentia variegata, Stål, Hem. Afr. iv. p. 144 (1866).
Enchophora sicca, Walk. List Hom. ii. p. 272 (1851) ; id. *loc. cit.* iv. t. iii. fig. 2 (1852).
Pyrgoteles siccus, Gerst. in Decken's Reisen, iii. (2) p. 428 (1873).
Belbina sicca, Stål, Trans. Ent. Soc. Lond. (3) i. p. 580 (1863).
Pyrgoteles cristatus, Karsch, Stett. ent. Zeit. 1894, t. ii. fig. 4 *a*.

Hab. S. Africa.

Ecuadoria, gen. nov.

Head prominently produced in front of eyes, the cephalic process in front of eyes about as long as from eyes to base of pronotum, robust, directed upwardly, and apically a little recurved, above strongly longitudinally channelled, notched on each side beyond middle ; face very much broadened from between eyes, where the lateral margins are concavely sinuate, lateral margins of the anterior and narrow prolongation

continued for about two thirds through disk of posterior broad area, between these ridges the surface is finely transversely striate and contains a central longitudinal ridge, which is broad and robust anteriorly and evanescent posteriorly; rostrum passing the posterior coxæ; pronotum centrally produced anteriorly, its lateral margins prominently subangulate and centrally longitudinally ridged; mesonotum with two discal strongly waved and angulated longitudinal ridges; posterior tibiæ with six or seven strong spines; legs strongly longitudinally channelled; tegmina about three times as long as broad, apically rounded, transversely reticulately veined, basal cell much longer than broad, veins to costal membrane oblique; wings broader than tegmina, reticulately veined except on upper basal area, anal area with reticulate veins.

I place this genus near *Enhydria*, Walk., and *Hariola*, Stål.

Type, *E. dichopteroides*, Dist.

Ecuadoria dichopteroides, sp. n.

Head above piceous brown, its base and eyes ochraceous, between eyes two contiguous black spots; pronotum testaceous brown, small tuberculous spots and an oblique fascia on each lateral area paler in hue, its anterior prolongation ochraceous with two large central oblong black spots; mesonotum fuscous brown, with the ridges, lateral areas, and a small spot on each side of apex dull ochraceous; abdomen above ochraceous, with the posterior segmental margins broadly black; body beneath and legs ochraceous, anterior and intermediate tibiæ annulated with black; tegmina with basal half fuscous brown, opaque, divided by a transverse macular ochraceous fascia, and with pale spots on costal membrane and claval area, apical area hyaline, with the veins fuscous, and with fuscous suffusions towards apex; wings with the basal area opaque, bright ochraceous, outwardly broadly margined with black, which forms a transverse fascia, apical area hyaline, the veins and apical margin fuscous.

Long., excl. tegm., 19 mm.; exp. tegm. 46 mm.

Hab. N.W. Ecuador; Rio Durango, 350 feet (Brit. Mus.).

Genus Enchophora.

Enchophora, Spin. Ann. Soc. Ent. Fr. viii. p. 221 (1839).

Type, *E. recurva*, Oliv. (*Fulgora*).

Enchophora nigromaculata, sp. n.

Head, thorax, and body beneath pale olivaceous brown; legs olivaceous, apices of tibiæ and the tarsi more or less piceous; pronotum with a very distinct posterior black submarginal fascia; mesonotum with an anterior black central spot; abdomen above piceous, the posterior segmental margins dull sanguineous, its base lacteously tomentose; tegmina with about basal two thirds pale testaceous, with scattered black spots, apical area dark ochraceous, thickly reticulate, and with some minute scattered cretaceous spots; wings fuscous, with the basal third carmine-red, all the veins fuscous; head with the anterior prolongation short, robust, strongly recurved, its apex about reaching base of head, above centrally and laterally strongly carinate, beneath distinctly ochraceous and laterally and centrally carinate; face with two strong central posteriorly diverging carinations; clypeus centrally carinate; rostrum extending to about middle of abdomen; pronotum strongly centrally ridged.

Long., excl. tegm., 21 mm.; exp. tegm. 54 mm.

Hab. Bolivia (*J. Steinbach*, Brit. Mus.).

Genus Copidocephala.

Copidocephala, Stål, Berl. ent. Zeitschr. xiii. p. 235 (1869).
Coanaco, Dist. Biol. Centr.-Amer., Rhynch. Hom. i. p. 28 (1887).

Type, *C. guttata*, White (*Enchophora*).

Copidocephala merula, sp. n.

Head greenish testaceous; pronotum pale virescent, with some minute paler spots and with an anterior transverse, broken, fuscous fascia; mesonotum testaceous, with its apex paler; metanotum and basal margin of abdomen piceous or blackish brown; abdomen ochraceous, its apex cretaceous; face, sternum, and legs pale testaceous, lateral areas of prosternum broadly pale virescent; tegmina with the basal half virescent, greyish on disk, with purplish-red spots principally situate on costal membrane and claval area, on disk the spots are in straight transverse series, two or three small spots a little beyond cell, followed by a macular fascia between costal membrane and clavus, and two widely apart before the outer reticulate area, which is pale bronzy; wings black.

Long., excl. tegm., 23 mm.; exp. tegm. 67 mm.

Hab. Colombia (Brit. Mus.).

Allied to *C. guttata*, White, from which it differs, apart from the differently spotted tegmina and unspotted wings, by

the more erect and less recurved cephalic process, the face more posteriorly widened, and its anterior process much more strongly, centrally, longitudinally ridged, &c.

Genus Apilæna.

Aphæna, Guér. Voy. 'Coquille,' Zool. ii. (2) i. p. 184 (1832).
Ulasia, Stål (part.), Stett. ent. Zeit. xxiv. p. 233 (1863).

Type, *A. fuscata*, Guér.

Genus Penthicodes.

Penthicodes, Blanch. in d'Orbign. Dict. d'Hist. Nat. x. p. 443 (1849).
Aphæna, Guér. Voy. Bélang. Ind. Orient. p. 451 (1834); Spin. Ann. Soc. Ent. Fr. viii. p. 240 (1839); nom. præocc. Guér. (*suprà*).
Aphana, Burm. Handb. Ent. ii. 1, p. 166 (1835); Amy. & Serv. Hist. Hém. p. 496 (1843); Stål, Stett. ent. Zeit. xxiv. p. 231 (1863); id. Hem. Afr. iv. p. 134 (1866); Dist. Faun. B. I., Rhynch. iii. p. 201 (1906).
Penthicus, Blanch. Hist. Nat. Ins. iii. p. 171 (1840); nom. præocc.

Type, *A. farinosa*, Weber.

Since using the name *Aphana* for this genus (Faun. B. I. *suprà*), when I thought I had solved the synonymic problem, I have found that Guérin, in first describing this genus under the name of *Aphæna* (Voy. 'Coquille,' Zool. ii. (2) i. p. 184, 1832), gave as the type his *A. fuscata* from New Guinea. This genus is therefore structurally distinct from other species included subsequently in *Aphæna*=*Aphana*, Burm., and *Penthicodes* thus becomes available. Blanchard regarded the name *Aphana* as preoccupied by *Aphanus*, Lap., an argument I did not and do not follow; but the type of Guérin's *Aphæna* settles the question.

Genus Scamandra.

Scamandra, Stål, Stett. ent. Zeit. xxiv. p. 232 (1863).

Type, *S. rosea*, Guér. (*Aphæna*).

Scamandra fasciata, sp. n.

Head, thorax, and body beneath pale castaneous brown; abdomen sanguineous; legs black; rostrum and posterior femora piceous brown; tegmina brownish ochraceous, spotted with piceous, and with three irregular, transverse, piceous fasciæ, the outermost immediately before a transverse, arcuated, linear, ochraceous fascia at about one third from apex, apical area brownish ochraceous, with the reticulate venation paler; wings purplish red, the upper basal area for about half the wing black, with olivaceous veins, and divided

near its apex by a short purplish-red transverse fascia, base of anal area stramineous, apical area brownish ochraceous, the apical margin paler; tubercle at base of posterior tibiæ moderately prominent; mesonotum transversely rugulose; pronotum finely blackly punctate; anterior process of head short, robust, extending to nearly half the length of vertex; face with two strong central longitudinal ridges, between which is a more obscure central ridge not extending more than one third from base; rostrum extending considerably beyond posterior coxæ. Tegmina and wings beneath with a subapical calcareous arcuated fascia.

Long., excl. tegm., 22–25 mm.; exp. tegm. 64–74 mm.

Hab. N.W. Borneo (Brit. Mus.); Kina Balu (*Whitehead*, Coll. Dist.).

Allied to *S. hecuba*, Stål, and *S. scriptifacies*, Walk., from both of which it may at once be superficially distinguished by the colour of the wings.

Scamandra varicolor, sp. n.

Head, thorax, and body beneath pale brownish ochraceous; abdomen sanguineous, with its base calcareous white; legs piceous; rostrum brownish ochraceous; tegmina for basal two thirds pale testaceous red, with darker sometimes fuscous spots, terminating in a darker, sometimes fuscous, transverse arcuated fascia immediately before a pale arcuated line defining the apical area, which is pale brownish ochraceous; wings pale sanguineous, with the venation virescent, with the upper basal area pale emerald-green, which, as divided by the veins, has the appearance of three ray-like fasciæ; posterior margin and base of anal area greyish or calcareous white, apical area pale brownish ochraceous; tubercle at base of posterior tibiæ prominent; mesonotum very finely and obscurely rugulose; pronotum somewhat thickly, finely, darkly punctate; anterior process of head short, not reaching middle of vertex; face with two strong central longitudinal ridges; rostrum considerably passing posterior coxæ.

Long., excl. tegm., 16–20 mm.; exp. tegm. 45–60 mm.

Hab. Malay Archipelago, Bali (*Doherty*, Brit. Mus.).

Genus Polydictya.

Polydictya, Guér. Icon. Règn. Anim., Ins. p. 358 (1830–34).
Thaumastodictya, Kirk. J. Bomb. Nat. Hist. Soc. 1902, p. 307.

Type, *P. basalis*, Guér.

Polydictya crassa, sp. n.

Head, thorax, body beneath, and legs piceous; face brownish ochraceous; abdomen brownish ochraceous, above with its base piceous black; tegmina pale dull castaneous; wings ochraceous, apex and posterior margin fuscous brown; pronotum centrally longitudinally carinate; face strongly excavate on each side; rostrum reaching the posterior coxæ; posterior tibiæ with two long spines on apical halves; tegmina closely and coarsely reticulate from base to apex.

Long., excl. tegm., 20 mm.; exp. tegm. 58 mm.

Hab. S. Celebes (Coll. Dist.).

Polydictya illuminata, sp. n.

Head, pronotum, face, and clypeus ochraceous; abdomen above shining metallic black, its lateral margins and the margins of the last two segments castaneous brown; body beneath and legs piceous; rostrum, coxæ, apices of femora, bases of anterior and intermediate tibiæ, and the whole of the posterior tibiæ pale ochraceous brown; tegmina stramineous, the venation ochraceous, and much spotted and mottled with black or piceous, for about basal half the shadings are maculate and on apical area waved irregular fasciæ are formed; wings dark fuscous, upper basal area pale brownish ochraceous; pronotum obscurely centrally carinate; mesonotum piceous brown, with a lateral spot on each side beyond middle and the apex ochraceous; anal appendage ochraceous; rostrum just passing the posterior coxæ; posterior coxæ with five spines, the two nearer base small and obscure; face subglobose, laterally excavate on each side.

Long., excl. tegm., 19–20 mm.; exp. tegm. 56–58 mm.

Hab. Malay Archipelago; Tambora, Sambawa (*Doherty*, Brit. Mus.).

Genus Birdantis.

Birdantis, Stål, Trans. Ent. Soc. Lond. (3) i. p. 581 (1863).

Type, *B. decens*, Stål.

Birdantis collaris.

Polydictya collaris, Walk. Journ. Linn. Soc., Zool. x. p. 98, t. iii. fig. 10 (1867).
vittiventris, Walk., MS.

Galela, gen. nov.

Head large, broad, protruding considerably in front of eyes,

broadly convex anteriorly, the margins above strongly ridged and its disk rugose; face long, broad, much longer than clypeus, its lateral margins parallel, its base convex and extending considerably in front of eyes, centrally longitudinally tricarinate, its apex concave, receiving base of clypeus, which is centrally obscurely carinate; rostrum reaching or passing the posterior coxæ; pronotum a little shorter than head, centrally ridged; mesonotum centrally a little shorter than head and pronotum together; posterior tibiæ with four or five spines; tegmina about three times as long as broad, transversely reticulate, more obscurely so on basal area; wings shorter and broader than tegmina, excepting at extreme base transversely reticulate.

Allied to *Birdantis*, Stål, and *Desudaba*, Walk., but differing by the structure of the much longer head and face.

Type, *G. pallescens*, Dist. (*Birdantis*).

Galela parva, sp. n.

Head, pronotum, mesonotum, body beneath, and legs pale brownish ochraceous, with small darker mottlings; metanotum piceous; abdomen above dark orange-yellow or pale testaceous; legs obscurely annulated with pale fuscous, the anterior tibiæ prominently annulated with dark fuscous; tegmina with about basal half testaceous, opaque, with paler spots, apical half hyaline, with the venation dark olivaceous and with a number of dark fuscous spots, of which two on disk are largest; wings hyaline, the venation fuscous, the apex more palely infuscate, basal third bright orange-yellow, outwardly broadly margined with black, the area at anal angle fuscous; head with the anterior area of vertex prominent and rugose; pronotum with a central ridge and cordately anteriorly produced, the process marginally ridged and traversed by the medial ridge; face with two strong central longitudinal ridges, between which is a finer and more obsolete central ridge; clypeus obliquely striate on each side; posterior tibiæ with four spines; rostrum passing the posterior coxæ.

Long., excl. tegm., 9–10 mm.; exp. tegm. 21–27 mm.

Hab. West Australia; Cossack (*J. J. Walker*, Brit. Mus.).

Galela abdominalis, sp. n.

Head, pronotum, mesonotum, body beneath, and legs pale brownish ochraceous, somewhat strongly mottled with piceous; metanotum much suffused with piceous; abdomen above testaceous red, with a segmental series of large black

spots on each side; apices of femora and annulations to anterior and intermediate tibiæ black; tegmina with rather less than basal half pale brownish testaceous, opaque, remaining area hyaline, with the venation and a number of scattered spots fuscous; wings hyaline, the venation and apical margin fuscous, and with a broad basal patch of orange-yellow confined to upper half of wing; head with a rounded rugose piceous prominence on anterior area of vertex, and a foveate spot on each side of base of vertex; pronotum with a strong central carination and the margins of the anterior prolongation also ridged; face with two prominent central black ridges, between which is a finer and more obscure ridge, and on each side a submarginal black line; rostrum very slightly passing the posterior coxæ; posterior tibiæ with four spines, those on apical half much the longest.

Long., excl. tegm., 13 mm.; exp. tegm. 32 mm.

Hab. Australia; Parry Harbour, Cape Bougainville (*J. J. Walker*, Brit. Mus.).

Erilla, gen. nov.

Allied to *Galela*, but differing principally by the structure of the face, which is not longer than the clypeus, its lateral margins not parallel, but strongly sinuate and considerably widened or ampliated posteriorly, its base, as in *Galela*, considerably extends in front of eyes, medially tricarinate, the carinations wider apart anteriorly than posteriorly; clypeus very long, a little ampliate on each side at base; rostrum extending beyond middle of abdomen; posterior tibiæ (in type) with six spines; mesonotum tricarinate, with a lobate appendage on each side at base; tegmina and wings as in *Galela*.

Type, *E. Turneri*, Dist.

Erilla Turneri, sp. n.

Body and legs dull ochraceous; vertex of head with a central black line; pronotum with a testaceous tint; mesonotum with the disk strongly blackly punctate and with black and testaceous markings at each basal angle; face with a curved line at base, spots on lateral margins, and confluent punctate impressions on disk black; clypeus with a large black discal spot; femora and anterior and intermediate tibiæ annulated with black or piceous; tegmina with more than basal half dull purplish brown, opaque, three linear spots in apical area of costal membrane and some obscure markings in claval area piceous; apical area hyaline, the venation

purplish brown, with some piceous spots, of which the largest are one at end of opaque coloration and two before apical margin; wings hyaline, the venation fuscous brown, extreme base ochraceous; head broadly extending beyond eyes, the vertex excavate, with the margins ridged; pronotum with a central ridge, the margins carinate; mesonotum centrally tricarinate, the lateral carinations posteriorly curved inward; face centrally tricarinate; rostrum almost reaching abdominal apex; posterior tibiæ with six spines.

Long., excl. tegm., 13 mm.; exp. tegm. 34 mm.

Hab. Queensland (*Gilbert Turner*, Brit. Mus.).

Genus Myrilla.

Myrilla, Dist. Trans. Ent. Soc. Lond. 1888, p. 487.

Type, *M. obscura*, Dist.

Myrilla papuana, sp. n.

Head, thorax, body beneath, and legs testaceous, mottled with black; abdomen above with the basal half testaceous, the apical half pale ochraceous; tegmina with the basal two thirds testaceous, mottled with black, the apical area hyaline, the venation fuscous and with prominent fuscous suffusions; wings piceous, the basal half darkest where the venation is more or less carmine-red; vertex of head much depressed within the prominent marginal ridges, with four longitudinal black fasciæ (two central and one near each lateral margin), front of head, and marginal ridges of vertex and pronotum ochraceous; face with three longitudinal carinæ, the central one straight and percurrent, the other two not reaching the posterior margin; rostrum reaching apex of abdomen; legs annulated with piceous; abdomen beneath with the segmental margins piceous; tegmina four times longer than broad.

Long., excl. tegm., 17 mm.; exp. tegm. 52 mm.

Hab. New Guinea; Ekeikei (*Pratt*, Brit. Mus.).

Allied to *M. obscura*, Dist., from which it is distinguished by the colour of the wings, the longer rostrum, &c.

Myrilla semihyalina, sp. n.

Head, pronotum, body beneath, and legs pale brownish ochraceous; a spot at both base of front and vertex of head and two central spots on anterior margins of pro- and mesonota black; abdomen above black, the segmental margins green or ochraceous; a central annulation and apices to anterior and intermediate tibiæ, and the same tarsi, black;

tegmina hyaline, the venation fuscous, basal third and costal membrane ochraceous, opaque, the first with fuscous spots, the latter with two transverse, broken, fuscous fasciæ, apical area with fuscous shadings; wings hyaline, with the venation fuscous, the extreme base with some short, pale, fuscous, and virescent markings; rostrum extending to about middle of abdomen; posterior tibiæ with six spines, the three on basal area shortest; face with the longitudinal carinations less profound than in the preceding species.

Long., excl. tegm., 14½–16½ mm.; exp. tegm. 45–50 mm.

Hab. New Guinea, Ekeikei (*Pratt*, Brit. Mus.); Wetter, near Timor (*Doherty*, Brit. Mus.).

Genus Eddara.

Eddara, Walk. List Hom., Suppl. p. 57 (1858).
Glayovia, Stål, Berl. ent. Zeitschr. iii. p. 313 (1859).

Type, *E. euchroma*, Walk.

Eddara catenaria, sp. n.

Head, thorax, abdomen beneath, and legs luteous, abdomen above sanguineous; metanotum and transverse basal fascia to abdomen piceous; face and clypeus greenish ochraceous; tegmina pale greyish virescent, the costal membrane ochraceous, basal two thirds with a number of black link-like spots, some complete and centrally ochraceous, others incomplete and forming only half a link, on apical area a number of subconfluent black spots; wings with about basal two thirds sanguineous or dark ochraceous, the apex and posterior margin fuscous, separated from the basal coloration by a narrow greyish fascia.

To be separated from *E. euchroma*, Walk., by the different colour of the tegmina and wings, the first of which are also apically more narrow and subangulate.

Long., excl. tegm., 13–15 mm.; exp. tegm. 34–36 mm.

Hab. B. E. Africa (*C. S. Betton*, Brit. Mus.).

ADDENDA.

Fam. Cicadidæ.

Subfam. *Tibicininæ*.

Division Tettigadesaria.

Coata, gen. nov.

Head a little longer than pronotum, including eyes little

more than half the breadth of mesonotum at base; vertex nearly twice as long as front, which is inserted in vertex for nearly half its length, the lateral margins of both strongly discontinuous; eyes large and oblique; ocelli placed near anterior margin of vertex; face with a strong central ridge, on each side of which is a narrow longitudinal sulcation before the lateral areas, which are transversely striate, the striations wide apart; clypeus shorter than face; pronotum with the lateral margins moderately convexly ampliate, deeply and acutely sinuate before the posterior angles, which are lobately produced; mesonotum considerably longer than pronotum, the cruciform elevation broader than long; abdomen broader than space between pronotal dilatations, longer than space between apex of head and base of cruciform elevation, beneath with the lateral margins broadly recurved, tympanal coverings entirely absent, in male the tympana prominently exposed; opercula very short, the orifices strongly exposed; rostrum about reaching the base of abdomen; anterior femora dilated, with a strong spine beneath before apex; tegmina hyaline, nearly three times as long as broad, the costal membrane broad above basal cell, radial area broad, apical areas eight; wings with six apical areas.

Type, *C. facialis*, Dist.

Coata facialis, sp. n.

♂. Body virescent, abdomen greyishly pilose; head with a large fuscous spot on each side of front and two linear spots on each anterior lateral area of vertex, the latter with two central longitudinal black fasciæ and a spot of the same colour near inner margin of each eye; pronotum with two central black fasciæ, which are inwardly sinuate beyond middle and ampliated at posterior margin, the lateral margins and fissures black; mesonotum with two central anterior fuscous or testaceous spots and macular indications of a continuous fascia on each lateral area; anal segment with a broad black basal margin; anterior and intermediate tibiæ biannulated with fuscous; apex of rostrum piceous; tegmina and wings hyaline, the veins defining the ulnar areas to tegmina in places black, the transverse veins at base of first, second, and third apical areas moderately infuscated.

In a female specimen from Ecuador the colour of the body is brownish ochraceous, the abdomen above with piceous suffusions, and the dark markings to the tegminal venation larger and more maculate.

Long., excl. tegm., 15–18 mm.; exp. tegm. 56–58 mm.

Hab. Ecuador (*Rosenberg*, Brit. Mus.); Santa Inéz (*Haensch*, Brit. Mus.); Quito (Brussels Mus.).

Some two years ago the British Museum purchased from Herr Haensch what were specified as cotypes of some of the species described by Herr Breddin. Amongst them was this species, labelled *Prunasis analis*, Bredd.; but, as I can find no record of such a description, a mistake must have been made.

V.—*On some West-African Species of* Barbus.

By G. A. Boulenger, F.R.S.

The four species of which descriptions are here given have sometimes been confounded. The large material at my disposal enables me to give revised definitions of them by which their distinction will be made easy. All four belong to the section with two pairs of barbels and with the last simple ray of the dorsal fin neither strongly ossified and spine-like nor serrated.

Their principal characters may be thus contrasted:—

A. Posterior barbel not longer than the eye and twice as long as the anterior.

Depth of body $2\frac{3}{4}$ to 3 times in total length; sq. 22–25 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$, 2–$2\frac{1}{2}$ between lat. l. and ventral ..... *B. ablabes*, Blkr.

B. Posterior barbel once to twice as long as the eye, not twice as long as the anterior.

Depth of body 3 to $3\frac{2}{3}$ times in total length; sq. 25–28 $\frac{4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$–3 between lat. l. and ventral; anterior barbel $1\frac{1}{2}$, posterior 2 diameters of eye..... *B. trispilus*, Blkr.

Depth of body 3 to $3\frac{1}{3}$ times in total length; sq. 21–25 $\frac{3\frac{1}{2}-4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$–3 between lat. l. and ventral; posterior barbel not longer than the anterior, 1 to $1\frac{1}{2}$ diameters of eye; last simple ray of dorsal not enlarged ..... *B. camptacanthus*, Blkr.

Depth of body $3\frac{1}{3}$ to $3\frac{1}{2}$ times in total length; sq. 24–27 $\frac{3\frac{1}{2}-4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$–3 between lat. l. and ventral; posterior barbel longer than the anterior, $1\frac{2}{3}$ to 2 diameters of eye: last simple ray of dorsal much thicker than first branched ray ..... *B. tæniurus*, Blgr.

Barbus ablabes.

Puntius (*Barbodes*) *ablabes*, Bleeker, Nat. Verh. Vet. Haarlem, xviii. 1863, no. 2, p. 114, pl. xxiii. fig. 1.
Enteromius potamogalis, Cope, Trans. Amer. Philos. Soc. (2) xiii. 1867, p. 407.
Barbus ablabes, Steindachn. Notes Leyd. Mus. xvi. 1894, p. 79.

Depth of body $2\frac{3}{4}$ to 3 times in total length, length of head $3\frac{1}{2}$ to 4 times. Snout rounded, as long as eye, 3 or $3\frac{2}{3}$ times in length of head, interorbital width $2\frac{3}{4}$ or 3 times; mouth inferior, its width $\frac{1}{4}$ length of head; lips moderately developed, interrupted on the chin; barbels two on each side, posterior as long as eye and twice as long as the anterior, the distance between them $\frac{2}{3}$ diameter of eye. Dorsal III 8, last simple ray flexible, not enlarged, as long as head; free edge of the fin slightly emarginate; its distance from the occiput a little less than its distance from the caudal fin. Anal III 5, longest ray $\frac{2}{3}$ to $\frac{2}{3}$ length of head. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, reaching or nearly reaching ventral; latter below anterior rays of dorsal. Caudal peduncle $1\frac{1}{2}$ times as long as deep. Scales 22–25 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$, 2 or $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Brownish above, whitish beneath, the dorsal scales darker at the base; a black straight lateral band, from the end of the snout, through the eye, to the base of the caudal; fins white, dorsal greyish in front.

Total length 85 mm.

Originally described from Dabo-Crom, Gold Coast; rediscovered in the Gaboon by M. du Chaillu, in Liberia by Dr. Büttikofer. I have examined numerous specimens from the Gold Coast, obtained by the late Mr. R. B. N. Walker, together with examples of the other *Barbus*, *B. trispilus*, described by Bleeker as found in the same bottle with the type of *B. ablabes*.

Barbus trispilus.

Puntius (*Barbodes*) *trispilos*, Bleeker, Nat. Verh. Vet. Haarlem, xviii. 1863, no. 2, p. 113, pl. xxiii. fig. 3.
Barbus trispilus, Günther, Cat. Fish. vii. p. 108 (1868), and Proc. Zool. Soc. 1899, p. 730.
Barbus camptacanthus, var. *liberiensis*, Steindachn. Notes Leyd. Mus. xvi. 1894, p. 80.

Depth of body 3 to $3\frac{2}{3}$ times in total length, length of head $3\frac{2}{3}$ to 4 times. Snout rounded, not longer than the eye; diameter of eye $3\frac{1}{3}$ to $3\frac{1}{2}$ times in length of head, interorbital width $2\frac{1}{3}$ to $2\frac{1}{2}$ times; mouth terminal, its width about $\frac{1}{3}$ length of head; lips moderately developed, interrupted on

the chin; barbels two on each side, anterior $1\frac{1}{2}$, posterior 2 diameters of eye, the distance between them about $\frac{1}{2}$ diameter of eye. Dorsal III 8, last simple ray flexible, not enlarged, as long as or slightly shorter than the head; free edge of the fin straight or very slightly concave; its distance from the occiput less than its distance from the caudal fin. Anal III 5, longest ray $\frac{2}{3}$ length of head. Pectoral $\frac{1}{3}$ or $\frac{5}{9}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as deep. Scales $25–28\ \frac{4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}–3$ between lateral line and ventral, 10 or 12 round caudal peduncle. Back brownish, sides and belly silvery, the scales of the lateral line and sometimes the series above it with a dark bar at the base; three round or oval black spots on each side, the first anterior to the vertical of the base of dorsal fin and above the lateral line, the second just behind the vertical of the dorsal fin and bordered below by the lateral line, the third at the base of the caudal fin and traversed by the lateral line; fins white, without spots.

Total length 70 mm.

Gold Coast; Liberia.

I have examined numerous specimens, collected by the late Mr. R. B. N. Walker and identified by Dr. Günther.

Barbus camptacanthus.

Puntius (*Barbodes*) *camptacanthus*, Bleeker, Nat. Verh. Vet. Haarlem, xviii. 1863, no. 2, p. 111, pl. xxiii. fig. 2; Sauvage, N. Arch. Mus. (2) iii. 1880, p. 48, pl. iii. fig. 2.

Barbus camptacanthus, Günth. Cat. Fish. vii. p. 134 (1868).

Depth of body 3 to $3\frac{1}{3}$ times in total length, length of head $3\frac{1}{2}$ to 4 times. Snout rounded, longer than the eye in the adult, as long as the eye in the young; diameter of eye $3\frac{1}{2}$ (young) to 5 times in length of head, interorbital width $2\frac{1}{3}$ to $2\frac{1}{2}$ times; mouth inferior, its width about $\frac{1}{3}$ length of head; lips moderately developed, interrupted on the chin; barbels two on each side, equal in length, 1 to $1\frac{1}{2}$ times diameter of eye, which equals the distance between them. Dorsal III 8, last simple ray flexible, not enlarged, $\frac{4}{5}$ to $\frac{5}{8}$ length of head; free edge of the fin slightly emarginate; its distance from the occiput a little less than its distance from the caudal fin. Anal III 5, longest ray $\frac{2}{3}$ length of head. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as deep. Scales $21–25\ \frac{3\frac{1}{2}–4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}–3$ between lateral line and ventral, 12 round caudal peduncle.

Recently preserved specimens, of which a number were

brought home from Fernando Po by Mr. Seimund, are of a dark olive-green above, shading to golden on the sides, and white beneath; scales of the sides dark at the base, most of those of the lateral line with a black spot at the base; a more or less distinct dark lateral stripe, usually expanding and more intensely black in front and on the caudal peduncle; all the fins, vertical and paired, bright vermilion.

Small nuptial pearl-like tubercles on the side of the head.

Total length 155 mm.

The types of this species are from Fernando Po. I have examined numerous specimens from that island, and others from the Benito River, Gaboon district, and the Kribi and Ja Rivers, S. Cameroon.

Barbus tæniurus.

Barbus tæniurus, Boulenger, P. Z. S. 1903, i. p. 24, pl. ii. fig. 2.

Depth of body $3\frac{1}{3}$ to $3\frac{1}{2}$ times in total length, length of head $3\frac{3}{4}$ to 4 times. Snout rounded, $3\frac{1}{2}$ to 4 times in length of head; diameter of eye 4 to $4\frac{1}{3}$ times in length of head, interorbital width $2\frac{1}{3}$ to $2\frac{1}{2}$ times; mouth inferior, its width 3 to $3\frac{1}{2}$ times in length of head; lips moderately developed, interrupted on the chin; barbels two on each side, anterior $1\frac{1}{2}$ to $1\frac{3}{4}$, posterior longer, $1\frac{2}{3}$ to 2 diameters of eye, the distance between them equal to diameter of eye. Dorsal III 8, last simple ray ossified and moderately strong, but much thicker than the first branched ray, as long as or a little shorter than head; free edge of the fin emarginate; its distance from the occiput much less than its distance from the caudal. Anal III 5, longest ray $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Pectoral $\frac{3}{4}$ to $\frac{5}{6}$ length of head, not reaching ventral; latter a little posterior to origin of dorsal. Caudal peduncle $1\frac{1}{2}$ to 2 times as long as deep. Scales 24–27 $\frac{3\frac{1}{2}-4\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$–3 between lateral line and ventral, 12 round caudal peduncle. Olive-brown above (in spirit), yellow on the sides and below; a series of black dots on the lateral line, and a black band on each side of the caudal peduncle; fins white.

Small nuptial pearl-like tubercles on the side of the head.

Total length 120 mm.

South Cameroon (Efulen, Kribi River).

Very closely allied to *B. camptacanthus*, some specimens of which it resembles exactly in coloration. Differs in the usually more slender form, the longer posterior barbel, and the thicker last simple ray of the dorsal fin.

VI.—*Description of a new* Barbus *from the Uganda Protectorate.* By G. A. Boulenger, F.R.S.

Barbus Portali.

Depth of body equal to length of head, $3\frac{2}{3}$ to 4 times in total length. Snout rounded, longer than the eye, which is 4 to $4\frac{1}{2}$ times in length of head and about $1\frac{1}{2}$ times in inter-orbital width; mouth terminal, its width about $\frac{1}{3}$ length of head; lips moderately developed, interrupted on the chin; barbels two on each side, anterior $1\frac{1}{2}$ to $1\frac{3}{4}$, posterior 2 to $2\frac{1}{2}$ diameters of eye, the distance between them about $\frac{2}{3}$ diameter of eye. Dorsal III 7, last simple ray strong, ossified, coarsely serrated behind, much shorter than the head; free edge of the fin not emarginate; its distance from the occiput less than its distance from the caudal fin. Anal III 5, longest ray $\frac{1}{2}$ to $\frac{3}{5}$ length of head. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as deep. Scales 29–31 $\frac{5\frac{1}{2}}{6\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Yellowish, back olive-brown; a dark greyish lateral stripe with or without two or three blackish blotches in its course; fins whitish.

Total length 100 mm.

Five specimens were obtained by Mr. R. B. Woosnam near Fort Portal, 12 miles east of Ruwenzori, in a small stream at an altitude of 4500 feet. This small stream is a tributary of the Mpanga, which flows into Lake Ruisamba, and runs fairly swiftly over rocks and gravel. The only other fish captured in its waters by Mr. Woosnam is *Clarias Carsoni*, Blgr., originally described from Fwambo, 21 miles S.S.E. of Lake Tanganyika, and since rediscovered in Lake Victoria.

Barbus Portali is nearly related to *B. zanzibaricus*, Peters, but differs in the much longer barbels. *B. carpio*, Pfeff., has a deeper body, fewer scales, and shorter barbels.

VII.—*Description of a new Mormyrid Fish from South Cameroon.* By G. A. Boulenger, F.R.S.

Marcusenius Batesii.

Depth of body equal to length of head, $4\frac{1}{2}$ to 5 times in total length. Head once and $\frac{1}{3}$ as long as deep; snout

rounded, $\frac{1}{4}$ length of head; mouth small, subinferior, its width $\frac{1}{4}$ length of head; a very distinct mental swelling; teeth small, notched, 5 or 6 in the upper jaw, 6 in the lower; nostrils midway between eye and end of snout, the anterior on a level with the centre of the former, the posterior on a level with its lower border; eye small, $\frac{2}{5}$ length of snout, $\frac{1}{3}$ interocular width. Dorsal 16–17, originating above fifth ray of anal, its length about $\frac{1}{3}$ of its distance from the head. Anal 22–23, a little nearer root of caudal than base of ventral. Pectoral pointed, about $\frac{3}{4}$ length of head, once and $\frac{1}{2}$ length of ventral, not reaching base of latter. Caudal with pointed lobes. Caudal peduncle $2\frac{1}{2}$ or $2\frac{2}{3}$ times as long as deep, a little shorter than head. 68–70 scales in the lateral line, $\frac{10}{11}$ in a transverse series on the body, $\frac{9-10}{9-10}$ in a transverse series between dorsal and anal, 16 round caudal peduncle. Uniform brown, somewhat lighter beneath.

Total length 145 mm.

Two specimens from the Kribi River, Efulen, South Cameroon, from Mr. G. L. Bates's collections.

Most nearly allied to *M. sphecodes*, Sauv., and *M. brachistius*, Gill. Distinguished from both by the number of scales round the caudal peduncle, which is less slender. This new species may be regarded as intermediate between *M. brachistius* and *M. pauciradiatus*, Stdr.

VIII.—*Description of a new Tree-Viper from Mount Ruwenzori.* By G. A. Boulenger, F.R.S.

Atheris Woosnami.

Snout truncate at the end, with sharp canthus. Eye rather small. Rostral twice and a half to three times as broad as deep; head-shields sharply keeled, 8 to 10 across the crown from eye to eye; 12 to 15 scales round the eye; one or two series of scales between the eye and the labials; nasal entire or divided; 10 upper labials; three or four pairs of small chin-shields, anterior largest and in contact with three or four lower labials; gular scales smooth or very faintly keeled. Scales strongly keeled, in 25 to 30 rows. Ventrals 151 in males, 158–162 in females; anal entire; subcaudals 49–52 in males, 44–47 in females. Olive-green to bright grass-green above, usually with a dorsal series of

large black rhombs which may be confluent into a zigzag band; a lateral series of smaller black spots; a Λ- or A-shaped black marking on the top of the head, the point between the eyes; a black streak on each side of the head, from above the nostril to above the last labial shield; lower parts uniform yellowish or pale green; end of tail black or blackish.

Total length 630 mm.; tail 85.

Several specimens were obtained by Mr. R. B. Woosnam on the east side of Ruwenzori, between 6000 and 6500 feet altitude. This fine snake may sometimes be seen coiled up round the stem of elephant-grass 10 feet above the ground. It is viviparous.

This species is well characterized by its smaller eye, its sharp canthus rostralis, and its smooth or nearly smooth gular scales.

IX.—*Alternation of Generations, Metamorphosis, and Direct Development.* By W. Wedekind *.

In my previous writings on the subject of parthenogenesis I have already pointed out that, in my opinion, so-called asexual reproduction was everywhere the primitive method, and that it is only in the course of phyletic development, through the series—segment, bud, spore, and female and male partheno-ovum,—that at last the ovum needing fertilization and the sperm belonging to it have arisen therefrom. It follows, therefore, that all organisms with sexual reproduction must be derived from asexual ancestors. According to the biogenetic law of recapitulation this phylogeny must also very generally have been repeated in the ontogeny, and I would, moreover, venture to assume that in earlier epochs the course of the entire ontogeny was not yet by any means so rapid as it usually is to-day. It therefore follows from our theory that the ancestral stage of asexual reproduction must formerly have still been displayed in the development of each individual, and that it was only gradually that it became more and more suppressed.

According to this interpretation, then, in the first instance from every fertilized ovum at least an asexual generation must again have developed, and only from this has there arisen once more the ultimate form with sexual reproduction.

* Translated by E. E. Austen from the 'Zoologischer Anzeiger,' Bd. xxix. Nos. 25/26 (March 6, 1906), pp. 790–795.

In other words, alternation of generations was universally the most primitive form of ontogeny, and consequently it is not of merely secondary origin through selection, but, on the contrary, it has persisted only here and there. Thus, on the basis of the theory of descent and the biogenetic law of recapitulation we arrive at this simple explanation: —*alternation of generations is* (nothing more than) *the ontogenetic repetition of the phylogenetic progressive development from lower organisms with asexual reproduction into higher species with dissociated sexual products.* In this way, too, the different varieties (heterogony &c.) are easily intelligible.

When, in consequence of continued acceleration of the ontogeny, the first asexual generation produces, instead of the previous numerous progeny, only a single offspring, and when, moreover, this single descendant no longer severs itself from the mother, but proceeds from it more or less continuously, the ontogeny assumes the form of *metamorphosis.* The latter has therefore arisen from alternation of generations by a process of constant abridgement; and thus we can shortly define metamorphosis as *a curtailed alternation of generations.*

In all cases, then, it is only through continuous acceleration of the ontogeny that *direct development*, as we find it to-day, has arisen from alternation of generations and metamorphosis. Direct development is everywhere the secondary process, which in consequence of its great rapidity is also well-nigh incomprehensible, whereas it is much easier for us to picture to ourselves phylogeny, which is a million times slower, and also an earlier and less rapid ontogeny.

In this way, therefore, alternation of generations and metamorphosis lose all that was previously inexplicable and become easily intelligible to us by means of the theory of descent, when we regard them simply as ontogenetic recapitulations of the development of the species. They are no new processes, which have only arisen at a later date, but, on the contrary, the oldest forms of ontogeny, which, on a further development of the organic world, should it chance to occur later on, will tend towards direct development, but have not originated from the latter. Their occurrence to-day represents only the last remnants of earlier and probably much more widely diffused conditions, just as is the case as regards modern parthenogenesis.

A material advantage of this mode of interpretation, therefore, is that it is nowhere necessary for us to assume the existence of a *cœnogenesis,* with retarded and altered development. Ontogeny consequently makes no detours, but merely

goes on developing continually in a tachygenesis which becomes constantly more and more accelerated.

Moreover, up to the present it has nowhere been shown that the retardation of ontogeny is only secondary. Fritz Müller, too, who is much quoted to this end, certainly brings forward in his well-known memoir many an instance of tachygenesis, and also maintains that development is frequently falsified by the struggle for existence which the free-living larvæ had to undergo; he remarks that this point needs no further elucidation, since it is self-evident, &c., &c. The author in question states that it is easy to understand how even a direct course of development may again be transformed through the struggle for existence into a development with metamorphosis. But in no passage of his work does Müller adduce any *fact* whatever in favour of this assertion, any more than the point has previously been proved by other authors. To me, too, that nature in so many instances should have made such a retrograde step is anything but "self-evident" and "easy to understand"; and still less can I picture to myself the *inner causes* of such a process, especially since I have long ago abandoned the pious belief of my scientific childhood in the omnipotence of selection.

The "utility" also of such a retarded development is absolutely incomprehensible to me. For what have butterflies, for instance, to gain from the fact that, with a more protracted caterpillar life, they are so much the longer exposed to the danger of being devoured before they reach the final goal of their development? Or wherein are they benefited by previously as caterpillars eating up the very plants upon which they subsequently want to live as butterflies?

And so probably in all cases the harmfulness of a slow development can be demonstrated at least equally as well as the advantage; and even when the latter is really present, it still need not on that account be an originating cause, but is, as I interpret it, merely the external stimulus, which, in the case of the species in question, has led to the longer ontogeny persisting until the present day.

In almost every instance, however, a species must derive the greatest advantage from completing its developmental stage as quickly as possible, in order afterwards to continue to live quite a long time as an adult animal. Among insects I need only remind the reader of the highly organized Hymenoptera, of which the metamorphosis is no longer so "complete" as is that of the beetles, butterflies and moths, &c. The metamorphosis, *e. g.* in the case of the bees, which, in contrast to that exhibited by the other orders referred to,

has already undergone considerable reduction, surely bears witness to the general striving after a constantly shorter tachygeny, although, from internal causes of which we are still ignorant, in the case of many lower animals this has not yet advanced so far as direct development.

As the weightiest objection to my interpretation I shall naturally again have to encounter the views on phylogeny which are held to-day. In the case of the lowest orders among the Tunicata we find direct development: consequently the alternation of generations in the higher Tunicata, which are evidently derived from the former, can only be a secondary acquisition. And likewise in the case also of the higher insects, since they are said to be derived from their lower relations which have direct development, "complete" metamorphosis can only be of secondary origin.

In opposition to this line of argument, however, I would call attention to the self-evident truth that in no class of the animal kingdom does there obtain a relation of direct descent between its existing higher and lower orders, and to this rule the Tunicates and Insects form no exceptions. The ancestral form of the Tunicata was consequently not in all points identical with the Appendicularidæ of the present day, but must at least have had a divergent attribute in common with the higher Tunicates. And thus we may naturally just as well imagine these Archi-Tunicates as in other respects entirely similar to the Appendicularidæ, but with asexual reproduction. A portion of these, the present Appendicularidæ, then branched off to one side quite early, and displayed a very rapid and precocious transition to sexuality, so that they, perhaps even in consequence of this over-speedy advance to sexual life, subsequently remained stationary at a lower stage of the development of the phylum. On the other hand the majority, while retaining asexual reproduction for a longer period, continued perhaps on that account slowly but nevertheless surely to make progress in their phylogenetic development, until in their case also a conclusion was reached with the attainment of sexuality in the higher orders. Moreover, this phylogeny of varying length was subsequently retained in the ontogeny also. Since no other material difference any longer existed between the ancestral form with asexual and the present Appendicularidæ with sexual reproduction, ontogeny, too, was easily able to proceed to direct development, while the less rapid phylogeny of the higher orders has left its traces in their ontogeny even at the present day.

Similarly, too, the "typical archi-normal Insect" was, in

my opinion, (not provided with wings and) not dicœcious. This ancestral form must rather have been represented by somewhat worm-like creatures, which (just as, indeed, many worms still do) reproduced themselves asexually and gave rise polyphyletically to the different orders. From these, too, there then very early branched off a portion, which likewise again, precisely because it precociously developed the condition of separate sexes, also remained stationary at the lowest stage; while the remainder, again in consequence of longer retention of the asexual mode of reproduction, had time to undergo further phyletic improvement, and only at the conclusion of their various orthogenies also became parthenogenetic or dicœcious as the case may be. Here also the phylogeny of varying length is then reflected again in a reduced or "complete" metamorphosis, while the latter itself represents no more than the "welding together" of the two primitive generations.

It appears exactly as though the transition to sexual reproduction is also universally connected with a pause in the orthogeny, so that, if the latter takes place rapidly or prematurely, the whole of the rest of the organization also generally remains stationary at a lower stage, while the slower attainment of sexuality in the phylogeny likewise allows time for a higher orthogeny. The one condition directly entails the other, and I would term this phenomenon shortly the *law of precocity* (*prematurity*). A more rapid ontogeny, a direct development, consequently only shows that the earliest stages of the asexual ancestors were already abandoned at a very early period, but not that they had been altogether wanting; and it may also very well be that traces of them are still to be discovered even at the present time.

Naturally my theory is not capable of direct proof, any more than is the opposite view. I think, however, that my theory is simpler and more natural, since by means of it, indeed, we at once get rid of the entire cænogeny, and need only imagine the ontogeny as having been accelerated, but not as having subsequently been altered, by side influences.

In this way also we should surely find less difficulty in understanding the manifold transitions, which still frequently occur especially between alternation of generations and metamorphosis, and with regard to which we may be in much doubt as to whether we are still confronted with a reduced alternation of generations or have before us an already commencing metamorphosis. They are all just gradations of one and the same phenomenon, which pass without a break one into the other, and with which hitherto the majority

of authors have not known how to deal correctly. Brandes alone, in his new edition of Leuckart's work on 'Parasites,' speaks on one occasion of a "masked" alternation of generations; but otherwise such intermediate stages are always interpreted as "commencing" alternation of generations. But still it is by no means quite clear how such a view can be taken. There certainly can be no question of orthogeny, and, on the other hand, neither can any value whatever be attributed to such "beginnings" from the point of view of selection. Thus it is consequently in all probability more correct to regard them simply as purposeless remnants, and so to consider them as we do the rudimentary organs, which, indeed, were equally conundrums before Darwin's time. In the embryological works of the last few years will be found the description of many a phenomenon which from this point of view would be much more readily intelligible.

The regenerative faculty, too, is thus perhaps capable of being interpreted simply as the rudiment of an earlier asexual mode of reproduction. The ability to produce from their asexual cell-material a new and distinct individual has gradually been lost by the higher animals (and this is how I account for metamorphosis also); but at least they have still retained the power of continually bringing the old individual up to its normal condition. This, then, probably also explains why it is precisely organisms with undiminished asexual reproduction (thus, the plants in an especial degree) that do not regenerate; and hyper-regeneration, too, is surely easy to understand when we regard it as a more powerful remnant of an earlier asexual reproduction.

It may be that thoughts like these have already occurred to one naturalist or another, and that it was only Tunicates, Insects, &c., that hitherto have always led to their being abandoned again. On that account I have already dealt with this main objection in the present paper, while I must defer the further development of my theory in fuller detail until somewhat later, in connexion with my thesis on parthenogenesis and arbitrary determination of sex in the higher animals. For it all hangs together, one thing follows from the other, and everything rests upon a mutual basis. The entire development of the organic world is to my mind a purely orthogenetic process, consisting in continually advancing "sexual dissociation" of the primitively latent-hermaphrodite (so-called asexual) original condition. Without such a "sexuality" of the organic world, a natural force, therefore, which has hitherto been disregarded, we shall, in my opinion, be unable to furnish a complete explanation of

organic life; but with a working hypothesis of this kind we at least advance a step or two further.

Just as little as we can explain the magneto-electric phenomena by means of mechanics alone, so do we find that these two no longer suffice for the organic phenomena; on the contrary, in their place also we must now assume the existence of a special form of energy, upon which, from its most conspicuous quality, I bestow the designation "sexuality." In this force there is, of course, just as little of the supernatural as in the other forces of nature. And that it is likewise already capable of being expressed in figures and is subject to mathematical treatment I shall shortly show elsewhere in a paper on the mathematical equations of the partheno-ova and their fertilization.

X.—*Natural History Notes from the R.I.M.S. Ship 'Investigator,' Capt. T. H. Heming, R.N., commanding.*—Series III., No. 13. *Two new Barnacles dredged in* 1905–6. By N. Annandale, D.Sc., Indian Museum, Calcutta.

Genus Dichelaspis.

Dichelaspis transversa, sp. n. (Figs. 1, 1 *a*.)

Capitulum bullate, with the orifice on the upper surface and almost parallel to the base, with a well-defined lobular projection on each side of the orifice at its upper extremity, with three complete valves and traces of a second pair. *Scuta* linear, sinuous or curved, short, uneleft; *carina* narrow, very short, almost straight, somewhat variable, without either a disk or a fork at its base; terga totally uncalcified, represented by a pair of amorphous chitinous patches. *Peduncle* stout, constricted above, as long as or longer than the capitulum.

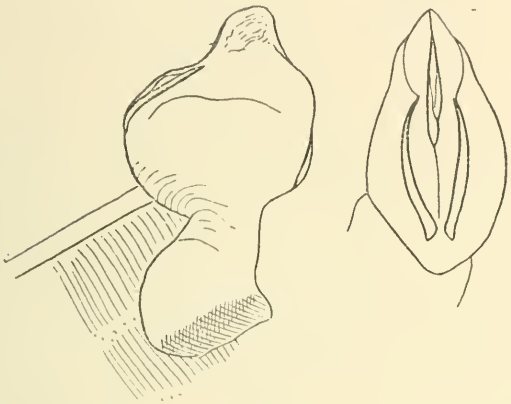
Mandible with five teeth; the four innermost short, simple, subequal; the outermost large, sharply pointed, widely separated from the others.

Penis longer than body, very stout, constricted distally and ending in a bunch of fine, curved, filiform processes; the whole organ densely covered with rings of minute, laterally flattened, triangular, chitinous spines, which have a flattened depressed base; a few larger chitinous structures with a subconical base and a recurved distal point scattered, with some short bristles, near the distal extremity. Anal ap-

pendages moderate, rounded distally, with a complete fringe of long stout hairs on the posterior and distal margins.

	mm.
Length of capitulum	4
Breadth „	3·5
Length of peduncle.....	7

Fig. 1. Fig. 1 *a*.



Locality. Northern end of Persian Gulf, shallow water. Numerous specimens on the gills of *Neptunus pelagicus*, together with specimens of *D. Vaillanti*, Gruvel *, which was described from a specimen of the same crab from Suez.

D. transversa is allied, as regards its external characters, to C. W. Aurivillius's *D. bullata* †, from which the presence of a carina at once distinguishes it. The latter species was described from the gills of a Javan Palinurid.

Dichelaspis bathynomi, sp. n. (Fig. 2.)

Capitulum amygdaloid, compressed, with seven valves. *Carina* narrow, feebly expanded below, fully calcified at the base only; the basal arm short, almost in contact with the scutum distally. *Terga* large, fully calcified round the umbo, subtriangular, but rounded above; the occludent margin much shorter than the other two, the scutal margin straight or slightly sinuous. *Scuta* large, completely divided; the occludent section horn-shaped, pointed below, truncated

* Nouv. Archives Mus. Paris, (4) vi. (1902).
† Kongl. Svenska Vetensk.-Akad. Handl. xxvi. no. 7 (1894).

or rounded and in contact with the tergum above ; the inner section irregularly triangular, broad at the base, pointed above, shorter than the outer section ; the whole plate feebly calcified except round the umbo. *Peduncle* stout, almost cylindrical, annulated, shorter than the capitulum.

Fig. 2.

Penis as long as the body, slender, tapering, minutely annulated, with a short process on the upper surface at the distal extremity. *Anal appendages* nearly reaching the junction of the rami of the sixth cirri above, rather slender, with a fringe of very long hairs on the upper third of the posterior margin and at the tip.

Mandible with five teeth ; the two innermost close together, small ; the next two subequal, moderate ; the outermost large, sharply pointed, not so widely separated from the others as in some species.

	mm.
Length of capitulum	8
Breadth ,, ...	4
Length of peduncle.....	4

Locality. Off the south-east coast of Arabia; 555 fathoms. Several specimens on the pleopods of *Bathynomus giganteus*.

This species appears to be related to *D. Hoeki*, Stebbing *, which was found on the gills of an American Palinurid.

XI.—*Description of a new Species of* Parnassius.

By F. Moore, D.Sc., F.Z.S.

Parnassius Balucha.

Male.—Upperside milk-white. *Fore wing* with the costal border basally irrorated with black scales, the basal area densely black-scaled; a dense black bar across middle of the cell, but not touching the median vein; a shorter black bar at upper end of the discocellular vein, followed close beyond by an irregular-shaped, longer, outwardly oblique bar, enclosing three crimson spots, this latter bar extending from the first subcostal branch to upper median branch, and its inner edge very slenderly joined to the discocellular bar by black scales along the intervening veinlets; the outer margin of the wing is bordered by a black-scaled decreasing band, which is broad anteriorly and slender posteriorly, and is traversed by a series of seven white rounded spots—one each placed between the veins, the upper one being more inwardly positioned towards the costa, the outer marginal edge of the black band formed of diagonally-quadrate portions, each of the latter including its contiguous cilia. *Hind wing* with the base and upper part of the abdominal margin black-scaled; a small black-scaled crimson-centred spot on middle of anterior margin and a similar discal spot beyond the cell; a slightly defined blackish-scaled submarginal series of five slender incurved lunules, the lower three being less defined, and each joined at the veins to a similar black-scaled marginal line, which is posteriorly broken between the veins, and at the vein-tips include their contiguous cilia. Thorax and abdomen blackish, clothed with long white hairs; front of head and palpi clothed with grey hairs; antennæ greyish, the tip white.

Underside white. *Fore wing* with the three black bars as on the upperside, but broader, the blackish-scaled outer band, as on upperside, indistinctly defined, its most distinct portion being that between the upper and middle median veinlets.

* Ann. & Mag. Nat. Hist. (6) xv. p. 18 (1895).

Hind wing with the costal and discal spot as on upperside, and two crimson-centred lineally-conjoined lunules on middle of the abdominal margin; the basal area of the wing, a broad zigzag fascia across the inner discal area, and a similar outer discal fascia speckled with minute black scales, the basal fascia enclosing two outwardly placed anterior crimson spots, also one within the cell and another on the abdominal margin; the outer discal fascia is edged by a slender submarginal black line incurved between the veins and joined to a similar marginal line with black points at the vein-tips, these latter including their contiguous cilia.

Expanse, ♂, $2\frac{1}{2}$ inches.

Hab. Baluchistan.

Several specimens, all males, were obtained by Mr. O. C. Ollenbach, between Quetta and Nushki, at 5000 feet elevation.

The nearest ally to the above species appears to be *Parn. maxima*, Staudinger, from Samarkand.

XII.—*On Three remarkable new Melolonthid Coleoptera from Sumatra and Borneo in the British Museum.* By Gilbert J. Arrow.

Nematophylla, gen. nov.

Caput latum; clypeus brevis; labrum bilobatum: mandibulæ crassæ, obtusæ, dentibus molaribus magnis, striatis; maxillæ corneæ, bilobatæ, lobis bidentatis, palpis maxillaribus longis, gracilibus, articulo ultimo securiforme; mentum subquadratum, medio profunde sulcatum et utrinque læve elevatum; antennæ maris 10-, fœminæ 9-articulatæ, illius articulis tribus ultimis longissimo flabellatis, articulis 3°–7^{m} brevissimis, 2° paulo majore, 1° sat longo; pedes graciles, unguibus medio dentatis, tibiis anticis tridentatis, coxis anticis parvis, vix transversis; segmenta abdominalia medio consolidata.

Nematophylla rugosa, sp. n.

Rufo-fusca, paulo depressa: capite lato, crebre punctato-rugoso, oculis magnis, clypeo a fronte linea impressa parum distincta separato, antice subangulariter emarginato, margine vix reflexo; prothorace lato, longitudinaliter aciculatim rugoso, medio leviter sulcato, postice marginato, leviter sinuato, lateribus subtiliter crenatis, sat regulariter arcuatis, postice valde contractis, angulis fere rectis: scutello fere æquilaterali, velutino; elytris multo

inæqualibus, crebre punctato-rugosis, angulis humeralibus fere rectis, lateribus ubique paulo arcuatis, callis apicalibus carinatis; pygidio haud magno, triangulari, æqualiter grosse et crebre punctato; corpore indumento velutino plus minusve vestito, setisque minutissimis nonnullis sparsuto.

Long., ♂ 10·5, ♀ 12·5 mm.

Hab. N.E. Sumatra, Indragiri River.

A pair of this pretty little insect was found by Mr. Rowland Taylor in 1895. It has the general aspect of *Lachnosterna* and *Brahmina*, from which it is impossible to dissociate it in spite of important divergences. Its very short and prominent anterior coxæ infringe the primary characteristic of the true Melolonthini, with which the fused abdominal segments and general structure connect it. Its most striking feature is the enormously elongate club of the male, consisting of three equal joints almost as long as the elytra. The scape is about as long as the six joints forming the stipes taken together, these being very short, but slightly increasing in diameter as they approach the club. In the female the club is extremely short, and between it and the elongate first joint there are only five joints, which are not compressed as in the male, but are conjointly a little longer than the scape. The prothorax is finely rugulose, the scutellum smooth and velvety, and the elytra very irregular, with shallow depressions, variolose punctures, and strong carinæ near the apices. The organs of the mouth are rather peculiar, and the claws have a strong curved tooth about the middle. The legs and underside are everywhere strongly punctured, and there is a greyish bloom partially covering the sterna, abdomen, and elytra.

Octoplasia gigantea, sp. n.

Robusta, elongata, corpore supra et subtus longe et erecte fulvo-hirto, pygidio abdominisque medio nudis, nigra, elytrorum parte posteriore corporeque subtus rufis, abdomine pallidiore; capite lato, clypeo leviter bilobato, grosse punctato, margine reflexo, fronte rugose punctata, sicut prothorace atque elytris, longe et parce hirsuta; prothorace crebre punctato, punctis majoribus piliferis interspersis, lateribus crenatis, piliferis, post medium valde angulatis, angulis anticis paulo productis; scutello lato, fortiter punctato; elytris longis, sericeis, sat fortiter punctatis, costis latis, lævibus, piliferis, marginibus exterioribus antice reflexis; pygidio glabro, fortiter punctato; prosterno postice tuberculis duobus divergentibus acutis instructo.

Long. 43 mm.; lat. max. 20 mm.

Hab. Borneo, Mount Dulit.

Two species of this genus, both inhabiting Borneo, have previously been described. The present one agrees with them in all its essential characters, but is much larger, and, indeed, is by far the largest of the great *Lachnosterna* group known to me. In its general form and colour it is like *O. princeps*, Sharp, but the long erect hairs with which the upper surface bristles distinguish it from all its congeners, now three in number. These hairs arise from very large punctures which are scattered irregularly over the prothorax and front of the head, but upon the elytra are confined to the smooth slightly elevated costæ. Another peculiar feature is found in the shape of the prosternal process, which has the unusual form of a transversely placed crescent, the two extremities of which are acutely pointed but not much elevated.

A single specimen was found by Mr. Charles Hose.

Octoplasia prolixa, sp. n.

Valde elongata, castanea, capite nigro, femoribus flavis, supra glabra, pectore dense flavo-hirto; capite lato, clypeo leviter bilobato, impunctato, margine reflexo, fronte crebre punctata, lateribus parcissime sed longe hirsutis; prothorace grosse sat crebre punctato, medio paulo impresso, lateribus crenatis, piliferis, regulariter arcuatis, haud angulatis, angulis anticis acutis, posticis rotundatis; scutello grosse punctato; elytris longissimis, lævibus, parum punctatis, costis sat distinctis, fere impunctatis, marginibus exterioribus haud reflexis; pygidio fortiter crebre punctato; processu prosternale breve, conico.

Long. 36 mm.; lat. max. 15 mm.

Hab. Borneo, Kina Balu (*Whitehead*).

I have seen only a single specimen of this also. It is another large species, but is chiefly noticeable for its great elongation, the elytra being four times the length of the prothorax. They have no silky bloom like *O. gigantea*, and their puncturation is rather feeble. Their lateral margins are bordered with a rather wide membrane, but are not reflexed, as in the other species.

XIII.—*On the Bats of the Genera* Micronycteris *and* Glyphonycteris. By Knud Andersen.

I. Micronycteris, Gray.

1856*. *Schizostoma*, P. Gervais, Expéd. Castelnau Amérique du Sud, Mamm., livraison 15, sheet 7, p. 49.—Type: *Schizostoma minutum*.

* The titlepage of the volume is dated 1855; on the probable dates of publication of the livraisons see C. Davies Sherborn and B. B. Woodward, Ann. & Mag. N. H. (7) viii. p. 164 (Aug. 1901).

Name preoccupied by *Schizostoma*, Bronn, 1835, a genus of Mollusca.

1866. *Micronycteris*, J. E. Gray, P. Z. S. p. 113.—Type: *Micronycteris megalotis*.

The subjoined characterization is confined to the features in which *Micronycteris* differs from *Glyphonycteris*:—

Skull *.—Facial portion, immediately in front of orbits, not conspicuously inflated. Basioccipital pits, antero-internally to cochleæ, shallow.

Dentition †.—i^2 not especially modified (compare *Glyphonycteris*). Upper canines not shortened, their vertical being about twice their antero-posterior basal diameter. The "heel" of p^3 represented only by a very narrow cingulum. *Inner border of the cingulum of* p^4 *with a distinct shallow emargination, dividing the cingulum into an antero-internal* ("cusp 6" ‡) *and a postero-internal tubercle* ("cusp 7").

Ears.—Conjoined by a transverse band across the head. Outer margin of ear-conch not distinctly concave in its upper half.

Chin.—A triangular naked space (in skins and alcohol specimens often contracted to a deep furrow), flanked by two oblique warts, converging downwards.

Wings.—Third and fourth metacarpal subequal in length, fifth the longest. First and second phalanx of third digit subequal.

Species.—Four species were catalogued by Dobson in 1878: *M. hirsuta, megalotis, minuta, Behni.* Since that time the following three species have been described: *M. brachyotis* (Dobson, 1879), *M. microtis* (Miller, 1898), *M. hypoleuca* (J. A. Allen, 1900). I have satisfied myself that *M. Behni* is a *Glyphonycteris*; the same is probably the case with *M. brachyotis*; and *M. hypoleuca* is apparently indistinguishable from *M. minuta*. The genus *Micronycteris*, as here restricted, therefore comprises the following four species: *M. megalotis, microtis, minuta,* and *hirsuta*.

Range.—From S. Brazil and Peru to Mexico.

* The skull of *M. minuta* is figured in 'Expéd. Castelnau Amérique du Sud,' Mamm., pl x. figs. 4, 4*a*. The skull of *M. megalotis* in Dobson's 'Cat. Chir. Brit. Mus.' pl. xxvi. figs. 3, 3*a*, 3*b* (1878); and in Herluf Winge's "Jordfundne og nulevende Flagermus fra Lagoa Santa," E Museo Lundii, ii. pt. 1, pl. i. fig. 1 (1892).

† I write the dental formula of *Micronycteris, Glyphonycteris,* and allied genera as follows:—$\frac{i^2\ i^3\ c\ \_\_\ p^3\ p^4\ m^1\ m^2\ m^3}{i_2\ i_3\ c\ p_2\ p_3\ p_4\ m_1\ m_2\ m_3}$.

‡ On the probable homologies of the cusps of mammalian teeth, see Herluf Winge, "Om Pattedyrenes Tandskifte især med Hen-syn til Tændernes Former," Vidensk. Medd. Naturhist. Foren. Kbhvn. 1882, pp. 15–69, pl. iii.; and a series of papers by the same author in E Museo Lundii.

1. *Micronycteris megalotis*, Gray.

Teeth.—p_2 higher than p_3 and p_4; p_3 and p_4 subequal in height (p_3 often a trifle lower); p_3 in cross-section at base a little smaller than p_4.—p^3 about half the height of the canine; p^3 and p^4 subequal in height. Tip of the principal cusp of p^3 situated only very slightly in front of a vertical line through the *middle* of the base of the premolar; vertical diameter of p^3 about equal to antero-posterior basal diameter; external surface of p^3 convex.

Ears.—Long and broad, reaching beyond the tip of the muzzle when laid forwards. Cross-striæ on ear-conch faint and rather ill-defined; number about 13–14; distance between uppermost and lowermost stria about 11 mm.

In the *fully adult male* the transverse band between the ears is triangular in shape, *i. e.* low laterally, triangularly raised in the middle; a small notch at the middle of the upper margin of the band (the top of the triangle). Immediately behind the band, in the fronto-parietal region, a triangular groove bordered by a horseshoe-shaped elevation of the skin; the median, triangularly projecting portion of the band, when laid backwards, fits exactly to the triangular groove, as the lid to a box; tufts of long hairs on the posterior surface of the "lid." The bat is no doubt able to cover and uncover the groove by moving the band forwards and backwards.

In females and young males the transverse band is much lower, not conspicuously higher in the middle than laterally; the frontal groove is absent or, at most, very ill defined.

The frontal groove (which, to my knowledge, has not been described by previous writers) is evidently analogous to the frontal sac in many species of *Hipposiderus*. The position is the same; the long hairs recall the hair-tuft in the *Hipposiderus* sac; and, as in the majority of *Hipposideri*, the apparatus is characteristic of the male sex. A frontal concavity almost identical in structure and position is found in the males of an Oriental species of *Nyctinomus* (*N. johorensis*).

Nose-leaves.—Lancet long, *i. e.* its extreme length about equal to $1\frac{1}{2}$ its width at base.

Wings.—Forearm practically naked; some short, scattered hairs are observable on very close inspection. Wing-membranes inserted on the ankles or the base of the metatarsus. Length of forearm 31·8–38 mm.

Foot and calcar.—The foot is comparatively small, equal to $\frac{1}{2}$ or $\frac{3}{5}$ the length of the lower leg. Calcar long, always longer than the foot, and always much more than half the length of the lower leg.

Tail and interfemoral.—The posteaudal portion of the interfemoral is longer than the tail, from the anus to the tip of the last vertebra.

Colour.—There are two extremes in the colour of the fur:—

(1) Upperside Prout's brown with a tinge of russet; base of hairs pure white or washed with ecru-drab. Underside wood-brown, base of hairs scarcely lighter.

(2) Upperside dull dark brown without any trace of russet tinge; base of hairs pure white or washed with ecru-drab. Underside hair-brown.

The extremes are connected by several transitional stages. The variation in colour is independent of the locality and, as it seems, of the age of the individuals.

Range.—The same as that of the genus.

Remarks.—The large p_3 and p^3, the median position of the principal cusp of p^3, the very small notch at the middle of the upper margin of the ear-band, the practically naked forearm, the long hand, the small foot, long calcar, long posteaudal interfemoral, and darker-coloured underside of the body readily distinguish this species from *M. minuta*. From *M. hirsuta* it differs by its smaller size and higher ear-band, from *M. microtis* by its much darker colour.

1 *a*. *Micronycteris megalotis*, f. *typica*.

1842. *Phyllophora megalotis*, J. E. Gray, Ann. & Mag. N. H. x. (no. 65) p. 257; Dec. 1842.—Type: ♂ imm., in alcohol; Brazil; British Museum (unregistered).

1842. *Phyllostoma elongata*, J. E. Gray, ibid. p. 257: Dec. 1842.—Type: ad., skin; Brazil; British Museum (no. 42. 8. 17. 8). Name preoccupied by *Phyllostoma elongatum*, Geoffroy, 1810. Indistinguishable from the type of *Phyllophora megalotis*.

1855. *Phyllostoma scrobiculatum*, J. A. Wagner, Schreber's 'Säugthiere,' Suppl. v. p. 627.—New name for *Phyllostoma elongata*, Gray (= *Phyllophora megalotis*, Gray).

Subspecific characters.—Tooth-rows shorter. Forearm and metacarpals shorter.

Details.—This southern form of *M. megalotis* differs from *M. m. mexicana* in the following particulars:—

The skull is slightly smaller (see measurements *, pp. 64–65); the mandible shorter; *the tooth-rows shorter*; upper teeth 6·8–7·3 mm., as against 7·4–7·8 in *mexicana*. The length of

* Only the following measurements require some explanation:—*Ears*, length from base of *inner* margin to tip. III.^{3}, IV.^{2}, V.^{2}, measured without the terminal cartilaginous rod. *Skull*, total length and basilar length, to front of canines (not to front of incisors). *Upper* and *lower teeth*, exclusive of incisors.

the forearm varies between 31·8 and 36·2 mm., in *mexicana* between 35·2 and 38; in the southern form the average is 34·4, in the northern 36. The metacarpals are shorter: in the southern form the third metacarpal measures 25·8–29·8 mm., in *mexicana* 29–32·7.—In every other respect (including the colour of the fur) the two races are alike.

Specimens examined.—32, from the following localities:—Pereque, S. Paulo (2); Sumidouro, Minas Geraes (1); S. Lorenço, Pernambuco (2); Chapada, Matto Grosso (2); R. Jurua, Amazonas (2); R. Perene, Junin, Peru (2); Kanuku Mts., B. Guiana (7); S. Esteban, Venezuela (2); Trinidad (2); Tobago (4); "Brazil" or uncertain localities (6).—18 skulls, from practically all the localities enumerated.

Range.—From S. Brazil and Peru, through Guiana and E. Venezuela, to Trinidad and Tobago.

1 *b*. *Micronycteris megalotis mexicana*, Miller.

1898. *Micronycteris megalotis mexicanus*, Gerrit S. Miller, Proc. Ac. Nat. Sci. Phil. 1898, pt. ii. pp. 329 31: Nov. 8, 1898.—Type: ♀ ad., in alcohol; Plantinar, Jalisco, Mexico; U.S. Nat. Mus.—Separated by Miller on account of its longer wing.

Subspecific characters.—Tooth-rows longer. Forearm and metacarpals longer.

Details.—See the typical race, above.

Specimens examined.—11, from:—Bogota region, Colombia (6); Dueñas, Guatemala (2); Bay of Honduras (1); Mexico (2).—9 skulls, from all the localities enumerated.

Range.—From Bogota, through Central America, to Mexico.

Remarks.—The examples recorded by Mr. Miller were from various places in S. Mexico (Oajaca, Colima, Jalisco); the British Museum material shows that this larger race has a much wider distribution. Judging from the series available, it would seem that it reaches its climax (*i. e.* its maximum size) in Central America.

Truly intermediate specimens between the southern race and *mexicana* I have not seen; but three skins from Maipure, Orinoco, thus from a border region between the areas of the two races, are *perhaps* intermediate in *external* dimensions (forearm 35–35·8 mm.; third metacarpal 28·7–28·8); the skull of one of the individuals is, however, quite pronounced *mexicana* (upper teeth 7·8 mm.); the two other skulls have been lost.

2. *Micronycteris microtis*, Miller.

1898. *Micronycteris microtis*, Gerrit S. Miller, Proc. Ac. Nat. Sci. Phil. 1898, pt. ii. pp. 328 29, 331; Nov. 8, 1898.—Type: ♂ ad., skin and skull; Greytown, Nicaragua; U.S. Nat. Mus. The only specimen recorded.

The species is known to me from the published account only.

The principal characters, according to Miller, are these:—Ears considerably shorter than in *megalotis*; inner surface of ear-conch with eight sharply defined cross-ridges, crowded into the space of 5 mm.* Colour of the fur, both dorsally and ventrally, wood-brown, with nearly white bases to the hairs. General size small: forearm 31 mm.

Other external features, as well as the dentition, essentially as in *M. megalotis*.

3. *Micronycteris minuta*, Gervais.

1856. *Schizostoma minutum*, Paul Gervais, Expéd. Castelnau Amérique du Sud, Mamm., livraison 15. sheet 7, p. 50, pl. vii. fig. 1 (whole figure); pl. x. figs. 4, 4 *a* (skull and dentition).—Type from Capella Nova, Brazil; Paris Museum.

? 1900. *Micronycteris hypoleuca*, J. A. Allen, Bull. Amer. Mus. N. H. xiii. pp. 90-91; May 12, 1900.—Type: ♀ ad., skin without skull; Bonda, Santa Marta region, Colombia; New York Museum; the only specimen on record.—Characters, according to Dr. Allen: "About the size of *M. minuta*, but white below instead of ashy, and the basal portion of pelage above white instead of ashy white." But British Museum examples (skins) of *M. minuta* from Brazil are,

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* Are the ears of the type specimen of *M. microtis* undamaged? My reason for raising the question is this:—In the proportionate size of the ears and in the cross-markings of the conch *M. hirsuta* is similar to *M. megalotis*. But in two British Museum examples of *M. hirsuta* the ears are very short, reaching only a little beyond the eyes when laid forwards, and the cross-markings on the inner surface of the conch are very strongly defined and crowded into a space of 6–7 mm.; they are, on the whole, puzzlingly like the type of ear described by Mr. Miller in *M. microtis*. But the ears of these two *M. hirsuta* have indubitably been singed (the bats may have been caught while trying to escape from a burning tree, or, perhaps more likely, been found dead in a hole of a partially burnt-down tree); though very much shrunk they have, however, *preserved their original shape*; they have simply contracted into scarcely ⅔ their natural size, and, as a consequence of that, the cross-markings have become very sharply defined, prominent beyond the plane of the conch, and crowded into a small space, and the ear-conch thick and stiff. Is the same, perhaps, the case with the ears of the only specimen known of *M. microtis*? If so, *M. microtis* is very closely related to *M. megalotis*, differing, as it seems, only in the much lighter colour of the fur (which, however, may be indicative of a light phase only) and, perhaps, a slightly smaller size.

some of them *white*, others greyish white below, and have the bases of the hairs of the upperside white. If, therefore, there is no other difference between *M. hypoleuca* and *M. minuta*, the former cannot be distinguished from the latter. I understand from Dr. Allen's description that he had no example of *M. minuta* for comparison.

Teeth.—p_3 much lower than p_3, only a little higher than the cingulum of p_2.—p^3 much lower than p^4, only a little higher than the cingulum of the canine. Principal cusp of p^3 situated near the anterior end of the tooth; vertical diameter of p^3 markedly shorter than antero-posterior basal diameter; external surface of p^3 concave.

Ears.—Essentially as in *M. megalotis*: long and broad, extending beyond the tip of the muzzle when laid forwards. Cross-striæ on ear-conch faint and rather ill-defined; number about 11–12; distance between uppermost and lowermost stria about 10 mm.

In the fully adult male the transverse band between the ears is as high as, or, rather, still higher than, in the male of *M. megalotis*; but the median notch is extremely deep, reaching practically to the base of the band, thus *dividing it into two distinct triangular lobes*. A coat of long hairs on the posterior surface of the band. Frontal groove as in the male of *M. megalotis*.

Spirit-specimens of females are not available for examination.

Nose-leaves.—Essentially as in *M. megalotis*, but lancet comparatively a trifle shorter, its extreme length being on average equal to about $1\frac{1}{3}$ its width at base.

Wings (compare the wing-indices below, p. 65). — The metacarpals are proportionately shorter than in *M. megalotis*; an inspection of the measurements (below, pp. 64–65) will show that whereas *M. minuta* has the forearm of precisely the same length as *M. m. mexicana*, its metacarpals are as short as in the small southern race, *M. m. typica*; this, together with a shortening of the proximal phalanges, makes as a total result *a proportionately shorter hand in M. minuta*. The second phalanx of the fourth digit is practically equal to the first phalanx (in *M. megalotis* decidedly shorter than the first phalanx).

The muscular part of the forearm is densely haired. Membranes inserted on the ankles or the extremity of the tibia. Forearm 36–37·5 mm.

Foot and calcar.—The foot is comparatively large, much more than $\frac{1}{2}$ the length of the lower leg. Calcar short, always shorter than the foot, and less than $\frac{1}{2}$ the length of the lower leg.

Tail and interfemoral.—The postcaudal portion of the interfemoral is shorter than the tail.

Colour.—Above as in *M. megalotis*, below considerably lighter. Upperside Prout's brown, base of hairs white; underside whitish or greyish white in the middle, drab on the flanks.

Range.—Brazil, from Santa Catherina in the south to Para in the north. Extending to Colombia, if *M. hypoleuca* is identical with *M. minuta*.

Specimens examined.—11, from:—Santa Catherina (3); Para (4); "Brazil" (4).

Remarks.—On hasty inspection *M. minuta* bears no small resemblance to *M. megalotis*. The two species are practically alike in the shape of the skull, in the ears and nose-leaves, and in the general size; *M. minuta* is not, as its technical name might suggest, smaller than *M. megalotis*. But *M. minuta* differs in the following important respects:—In the very conspicuous reduction of p_3 and p^3; in having the transverse band between the ears divided into two separate triangular lobes; in having the proximal half of the forearm densely haired; in the proportionately shorter hand; in the larger foot, short calcar, short postcaudal interfemoral, and lighter-coloured underside of the body.

4. *Micronycteris hirsuta*, Ptrs.

1869. *Schizostoma hirsutum*, Peters, MB. Akad. Berlin, p. 397.—Type: ♂ ad., in alcohol; locality unknown; Paris Museum.

Skull.—Similar in shape to the skull of *M. megalotis* and *M. minuta*, but much larger, and brain-case less vaulted and raised above the facial region, the profile-line, from the uppermost point of the brain-case to the nasals, therefore less concave.

Teeth.—Cutting-blade of i^2 markedly less compressed antero-posteriorly than in *M. megalotis* and *minuta*. Upper premolars as in *M. megalotis*. Almost the same is the case with the lower premolars: p_2 slightly higher than p_4, which is slightly higher than p_3.

Ears.—Proportionate size as in *M. megalotis* and *minuta*; number of cross-ridges 13–14, covering a space of about 11 mm.

Transverse band between ears, in both sexes, very low, straight (not higher in the middle), and without median notch. There seems to be no frontal groove (the two specimens examined of this very rare bat are in a bad state of preservation).

Nose-leaves.—Lancet proportionately shorter, its extreme length only a little longer than its width at base.

Wings.—Wing-structure almost precisely as in *M. megalotis*, the only noteworthy difference being the somewhat shorter metacarpals.

Forearm haired almost to the extremity. Membranes inserted very nearly on the ankles. Forearm 43·5–45 mm.

Calcar.—Slightly longer than the foot.

Specimens examined.—Pozo Azul, Costa Rica, 200 m. (♂ ad., ♀ ad.). One skull.

Range.—As yet known from Costa Rica only.

Remarks.—The large size of *M. hirsuta* prevents its confusion with any other species of the genus.

II. Glyphonycteris, Thos.

1896. *Glyphonycteris*, Oldfield Thomas, Ann. & Mag. N. H. (6) xviii. pp. 301–2; Oct. 1, 1896.—Type: *Glyphonycteris sylvestris*.

Skull.—Facial portion, immediately in front of orbits, very conspicuously inflated. Anterior nasal openings more horizontal in position than in *Micronycteris*, directed chiefly upwards. Basioccipital pits, antero-internally to cochleæ, very deep.

Dentition.—i^2 very pronouncedly chisel-shaped, its cutting-blade broad from side to side, extremely thin antero-posteriorly. Canines short, their antero-posterior basal about equal to their vertical diameter. Inner cingulum of p^3 developed into a conspicuous rather broad "heel"; tip of the principal cusp of p^3 anterior in position, situated in a vertical line through the *front end* of the base of the premolar; antero-posterior basal much longer than vertical diameter. *Inner margin of the cingulum of p^4 convex*; no distinct "cusp 6."

Ears.—Not conjoined by a transverse band across the head. Outer margin of ear-conch distinctly concave in its upper half.

Chin.—As in *Micronycteris*.

Wings.—Third and fifth metacarpal subequal in length, *fourth the shortest*. Second phalanx of third digit from $1\frac{1}{5}$ to $1\frac{1}{3}$ the length of the first phalanx.

A comparison with *M. megalotis* and *hirsuta* (in *M. minuta* the hand is peculiarly shortened) will readily show how this modification of the wing-structure has been effected (see wing-indices, below, p. 65):—In *Glyphonycteris* the fourth metacarpal has, very nearly, the same proportionate length as in *M. hirsuta*, whereas the fifth and, still more, the third

have increased in length, making as a total result the fifth and third metacarpal subequal, the fourth the shortest. In *Glyphonycteris* the first phalanx of the third digit is shortened, the second correspondingly lengthened; in other words, the joint between the two phalanges has been removed in proximal direction (compare wing-indices of *Glyphonycteris* and *M. megalotis*). The joint between the first and second phalanx of the fourth digit has been similarly removed in proximal direction, making the latter phalanx decidedly longer than the former.

Species.—The genus was based on *G. sylvestris.* An examination of the British Museum material has convinced me that Peters's *M. Behni* is a *Glyphonycteris*; the same is probably the case with Dobson's *M. brachyotis.*

Range.—From Brazil (Matto Grosso) and Peru through Guiana to Central America.

1. *Glyphonycteris Behni,* Ptrs.

1865. *Schizostoma Behnii,* Peters, MB. Akad. Berlin, pp. 505–8.—Type: ♀ ad., in alcohol; Cuyabá, Brazil.

Skull and teeth.—See the diagnosis of the genus.

Ears.—Short; not reaching the tip of the muzzle when laid forwards. Cross-striæ faint, rather ill-defined; number about 10 (?), covering a space of about 9 mm.

Nose-leaves.—Essentially as in *M. megalotis,* the extreme length of the lancet being equal to about $1\frac{1}{2}$ its width at base.

Wings.—Forearm practically naked. Membranes from the ankles. Length of forearm about 45–47 mm.

Calcar.—Shorter than the foot and very nearly equal to half the length of the lower leg.

Tail and interfemoral.—The postcaudal interfemoral seems to be equal to the length of the tail (the available specimens are somewhat damaged).

Specimens examined.—River Cosnipata, District of Puno, S.E. Peru (2, skins in alcohol). One skull.

Range.—As yet only recorded from Cuyabá (Matto Grosso) and Cosnipata.

2. *Glyphonycteris sylvestris,* Thos.

1896. *Glyphonycteris sylvestris,* Oldfield Thomas, Ann. & Mag. N. H. (6) xviii. pp. 302-3; Oct. 1, 1896.—Type: ♂ ad., skin; Miravalles, Costa Rica; British Museum (no. 96. 10. 1. 2).

Specific characters.—Similar to *G. Behni,* but smaller. See the measurements below, pp. 64–65.

Colour.—Hairs of upperside with four alternating rings of dark brown and whitish; the extreme base, next to the skin, white; a broad ring of blackish brown; a broad ring of white or yellowish white; narrow tips of hairs approaching clove-brown. Fur of underside dark brown at base, greyish drab at tip.

Range.—As yet only known from the type specimen, obtained at Miravalles, Costa Rica.

3. *Glyphonycteris brachyotis*, Dobson.

1879 *. *Schizostoma brachyote*, Dobson, P. Z. S. 1878, p. 880.—Type from Cayenne; Paris Museum; the only specimen on record.

The species is known to me from the published account only.

Dobson did not examine the skull; the dentition is not described in detail; the presence or absence of a transverse band between the ears is not mentioned, nor is there any accurate information as to the proportionate length of the metacarpals.

Notwithstanding these deficiencies in the description of the species, I think there can be little doubt that it is a member of the genus *Glyphonycteris*:—(1) The cusp of the first upper premolar (p^3) is, according to Dobson, "very oblique, touching the canine"; this probably means that the tooth is remarkably long in antero-posterior direction, and the cusp situated at the front end of the tooth, as in *Glyphonycteris*: (2) the ears ("much shorter than head," tip "obtusely pointed") are as in *G. Behni*, not as in a *Micronycteris*: (3) Dobson's omission of any reference to the ear-band is probably an indication that it is absent: (4) the second phalanx of the third digit is much longer than the first phalanx, also one of the features of *Glyphonycteris* in contradistinction to *Micronycteris*: (5) unfortunately Dobson only gives measurements of the third and fifth digits, but the wing-indices, as derived from these measurements, are more in accordance with those of *Glyphonycteris* than with those of *Micronycteris*.

G. brachyotis seems to be precisely of the same size as *G. sylvestris*, but the calcar is stated to be longer than the foot.

Range.—Cayenne.

* The paper was read before the Zoological Society on Nov. 5, 1878, but probably not published until April 1879.

Synopsis of the Forms.

p^4 with a distinct cusp 6. (i^2 not very pronouncedly chisel-shaped.) Basioccipital pits shallow. A transverse band between the ears. 3rd and 4th metacarpals subequal, 5th the longest. First and second phalanx of third digit subequal	*Micronycteris.*
Ears extending beyond the tip of the muzzle when laid forwards.	
Smaller: Maxillary tooth-row about 6·5–8 mm. Forearm about 31–38.	
p_3 as high as p_4. p^3 as high as p^4. Transverse band between ears undivided. Calcar longer than foot (c. u.). Postcaudal interfemoral longer than tail. Forearm practically naked. Underside of body darker	*M. megalotis.*
Maxillary tooth-row 6·8–7·3. Forearm 31·8–36·2	*M. m. typica.*
Maxillary tooth-row 7·4–7·8. Forearm 35·2–38	*M. m. mexicana.*
p_3 much lower than p_4. p^3 lower than p^4. Transverse band between ears divided by a deep median notch into two triangular lobes. Calcar shorter than foot. Postcaudal interfemoral shorter than tail. Muscular part of forearm haired. Underside of body lighter	*M. minuta.*
Larger: Maxillary tooth-row about 9·5. Forearm about 43·5–45	*M. hirsuta.*
Ears not extending beyond the tip of the muzzle when laid forwards *. Cross-ridges on earconch sharply defined, crowded *. Fur wood-brown. Small: forearm about 31 mm.	*M. microtis.*
No distinct cusp 6 to p^4. (i^2 very pronouncedly chisel-shaped.) Basioccipital pits very deep. No transverse band between the ears. 3rd and 5th metacarpals subequal, 4th shortest. Second phalanx of third digit considerably longer than first	*Glyphonycteris.*
Calcar shorter than foot.	
Forearm 45–47 mm.	*G. Behni.*
Forearm about 40·5 mm.	*G. sylvestris.*
Calcar longer than foot. Forearm about 40·5 mm.	*G. brachyotis.*

General Remarks.

M. megalotis.—The two races of *M. megalotis* are of some interest from a distributional point of view. A vast longitudinal tract of S. America, from the Llanos of Venezuela to the Pampas of Argentina—now the Orinoco Valley, the Upper Amazons with numerous affluents, and the Parana River system—was, as well known, in a late geological epoch

* See footnote on p. 55.

a sea, which, however, probably was subdivided into a northern and southern portion, communicating by a comparatively narrow sound between the Central Brazilian and Bolivian highlands. *The bed of the northern part of this ancient sea forms, approximately, the geographical line of separation between the two races of M. megalotis*: broadly speaking, we find south, south-east, and east of that line (Brazil, Guiana, Venezuela) *M. m. typica*; west and north-west of the ancient sea-bed (Colombia, through Central America to Mexico) *M. m. mexicana*.—Later on, the passage from the Central Brazilian highlands must have been easy to Bolivia and Peru, likewise from Venezuela some distance north-westwards (and to coast-islands, as Trinidad and Tobago). That on other points, too, some shifting of the areas in the course of time has taken place is only what was to be expected. It is, no doubt, in a comparatively late period that the species has spread through Central America to Mexico.

M. minuta.—*M. minuta* is very closely related to *M. megalotis*; the complete resemblance in the skulls, in the ears and nose-leaves, the strong development of the ear-band, and the presence of a frontal groove in both species tend to show that their common origin cannot lie very far back. But in the strong reduction of p_3 and p^3 *M. minuta* has reached a higher stage than any other species of the genus. The more complicated ear-band (probably making the ears more independent of each other in their movements) and the shortening of the tail are also evidences of a higher specialization.

M. hirsuta.—So far as the premolars are concerned, *M. hirsuta* is practically on the same level as *M. megalotis* (though there is, perhaps, a slightly more pronounced tendency to reduction of p_3). But the inner upper incisors (i^2) are much less compressed antero-posteriorly, thus without that approximation to chisel-shape so evident in the other species; the skull is less vaulted; and the band between the ears very low. Its origin from the *Micronycteris* stem may, therefore, be assumed to date back to a time when these three peculiarities were not carried so far as in the now living *M. megalotis*.

Glyphonycteris.—Some of the peculiarities which entitle *Glyphonycteris* to the rank of a distinct genus are already foreshadowed in *Micronycteris*. In *M. megalotis* and *minuta* the cutting-blades of the upper inner incisors (i^2) are conspicuously compressed in antero-posterior direction; in *Glyphonycteris* this feature is carried to an extreme. In *M. minuta* the principal cusp of p^3 is situated very near the

front of the tooth and the vertical is shorter than the antero-posterior basal diameter; the same is the case in *Glyphonycteris*, but at the same time the inner cingulum (heel) of p^3 is more developed. The canines and premolars, both in the upper and lower jaw, are peculiarly low, and the antero-internal tubercle of p^4 (cusp 6) has disappeared (probably fused with cusp 7). In all these features *Glyphonycteris* has evidently arrived at a higher degree of specialization than *Micronycteris*.—The shallow depressions in the basioccipital of a *Micronycteris* have become deep pits in *Glyphonycteris*; the anteorbital region is inflated. This, too, is a further development of peculiarities already present, to some small extent, in *Micronycteris*.—Certain external characters also bear evidence of a higher specialization: the lengthening of the fifth and third metacarpals (making the fourth the shortest) and the lengthening of the second phalanges, more particularly the second phalanx of the third digit.—But in one respect, at least, *Glyphonycteris* seems to be more primitive than any known *Micronycteris*: in *Glyphonycteris* there is no transverse band between the ears; in *M. hirsuta* the band is low, in *M. megalotis* high, in *M. minuta* both high and complicated in structure.

The general result of the study of *Glyphonycteris* may be epitomized as follows:—It has probably originated from the *Micronycteris* stem at a period when the transverse band between the ears was still not developed; in certain characters of the skull, in the dentition, and wing-structure it has taken a course of its own, thereby partly further developing such peculiarities as can already be traced in *Micronycteris*.—The three species of *Glyphonycteris* are very closely allied.

The probable interrelations of the bats reviewed above are illustrated in the subjoined diagram:—

Table of Measurements.

	M. megalotis.				*M. microtis.*	*M. minuta.*		*M. hirsuta.*		*G. Behni.*		*G. sylvestris.*	*G. brachyotis.*
	f. *typica.* 30 adults. 18 skulls.		*mexicana.* 10 adults, 9 skulls.		Type. (After Miller.)	8 adults, 6 skulls.		2 adults, 1 skull.		2 adults, 1 skull.		♂ ad. Type.	Type. (After Dobson.)
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.	Min.	Max.		
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Ear-conch, length	15	18	15	17·5	.....	15·8	16	...	...	14	14·8	.....	.....
,, width	13	15·5	14	15·5	9 [?]	14	14·3	...	...	12	12·8	.....	12·7
Tragus, length	4·8	5·7	5·2	5·2	5·8	5	5·2	...	...	5·2	...	.....	.....
Lancet, length	6·5	7·8	7·2	8	.....	6	6·8	...	6	6	6·2	.....	?7·6
,, width	4·3	5·2	4·6	5	.....	4·2	5	...	5·2	4	4	.....	?5·1
Horseshoe, width	4·2	5·2	4·8	5	.....	4·8	5	...	5·2	4·8	4·8	.....	.....
Forearm	31·8	36·2	35·2	38	31	36	37·5	43·5	45	?45	?45	40·3	40·6
3rd metacarpal	25·8	29·8	29	32·7	26	26·7	29	33·7	35·8	38·5	38·5	35·7	35·6
III.^{1}	12·2	15	13·7	15·2	12·6	11	12·2	16·2	18	14·2	15	13·8	14
III.^{2}	12·8	15·3	14	15·7	11	11·8	14	16·8	17·5	20	21·7	19·8	17·8
III.^{3}	7	8·5	7·8	8	.....	7	8·5	10	...	8	...	8·2	8·9
4th metacarpal	26	30·3	30	32·7	.....	27	30	35·2	37	36·5	36·8	33·8	.....
IV.^{1}	9·8	11·7	10·8	12·6	.....	8·5	9·5	12·8	14·2	11·8	12	10·7	.....
IV.^{2}	8·2	10	9·2	10·5	.....	9	9·7	11	...	13·8	13·8	12·5	.....
5th metacarpal	28·2	31·2	30·5	33·2	.....	28·8	30·7	37·2	38·5	39·5	39·7	36	34·3
V.^{1}	10	11·7	10·7	13	.....	9·3	10·7	12·5	14·2	10·8	11·5	10	10·7
V.^{2}	7·5	9·7	8·7	9·7	.....	7·2	8·8	10·8	...	9·5	10·3	9·3	11·1

Tail	10	15	12·7	14·2	.....	9·5	12	...	...	?9·5	...	.....	.....
Postcaudal interfemoral	13·2	17·3	15·3	18	.....	7	9·5	..	...	?10	...	.....	.....
Lower leg	14·8	16·7	16	17	12·6	16	18	19·8	21·5	18	18·2	15·5	16·5
Foot, with claws	8·2	10·2	9·5	10	8	10	11·8	11·5	...	9·8	10·5	?10·5	10·2
Calcar	9·8	12	10	11·5	.....	6·5	8	?12	?13	8·5	9·2	?7·7	11·4
Skull, total length	17·7	19	19·2	20	.....	18·5	...	24	...	...	...	19·8	.....
,, basilar length	13·6	14·8	14·8	15·7	.....	14·1	...	18·7	...	...	...	15·7	.....
,, mastoid width	8	9	8·8	9	.....	9	...	10·7	...	...	...	9·5	.....
,, zygomatic width	8·5	9·5	9	9·8	.....	8·8	...	11·8	...	...	...	10·2	.....
,, maxillary width	5·8	6·6	6·5	6·7	.....	5·7	6·2	7·8	...	7·5	...	7·2	.....
,, anteorbital width	4·5	5·2	5·1	5·5	.....	4·5	5	6·2	...	6	...	5·8	.....
,, across cingula of canines	3·2	3·6	3·6	3·8	.....	3·1	3·6	4·8	...	4	...	3·8	.....
Mandible	11·7	12·8	13	13·2	.....	11·8	12·2	16·2	...	14·2	...	13·5	.....
Upper teeth	6·8	7·3	7·4	7·8	.....	6·7	7·2	9·5	...	8·4	...	8·2	.....
Lower teeth	7·2	8	7·9	8·4	.....	7·2	7·7	10·2	...	9	...	8·7	.....

Wing-indices.

	Forearm.	3rd metac.	III.¹.	III.².	III.³.	4th metac.	IV.¹.	IV.².	5th metac.	V.¹.	V.².
M. megaloʻis	1000	834	393	404	226	842	312	261	871	315	246
M. minuta	1000	758	321	345	215	780	250	250	813	277	220
M. hirsuta	1000	786	386	388	226	845	305	248	886	302	241
G. Behni and *sylvestris*	1000	866	329	472	187	823	272	309	885	249	224

XIV.—*Descriptions of Five new Freshwater Fishes from Sarawak, Borneo, collected by Dr. C. Hose.* By C. Tate Regan, B.A.

Barbus Hosii.

Depth of body $3\frac{3}{4}$ in the length, length of head $3\frac{1}{3}$. Snout a little shorter than eye, the diameter of which is $3\frac{1}{3}$ in the length of head, interorbital width 2. Cleft of mouth extending to below anterior margin of eye; jaws equal anteriorly; 2 barbels on each side, the posterior somewhat the longer, nearly $\frac{1}{2}$ the length of head. Scales 36 $\frac{5\frac{1}{2}}{5}$, $2\frac{1}{2}$ between lateral line and root of ventral. Dorsal III 7, its origin equidistant from tip of snout and base of caudal; third simple ray not enlarged, $\frac{2}{3}$ the length of head. Anal III 5, when laid back reaching the base of caudal. Pectoral nearly reaching the ventral; ventrals originating below the middle of dorsal, extending nearly to the vent. Caudal forked. Caudal peduncle as long as deep. A dark vertical stripe above the root of the pectoral, covered by the opercular flap; scales dark at the edges; fins pale.

Baram District.

A single specimen, 78 mm. in total length.

Cosmochilus falcifer.

Pharyngeal teeth simple, obtuse, 5.3.2—2.3.5. Depth of body $2\frac{3}{4}$ in the length, length of head 4. Snout a little longer than eye, the diameter of which is $3\frac{2}{3}$ in the length of head, interorbital width $2\frac{2}{3}$. Mouth not or scarcely extending to below the nostril; lower jaw shorter than the upper. Upper lip with 4 series of papillæ, the outer series produced as short barbel-like processes; lower lip with similar fringes; anterior barbel about $\frac{2}{3}$ the length of head, posterior barbel nearly as long. Scales 36–39 $\frac{6}{7-8}$, 5 between lateral line and root of ventral. Dorsal IV 8, its origin slightly nearer to tip of snout than to base of caudal, the fourth simple ray enlarged, articulated throughout and with serrated posterior edges, very elongate, when laid back extending to the caudal; anterior branched rays rapidly decreasing in length, the free margin of the fin deeply concave. Anal III 6. Dorsal and anal fins scaly at the base. Pectoral nearly reaching the ventral; ventrals originating

nearly below the origin of dorsal, extending to the vent. Caudal forked. Caudal peduncle a little longer than deep. Olivaceous; scales with dark edges; dorsal and caudal dusky.

Baram River.

Two specimens, each 160 mm. in total length.

This is the second species of the genus *Cosmochilus*, Sauvage, established in 1878 for a Siamese fish, *C. Harmandi*.

Liocassis baramensis.

Depth of body $4\frac{2}{5}$ in the length, length of head $3\frac{3}{5}$. Head $1\frac{3}{5}$ as long as broad. Diameter of eye 9 in the length of head. Snout obtusely pointed, a little more than $\frac{1}{3}$ the length of head, projecting beyond the mouth. Nasal barbel nearer to eye than to tip of snout, when laid back not reaching the eye; maxillary barbel $\frac{1}{3}$ the length of head, extending to below the eye; head covered with smooth skin; occipital process twice as long as broad, separated by an interspace equal to $\frac{1}{2}$ its length from the basal shield of the dorsal spine; clavicular process extending to the middle of the pectoral spine. Vomerine teeth in a curved uninterrupted band, with the median posterior projection rudimentary. Dorsal I 7; spine feebly serrated behind, $\frac{1}{2}$ the length of head. Adipose fin $1\frac{3}{4}$ as long as the base of the dorsal and greater than its distance from the latter. Anal 14. Pectoral spine a little more than $\frac{1}{2}$ the length of head, with 23 serræ on its inner edge. Ventrals nearly reaching the origin of anal. Caudal forked. Least depth of caudal peduncle $1\frac{5}{6}$ in the distance from the base of last anal ray to that of the middle caudal rays, which is $5\frac{3}{5}$ in the length of the fish. Brownish, with 2 oblong pale areas on each side of the posterior part of the body above the lateral line, the second small and well-separated from the first; similar pale areas below the lateral line are confluent and the anterior meets that of the other side in front of the anal fin; fins more or less blackish at the base and with blackish intramarginal bands.

Baram River.

A single specimen, 190 mm. in total length.

Liocassis Hosii.

Depth of body about 5 in the length, length of head 3–$3\frac{1}{2}$. Head $1\frac{3}{4}$ or $1\frac{4}{5}$ as long as broad. Diameter of eye 7–$9\frac{1}{2}$ in the length of head. Snout obtusely pointed, $\frac{1}{3}$ the length

of head, projecting beyond the mouth. Nasal barbel nearer to eye than to tip of snout, when laid back extending to the eye; maxillary barbel $\frac{3}{8}$ to $\frac{1}{2}$ the length of head, extending beyond the eye; head covered with smooth skin; occipital process about twice as long as broad, separated by an interspace which is less than its own length from the basal shield of the dorsal spine; clavicular process extending to the middle of the pectoral spine. Vomerine teeth in a curved uninterrupted band, with the median posterior projection rudimentary or wanting. Dorsal I 7: spine feebly serrated behind, about $\frac{1}{2}$ the length of head. Adipose fin $1\frac{1}{2}$–2 as long as the base of dorsal and equal to or greater than its distance from the latter. Anal 13–16. Pectoral spine about $\frac{1}{3}$ the length of head, with 16–21 serræ on its inner edge. Ventrals nearly or quite reaching the origin of anal. Caudal forked. Least depth of caudal peduncle $2\frac{1}{2}$–$2\frac{3}{4}$ in its length. Brownish; on each side 2 or 3 oblong pale areas both above and below the lateral line; fins blackish at the base and with blackish marginal or intramarginal bands; caudal, in addition, with a blackish spot on each lobe.

Sibu.

Six specimens, measuring up to 170 mm. in total length.

Macrones baramensis.

Depth of body $4\frac{2}{3}$ in the length, length of head $3\frac{2}{3}$. Breadth of head $1\frac{1}{3}$ in its length, diameter of eye 5. Snout $\frac{1}{3}$ the length of head, broad, obtuse, slightly projecting beyond the mouth. Palatine bands of teeth confluent with the small vomerine patch. Nasal barbel nearer to end of snout than to eye, $\frac{1}{2}$ the length of head; maxillary barbel extending to the posterior end of the adipose fin. Head covered with smooth skin; occipital process very long and slender, 6 times as long as broad, extending beneath the skin to the basal shield of the dorsal spine. Clavicular process not reaching the middle of the pectoral spine. Dorsal I 7, the spine weakly serrated behind, a little more than $\frac{1}{2}$ the length of head; anterior branched rays $\frac{3}{4}$ the length of head. Adipose fin commencing at a distance from the dorsal which is equal to $\frac{2}{7}$ the length of its own base, which is equal to its distance from the dorsal spine. Anal 11. Pectoral spine about $\frac{2}{3}$ the length of head, with moderately strong serræ on the inner edge. Ventrals not quite reaching the anal. Caudal forked. Caudal peduncle $1\frac{1}{3}$ as long as deep. Brownish, fins dusky.

Baram river.

One specimen, 150 mm. in total length.

XV.—*Descriptions and Records of Bees.*—XII.

By T. D. A. Cockerell, University of Colorado.

Nomada (*Xanthidium*) *subrutila*, Lovell & Ckll., 1905.

Boulder, Colorado, at flowers of *Pulsatilla hirsutissima*, one ♂, May 1, 1906 (*Marie Gill*).

This species was previously known by a single male taken in Maine. The Colorado example has the flagellum duller and distinctly denticulate, and the b. n. passes a short distance basad of the t.-m., but they otherwise agree. In my table of Rocky Mountain species the insect runs to *N. civilis*, from which it is easily known by the denticulate flagellum and other characters. It is nearest to *N. luteoloides*, Robertson, and it is not unlikely that it will prove to be only subspecifically distinct.

Nomada pulsatillæ, sp. n.

♀.—Length about 7½ mm.

Red and black, with no yellow anywhere; mandibles simple; head broad, facial quadrangle conspicuously broader than long; head red, with the cheeks posteriorly, a large patch enclosing the ocelli, the middle of front (enclosing no red spot), the region about antennæ, and a broad mark extending halfway down sides of clypeus all black; the supraclypeal area is black, with a red spot; hair of head and thorax above fuscous, black on scutellum and scape; that on metathorax, pleura, and cheeks pallid; antennæ long, entirely ferruginous, third joint about as long as fourth; mesothorax coarsely rugoso-punctate, red, with a broad median black stripe; scutellum red, flattish, and not bilobed; metathorax nearly all red except a broad median black band; pleura red; tegulæ shining coppery red, rather closely punctured. Wings very dark at apex, stigma ferruginous, nervures dark fuscous; second s.m. not especially broad above; b. n. a moderate distance basad of t.-m. Legs bright red, the coxæ and trochanters marked with red, and the hind femora with two more or less suffused black stripes behind; hind tibiæ and tarsi behind with fine golden tomentum. Abdomen broad, oval in form, very shiny chestnut-red, the hind margins of the first two segments strongly blackened, but not really banded; first segment with a broad black mark (enclosing a red dot) on each side

of base and a linear one in the middle; apical band of tomentum on fifth segment narrow; pygidial plate broadly rounded; venter red, without markings.

Hab. Boulder, Colorado, at flowers of *Pulsatilla hirsutissima*, April 20, 1905 (*Cockerell*).

In the table of Rocky Mountain species (Bull. 94, Colo. Exp. Sta.) this runs to 68, and runs out because the abdomen has no yellow spots. From *N. Packardiella* it differs by the much broader abdomen, without yellow spots or distinct black bands, the golden pile on the entirely red hind tibiæ, &c. From *N. Clarkii* it differs by its smaller size and the details of the coloration of the abdomen, but the two are closely allied. From *N. latifrons* it differs by the broad abdomen &c. It is also related to *N. valida*.

There is quite a strong superficial resemblance (as seen without a lens) to *N. polyacantha*, Perez, from Barbary, but that species has the b. n. meeting t.-m., the mesothorax black, &c.

Nomada undulaticornis, sp. n.

♂.—Length about 8 mm.

Black, lemon-yellow, and ferruginous; mandibles simple; anterior coxæ pointed at apex, but not spined; head coarsely sculptured, black, with the labrum, base of mandibles, clypeus except upper lateral margins, and lateral face-marks (ending very narrowly on orbital margins below level of antennæ), all yellow; facial quadrangle longer than broad; pubescence of head and thorax rather abundant, pallid, with an ochreous tint, face with appressed silky hair; scape not greatly swollen, yellow in front; flagellum yellowish ferruginous beneath, above black about as far as the eighth (antennal) joint; third antennal joint about as long as the fourth, apical joint pointed; joints 6 to 9 strongly undulate beneath, or, one might say, tuberculate; mesothorax entirely black, very coarsely and confluently rugoso-punctate; tubercles red; a small red mark on anterior part of pleura; scutellum strongly bigibbose (mammiform), the gibbosities red; metathorax entirely black, rugoso-plicate basally; tegulæ red, dullish, closely punctured. Wings strongly dusky at apex, stigma ferruginous, nervures fuscous; second s.m. rather narrow; b. n. going only just basad of the oblique t.-m. Legs red, coxæ largely black, middle femora with the basal two fifths behind black; hind femora mostly suffused with black on both sides. Abdomen broad, convex, dark red,

with the basal half of the first segment black, the apical margins of the first two segments infuscated; the extreme bases of the second to fourth (at least) segments black; the second segment with a large yellow patch on each side, the third to fifth with yellow bands, very narrowly interrupted in the middle, the sixth with a large transverse yellow patch; apical plate deeply notched, only moderately broad; venter with a few small yellow marks.

Hab. Boulder, Colorado, at flowers of *Pulsatilla hirsutissima*, April 20, 1905 (*W. P. Cockerell*).

I thought at first that this was the male of *N. pulsatillæ*, but there are so many differences that it seems best to regard it as distinct. In the table of Rocky Mountain species it runs to 62, but runs out because of the rather small size and red on scutellum. It is known from *N. vicinalis* by its smaller size, total absence of yellow on thorax, &c. There seems to be some affinity with *N. denticulata*, Rob.

Nomada flammigera, sp. n.

♀.—Length just over 8 mm.

Mandibles simple; head and thorax red, with black markings and no yellow; abdomen narrow, light red, with a sericeous surface, and a round cream-coloured spot on each side of second segment, but no other light markings. Head broad, face conspicuously broader above than below; labrum with a small tubercle; front above antennæ broadly black, but no black at sides of clypeus; ocelli on a small transverse black area; cheeks posteriorly black; antennæ long, all red, except that the end of scape is black behind; third joint conspicuously shorter than fourth, but still much over half its length; hair of head and thorax very scanty above, but snow-white patches showing on cheeks beneath, lower part of pleura, metathorax, &c.; mesothorax with a median black band, the red on each side of which is deeply incised by black anteriorly, producing the appearance of flames; scutellum and metathorax red, the latter with a rather weak black band; pleura and tubercles red; tegulæ light red. Wings dusky, especially at apex, with the usual light area; stigma and nervures fuscous; second s.m. broad above, third narrowed almost to a point; b. n. passing far basad of t.-m. Legs red; middle femora blackened at base; hind femora much blackened in front and behind; spurs creamy white; basal joint of hind tarsi black, contrasting with the bright red tibia and the red small joints of tarsi. Abdomen without

black above, except a couple of black spots on each extreme side of first segment; beneath, the first segment has a large black fish-tail mark, the prongs long, and the hind margins of the first two segments are suffused with dusky.

Hab. N. Yakima, Washington State, May 15, 1903 (*Eldred Jenne*).

From Mr. Melander, with his no. 18. In the table of Rocky Mountain species this runs to 70, but is quite distinct from *N. Sayi*. In Robertson's table it runs to 4 (*N. Cressonii* and *Sayi*), but is not identical with the species there indicated. The insect reminds one strongly of some of the species of *Gnathias*.

Also at N. Yakima, but on June 5, Mr. Jenne took *Nomada erythrochroa*, Ckll., of which only one specimen (from Paseo) was previously known.

Centris Morsei marginata (Fox).

The *Centris marginata* of Fox is evidently only a variety of *Morsei*, as Mr. Fox suspected. The original type, which is before me, shows that the abdomen is not bare, as Fox states, but is pruinose-pubescent exactly as in *Morsei*. The lack of pubescence on the middle of the thorax is due to abrasion. The fourth antennal joint is red beneath. A second specimen of this form has been taken by Dr. F. H. Snow at the San Bernardino Ranch, Douglas, Arizona, 3750 feet, August.

Centris atripes, Moesary.

Renewed study convinces me that *C. Foxi*, Friese, must fall as a synonym of *C. atripes*. The species is to be added to the fauna of Arizona, as Dr. F. H. Snow took two males at the San Bernardino Ranch in August. At the same locality Dr. Snow took *Protoxæa gloriosa* (Fox), also new to Arizona.

Oxæa tristis, Gribodo.

San Bernardino Ranch, Arizona, Aug. (*F. H. Snow*). New to the United States.

Xenoglossodes eriocarpi (Ckll.).

Brownsville, Texas, June (*F. H. Snow*). This record extends the known range about four degrees south.

Anthophorula compactula, Ckll.

Brownsville, Texas, June, 2 ♂, 3 ♀ (*F. H. Snow*). New to Texas.

All of these have only two submarginal cells, apparently indicating that this is, after all, the normal condition of the species. The eyes of the female are of a beautiful deep sea-green (bluish-green) colour.

Exomalopsis Snowi, sp. n.

♂.— Length about $7\frac{1}{2}$ mm.

Black, with coarse pale fulvous pubescence; clypeus black; labrum dull yellowish white; mandibles mainly rufous; antennæ ferruginous, the flagellum subfuscous above, with the sutures darker; tegulæ large, shining, translucent apricot-colour. Wings hyaline, slightly yellowish, the apex broadly dusky; the large stigma and the nervures ferruginous. Abdomen rather pointed for an *Exomalopsis*, having the sides and apex of the first segment and base of the second broadly ferruginous; no distinct hair-bands on abdomen, but much long coarse hair. Legs bright ferruginous, the long plumose hair on hind tarsi behind largely blackened; hair of legs otherwise very pale fulvous. Labial palpi with first joint more than twice length of second; maxillary palpi long and slender. Face densely covered with silky pale fulvous hair; eyes dark sea-green; mesothorax very shiny, with strong punctures except in the middle, where it is impunctate; second submarginal cell variable, narrow and much narrowed above, or comparatively broad, receiving the first r. n. very near the apex, or not much beyond the middle; b. n. meeting t.-m., or passing a short distance basad of it.

Runs in Friese's table (1899) to 6, and runs out because of the red legs &c.

Hab. Brownsville, Texas, June, 3 ♂ (*F. H. Snow*).

Xenoglossa pruinosa limitaris, subsp. n.

♂.—Clypeus without any yellow spot; hair of head cinereous, with black hairs sparsely intermixed on face and vertex; hair of thorax above pale, with only a slight fulvous tint. Legs red, more or less clouded with blackish; abdomen very black and shiny, with the usual bands much reduced.

Looks like a distinct species, but I find no structural differences from *pruinosa*.

Hab. Brownsville, Texas, June (*F. H. Snow*).

Andrena nigritula, n. n.

Andrena nigrita, Morawitz, in Fedtschenko, Turkestan Mellifera, ii. 1876, p. 196 (not of Fabricius, 1775).

Dasiapis olivacea (Cresson).

Brownsville, Texas, June, both sexes (*F. H. Snow*). New to Texas.

Tetralonia Edwardsii vagabunda, Ckll.

In my original account of this bee (Trans. Amer. Ent. Soc. xxxii. p. 95) I stated that it was from flowers of *Onosmodium*. During my absence in June 1905 my wife collected a series of bees from the flowers of a plant which she took to be *Phacelia*, and so labelled them. I did not see the plant in flower, but later in the year we found what appeared to be the same, with abundant fruit, and it was *Onosmodium carolinianum*. This year we have found the original plant in flower, and it is *Phacelia heterophylla*, Pursh; but growing in the same places, and almost exactly similar in foliage and manner of growth, is the *Onosmodium*. Such resemblance between two plants growing under the same conditions, but of different families and having quite different flowers, is interesting.

The following bees were taken by my wife from flowers of *Phacelia heterophylla* at Boulder:—*Halictus meliloti*, Ckll., *Dialictus anomalus* (Rob.), *Alcidamea simplex* (Cresson), *Megachile brevis*, Say, *Tetralonia Edwardsii vagabunda*, Ckll., *Ceratina nanula*, Ckll., and *C. neomexicana*, Ckll.

At Ward, Colorado (9000 feet), a *Phacelia* closely allied to *heterophylla* was found in quantity. It was recorded at the time as *P. circinata*, following Coulter's manual; but it is not the true species of that name, and I suppose that it must belong to *P. alpina*, Rydberg, 1900. It proved very attractive to bees, and the following were collected on it at Ward in July by my wife and myself:—*Colletes phaceliæ*, Ckll., *Anthidium emarginatum*, Say, *A. conspicuum*, Cress., *Osmia propinqua*, Cress., *Monumetha argentifrons*, Cress., *Megachile latimanus*, Say, *M. vidua*, Smith, *Bombus Edwardsii*, Cress., var., *B. iridis phaceliæ*, Ckll.

Thygater, Holmberg.

In Trans. Amer. Ent. Soc. xxxii. p. 115, I called attention to the identity of *Thygater* with *Macroglossapis*, and gave reasons for supposing that the latter had priority. I learn

from Mr. J. C. Crawford, however, that Holmberg, in Actes Acad. Cordoba, v. p. 133 (1884), remarked that *Tetralonia terminata*, Smith, had only three joints to the maxillary palpi, and might form a new genus *Thygater*. This slight reference has been overlooked by all subsequent authors, but I think it will hold the name, giving *Thygater* priority.

The genus consists of the following known species :—

Thygater terminata (Sm.), *T. chrysophora*, Holmbg., *T. analis* (Lep.), *T. albilabris* (Cress.), *T. montezuma* (Cress.), *T. modesta* (Sm.), *T. rubricata* (Sm.).

Bombus Kohli, n. n.

Bombus carbonarius, Handlirsch, Ann. naturh. Hofmus. Wien, 1888, p. 242. (S. America.)

The name is changed because of *B. carbonarius*, Menge, 1856, from Prussian amber. As Friese has already named a *Bombus* after Dr. Handlirsch, the present insect may bear the name of another distinguished naturalist of Vienna. I possess the species from Villa Encarnacion, Paraguay, collected by Mr. Schrottky. Dr. Handlirsch, to whom I wrote concerning the preoccupation of *carbonarius*, replied that he did not himself intend to propose a substitute.

Sphecodes hesperellus pulsatillæ, subsp. n.

♀.—Like *S. hesperellus*, Ckll., but somewhat larger; the wings longer (about 7 mm.), *blackish*, quite dark, not reddish as they are in *hesperellus*; abdomen darker, deep chestnut-colour; rugæ of metathoracic enclosure more numerous, very distinct. Superficially like *S. pecosensis*, Ckll., but very distinct by the shining mesothorax, with scattered punctures. The first abdominal segment is sparsely punctured.

Hab. Boulder, Colorado, at flowers of *Pulsatilla hirsutissima*, April 20, 1906 (*W. P. Cockerell*).

XVI.—*Descriptions of Two new Species of* Acræidæ *from Entebbe, Uganda.* By Emily Mary Sharpe.

Family **Acræidæ**.

Acræa cerita.

Allied to *A. cerasa*, Hewits., but is at once distinguished from that species by the greyish-black discal band on the

fore wing, extending from the costa to the inner margin and enclosing the rufous-brown basal area; the black spot in the discoidal cell smaller and with two extra black spots visible above the submedian nervure. Hind wing with a greyish-black border on the hind margin, the rest of the wing rufous brown relieved by black spots, somewhat smaller in size and less in number than in *A. cerasa*.

Underside does not differ from the allied species mentioned above; the black spots on the basal area of both wings not so strongly indicated.

Expanse 1·6 inches.

Hab. Entebbe, Uganda.

Type in the collection of Mr. H. Grose-Smith.

Planema macarista.

Allied to *P. macaria*, Godt., and *P. alicia*, Grose-Smith.

Male.—Fore wing with the ground-colour dark brownish black; a broad ochraceous band crossing the discal area from the costa to the inner margin, where it extends to the posterior angle.

Hind wing resembling that of *P. alicia*, the white band crossing the discal area having a suffusion of ochraceous buff on the costal area and on the brown hind-marginal border. Basal area dark brown, with black spots rather strongly defined.

Underside similar to that of *P. alicia*, the basal area of the hind wing chestnut-brown thickly covered with black spots.

Expanse 2·6 inches.

The female is somewhat larger than the male and is black and white.

Fore wing with the ground-colour brownish black, relieved by a broad white band on the subapical area; the inner edge more sharply defined on the basal edge.

Hind wing with the white discal area broader, especially on the inner margin; the basal area darker and with smaller black spots than in *P. macaria*.

Underside not differing from that of the male in markings, only in the black and white ground-colour.

Expanse 3·3 inches.

Hab. Entebbe, Uganda.

Types in the collection of Mr. H. Grose-Smith.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 104. AUGUST 1906.

XVII.—*Descriptions of some new Species of Heterocera from Tropical South America.* By HERBERT DRUCE, F.L.S. &c.

Family **Syntomidæ**.

Mesothen mysia, sp. n.

Male.—Head, antennæ, palpi, and legs black; collar, tegulæ, thorax, and abdomen yellow, the abdomen banded with black. Primaries hyaline, the costal margin, apex, outer margin, and veins all black: secondaries hyaline; veins, apex, and inner margin black.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Peru, La Oroya, Rio Inambari, 3000 feet (*Mus. Druce*).

Mesothen flavicostata, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen yellow; palpi black; antennæ black, the shaft white for more than half length; two black spots on the thorax and one on each of the tegulæ; abdomen with a bluish-black spot on each segment from the base to the anus and with a double row of small black spots on each side; the anus black; legs yellow. Primaries hyaline, the base and costal margin to the apex yellow, the apex and outer margin black: secondaries hyaline, the apex and inner margin black; veins all black.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Cosmosoma pytna, sp. n.

Male.—Head, antennæ, and palpi black; collar and tegulæ yellow, edged with black; thorax black; a blue spot on each side of the head; abdomen yellow, the second and third segments black, with bright metallic-blue spots on each side; anal segments black, spotted with metallic blue. Primaries hyaline, yellow at the base, the apex and outer margin broadly black, the veins all black: secondaries hyaline, the apex and outer margin black, the inner margin orange. Underside very similar to the upperside, but both wings more orange at the base.

Expanse 1½ inch.

Hab. W. Central Trinidad, Caparo (*Mus. Druce*).

Cosmosoma villia, sp. n.

Male.—Head, antennæ, collar, thorax, abdomen, and legs brownish yellow, the collar with two black spots in front; tegulæ black, edged with yellow; the segments of the abdomen edged with yellow and black; a double row of metallic-blue spots extends down the abdomen from the base to the anus. Primaries and secondaries yellowish hyaline, the fringes of both wings black.

Expanse 1½ inch.

Hab. Peru (*Mus. Druce*).

Rhynchopyga semirufa, sp. n.

Male.—Head, antennæ, palpi, and thorax black; collar and tegulæ bright red; abdomen bright red, with a central black line from the base to the anus; underside of the thorax and legs black; a large white spot at the base of the abdomen. Primaries brownish hyaline, red at the base; the veins all black, the apex and outer margin broadly black: secondaries brownish hyaline, the apex, outer margin, and veins black. The underside of both wings with the veins red from the base to the black margins.

Expanse 1 inch.

Hab. Peru, La Merced, 2000–3000 feet (*Mus. Druce*).

Eurota elegans, sp. n.

Male.—Head, antennæ, palpi, tegulæ, legs, and anus black; collar pale yellow: abdomen pale yellow, the basal segment and the sides of the second and third segments bright red. Primaries black, the base pale yellow; a white hyaline spot

at the end of the cell and a larger one below; an apical band of five hyaline white spots crosses the wing from the costal to the outer margin: secondaries black, the base pale yellow; a rather large hyaline white spot about the middle; the inner margin red at the base. Underside very similar to the upperside.

Expanse 1½ inch.

Hab. Paraguay (*Mus. Druce*).

Methysia hilda, sp. n.

Male.—Head, antennæ, palpi, abdomen, and legs black; collar, tegulæ, thorax, and basal segments of the abdomen bright scarlet. Primaries and secondaries dusky semihyaline black; veins all black, apex and outer margin black.

Expanse 1 inch.

Hab. S.E. Peru, La Oroya, Rio Inambari, 3000 feet (*Mus. Druce*).

Pseudaclytia major, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen brownish black, the back of the head reddish orange; legs brownish black. Primaries brownish black, palest from the apex to the anal angle, the veins all black: secondaries whitish hyaline, the apex and outer margin clouded with black, the veins black. The underside very similar to the upperside.—*Female* almost identical with the male.

Expanse 1½ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Allied to *Pseudaclytia minor*, Schaus.

Napata superba, sp. n.

Male.—Head, antennæ, and thorax black; palpi black, white in front; collar, tegulæ, and abdomen bright metallic blue, underside of the abdomen white. Primaries black, the basal half of the wing very bright metallic blue; two small metallic-blue spots in front of the cell; apex white: secondaries black, the base and central part of the wing bright metallic blue, the apex white. The underside very similar to the upperside.—*Female* like the male.

Expanse 1¾ inch.

Hab. Peru, La Mercede, 2000–3000 feet (*Mus. Druce*).

Allied to *Napata albiplaga*, Walker, and *Napata quadristrigata*, Hampson.

Eucereon Ockendeni, sp. n.

Male.—Head, antennæ, and collar black; sides of the head and tegulæ white, the tegulæ edged with white; thorax and abdomen black, the sides of the abdomen spotted with yellow; the anus black; legs black; the base of the abdomen on the underside white. Primaries white, with black markings very similar to *Eucereon Davidi*, Dogn., but much finer and more broken up into spots: secondaries hyaline white, the apex broadly black, the outer margin edged with black.

Expanse 2 inches.

Hab. S.E. Peru, Aqualani, 10,000 feet (*Mus. Druce*).

Eucereon antonia, sp. n.

Male.—Head, antennæ, and palpi black; back of the head yellow; collar, tegulæ, thorax, and basal half of the abdomen dark brown, tegulæ edged with grey; the four anal segments of the abdomen bright red; the anus black; legs dark brown. Primaries yellowish brown, the spots and markings all black, the veins yellowish: secondaries black-brown.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Allied to *Eucereon lutulentum*, Möschl.

Eucereon pallada, sp. n.

Male.—Head, collar, and thorax pale fawn-colour streaked with black; antennæ and palpi black; abdomen above bright red, the base, anus, and a line on both sides black; the underside orange-yellow. Primaries pale fawn-colour, streaked with black between the veins; the fringe yellowish: secondaries semihyaline pale brown, darkest at the apex and round the outer margin.

Expanse $1\frac{3}{4}$ inch.

Hab. South Brazil, Parana (*Mus. Druce*).

Eucereon ignota, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen brownish grey; legs whitish. Primaries dusky white, thickly lined with dark grey; the fringe white: secondaries semihyaline white, the apex and outer margin broadly banded with black. Underside of the primaries blackish brown, with a white spot at the end of the cell and one on the costal margin near the apex: secondaries similar to the upperside.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Eucereon sadana, sp. n.

Male.—Head, palpi, and antennæ black, back of the head bright red; collar, tegulæ, thorax, abdomen, and legs dark brown; the underside of the thorax and abdomen bright pinkish; legs brown. Primaries dark brown: secondaries semihyaline brownish black. Underside black-brown; primaries deeply bordered with yellowish brown along the costal margin; fringe black.

Expanse $1\frac{1}{4}$ inch.

Hab. Peru, Carabaye, 5000 feet (*Mus. Druce*).

Allied to *Eucereon flavicincta*, Schaus.

Philoros nora, sp. n.

Male.—Head, antennæ, and thorax black; front of the head and palpi white; collar red; tegulæ black, edged with white; abdomen blue-black; legs white. Primaries black, the costal margin edged with white, the inner margin from the base to the anal angle edged with yellow; the fringe black: secondaries dark blue, the apex, outer margin, anal angle, and inner margin broadly banded with bright red.—*Female* the same as the male.

Expanse $1\frac{1}{2}$ inch.

Hab. Peru, La Merced, 2000–3000 feet (*Mus. Druce*).

Allied to *Philoros laura*, Hampson.

Family **Arctiadæ**.

Robinsonia morula, sp. n.

Male.—Head yellow, antennæ black, collar and tegulæ white edged with brown, thorax white; abdomen black, underside greyish; a yellowish-white line extends from the base to the anus; the anus yellow; legs yellowish brown. Primaries pale brown, the veins brown; a semihyaline white band extends from the base to the apex: secondaries white, slightly dusky at the anal angle; the fringe white.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Automolis semibrunnea, sp. n.

Male.—Head, collar, and underside of the thorax reddish orange; antennæ black; tegulæ and thorax pale yellow, the base of the thorax and first two segments of the abdomen orange, the abdomen and legs black. Primaries from the base to nearly the middle pale yellow, shading off to dark

reddish brown at the apex and outer margin; the fringe black: secondaries pale yellow, edged with black from the apex to the anal angle. Underside very similar to the upperside, but the costal margin and apex of the primaries edged with orange-red.—*Female* the same as the male, but slightly larger.

Expanse, ♂ 1½, ♀ 2 inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Automolis roseofasciata, sp. n.

Male.—Head, collar, antennæ, palpi, and legs reddish brown; tegulæ and thorax pale yellow; abdomen pale yellowish red, the underside black. Primaries pale citron-yellow, crossed about the middle from the costal to the inner margin by a wide rose-coloured band; a small red dot at the end of the cell; the apex and outer margin rose-colour, shading to brown: secondaries chrome-yellow, shaded with rose-colour at the apex; the fringe chrome-yellow.

Expanse 1⅓ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Elysius lavinia, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, abdomen, and legs black; a yellow spot on both sides of the head. Primaries very dark brown, the base yellowish, the costal margin from the base to the apex pale yellow; a >-shaped yellow line at the end of the cell; the fringe dark brown: secondaries pale greyish brown, dusky at the apex and round the outer margin. Underside very similar to the upperside; the costal margin of the secondaries yellow.

Expanse 2 inches.

Hab. S.E. Peru, Aqualani, 10,000 feet (*Mus. Druce*).

Allied to *E. pallidicosta*, Walk., and *E. carbonaria*, Dogn.

Elysius terra, sp. n.

Male.—Head, collar, and underside of the thorax orange-yellow; antennæ, tegulæ, thorax, abdomen, and legs deep black, the anal segments on the underside of the abdomen yellow. Primaries black, with a bluish shade from the base to the outer margin: secondaries bluish hyaline, the veins and the apex, outer and inner margin broadly black; the fringe black.

Expanse 1¼ inch.

Hab. East Peru, Huancabamba, 6000–10,000 feet (*Mus. Druce*).

Allied to *E. atrata*, Felder.

Ischnocampa farinosa, sp. n.

Male.—Head, tegulæ, and thorax pale grey; abdomen yellow; antennæ, underside of thorax, abdomen, and legs dark brown. Primaries pale greyish brown: secondaries sordid white, brownish at the apex and on the inner margin; the fringe pale brown. Underside very similar to the upperside.

Expanse 2 inches.

Hab. Venezuela (*Mus. Druce*).

Opharus conspicuus, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and base of the abdomen black; abdomen bright orange, the underside and legs black; a fine black line extends from the base to the anus. Primaries blackish brown, the veins darker: secondaries greyish white, darkest at the apex and anal angle; the fringe dark greyish brown. Underside very similar to the upperside, but paler in colour.—The *female* almost identical with the male, but larger.

Expanse, ♂ $1\frac{3}{4}$, ♀ 2 inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Opharus domingona, sp. n.

Male.—Head, antennæ, palpi, collar, thorax, basal half of the abdomen, anus, and legs black, the last four segments of the abdomen banded with yellow; a spot on each side of the thorax and one at the base white. Primaries blackish brown, the veins black; a darker spot at the end of the cell; the fringe blackish: secondaries white, the apex and inner margin blackish brown. The underside very similar to the upperside, but paler in colour.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Allied to *Opharus albipunctatus*, Druce.

Opharus cornelia, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, and thorax black; a spot at the back of the head, one on each side of the thorax and at the base of the abdomen all bright blue; abdomen yellow, each segment edged with black, the underside and legs blackish brown. Primaries black, with a small blue spot close to the base; the fringe black: secondaries hyaline to beyond the middle, the apex and outer margin broadly

black. The underside the same as the upperside, but slightly browner in colour.

Expanse 1½ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Opharus sestia, sp. n.

Male.—Head yellow; antennæ and palpi black; collar white, edged with black; tegulæ white, with a yellow spot at the base edged with black; thorax dark brown; abdomen above yellow, with a central row of black spots from the base to the apex; underside of the thorax yellow, of the abdomen black, legs brownish black. Primaries brown; a small yellow spot close to the base; two spots on the inner margin, with a fine line of spots beyond, all white; four white spots at the end of the cell; a curved line of small white dots beyond the cell extending from the costal to the inner margin, and a curved submarginal band of white spots from the apex to the anal angle; two detached white spots about the middle of the outer margin; the fringe brown: secondaries pale brown, whitish in the middle; the fringe dark brown. Underside very similar to the upperside.

Expanse 1¾ inch.

Hab. Peru, Rio Huacamayo, Carabaya, 3000 feet (*Mus. Druce*).

Amastus rumina, sp. n.

Phœgoptera aconia, Druce, Biol. Centr.-Am., Het. i. p. 95.

Male.—Head and thorax sordid white; palpi grey, the upperside black; antennæ black; collar and tegulæ striped with dark orange; the underside of the thorax orange; legs brownish white; abdomen yellow, with a row of small white spots on each side; underside of abdomen sordid white, the anus and anal tuft orange. Primaries semihyaline reddish brown, with the marking as in *Amastus aconia*, Herr.-Schäff.: secondaries semihyaline yellowish white; the fringe yellowish. —*Female* the same as the male.

Expanse 3½ inches.

Hab. Costa Rica, Candelaria Mountain (*Underwood, Mus. Druce*).

This species is clearly distinct from *Amastus aconia*, Herr.-Schäff., of which I now have a good series of specimens from S. America.

Amastus semifulvus, sp. n.

Female.—Head, collar, tegulæ, thorax, and abdomen

white, the two anal segments black; antennæ and palpi black; underside of the abdomen black; the legs pale brown. Primaries hyaline, the veins dark brown; the outer margin from the apex to the anal angle pale primrose-yellow, thickly irrorated with brown scales; the points of the veins on the outer margin black; the fringe primrose-yellow.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Aqualani, 10,000 feet (*Mus. Druce*).

Three females.

Halisidota mincosa, sp. n.

Female.—Head, antennæ, palpi, tegulæ, abdomen, and legs black; back of head pale yellow; collar, sides and base of the thorax rose-colour; abdomen with a double yellow line on each side. Primaries pale greyish brown, the costal margin from the base to the apex yellow; a yellow line down the middle of the wing from the base to the outer margin; the veins yellow: secondaries dusky semihyaline white, darkest at apex and on the inner margin; the fringe yellowish.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Oconeque, Carabaya, 7000 feet (*Mus. Druce*).

Heliactinidia bimaculata, sp. n.

Male.—Head, antennæ, palpi, tegulæ, thorax, abdomen, and legs black; collar yellow; the underside of the abdomen yellow. Primaries pale brown, crossed beyond the cell from the costal margin to the anal angle by a yellowish-white band, widest on the costal margin: secondaries orange-yellow, the apex and anal angle broadly black.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Brazil, Rio Grande (*Mus. Druce*).

Allied to *H. chiquinda*, Druce.

Turuptiana tessellata, sp. n.

Male.—Head, palpi, antennæ, and legs black; back of the head and collar yellow; tegulæ black, edged with yellow; thorax black; abdomen yellow, the middle segments tufted with black. Primaries yellow, crossed from the costal to the inner margin by three irregular curved bands of large black spots; a black spot close to the base; the veins almost white; the fringe yellow: secondaries pale yellow; a submarginal row of blackish spots extends from near the apex to the anal angle; the fringe pale yellow.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Aqualani, 10,000 feet (*Mus. Druce*).

Pitane evora, sp. n.

Male.—Head, collar, and base of tegulæ yellow ; antennæ and palpi black ; black spot on back of the head, two on the collar, and one on each of the tegulæ ; thorax brown ; abdomen black, the base yellowish ; the anus yellow ; the underside of the thorax and abdomen yellow ; the legs yellow. Primaries pale brown, palest at the end of the cell and along the inner margin ; fringe pale brown : secondaries pale yellow, the apical half of the wing blackish brown. Underside the same as above.—The *female* almost identical with the male.

Expanse, ♂ $1\frac{3}{4}$, ♀ 2 inches.

Hab. Peru, Pozuzo (*Mus. Druce*).

Subfamily *Lithosianæ*.

Dipæna peculiaris, sp. n.

Male.—Head, antennæ, palpi, collar, thorax, and abdomen black ; two cream-coloured spots on the collar ; tegulæ and a spot at the base of the thorax cream-colour ; anus orange-red ; underside of the abdomen white ; legs black ; the shaft of the antennæ fringed with scales above. Primaries cream-colour, the base and a broken band crossing the wing beyond the middle from the costal to the inner margin, a spot at the apex and on the outer margin, all dark blackish brown : secondaries semihyaline whitish brown, the apex and outer margin blackish, the inner margin black. Underside : primaries black ; secondaries similar to the upperside.

Expanse $1\frac{1}{4}$ inch.

Hab. Peru, La Union, Rio Huacamayo (*Mus. Druce*).

Quite unlike any other species known to me, but somewhat resembles a *Eucereon*.

Procrimima viridis, sp. n.

Male.—Head, palpi, collar, tegulæ, thorax, abdomen, and legs greenish black ; antennæ black. Primaries and secondaries black ; underside of primaries and secondaries pale metallic bluish green.

Expanse $1\frac{1}{10}$ inch.

Hab. Brazil (*Brit. Mus.*).

Ptychoglene ripena, sp. n.

Male.—Head, antennæ, and palpi black ; collar crimson ;

tegulæ, thorax, and abdomen black. Primaries black, semi-hyaline from the end of the cell to the apex and outer margin; the veins all black: secondaries crimson; the costal margin, apex, and outer margin broadly black.

Expanse $1\frac{1}{10}$ inch.

Hab. Bolivia, Chaco (*Garlepp, Brit. Mus.*).

Tuina bellona, sp. n.

Female.—Head, antennæ, palpi, collar, tegulæ, and thorax black; abdomen glossy dark blue. Primaries and secondaries glossy dark blue; primaries with three red streaks at the base; an elongated red spot close to the costal margin near the apex. Underside very similar to the upperside, but not so bright in colour.

Expanse $1\frac{3}{4}$ inch.

Hab. Peru, Oroya Railway to Chichla, 12,200 feet (*Brit. Mus.*).

Cithene hodeva, sp. n.

Female.—Head, palpi, antennæ, collar, thorax, and abdomen black; tegulæ and sides of the abdomen yellow; legs black. Primaries brownish black; a yellow streak at the base on the inner margin; a round spot at the end of the cell and an angular shaped one below, both yellow; the two spots are almost joined by a fine yellow line; the fringe brownish black: secondaries yellow, the apex and outer margin bordered with brownish black.

Expanse $1\frac{1}{2}$ inch.

Hab. Peru, Palca (*Simons, Brit. Mus.*).

Family **Leparidæ**.

Carama bella, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen white; antennæ bright red. Primaries and secondaries pure white, the costal margin edged with black.—*Female* the same as the male.

Expanse, ♂ $1\frac{1}{4}$, ♀ $1\frac{1}{2}$ inch.

Hab. Peru, La Union, Rio Huacamayo, 2000 feet (*Mus. Druce*).

Carama modificata, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen pale fawn-colour; abdomen clothed with whitish hairs at the

base; antennæ brown; underside of thorax and abdomen brownish white. Primaries fawn-colour, whitish at the base; on the inner margin a <-shaped white marking at the end of the cell; a small black spot at the end of the cell and one beyond the cell; the fringe fawn-colour: secondaries creamy white, the fringe and outer margin shaded with fawn-colour. Underside: primaries brown, the inner margin and veins white; the white mark at the end of the cell as above: secondaries white.—*Female* very similar to the male, but larger.

Expanse, ♂ $1\frac{1}{2}$, ♀ 2 inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Carama fusca, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen blackish grey; palpi black; antennæ yellowish brown; underside of abdomen and thorax clothed with dark grey hairs. Primaries blackish grey; a pale grey spot at the end of the cell: secondaries grey, whitish at the base. Underside of the primaries black, the grey spot at the end of the cell more distinct; secondaries grey.—*Female* similar to the male.

Expanse, ♂ $1\frac{6}{10}$, ♀ 2 inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Allied to *Carama grisea*, Schaus.

Carama distincta, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen creamy white; antennæ yellowish; palpi black. Primaries very pale fawn-colour, the costal, outer, and inner margin white; a white mark at the end of the cell and one black spot beyond: secondaries pure white. Underside of both wings white, the costal margin from the base to beyond the middle broadly black.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Carama rufidorsata, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and base of the abdomen pale brown; the upperside of the abdomen bright red, the sides and underside white. Primaries pale brown, darkest near the apex; a small black dot at the end of the cell and one beyond nearer the outer margin: secondaries pale brown, whitish at the base. The underside very similar to the upperside, but rather paler in colour.

Expanse $1\frac{4}{10}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Carama parmata, sp. n.

Male.—Head and underside of the thorax white; antennæ, collar, tegulæ, thorax, and abdomen fawn-colour. Primaries and secondaries fawn-colour; a black spot at the end of the cell on the primaries; fringes fawn-colour. The underside the same as the upperside, but paler in colour.

Expanse $1\frac{3}{4}$ inch.

Hab. S. Brazil, Rio Grande do Sul (*Mus. Druce*).

Carama nox, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen black. Primaries and secondaries black. The underside black.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Carama nigrovenosa, sp. n.

Male.—Head, collar, tegulæ, thorax, underside of the thorax, and legs black; abdomen pale yellow; anus grey; antennæ brown. Primaries white; costal and inner margins and veins black-brown: secondaries white, the costal margin and fringe grey. Underside similar to the upperside.

Expanse $1\frac{3}{4}$ inch.

Hab. Peru, La Union, Rio Huacamayo, 2000 feet (*Mus. Druce*).

Family **Limacodidæ**.

Sciathos metaleuca, sp. n.

Male.—Head orange-yellow; antennæ black; collar and tegulæ cream-colour, tipped with orange; thorax and base of abdomen clothed with long white hairs; abdomen orange-yellow; underside of the abdomen black. Primaries yellowish white, the costal margin orange near the apex; a band of small black spots crosses the wing from the costal margin near the apex to the middle of the inner margin: secondaries yellowish white.

Expanse $1\frac{1}{4}$ inch.

Hab. S.E. Peru, Oconeque, Carabaya, 4000 feet (*Mus. Druce*).

Sciathos semirufa, sp. n.

Male.—Head red; palpi white; antennæ black; collar white; tegulæ white, tipped with red; thorax white, with

red spots on each side; abdomen bright carmine-red; anal tuft white. Primaries dark grey, the costal margin from the base to the apex broadly white; the fringe yellow: secondaries bright red; the fringe yellowish. Underside of both wings red, without any markings.

Expanse $1\frac{3}{4}$ inch.

Hab. Peru, Quinton, Carabaya, 5000 feet (*Mus. Druce*).

Eulimacodes tersula, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, and abdomen dark brown; legs dark brown. Primaries: the basal half dark brown, the outer half pale brown, crossed from the costal to the inner margin by three waved greyish bands; a white spot below the cell, then alternately light and dark brown: secondaries dark brown; the fringe pale brown. The underside of both wings pale brown.

Expanse $1\frac{1}{4}$ inch.

Hab. Peru, La Oroya, Carabaya, 3000 feet (*Mus. Druce*).

Perola antelia, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, and abdomen greyish brown. Primaries dark grey from the base to beyond the middle; a white curved line crosses the wing from the costal margin near the apex to the inner margin near the anal angle; the outer margin white at the apex, irrorated with reddish-brown scales at the anal angle; a marginal row of small black spots extending from the apex to the anal angle; the fringe pale brown: secondaries pale brown, lightest at the apex.

Expanse 1 inch.

Hab. Peru, La Oroya, Carabaya, 3000 feet (*Mus. Druce*).

Echedorus fasciatus, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen white; antennæ yellowish; anal tuft yellowish brown. Primaries white, clouded with black at the base and apex; the fringe white: secondaries white; a blackish band partly crosses the middle of the wing from the apex; fringe white.

Expanse 1 inch.

Hab. Peru, La Union, Carabaya, 3000 feet (*Mus. Druce*).

Family **Bombycidæ**.

Bombyx inornata, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen dark

brown; antennæ black; underside of abdomen and legs reddish brown. Primaries dark brown, shaded with olive-green at the apex and across the middle of the wing; a curved dark brown band extends from the apex to the anal angle; the fringe dark brown: secondaries dark brown, palest at the base; a dark brown line crosses the middle of the wing from the costal to the inner margin. Underside of both wings reddish brown; primaries with a large black spot at the end of the cell; the apex and outer margin dark brown.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Carthara bifasciata, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen greyish black, with some brown hairs on the upperside of the abdomen; the anal tuft yellowish. Primaries dark brown, with a reddish spot close to the base; two waved greyish lines cross the wing from the costal to the inner margin, the first near the base, the second beyond the cell; three metallic-silver dots at the end of the cell in the form of a triangle: secondaries dark reddish brown, palest on the costal margin; the anal angle yellowish brown. Underside: both wings pale reddish brown.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Family **Lasiocampidæ.**

Tolype nigrescens, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen black; two white spots at the base of thorax and some white hairs on each side; underside of the thorax and legs thickly clothed with white hairs. Primaries hyaline black, the veins black: secondaries hyaline black, the inner half of the wing brownish black.

Expanse 2 inches.

Hab. Peru, Quinton, Carabaya, 5000 feet (*Mus. Druce*).

Hydrias onoba, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen greyish brown; the anus and underside of the abdomen light yellow; legs yellowish brown. Primaries pale brown, thickly irrorated with grey scales; an orange-red spot at the

end of the cell; the fringe at the apex and outer margin yellow: secondaries pale brown, thickly irrorated with grey scales; the fringe yellow. The underside similar to the upperside.

Expanse 1½ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Ocha hedila, sp. n.

Male.—Head, tegulæ, and thorax white; collar pale brown, edged with white; antennæ pale brown; abdomen pale brown, the sides and underside white. Primaries pale brown, the base, a streak at the end of the cell, the apex, and part of the outer margin white: secondaries white, clouded near the apex and round the outer margin with blackish brown. Underside of both wings white; the costal margin of the primaries from the base almost to the apex yellowish brown; a dark brown spot in the cell.—The *female* is very similar to the male, but the abdomen is all white and the undersides of the primaries are much more clouded with blackish brown; the female is larger than the male.

Expanse, ♂ 1, ♀ 1½ inch.

Hab. Peru, La Oroya, Carabaya, 3000 feet (*Mus. Druce*).

A female of this species is in the British Museum from Panama.

Ocha meroma, sp. n.

Male.—Head, collar, tegulæ, and thorax greyish white; antennæ pale brown; abdomen black; anal tuft white. Primaries grey, irrorated with small black scales; the apex white, the outer margin broadly banded with pale brown: secondaries black, the outer margin from the apex to the anal angle yellowish white. Underside very similar to the upperside, but the primaries blacker.

Expanse 1¼ inch.

Hab. Peru, La Union, Rio Huacamaya, 2000 feet (*Mus. Druce*).

Ocha patara, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen cream-colour. Primaries cream-colour, the base thickly spotted with reddish brown; a central band of reddish-brown spots extends from the base to the outer margin: secondaries cream-colour, with a reddish-brown streak at the apex.

Underside: both wings cream-colour; a reddish-brown spot on the primaries at the end of the cell.

Expanse 1 inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Apatelodes striata, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen brownish fawn-colour. Primaries fawn-colour, with six angular lines near the apex; a white spot at the apex; a black dot on the inner margin close to the base; the fringe fawn-colour: secondaries brownish fawn-colour, the veins all paler in colour. Underside pale fawn-colour; the secondaries crossed about the middle by two waved pale lines; a rather large brown spot at the apex.

Expanse $1\frac{1}{2}$ inch.

Hab. Peru, La Union, Rio Huacamaya, 2000 feet (*Mus. Druce*).

Apatelodes bicolorata, sp. n.

Male.—Head and palpi bright red; collar, tegulæ, thorax, and abdomen cream-colour; a few reddish hairs at the base of the abdomen. Primaries cream-colour, thickly irrorated with small red scales, crossed from the costal to the inner margin by two pale fawn-coloured lines, the first nearest the base, the second beyond the cell; two submarginal black spots near the apex: secondaries creamy white, darkest on the inner margin. The underside of both wings similar to the upperside, but paler in colour.

Expanse $1\frac{3}{4}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

Family **Cossidæ.**

Costria Ockendeni, sp. n.

Male.—Head white; antennæ pale brown; collar blue-grey; tegulæ white, edged with black; thorax grey, reddish brown at the base; abdomen white; underside of the thorax and abdomen black; legs greyish black. Primaries white, the inner half shaded with brown; four blue-grey waved bands cross the wing from the costal to the inner margin, the first and second near the base, the third about the middle, and the fourth beyond; the wing is striated with many very fine brown lines, which cross from the costal to the inner margin; two large submarginal black spots, surrounded with

white nearest the apex: secondaries white, slightly brownish near the base. Underside very similar to the upperside, but browner.

Expanse 2 inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*Mus. Druce*).

I have named this beautiful species after Mr. Rosenberg's late collector G. Ockenden, who died in Peru of typhoid in the early part of this year.

Family **Noctuidæ**.

Euglyphia proserpina, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen blue-black; anus scarlet; underside of head, thorax, and part of abdomen scarlet; legs clothed with long scarlet hairs. Primaries steel-black, shaded with deep black along the inner margin to the end of the cell; two curved black lines beyond the cell, crossing the wing from the costal to the inner margin; a marginal row of black spots extends from the apex to the anal angle; the fringe black: secondaries steel-black, the veins deep black. Underside: primaries greyish black, darkest along the costal half of the wing: secondaries pale glossy greyish black, the veins deep black.

Expanse 2 inches.

Hab. Peru, La Oroya, Carabaya, 3000 feet (*Mus. Druce*).

Allied to *Euglyphia hieroglyphica*, Cram.

XVIII.—*Notes on the Genus* Hæmatopota *of the Family* Tabanidæ *in the British Museum Collection*. By Gertrude Ricardo.

[Plates III.–VI.]

Hæmatopota, Meigen.

Hæmatopota, Meig., Illiger's Mag. ii. 267. 40 (1803).

This genus is readily distinguished by the peculiar markings of the wings, but the species are not easy to describe.

Loew gives what he considers good characteristics for the distinction of the species in his Dipt. Südafrik., relying on the shape of the head, the position, shape, and size of the paired spots, and the absence or presence of the unpaired spot, and, in a lesser degree, on the markings on the face; the shape of the antennæ he considers a doubtful character,

especially as to the incrassate or cylindrical first joint, but the legs afford good characteristics. He considers the wings very difficult to describe, but gives some of the chief points. To the above I am inclined to add the shape and size of the frontal callus as useful, the general shape of the antennæ (which vary considerably), and to rely upon the presence or absence of rings on the legs and the possession of a white base to the tibiæ.

Though the markings of the wings may be relied upon as a rule, there is no doubt that they vary slightly in different specimens of one species, as in the shape or length of the apical band and in the presence or absence of the pale markings at the openings of the cells. The rings on the legs also are not to be implicitly relied upon, a second faint pale ring sometimes appearing in a species which, as a rule, has only one ring; this occurs chiefly on the fore tibiæ.

My tables are drawn up only for the females.

Those species marked with an asterisk denote there are specimens of them in the British Museum collection.

Through the kindness of Mr. J. A. Gerald Strickland, who has devoted a great deal of time and trouble to the work, I am enabled to give photographs of the wings of all the new species but one, of four of Bigot's types, and of two of Walker's types, which it is hoped will be of assistance in the identification of the species and will save the wearisome labour of reading through long descriptions of the intricate markings of the wings. The actual colouring of the wings is given in the letterpress as nearly as possible as it strikes the naked eye. The magnification is approximately ten diameters.

The species described by Wiedemann as *Hæmatopota coarctata* (Auss. zweifl. Ins. p. 578) from South America does not belong to this genus, but to *Acanthocera*, Macq., as surmised by Bigot (Bull. Soc. Zool. Fr. xvi. p. 74, 1890), and is included in my table of the latter genus in Ann. & Mag. Nat. Hist. xiv. (7) p. 363 (1904). This genus does not occur in South America.

Palæarctic Region.

For a catalogue of the *Hæmatopota* of the Palæarctic Region, that of Bezzi, published 1903 in his 'Katalog der paläarktischen Dipteren,' should be referred to.

The following amendments to it should be noted, viz. *H. lusitanica*, Guér., *is* a distinct species, not a synonym of *H. pluvialis*, L., and *H. tristis*, Bigot, is a synonym of *H. pluvialis*, L., not a distinct species.

The following table does not include *H. obscurata*, Bigot, which is unknown to me:—

1.	Wings reddish brown	*rufipennis*, Bigot.
	Wings grey	2.
2.	Wings with a clear hind margin	**pallens*, Loew.
	Wings with no such clear hind margin	3.
3.	First joint of antennæ largely yellow. Femora wholly or partly yellow	**variegata*, Fabr.
	First joint of antennæ black or brown. Femora usually blackish or grey	4.
4.	First joint of antennæ cylindrical, as long as and hardly thicker than the third joint, with dense grey tomentum	**italica*, Meigen.
	First joint of antennæ elliptical, thicker and shorter than the third joint, shining black	**pluvialis*, Linn.
	First joint of antennæ very stout, not constricted at the tip, with only grey tomentum at the extreme base	5.
5.	Larger species, 13 mm.	**lusitanica*, Guérin.
	Smaller species, 10 mm.	**crassicornis*, Wahlb.

The males of *H. rufipennis* and *H. lusitanica* are not known.

Hæmatopota rufipennis, ♀, Bigot.

The type is much denuded and deteriorated, but may be easily known by the dark colour of its wings, which are a reddish brown with clearer spots and markings; the abdomen is apparently black and the legs reddish with some black colour.

Hæmatopota pallens, ♀, Loew.

Six females from Algeria, 21ʰ. vii. 93 (*Eaton*), 94. 114. These answer to Loew's description, but the first joint of the antennæ is grey, not black.

Hæmatopota variegata, ♂ ♀, Fabr.

Three females from Hyères, 4. ix. 93 (*Verbury*), 93. 123.

Two females from Castel Fusano, Ostea, Italy (*Dr. Sambon*), 1901. 99.

Two females from Boscoff, Brittany, 6. ix. 92 (*O. Thomas*), 92. 135.

Two females from Kanea, Crete, first week in May, 1904 (*Miss M. D. Bates*), 1905. 25; and others from Morea and Italy.

This species, originally described from a specimen from Tangiers, must be very nearly related to, if not identical with,

H. italica, both species being distinguished by the cylindrical long first joint of the antennæ. The characters given in the table to distinguish the two species are taken from Schiner and other authorities, but will probably not prove satisfactory, judging from the material in the National Collection, which, however, is too poor to throw further light on the question.

Hæmatopota italica, ♂ ♀, Meigen.

One female from Nicosia, Cyprus (*Miss M. D. Bates*), 1903. 64.

One female from France.

Mik, in 'Fauna Hernstein,' Becker, iii. p. 515 (1886), distinguishes this species from *H. pluvialis* by the cylindrical first joint of the antennæ, which is *as long as the third joint and hardly thicker*, and adds that the grey tomentum covering it is so thick that only here and there is the shining black colour to be seen through.

Hæmatopota pluvialis, ♂ ♀, Linn.

Specimens are in the Brit. Mus. Coll. from Norway, Leenane, Co. Galway, Gloucestershire, Avon Valley, Boppard on the Rhine, Alps, Spain, The Hague, Italy, and France.

It is distinguished from *H. italica* by its thickened first antennal joint, which is distinctly wider in the middle and much shorter than the third joint, and the bright black colour is not obscured by grey pubescence.

The *H. tristis*, ♀, Bigot, type, with the exception of the more yellow colour of the middle and posterior femora, is identical with this common European species; the type comes from Japan.

Hæmatopota lusitanica, ♀, Guérin.

Five females from Portugal (*O. Thomas*), 98. 99.

A large blackish species, evidently distinct from *H. crassicornis*; but at present the only distinction I can give to separate them is the larger size of the above.

Hæmatopota crassicornis, ♂ ♀, Wahlberg.

One male from Beaulieu, New Forest (*Ricardo*), 14. vii. 98.
One male from Avon Valley, 24. v. 96.
One male from Bantham, 26. vi. 96.
Four males from Wick, near Bristol (*Ricardo*), 27. vi. 05.
One female from Gravesend (*Yerbury*), 94. 14. 3.

One female from Glen Avon, S. Banffshire (*W. R. O.-Grant*), 93. 95.

The male of this species may easily be distinguished by the wholly black colour of the antennæ and by the very thick first joint.

The female is less easily distinguished from that of *H. pluvialis*, but Strobl, in Mittheil. Ver. Steierm. 1892, xviii. (1893), recognizes it by the extraordinarily thick first joint, which is short, stout, and not constricted near the tip; only at its base is it obscured by grey tomentum; the shining black band above the antennæ is narrower and not produced above in the centre; the third joint of the antennæ is only red at the base. In *H. pluvialis* the first joint is much slenderer, covered with grey tomentum to the middle and strongly constricted before the tip; the red colour on the third joint is more extended, the black band broader, produced in the centre as a triangle.

The four males collected by me form part of a series of two dozen or so caught in one week, resting on the highest and sunniest parts of a stone wall round an unoccupied farmyard; no females were to be seen. I was not successful in discovering their breeding-place.

Nearctic Region.

There are only two species known in N. America, both said to be fairly common. There was a specimen in the British Museum Collection labelled "N. America" and placed under *H. punctulata*; it is apparently a specimen of *H. variegata*, and certainly does not agree with the description of either of the N.-American species; the locality-label is probably incorrect.

H. punctulata, Macq., Dipt. Exot. i. p. 163 (1838); Walker, List Dipt. v. p. 295 (1854); Osten Sacken, Cat. Diptera N. Amer. p. 55 (1878); Bigot, Bull. Soc. Zool. Fr. xvi. p. 77 (1890); Hine, Tabanidæ of Ohio, Ohio Acad. Science, Special Papers, no. v. p. 23 (1903).—United States.

H. americana, Osten Sacken, Mem. Boston Soc. ii. p. 395 (1876); id. Cat. Diptera N. Amer. p. 55 (1878); Bigot, *l. c.*; Johnson, Proc. Acad. Nat. Sci. Philad. p. 323 (1895); Hine, *l. c.*; id. Ohio Nat. v. no. 2, p. 231 (1904).—Colorado, British Columbia.

Ethiopian Region.

The described species of *Hæmatopota* from this region number nineteen, counting *H. ruficornis*, ♂, Macq., and *H. ruficornis*, ♀, Walker, as two distinct species, and *H. dorsalis*, Loew, as a synonym of *H. decora*, Wlk.;

thirteen of these are from South Africa, two from West Africa, and five from East Africa. Ten new species are described in this paper, of which five come from Uganda, four from East Africa, and one from the Transvaal, bringing up the total of described species to thirty. Loew's Dipt. Südafrik. should be consulted for species from South Africa.

The character given in the table of the first joint of the antennæ as incrassate or not incrassate should not be regarded as absolute, as it is difficult in some cases to decide under which head a species should be placed. I have interpreted incrassate after Mik's definition ('Fauna Hernstein,' Becker, iii. p. 515, 1886), viz. when the first joint is elliptical in shape, that is distinctly widened in the middle looked at from above, it is incrassate as distinguished from simply cylindrical or not incrassate. I have not seen the type of *H. inappendiculata*, ♀, Bigot.

H. ocellata, ♀, Wied., Zool. Mag. iii. p. 38 (1819); id. Dipt. Exot. i. p. 100 (1821); id. Auss. zweifl. Ins. i. p. 217 (1828); Walker, List Dipt. pt. i. p. 100 (1846); Loew, Dipt. Südafrik. p. 48 (note) (1860); Schiner, Reise der Novara, p. 81 (1866).—Cape of Good Hope.

H. imbrium, ♀, Wied., Auss. zweifl. Ins. i. p. 215 (1828); Macq., Dipt. Exot. Suppl. 1, p. 46 (1848); Walker, List Dipt. pt. v. Suppl. 1, p. 295 (1854).—Caffraria, Cape.

H. ruficornis, ♂, Macq., Dipt. Exot. Suppl. 1, p. 45 (1848); Walker, List Dipt. pt. v. Suppl. 1, p. 296 (1854).—Port Natal.

H. ruficornis, ♀, Walker, Dipt. Saund. p. 453 (1850).—Port Natal.

H. decora, ♀, Walker, Dipt. Saund. p. 454 (1850).—Port Natal. [*H. dorsalis*, Loew, Dipt. Südafrik. p. 52.]

H. duplicata, ♀, Loew, Dipt. Südafrik. p. 47, pl. i. fig. 24 (1860).—Cape Town.

H. obscura, ♂, Loew, ib. p. 48, pl. i. fig. 25 (1860).—Cape.

H. scutellaris, ♀, Loew, ib. p. 49 (1860).—Caffraria.

H. recurrens, ♀, Loew, ib. p. 50, pl. i. fig. 26 (1860).—Port Natal.

H. vittata, ♀, Loew, ib. p. 50, pl. i. fig. 28 (1860).—N'Gami, S. Africa.

H. bistrigata, ♀, Loew, ib. p. 51, pl. i. fig. 27 (1860); Schiner, Reise der Novara, p. 81 (1866).—Caffraria.

H. circumscripta, ♀, Loew, ib. p. 51, pl. i. fig. 31 (1860).—Caffraria.

H. inappendiculata (♀?), Bigot, Archiv. Entom. ii. p. 350 (1858).—Gaboon, W. Africa.

H. guineensis, ♀, Bigot, Ann. Soc. Ent. Fr. 1891, p. 369; id. Bull. Soc. Zool. Fr. xvi. p. 76 (1891). [*H. cordiyera*, Bigot, *l. c.*, name twice chosen.]—Abyssinia.

H. hieroglyphica, ♀, Gerstäcker, Arch. für Nat. xxxvii. p. 362 (1871); id. Decken's Reisen in Ost-Afrik. pt. iii. p. 385 (1873).—Endara, Zanzibar.

H. maculiplena, ♀, Karsch, Berlin. ent. Zeit. xxxi. p. 371, pl. iv. fig. 5 (1887).—Bondei, E. Africa.

H. albihirta, ♀, Karsch, *l. c.* pl. iv. fig. 4 (1887).—Usambara, East Africa.

H. strigipennis, ♀, Karsch, Ent. Nachr. xv. p. 239 (1890).—Gaboon, West Africa.

H. meteorica, ♀, Corti, Ann. Mus. Civ. Genova, xxxv. p. 131 (1895).—Gallaland, E. Africa.

1.	Wings with no appendix	*inappendiculata*, ♀, Bigot.
	Wings with an appendix	2.
2.	Legs uniform in colour, with no rings of lighter colour	29.
	Legs with rings of light and dark colour.	3.
3.	Hind tibiæ with two rings of light colour	4.
	Hind tibiæ with one ring of light colour.	28.
4.	Wings with two milk-white bands	*strigipennis*, ♀, Karsch.
	Wings with no such bands	5.
5.	First joint of antennæ not incrassate, or hardly so	6.
	First joint distinctly incrassate	16.
6.	Anterior tibiæ dilated, with one white ring	*circumscripta*, ♀, Loew.
	Anterior tibiæ not dilated	7.
7.	Anterior tibiæ with two white or yellow rings	8.
	Anterior tibiæ with one white or yellow ring	9.
8.	Wings with the apical band double; antennæ brownish	*duplicata*, ♀, Loew.
	Wings with the apical band single; antennæ reddish	**hirta*, ♀, sp. n.
9.	Abdomen with spots	10.
	Abdomen with no distinct spots	15.
10.	Legs pitchy brown	11.
	Legs yellowish or reddish brown	12.
11.	Abdomen light brown, base and spots only, grey	*hieroglyphica*, ♀, Gerst.
12.	Abdomen reddish brown	13.
	Abdomen blackish grey	14.
13.	Abdomen dark red-brown, with light brown spots; the first joint of antennæ short	*maculiplena*, ♀, Karsch.
	Abdomen red-brown, with lighter spots; first joint of antennæ not short	**ruficornis*, ♀, Wlk.
14.	First joint of antennæ short	**nigrescens*, ♀, sp. n.
	First joint of antennæ long	**longa*, ♀, sp. n.
15.	Abdomen brown; legs yellowish brown.	*guineensis*, ♀, Bigot.
16.	Scutellum almost wholly dark; antennæ deep black, reddish at the base of the third joint	**obscura*, ♂ ♀, Loew.
	Scutellum not almost wholly dark	17.
17.	Basal joint of hind tarsi with white hairs at the base	*albihirta*, ♀, Karsch.
	Basal joint of hind tarsi with no such white hairs	18.
18.	Thorax with a broad median stripe	19.
	Thorax with no broad median stripe	21.
19.	The upper part of the face black	*vittata*, ♀, Loew.
	The upper part of the face not black	20.
20.	A yellowish-brown species, with the rosettes of the wings very distinct	**ugandæ*, ♀, sp. n.
	A blackish-brown species, with the rosettes of the wings indistinct, but the veins shaded	**distincta*, ♀, sp. n.

21. Ground-colour of wings light rusty brown ..... *bistrigata*, ♀, Loew.
Ground-colour of wings pale blackish grey or brownish grey ..... 22.
22. Antennæ brownish or blackish..... 23.
Antennæ testaceous or reddish brown, sometimes black at the extreme apex. 25.
23. Abdomen with triangular median spots of whitish colour on the segments .. **imbrium*, ♀, Wiedem.
Abdomen with no such spots ..... 24.
24. First joint of antennæ distinctly incrassate; the two black spots on the face joined ..... *scutellaris*, ♀, Loew.
First joint of antennæ hardly incrassate; the two black spots on the face small, widely separated ..... *recurrens*, ♀, Loew.
25. Upper part of face yellowish brown, with no spots ..... 26.
Upper part of face not yellowish brown, but with spots ..... 27.
26. First joint of antennæ moderately incrassate, small, yellow .... **brunnescens*, ♀, sp. n.
First joint of antennæ much incrassate, large, greyish ..... **bipunctata*, ♀, sp. n.
27. Wings with distinct ocelli: an ashy-grey black species (from the Cape) .. **ocellata*, ♀, Wiedem.
? Wings with no distinct ocelli: a brown species (from East Africa) ..... *meteorica*, ♀, Corti.
[27 *a*. Antennæ red, apex black ..... *ruficornis*, ♂, Macq.]
28. Thorax with a broad white stripe. Face black above. Third joint of antennæ wide, short ..... **decora*, ♀, Walker.
29. Wings have a chequered appearance .. **brunnipennis*, ♀, sp. n.
Wings have not a chequered appearance; the dark colour predominates only on the posterior border and at the apex ..... 30.
30. Palpi and antennæ yellowish ..... **unicolor*, ♀, sp. n.
Palpi and antennæ blackish ..... **similis*, ♀, sp. n.

Hæmatopota hirta, ♀, sp. n.

Type (female), Uganda (*Lt.-Col. Bruce*), 1903. 206, and nine other females.

These were collected and sent by Lt.-Col. Bruce to the British Museum (Natural History) in a box with tsetse-flies and other Tabanidæ.

A dark hairy species; face with long white pubescence; the grey spots on the abdomen large and prominent, appearing at first sight as grey stripes.

Face greyish, with long white hairs; some brown colour appears on the sides, but there are no black spots. Palpi yellowish, with white hairs at the base and black pubescence on the apical half. Antennæ red, the first joint not incras-

sate, with long black pubescence; the second joint round with black hairs; the third wide, rather short, black at its extreme apex. Frontal callus broad, black, shining, barely reaching the eyes on its anterior border, receding from them entirely on the posterior border, which is straight; the spot between the antennæ black, being a continuation of the callus; brown rings round the antennæ; the paired spots small, black, not reaching the eyes; the forehead yellowish brown near the callus, darker on the vertex. Thorax brown, with three yellowish-brown linear stripes; a large oblong spot at the suture on each side-stripe and another one at the base of each stripe; sides of thorax grey, the pubescence on the dorsum spare and short, of a pale yellow colour, on the sides with long black and then white hairs. Scutellum brown, with pale yellow pubescence. Abdomen dark brown, with large, irregular-shaped, grey spots on each side, almost reaching the anterior border of each segment, but not the posterior border; the posterior borders of the segments of the same colour, widest in the middle, the sides partly grey; underside greyish. Legs yellow and brown, the femora yellow with white pubescence, which is thickest on the fore femora; all the tibiæ have two yellow rings; the tarsi are darker on the apical half of the joints; the tibiæ and tarsi with black pubescence. Wings greyish, with yellowish-brown stigma and veins, the pale markings fairly distinct, the apical band short, single.

Length 8 mm.

In some of the specimens the paired spots are larger and reach the eyes.

Pl. III. fig. 1, type (female).

Hæmatopota ruficornis, ♀, Walker.

Type, 68. 4 (*Saunders*), Natal.

One female from Cape Town (*H. A. Spencer*), 91. 29. The type is a well-preserved specimen.

The species is distinguished from *H. hieroglyphica*, Gerst., by the characteristics mentioned in the table, and also by the presence of spots on the face, whereas they are apparently absent in Gerstäcker's species, and the transverse callus is shining red-brown, not pitchy black. From *H. meteorica*, Corti, it is distinguished by the absence of any large brown longitudinal band on the underside of the abdomen, and only the extreme tip of the antennæ is black. The following redescription may be found useful:—

A red-brown species, with distinct grey spots on the abdomen and testaceous antennæ.

Face grey; the spots under the antennæ are red rather than black, as is also the transverse stripe, which is indistinct and broken up into red dot-like spots. Palpi reddish, with dense black pubescence above and some grey hairs below. Antennæ rather long, the first joint light yellow, cylindrical, but not very slender, with black pubescence; the second the same colour, with similar pubescence; the third reddish, only the last divisions black, a little longer than the first two joints together. Frontal callus the same colour as the first antennal joint, slightly lunate in front, very slightly sinuous on the posterior border, narrow, reaching the eyes; there is a faint brown double spot between the antennæ; the paired spots are brown, large, touching the eyes, the unpaired spot nearly as large, brown; the forehead yellowish brown, with grey pubescence. Thorax red-brown, with narrow grey stripes, the outer ones only reaching the suture and ending in the usual spots; sides of thorax and breast greyish; scutellum yellow-brown, with grey pubescence. Abdomen yellow-brown, darker at the apex, the spots on the sides of the segments very distinct and large, the median ones indistinct; the sides of the first three segments are grey, also the posterior borders of the segments; the pubescence is chiefly grey; the underside of abdomen faint red, with grey tomentum and pubescence. Legs yellowish, the rings on the middle and posterior legs dark brown; the tarsi black, as are also the fore tibiæ on the apical half. Wings greyish brown, the white markings conspicuous, especially so at the opening of the fifth posterior cell; the apical band sinuous, single; veins yellowish brown; there is a distinct ocellus above the brown stigma; all the posterior cells except the fourth with clear margins, that of the fifth being the largest.

Length 9 mm.

Pl. III. fig. 2, type (female).

A smaller specimen from Cape Town seems identical. It hardly seems probable that the male described by Macquart as *H. ruficornis* is identical with the above, as suggested by Walker; Macquart describes his species as blackish, and says the third joint of the antennæ is a little shorter than the first joint; the locality is Port Natal.

Hæmatopota nigrescens, ♀, sp. n.

Type (female), Altri-iga, Mawe, B. E. Africa (*C. S. Betton*), 1900. 35, 13. iii.–4. v. 99.

A small black-grey species with yellow antennæ and yellow legs; the first joint of the antennæ short.

Face grey, with no black spots; a narrow brown stripe between the antennæ and the eyes, bordering the frontal callus. Palpi the same colour, with black pubescence. Frontal callus shining black, narrow, bordering the antennæ closely, leaving only a small triangular black spot between the antennæ, reaching the eyes, not produced in the middle. Antennæ light yellow; the first joint short, cylindrical, the second round, short, with no cup-like prolongation above, the third with the basal annulation not very wide; there are ong black hairs on the first two joints. Forehead wide, greyish, with the dark ground-colour apparent, becoming shining on the vertex; the paired black spots are small, not touching the eyes; there is no sign of the unpaired black spot. Thorax black, with three faint grey stripes and grey tomentum, which latter covers the scutellum. Abdomen black, with a well-marked series of hoary-grey undefined spots on each side; the hind margins of the segments are also grey. Legs the same colour as the antennæ; the tarsi darker; the rings of the middle and posterior tibiæ are faintly outlined by a dark ring of colour, but even this is not apparent on the fore tibiæ. Wings greyish, the rosettes of light colour, fairly distinct; the apical sinuous band is double; stigma and veins yellowish brown.

Length 8 mm.

Pl. III. fig. 3, type (female).

It was not possible to get a very satisfactory photograph of the wing, owing to its imperfect condition.

Hæmatopota longa, ♀, sp. n.

Type (female), Nyasaland, Nov. 1892 (*H. H. Johnston*), 94. i. 2; one female from Ndi, E. Africa (*W. S. Godfrey*), 98. 69; one female from Lunigina River, Henga, west of Lake Nyasa, 3000 feet, 29. i. 94 (*R. Crawshay*), 98. 81.

A small black species, distinguished by the long cylindrical first joint of the yellow antennæ.

Face grey, with two black spots in the centre, not contiguous; the usual stripe is almost resolved into a large spot bordering on the eyes and small punctuated spots. Palpi yellowish, with white hairs at the base and black hairs beyond. Antennæ light yellow, the third joint darker on its apical half; the first joint long and slender, together with the second nearly as long as the third joint; the second short, with tuft-like black hairs below and above on its upper edge. Frontal callus black, shining, in front lunate, with two black spots proceeding from it between the antennæ; the

hind border somewhat sinuous; the paired spots large, touching the eyes, the unpaired spot small and indistinct. Forehead brownish, with grey tomentum forming a broad arrow on the vertex (the arrow-like shape is only distinct on the type). Thorax brown-black, rather shining, with grey stripes. Abdomen brownish black, the hind borders of the segments greyish; there are indistinct grey spots on the hind segments. Legs brownish, the usual lighter rings and the base of the metatarsi yellow, the tarsi black, the fore tibiæ slightly dilated. Wings brown, with the rosettes of light colour clearly marked; the apical sinuous line broad and single, the posterior cells usually with light colour on the outer border; stigma and veins yellowish brown.

Length 9 mm.

Pl. III. fig. 4, female (not type).

Hæmatopota obscura, ♂ ♀, Loew.

Two females from Karkloof and one female from Port Natal seem to agree with the description of the female given by Loew; the spots on the abdomen are hardly visible on one of the specimens.

Hæmatopota ugandæ, ♀, sp. n.

Type (female) and nine other females from Uganda (*Lt.-Col. Bruce*), 1903. 206.

This species is nearly allied to *H. vittata*, Loew, but is distinguished from it, firstly, by the absence of the black band on upper part of face; secondly, by the broader frontal callus produced to a point on the posterior border; thirdly, by the shape of the antennæ, which are longer and more slender and the first joint is less incrassate; and fourthly, by the absence of the unpaired black spot on the forehead. From *H. distincta*, sp. n., it is easily distinguished by the difference in the wings, its smaller and less robust appearance, and its lighter colouring.

Face brownish, covered with grey tomentum, the brown colour appearing as the usual spots and as the transverse stripe: the spare pubescence is yellowish. Palpi faint red, with grey tomentum and short black pubescence. Antennæ yellowish brown, with some grey tomentum, the last divisions of the third joint deep black; the first joint slightly incrassate, the second short, both with black pubescence, the third rather long and slender. Forehead brown, yellowish at the sides and round the spots. Frontal callus reddish brown, shining (in some of the other specimens it is darker, almost

black), broad, produced on its anterior border; the paired spots large, not reaching the eyes, deep brown; the unpaired spot is not apparent. Thorax brown, with three narrow yellowish stripes, the central one expanding beyond the suture into a broad median stripe with spots at its base, the side ones end in the usual spots, sides yellowish; or the thorax might be described as yellowish brown with three brown stripes, the middle one divided by a yellow line and terminating at the suture. Scutellum brown, with a central yellowish stripe. Abdomen brownish, yellower at the base and on the sides, where the yellow appears as large irregular spots, and the posterior borders of the segments are yellow with short yellow pubescence; the underside greyish brown. Legs reddish brown with yellow rings; the fore tibiæ only yellow at the base. Wings brown, with the rosettes more distinctly marked than in *H. distincta*, often lighter in the centre; veins brown; stigma dark brown; apical band single; the blotch on the apical line in the type is not always present, and may perhaps be accidental, due to a loss of colouring-matter.

Length 10 mm.

Pl. III. fig. 5, type (female).

Hæmatopota distincta, ♀, sp. n.

Type (female) from Plateau of Zomba, Nyasaland (*A. Sharp*), 97. 46; one female from Kasungu Mt., Nyika, Nyasaland, 4. iii. 96 (*R. Crawshay*), 98. 81; one female, British East Africa (*C. S. Betton*), 1901. 319.

A well-marked distinct species, the thoracic markings allied to those of *H. vittata*. In colour dark brown, the scutellum yellowish brown, the legs with the usual white or yellow rings.

Face reddish, with grey tomentum; no black spots and only a trace of the transverse stripe. Palpi rather long, yellowish red, with black hairs and some white hairs below. Antennæ brown-black, dull red at the base of the first and third joints, the first only slightly incrassate, and with the second joint covered with black pubescence, the last annulations of the third joint black. Forehead reddish brown, the frontal callus and paired spots darker brown; the callus shining, broad, reaching the eyes, lunate on the posterior, almost straight on the anterior border; the spots between the antennæ black; the unpaired spot small, joined to a dark median spot on the vertex. Thorax brown-black, the sides reddish grey; the stripes narrow, grey, the median one not very distinct, prolonged into an oblong spot with a wide

base, the outer ones ending in small spots. Scutellum yellowish brown, with very distinct grey tomentum on the anterior border. Abdomen brown, with yellowish borders to the segments and fairly distinct grey spots on each side of every segment; the underside brown, with faint yellow borders and with grey tomentum. Legs dark brown, the rings light yellow; the fore legs only yellow at the base of the tibiæ. Wings large, dark brownish; the dark markings give many of the veins the appearance of being shaded; the rosettes are fairly distinct, the apical sinuous line single, concave, short, only reaching just beyond the anterior fork of the third vein.

Length 11 mm.

Pl. III. fig. 6, type (female).

Hæmatopota brunnescens, ♀, sp. n.

Type (female) and other females from Uganda (*Lt.-Col. Bruce*), 1903. 206, and British Central Africa.

A small brown species with grey wings; the upper part of the face yellow-brown and the first joint of the antennæ rather short.

Face grey, with grey pubescence and no black spots, the upper part yellowish brown, where it reaches the callus becoming yellower. Palpi fairly long, grey, with black pubescence. Antennæ yellowish, darker at the extreme apex and on the upper angle of the base of the third joint; first joint rather short, slightly incrassate, the second small, both with black pubescence. Frontal callus yellowish brown, shining, almost straight on both borders, reaching the eyes; the paired spots black, reaching the eyes. Forehead reddish brown, with grey tomentum, most noticeable in contact with the callus and on the vertex; some very short black pubescence apparent. Thorax brown, with three yellowish-grey linear stripes, the middle one very faint, the outer ones ending at the base in enlarged spots; the sides of the thorax and shoulders grey; scutellum reddish brown, the red rather apparent, probably owing to the denudation of the grey tomentum, which is most noticeable on the borders. Abdomen dark brown, with the posterior borders of the segments yellowish; the spots on the sides grey, round; the underside grey and brown. Legs yellowish brown, some grey tomentum on the femora and tibiæ and some yellow pubescence on the posterior femora, the usual rings yellowish. Wings uniformly grey, with faint pale markings; stigma yellowish brown, veins brown, appendix long.

Length 9 mm.

Pl. IV. fig. 7.

In other specimens the abdomen is redder, the grey spots very distinct, and often a grey median line is present; the abdomen of type is evidently denuded.

A series from Buruli, Uganda, "in patch of forest on Lukogo River, halfway between Junda and Kisoliza," have the following note:—"Especially virulent species, complained of by natives as injuring if not actually killing their cattle" (*Lt.-Col. Bruce*).

Hæmatopota bipunctata, ♀, sp. n.

Type (female), from Volksrust, Transvaal, 5400 feet, 17. xi. 1903 (*Crawshay*), and another female from same locality.

A well-marked species with distinct ocelli and markings on the brown mottled wings; the black abdomen with two rows of grey spots. It is nearly related to *H. duplicata*, Loew, but the apical band of wing is not double, though at its end it throws off an indistinct branch; the first joint of the antennæ is incrassate, a point not mentioned by Loew in regard to his species, and there is no median line on the abdomen, which, with the very distinct spots on each segment, distinguishes it from *H. duplicata*, besides other small differences.

Face grey, with black pubescence and no spots, the upper part yellowish brown; above yellowish; below brown, but broken up in the centre, which is greyish. Palpi long and slender, stouter at base, tapering to an obtuse point, yellowish, with grey tomentum and black hairs. Antennæ reddish brown, the basal joint densely covered with grey tomentum, with long black hairs and a few yellow shorter hairs, stout and large, in length approaching that of the third joint; the second joint small, red, with black hairs; the third red, at the apex blackish, the red basal portion broader. Frontal callus very inconspicuous, being covered with grey tomentum; it is yellowish, small, and narrow, not attaining the eyes, hardly extending beyond the base of the antennæ, straight on both borders; the paired spots black, large, reaching the eyes. Forehead wide, brownish, covered with grey tomentum; on the vertex a large heart-shaped brown spot, with a fine grey median line dividing it into two halves; the pubescence of the forehead black, short. Beard white. Thorax blackish brown, with two interrupted grey stripes and a trace of a narrow median one; shoulders and sides grey; the scutellum

the same colour, with a grey median stripe and grey on the outer borders. Abdomen black-brown, with distinct large grey spots on each side, beginning from the first segment and reaching to the last segment; the posterior borders grey; on the second segment the border is enlarged to a triangular median spot; traces of similar spots are seen on the other segments, but they form no distinct median stripe; the very short pubescence is chiefly black on the dark colouring and grey on the grey colouring, with the sides the same. Underside brown, with inconspicuous yellow pubescence. Legs brown, the knees of the femora yellow; the tibiæ with two yellow rings; the tarsi brown, the basal joint yellow, brown at the extreme apex; the pubescence of the legs black, with some few white hairs. Wings brown, the extreme base and fore border lighter, all the rosettes fully formed and distinct; the stigma brown; veins brown; the appendix large.

Length 10 mm.

Pl. IV. fig. 8, type (female).

The second female is apparently the same species, though much discoloured.

Hæmatopota imbrium, ♀, Wiedem.

Two specimens in poor preservation labelled "South Africa (*Dr. Smith*)," 44. 6, are probably identical with this species.

Loew remarks that it is difficult to distinguish between this species and his *H. recurrens* and *H. scutellatus*; the whitish triangular spots on the median line of the abdomen mentioned by Wiedemann are not present in his species. Macquart declares *H. imbrium* to be a common species in Kaffraria.

Hæmatopota ocellata, ♀, Wiedem.

One female from Estcourt, Jan. 1897 (*G. A. K. Marshall*), 1903. 17.

Two females from Cape Colony, 40. 6. 26. 702 and 703.

It is impossible to add anything to the original description of this species from the want of a good series of specimens. *H. meteorica*, ♀, Corti, seems difficult to distinguish from Wiedemann's species; the distinction regarding the wings given in the table is from the author's description.

Hæmatopota meteorica, ♀, Corti.

Two females from Zomba, Nyasaland (*Sharp*). 97. 46, may belong to this species, but are in too bad condition for

more exact determination; the legs are rather darker than the author describes in his species and no median grey line is apparent on the abdomen.

There are two specimens from the same locality, likewise badly preserved; in the wings the light colour is almost entirely broken up into minute spots; probably they will prove to be a new species.

Hæmatopota decora, ♀, Walker [*H. dorsalis*, Loew].

Type (female), Saunders Coll., 68. 4, Natal; and seven females from Busoga, Uganda (*Bruce*), 1903. 270.

These specimens have not the stripes of the thorax continuous as in table i. fig. 33 of Loew's 'Diptera Südafrika,' but interrupted at the suture for a space; otherwise they agree with Loew's description; his type came from Caffraria, S. Africa. The figure of the antennæ in his fig. 34 is evidently incorrect, the first joint being very much incrassate and the third joint much broader than usual, as noted in the text.

Pl. IV. fig. 9, type (female).

Hæmatopota guineensis, ♀, Bigot.

Type (female) from Abyssinia.

This species was first named *H. cordigera*, but was changed to the above name by the author, *cordigera* being already used for a species from Asia. The type was described with the antennæ incomplete, only the first two joints remaining; these are cylindrical, yellow in colour. The frontal callus is pitchy brown, broad, produced on its hind border, almost straight on the anterior border; the paired spots large, brown, reaching the eyes; the unpaired spot is very small and indistinct; the spots on the face are brown and the transverse brown stripe is placed on a line with them, nearly joining them. The thorax is reddish brown, with three narrow grey stripes, the outer ones ending at the suture in the usual spots; there are also half-moon spots at the base of the thorax; scutellum the same colour, with grey tomentum; the abdomen is brownish, yellower at the base, and the posterior margins of the segments are lighter coloured. Legs yellowish brown, the fore tarsi somewhat dilated. Wings brown-grey, the extreme apex clear; veins and stigma brown; the apical sinuous line begins below apex, reaching the posterior branch of the third vein, where it joins another short band from the anterior branch.

Length 9 mm.

Pl. IV. fig. 10, type (female).

Hæmatopota brunnipennis, ♀, sp. n.

Type (female) and another female from Salisbury, Dec. 1899 (*G. A. K. Marshall*).

One female from Lunigina River, Henga, west of Lake Nyasa, 3000 feet, 29. i. 94 (*R. Crawshay*), 98. 81.

Five females, 24 miles from Blantyre, Brit. Centr. Africa, 22. i. 1905, 6 to 7 A.M. (*Dr. J. E. S. Old*), with note: "In tall green reeds: bit donor and his man. Usually silent and very sluggish."

This and the following species are distinguished by the absence of lighter rings of colour on the legs.

A greyish-brown species with brownish wings and yellow legs and antennæ, the tips of the latter being black.

Face brown, the dense tomentum gives it a grey appearance; no black spots or stripe present. Palpi pale yellow, with yellow pubescence and some black pubescence on the upper surface. Antennæ yellowish, the tips dull black; the first joint only slightly incrassate, the third rather long and slender, the first two joints with some black pubescence. Frontal callus mahogany-brown, shining (on the one from Lake Nyasa it is more yellowish brown), narrow, attaining the eyes, much produced in front; a narrow brown stripe between the antennæ; the paired spots large, triangular, black, not reaching the eyes, the unpaired spot indistinct; the sparse pubescence on the forehead white; on the vertex are two oblong brown spots divided in the middle. Thorax brown, with three grey stripes, the median one linear, the side ones indistinctly continued from the suture; the sides and breast grey. Scutellum brown, grey in the middle and at the sides. Abdomen brown, with grey spots; the grey colour apparent at the sides and on the posterior border of the segments, also as a fine median line, the first segment being almost wholly grey. The underside brown, grey at the sides, on which some minute black dots are scattered. Legs yellowish, the femora with grey tomentum, and some black pubescence on the tarsi. Wings have a chequered appearance, the brown and the white colour very distinct: seen with the naked eye the brown colour is more marked at the apex and on the fore border as blotches; stigma light brown; veins brown.

Length 9½ mm.

Pl. IV. fig. 11, type (female).

Hæmatopota unicolor, ♀, sp. n.

Type and one other female from Uganda (*Lt.-Col. Bruce*),

1903. 206; and another female from Uganda Protectorate (*C. S. Betton*), 1902. 146.

This species is distinguished by the absence of the lighter rings on the legs and by the appearance of the wings, which are almost wholly pale at the base, the dark colour predominating on the apical half and on the posterior border.

Face grey, with some silvery-white pubescence; no spots or stripes are visible. Palpi yellow, large, robust, with white pubescence, mixed with some black hairs. Antennæ reddish, the third joint darker and wholly black on the last three annulations; the first joint is slightly incrassate, the second short, both with black pubescence; the third is rather long. Frontal callus yellowish brown, shining, slightly sinuous on both borders, with a triangular projection in the centre of the anterior border. Forehead brown, covered with grey tomentum; the paired spots large, black, not reaching the eyes, the unpaired spot small, brownish; the sides with yellowish tomentum. Thorax, scutellum, and abdomen of a uniform sandy-yellowish colour, the dark ground-colour rarely visible; the pubescence pale, short, and yellow, thickest on the abdomen; the grey stripes on the thorax are faint. Legs yellow. Wings to a great extent pale on the basal half; the basal, anal, and discal cells, and fore border as far as the stigma almost wholly pale-coloured, only a few brown blotches appearing; the dark colour on the apical half of the wing is greyish brown; stigma and first two longitudinal veins yellowish, other veins brown; only two rosettes distinctly marked; the appendix long.

Length 11 mm.

Pl. IV. fig. 12, type (female).

Hæmatopota similis, ♀, sp. n.

Type (female) and three other females from Uganda (*Lt.-Col. Bruce*), 1903. 270.

This species is nearly related to *H. unicolor*, sp. n., but may be distinguished from it by its dark palpi and antennæ and in the following particulars:—

There are traces of a dark stripe between the antennæ and the eyes, but it is hardly visible in the other specimens. Palpi greyish black, with thick black pubescence and some yellow hairs at their bases. Antennæ greyish black, the second joint and the base of the third reddish; the three last annulations of the third joint black, all joints with black pubescence; the first joint is not so incrassate as in *H. unicolor*, but is almost cylindrical. Frontal callus black,

shining, narrow, reaching the eyes, the anterior border concave, the posterior border slightly produced in the centre; there are two small brown stripe-like spots between the antennæ; the paired spots are large, black, reaching the eyes; the forehead is yellower, the tomentum being of this colour. The stripes on the thorax are distinct. Legs darker, the base of the tibiæ yellow; the femora blackish, with grey tomentum; the fore tarsi black, the basal joint of the middle and posterior tarsi yellow, the other joints black; on the middle and posterior tibiæ the black pubescence gives the appearance of a dark ring in the middle. Wings rather darker, especially on the fore borders; the anal cell is dark, but the first posterior cell is light-coloured for two thirds of its length; the upper rosettes are broken up, so that none are distinct; veins and stigma dark brown.

Length 10 mm.

Pl. V. fig. 13, not type (female).

Oriental Region.

The described species of *Hæmatopota* from the Oriental Region are fourteen in number, given in Wulp's Cat. Dipt. S. Asia. As the material in the British Museum (Natural History) Collection chiefly consists of new species from India and Ceylon, I have given a separate table for these and the Bigot types belonging to Mr. Verrall, including one Fabrician species of which there are specimens in the Collection and one of Walker's types from India. Another table, mostly of the older species, chiefly from the East Indies, including one of Walker's types, is given as a possible help to identification.

The six new species described are all from India and Ceylon.

Through the kindness of Mr. Verrall I have had access to the Bigot types with the exception of *H. ciliipes* and *H. pachycera*. Of the former there is an example in the British Museum Collection. Of the latter I have no knowledge; it is distinguished, according to the author, by the antennæ being twice as long as the head, with a black abdomen, two rows of spots and the borders of the segments indistinctly grey. The author is doubtful whether these two species should belong to the genus.

H. concentralis, ♀, Walker, is not included in the tables, the type being without a head or wings, and no locality given.

H. serpentina, Wied., described without a locality, is

probably an Asiatic species, but I have not seen any specimens to correspond to the description.

Table of Indian and Ceylon Species.

1.	Legs uniform in colour	2.
	Legs with rings of lighter colour, or, at least, with the base of the fore tibiæ white or yellow	5.
2.	The first joint of the antennæ as long as the second and third combined	3.
	The first joint of the antennæ not so long as the third joint	4.
3.	Abdomen brown, with grey stripe and spots.	**roralis*, ♀, Fabr.
4.	Abdomen brown, with a very distinct hoary grey stripe	*limbata*, ♀, Bigot.
5.	Legs white or yellow at the base of the fore tibiæ, but no typical rings of lighter colour.	6.
	Legs with typical rings of lighter colour on the middle or posterior tibiæ, or on both	9.
6.	Antennæ long and slender, the first joint cylindrical	7.
	Antennæ stout, the first joint incrassate	8.
7.	A narrow brown species, no spots apparent on the abdomen	*indiana*, ♀, Bigot.
8.	A yellowish-brown narrow species, with grey spots on the abdomen	**cana*, ♀, Walker.
9.	Antennæ long and slender. the first joint cylindrical	10.
	Antennæ rather long, the first joint incrassate.	12.
	Antennæ with the first joint very short, only half as long as the third joint	16.
10.	Middle tibiæ only have rings of lighter colour.	**unizonata*, sp. n.
	Middle and posterior tibiæ with rings of lighter colour	11.
11.	The paired spots coalesce; a dark brown species, with no spots on the abdomen	*cordigera*, ♀, Bigot.
	The paired spots do not coalesce; a greyish-brown species, with grey spots on the abdomen	**cingalensis*, ♀, sp. n.
12.	A grey species, with chequered wings	**tessellata*, ♀, sp. n.
	Species with wings not chequered	13.
13.	Species with pale band across the wing and no rosettes	14.
	Species with no pale band, but the usual rosettes	15.
14.	Reddish species, with hind tibiæ incrassate and fringed	**rubida*, ♀, sp. n.
	Black species, with all the tibiæ densely fringed and the anterior and posterior tibiæ incrassate	**cilipes*, ♀, Bigot.
15.	Blackish species, with the hind tibiæ fringed, but not incrassate	**lata*, ♀, sp. n.
16.	Dark brown species; abdomen grey at base, with white borders to the segments	**brevis*, ♀, sp. n.

H. cana, ♀, Walker, might almost be included under those with legs uniform in colour, but that the fore tibiæ are yellow at the base.

Table of Species from the East Indies.

1.	Base of fore tibiæ white, no typical rings on the legs	2.
	Base of fore tibiæ white, with typical rings on the legs	4.
2.	Thorax with a broad yellow stripe	*cingulata*, ♀, Wied.
	Thorax with no such stripe	3.
3.	Thorax and antennæ red; abdomen brownish yellow at base, black on the posterior segments	*borneana*, ♀, Rond.
	Thorax brownish; abdomen brown, with grey spots at sides and a grey median stripe.	*punctifera*, ♀, Bigot.
4.	Hind tibiæ with rings	5.
	Middle tibiæ only with rings	6.
5.	Abdomen yellow	*irrorata*, ♀, Macq.
	Abdomen blackish brown, with white borders to the segments	*lunulata*, ♀, Macq.
	Abdomen reddish brown, with grey spots and stripes	*javana*, ♀, Wiedem.
6.	Small dark species	**atomaria*, ♀, Walk.

The figures of the wings of *H. lunulata*, *irrorata*, and *javana* by Wulp in 'Fauna Midden-Sumatra,' pt. ii. p. 19, tab. i. figs. 14, 13, 12 (1892), should be consulted.

Hæmatopota limbata, ♀, Bigot.

Type (female) from Bengal, and another female from Khasi Hills.

A fair-sized species, easily distinguished by the prominent bluish-grey median stripe of abdomen, with large black spots on the upper part of the face.

Brown. Face grey; a large irregular-shaped black spot on each side of antennæ, reaching to the eyes. Frontal callus yellow, shining, narrow, concave on the anterior border; the spot between the antennæ black. Forehead grey; the paired spots black and distinct, the unpaired spot brown, indistinct. Antennæ yellow; the first joint stout, not so long as the third joint, with black pubescence; the second joint very small, with black hairs; the third joint broad, becoming narrower where the annulations begin, and tapering to a point. Palpi yellow, with dense black pubescence. Thorax blackish brown, lighter-coloured at the sides, with faint narrow grey stripes, the breast with hoary markings. The

abdomen brown, the posterior borders of the segments narrowly yellowish; some faint black markings on the sides of abdomen; the underside brown, covered with grey tomentum. Legs yellow, with fine black pubescence; the coxæ grey pollinose. Wings grey, with yellow veins and a long appendix; most of the veins are faintly shaded with darker colour; the typical markings are faint; there is one rosette apparent, enclosing the appendix, and another beyond.

Length 11½ mm.

Hæmatopota roralis, Fabr.

One male from Velverry, Ceylon, 25. x. 91 (*Yerbury*), 92. 192; one female from Pankullam Road, Trincomalee, 1. i. 91 (*Yerbury*), 92. 192; one female from Hot Wells, Trincomalee, 8. xi. 91 (*Yerbury*), 92. 192.

A black-brown species, with grey stripes and spots and long yellow antennæ.

The original description (of the female) being short and incomplete, the following particulars may be found useful:—

♀. Face grey, no spots below the antennæ; the frontal callus yellow, shining, broad, the anterior border slightly concave; a small brown spot exists between the antennæ. Forehead grey, the paired spots large, black; the unpaired spot is not present. Antennæ yellow; the first joint as long as the two following, fairly stout, with some fine black pubescence; the second small, round, with black hairs; the third broad, not ending in as tapering a point as usual. Thorax black-brown, with three grey stripes and grey sides; breast grey. Abdomen black-brown; the grey spots at the sides large, nearly square, the median stripe narrow, the posterior borders of the segments lighter. Legs of a uniform yellow colour. Wings grey, with brown veins and stigma; the usual rosettes and markings distinct; an appendix present.

The male is similar, with the exception of the antennæ, which differ, the first joint being stout and short, not so long as the third joint.

Length 9 mm.

Hæmatopota cana, ♀, Walker.

Type (female), Northern Bengal, 42. 25 (*Lieut. Campbell*).

A small yellow-brown species, with large grey spots at the sides of abdomen and an indistinct median stripe.

The type is in very poor preservation, which makes any description of it incomplete.

Face grey, no spots; the frontal callus brown, both its borders somewhat irregular; a small brown spot is situated between the antennæ; the paired spots are brown, large, oblong, the unpaired one is small. Forehead grey. Antennæ brown, the first joint yellowish, stout, not quite so long as the third; the palpi yellow, with black pubescence. Thorax blackish, with three grey stripes, the sides and breast greyish. Abdomen yellowish, darker at the tips, with large hoary grey spots on the sides; the median stripe appears incomplete, the hind borders of the segments narrowly yellow. Legs yellow; the fore coxæ very long; the femora brownish; the fore tibiæ brown, yellow at the base; the tarsi brown at the tips. Wings grey, the veins yellow, with an appendix; the light rosettes and spots fairly distinct.

Length 8 mm.

Hæmatopota alomaria, ♀, Walker.

Type (female), Sarawak, Borneo (*Wallace*), 56. 44, and two other females from Sarawak, 57. 36.

A small dark species, with brown wings, distinctly marked with the usual rosettes and spots; the first joint of the antennæ incrassate.

Face grey; two small black spots beneath the antennæ; the upper part of the face with a brown stripe, which becomes yellowish near the antennæ; the palpi yellow, with black pubescence; the beard white. Frontal callus pitchy brown, shining, broad, reaching the eyes, with the posterior border convex, rounded, the anterior border reaching round the antennæ; the paired spots black, round, reaching the eyes and the frontal callus, with yellow borders. Forehead brown, yellower on the vertex; the unpaired spot not present. Antennæ blackish; the first joint dark red, shining, with black hairs, slightly incrassate, considerably shorter than the third; second very small; third broad, ending in a point. Thorax brown, with traces of darker stripes and of short white pubescence; scutellum the same colour; breast brown. Abdomen brown, with narrow greyish borders to the segments, which are broader on the underside. Legs reddish brown, with black pubescence, which becomes fringe-like on the hind legs; the base of the anterior tibiæ white, the middle tibiæ with the typical rings, the posterior tibiæ brown at the extreme base, then white and brown on the apical half. Wings brown, with brown veins and an

appendix; the apical band single; all the posterior cells and apical cell with a triangular white spot at their openings, with the exception of the fourth posterior cell.

Length 9 mm.

Pl. V. fig. 14, not type (female).

Hæmatopota unizonata, ♂ ♀, sp. n.

Type (male), Hakgala, Ceylon, 95. 91 (*Yerbury*), 92. 192.

Type (female), Hakgala, Ceylon, 21. v. 91 (*Yerbury*), 92. 192; three females, from Nuwara Eliya, 16. v. 91, 12. v. 91, 5. v. 91 (*Yerbury*), 92. 192; five females from Pandaluoya, Ceylon (*Green*), 90. 115 and 95. 91, and one female, April 1898, 1903. 150; one female from Galagedara, Ceylon, June 1897 (*Green*), 1903. 150.

There is a note by Col. Yerbury on this species, viz.: "Very common at Nuwara Eliya, May 1891."

A reddish-brown species, with rings on the middle tibiæ only; the other tibiæ white at the base; the antennæ long, cylindrical.

Face grey; a yellowish stripe covered with brown dots and spots reaches from the antennæ to the eyes on each side; palpi yellow, with white pubescence; beard white. Frontal callus dark brown, shining, concave on the anterior, convex on the posterior border; the spot between the antennæ black, oblong; the paired spots black, oblong, just reaching the eyes, with grey borders. Forehead brownish yellow, darker on the vertex, grey at the sides. Antennæ long and slender, reddish yellow, the third joint darker; the first joint not quite so long as the third, the second small, both with black pubescence. Thorax reddish brown, the shoulders, two stripes which reach the suture and end in two spots, the base of thorax, and a spot on each side grey; traces of a short white pubescence on the dorsum; breast brown with brown pubescence, then grey with white pubescence; scutellum reddish brown. Abdomen a redder brown, segments bordered with narrow whitish bands; pubescence black, white on the borders of the segments and at the sides; traces of grey spots on the apical segments; the underside brown, with white borders to the segments, grey at the sides. Legs dark brown, the middle tibiæ redder, with two white rings, and the base of the tarsi yellowish, as are also the posterior tarsi; the middle femora are reddish, with white pubescence. Wings brownish, with brown veins and an appendix; the light markings distinct, with three rosettes, the apical band single.

Length 8 mm.

The male is identical, but the stripe on the face is deep brown; the antennæ darker, the first joint shining brown, incrassate, with long black hair, the second short, the third slender, longer than the first joint; the frontal callus is the same colour; the forehead above is grey, the pubescence on the sides of the thorax is thicker, and the apical band of the wing is broader, and there are more light markings at the openings of the cells.

Pl. V. fig. 15, type (male); fig. 15 *a*, type (female).

Hæmatopota cingalensis, ♀, sp. n.

Type (female), 19th milestone, Candy Road, Ceylon, 22. x. 90 (*Yerbury*); two females from Tamblegam, 5. x. 90 (*Yerbury*); and a series of females from Anaradhupura, Ceylon (*Oliver Bartholomew*), 27. xii. 99.

There is a note with Col. Yerbury's specimens to the effect that the species is common on the road near Tamblegam in October and November.

This species is distinguished from *H. cordigera*, Bigot, by the paired spots *not* coalescing, by the longer first joint of the antennæ, and by the fore legs being lighter in colour.

A dull greyish-brown species.

Face grey; an oblong black spot under the antennæ, and a black stripe reaching from the eyes halfway across to the lower edge of this spot, the colour above the stripe being yellowish. Frontal callus pitchy brown, shining, with a concave fore border, from which a black spot proceeds to between the antennæ; the posterior border is produced in the middle; the paired spots are black, large, almost touching the eyes; the unpaired spot apparent, sometimes indistinct; forehead yellowish, grey at the sides. Antennæ yellow; the third joint darker, its last three annulations dull black; the first joint curved, not quite so long as the third; the second joint very small. Thorax brown, with three well-marked grey stripes and four grey spots on its posterior border, the side ones ending at the suture in a spot; there are traces of short white pubescence on the dorsum; the breast is grey, with some white hairs. Abdomen light mahogany-brown or brownish, with light yellow borders to the segments and a well-marked grey stripe starting from the second segment; there are also distinct oblong grey spots on each side, beginning from the third segment; there is some short white pubescence, thickest on the yellow borders of the segments; the underside with grey tomentum. Legs reddish yellow, the fore tibiæ white at the base, or, rather, with one narrow

white ring on the basal half; the apical half black; the middle and hind tibiæ with well-marked typical whitish rings. Wings greyish, with a yellowish-brown stigma and yellow veins and an appendix; the rosettes and markings are distinct; the apical band in the type and other specimens is double, but in others the double branch is only represented by two small spots, as shown in the photograph.

Length 8 mm.

Pl. V. fig. 16, not type (female).

Hæmatopota tessellata, ♀, sp. n.

Type (female), Hot Wells, Trincomalee, 8. xi. 91 (*Yerbury*), 92. 192.

A grey species with brown wings, the white markings very clearly defined, so that the wings have a chequered appearance; the middle and hind tibiæ with rings.

Face grey, only a trace of a brown stripe between the antennæ and the eyes. Frontal callus black, short, not reaching the eyes, very much produced on the posterior border, ending in a point; the anterior border almost straight; the paired spots large, black, not reaching the eyes; the forehead is apparently grey, and no paired spot visible. Antennæ yellow; the third joint dusky, the first joint incrassate, rather shorter than the third, the second very short, the third long, tapering to a point. Thorax brown, with three grey stripes; the shoulders, base, and sides of thorax grey; a short white pubescence on the dorsum; the breast grey. Abdomen brown, with rather wide white borders to the segments, grey spots on the posterior segments, and a faint grey median stripe. Legs brown, the femora lighter, the middle and posterior tibiæ with rings, the basal joint of the tarsi of the middle and posterior legs whitish. Wings brown, with yellowish-brown veins and an appendix; the apical band double; the openings of the posterior cells light-coloured.

Length 8½ mm.

Pl. V. fig. 17, type (female).

A male from Velverry, Ceylon, 26. x. 91 (*Yerbury*), 92. 192, in poor preservation, is probably the male of this species.

Hæmatopota rubida, ♀, sp. n.

Type (female) from Burmah, 57. 16 (*Mrs. Waring*).

An easily distinguished red species, with the hind tibiæ incrassate; the hind femora with a white bunch of hairs above and a fringe of black hairs on the underside.

Face grey, the whole upper part deep black; the palpi yellow, with black pubescence and white hairs below. Frontal callus shining brown, protuberant, rounded, the posterior border produced, the anterior border with a deep incision in the middle, filled by the black spot usually present between the antennæ, which is large and square with yellow borders; the frontal callus is short, not reaching the eyes; forehead grey, darker in the centre; the paired spots are black, small, and isolated, the unpaired spot not present. Antennæ are of an unusual form; the first joint very much incrassate and large, nearly as long as the third joint, yellow and shining, the second very small and narrow, yellow, both joints with black pubescence; the third joint very broad, ending in an obtuse point, reddish yellow, darker at the tip. Thorax reddish brown, with lighter stripes, darker at the sides; the breast grey, with white hairs; the scutellum the same colour. Abdomen reddish brown, with very narrow yellow borders to the segments, darker at the apex; the underside yellow, with grey tomentum. Legs reddish brown; the anterior and posterior pairs the darkest, the anterior tibiæ white at base, the middle tibiæ yellowish brown, the two yellow rings not well defined; the posterior femora broad, with the fringe of hairs on the underside black, on the upperside black on the basal half, on the apical half a tuft of white hairs are present; the posterior tibiæ very stout and broad, with ill-defined rings as on the middle pair, and fringed with black hairs above and below; the basal joints of the middle and posterior tarsi pale yellow. Wings reddish brown, the veins yellow, with a long appendix, the apical band single; the pale streak across the middle of the wing is very noticeable, and at once distinguishes the species from *H. lata*, sp. n.

Length 10 mm.

Pl. VI. fig. 18, type (female).

Hæmatopota lata, ♀, sp. n.

Type (female) from Khasi Hills district, India (*Chennell*), 1878. 96. 135; five females from N. Chin Hills, Burmah, iv. 93 (*Watson*), 94. 4.

A dark brown, broad-bodied species, distinguished by the broad hind tibiæ fringed with black hairs.

Face grey, with some brown marks below the antennæ; the stripe between the antennæ and the eyes yellow, with some brown dots; the beard white; the palpi yellow, with white pubescence and a few black hairs intermixed. Frontal

callus brown, shining, narrow, reaching the eyes; the anterior border irregular, with yellow edges; the posterior border nearly straight; the paired spots black, large, touching the eyes; the unpaired spot small, bordered with yellow; forehead grey, yellower on the vertex, with short black pubescence. Antennæ very similar to those of *H. rubida*, long, robust, yellowish red, darker at the tip, with black pubescence; the first joint shorter than the third, stout, incrassate, the second very small, the third broad, ending in an obtuse point. Thorax brown, with a narrow, indistinct, grey median stripe continued to the scutellum; the side stripes grey, broader, ending at the suture in triangular spots; the shoulders and posterior border of the thorax grey; a short grey stripe from each side of the base of the thorax running up to the suture outside the usual side-stripes; the sides and breast grey, the latter with white hairs; traces of silvery-white pubescence on the dorsum, with some black pubescence. Scutellum brown, grey on its anterior border. Abdomen brown, with distinct greyish-white borders to the segments; the sides of the first four segments grey; from the fourth segment large grey spots are apparent on each side; a grey median stripe is here indistinct, but apparent on the other specimens; the pubescence brown, with some white hairs, especially at the sides; underside grey. Legs yellowish, the fore tibiæ white at base, dark brown on the apical half; the fore tarsi brown, the middle and posterior pale at base; the anterior and middle femora with whitish pubescence, the hind ones with a heavy fringe of black hairs; the tibiæ yellowish, with a brown ring in the middle and brown at base, thus appearing as yellow rings on the tibiæ; the hind tibiæ with a heavy fringe of black hairs extending two thirds of the length to the apex.

Wings greyish, with yellow veins and stigma and a long appendix; the apical band single, divided in half, the two upper rosettes distinct; in the corner of the wing is a round circle, and above this a double concave circle extending into the anal cell; above the stigma is a small round circle; the basal half of the first posterior cell is wholly pale; only the upper part of the third rosette is distinct.

Length 9 mm.

In the females from Burmah the wings are browner and the white markings more numerous at the opening of posterior cells.

Hæmatopota brevis, ♀, sp. n.

Type (female), Kanthalla, Ceylon, 19. x. 99 (*Verbury*),

92. 192, and another female; one female from Velverry, Ceylon, 18. i. 91 (*Verbury*), 92. 192; two females from Bangalore, Mysore, June 24 (*Watson*), 95. 28, and type (male) from the same locality.

This species is distinguished from *H. cingalensis* by the short first joint of the antennæ, and from *H. javana*, Wiedem., by the blackish-brown abdomen with white incisions and a mere trace of a grey stripe.

A brown species, distinguished by its short first antennal joint and by the rings on the middle and posterior tibiæ.

Face grey, with brown pubescence; a dark spot under each antenna and some darker colour continued to the mouth; the stripe on each side yellowish, with brown dots and spots; the beard brown; the palpi yellow, with black pubescence and white hairs below. Frontal callus yellow-brown, in some specimens darker in the middle, short, broad, not reaching the eyes, the anterior border nearly straight, the posterior convex; the spot between the antennæ small, ill-defined, brown. Forehead yellowish brown, darker on the vertex; the paired spots black, triangular, the apices touching the frontal callus. Antennæ yellowish, densely covered with grey tomentum, at the apices black; the first joint short, robust, with black pubescence, the second small, with black hairs, the third slender, twice as long as the first. Thorax brown, with short silvery-white tomentum, and three grey stripes all ending in a grey spot, but the median one the longest; the base of thorax and shoulders grey; scutellum brown, grey on the posterior border, pubescence at the sides brown; breast reddish brown. Abdomen the same colour as the thorax, the borders of the segments whitish, the sides of the first two segments grey; there is a trace of a grey stripe on the second segment only. Legs brown-black, the base of the tibiæ white; the first joint of the fore tarsi nearly as long as the four remaining joints, which are broad and short; the middle and posterior tibiæ reddish brown, with yellow rings; the base of the middle and posterior first joint of the tarsi yellow. Wings brownish, the veins brownish, with an appendix; the apical band double; the openings of the posterior cells mostly light-coloured.

Length 9 mm.

Type (male) differs in the third joint of the antennæ being broader and shorter, the forehead grey, with a large oblong brown spot. The abdomen is redder brown, with a distinct grey stripe; the scutellum wholly grey, the fore tarsi not so

broad, the wings and the base of the tarsi more white than yellow, the apical line of the wing broader.

Pl. VI. fig. 19, type (female).

A fuller description of the three following species may be found useful.

Hæmatopota indiana, ♀, Bigot.

A brown species, distinguished by its long slender antennæ and all the tibiæ white at the base.

Face grey, dark brown in the centre, immediately below the antennæ; the stripe between the antennæ and the eyes brown, but broken up into dots and spots. Palpi reddish, rather long, with brown pubescence and some white hairs; beard white. Frontal callus narrow, long, reaching the eyes, shining brown, both borders nearly straight; the spot between the antennæ black, bordered with grey; the paired spots dark brown, large, reaching the eyes and almost touching the callus; the unpaired spot brown, small; forehead yellowish, with brown markings and grey tomentum and short black pubescence. Antennæ long, slender, yellow; the third joint dusky, reddish at base, black at apex; the first joint as long as the part of the third joint which is unannulated, the second joint small, both with black pubescence. Thorax brown, with grey shoulders and three narrow grey stripes; short yellowish pubescence is visible on the dorsum; the sides brown, with black hairs; the breast grey. Abdomen a redder brown, with light narrow borders to the segments, darker at the apex; the pubescence on the light borders short and yellowish, on the other parts black; a hoary grey median stripe is very distinct from the second to the fifth segment; the underside brown, grey at the sides. Legs reddish brown, the fore tibiæ and tarsi darker brown, with black pubescence; the base of all the tibiæ whitish, on the middle tibiæ the white extends further; the basal joint of the middle and posterior tarsi whitish. Wings brown, with yellowish-brown veins and stigma and an appendix; the apical band single, broad; the first, second, third, and fifth posterior cells light-coloured at their apices; the dark spot in the fifth posterior cell (as shown in figure) is only noticeable on the wing in certain lights.

Length 9 mm.

The type is labelled "Mergherita, 5373. 8."

Pl. VI. fig. 20, type (female).

Hæmatopota cordigera, ♀, Bigot.

Type from India.

This species is easily distinguished by the colouring of the forehead, by the cylindrical antennæ, and by the rings on the middle and posterior tibiæ.

Face grey, no spots except faint traces of two below the antennæ. Palpi yellow with black pubescence; beard white. Frontal callus dark brown, shining, reaching the eyes, broad, bordered in front by a shining yellow narrow band, which is continued between the antennæ instead of the usual black spot. Forehead grey, with a large, brown-black, heart-shaped spot in place of the usual paired spots; it joins the posterior border of the frontal callus and almost reaches the eyes at the sides, becoming narrower on its posterior half it is continued to the vertex as a broad stripe. Antennæ yellow, long, slender, but not so long as those of the preceding species, the first joint being not much more than half as long as the third, the second joint short, both with black pubescence; the third with the extreme apex dusky. Thorax brown, with grey shoulders and grey stripes, ending in spots at the suture; grey spots at the base; the sides are also grey, as is the breast, which has white hairs. Scutellum brown, grey in the centre. Abdomen dark brown, with distinct white borders to the segments, but no sign of stripe or spots; the underside brown, with grey tomentum. Legs yellowish brown; the fore tibiæ and tarsi dark brown, the fore tibiæ white at base, the middle and posterior tibiæ with the typical rings, and the basal joint of the tarsi whitish. Wings pale brown, with brown veins and an appendix; the apical band single, broad, and curved.

Length 8 mm.

Pl. VI. fig. 21, type (female).

Hæmatopota punctifera, ♀, Bigot.

From Java.

The antennæ are incomplete; the first joint red, short, and incrassate, the second one red, small.

Face grey, with white hairs, no spots, but a dark brown band between the eyes and the antennæ. Palpi reddish, with black pubescence. Frontal callus black, shining, reaching the eyes, narrow, curved on the posterior border and produced to a point in the centre; a black spot between the antennæ. Forehead (denuded) blackish, with grey tomentum and some golden pubescence. Thorax (denuded)

brown, with grey stripes and tomentum and some black and grey pubescence; sides grey, with traces of fulvous and grey pubescence; scutellum brown, with median grey stripe and greyish pubescence. Abdomen brown, with grey median stripe, grey spots on each side, and grey sides; the greyish pubescence rather dense. Legs reddish brown, the tibiæ yellower, the anterior ones whitish at the base, brown at the apex; the anterior tarsi brown, the middle and posterior tarsi yellow, darker at the joints and apex; coxæ with rather long white pubescence; femora with short white pubescence; tibiæ and tarsi with some black pubescence. Wings greyish, with appendix; veins yellowish brown; stigma brown; a darker spot is visible above the stigma.

Length 8 mm.

Pl. VI. fig. 22, type (female).

Hæmatopota cilipes, ♀, Bigot.

One female from near Nhatrang, Annam, 22. x. 1905 (*Dr. Vassal*).

The type came from Laos.

Bigot suggests that this species and *H. pachycera* should properly belong to a new genus. Certainly this handsome small black species with densely hairy legs, and the striking brown wings with faint pale streaks, but no rosettes, differs considerably from other species of *Hæmatopota* from the Oriental Region as yet known to me; but the shape of the antennæ is very similar to those of *H. rubida*, sp. n., and *H. lata*, sp. n., described above, more especially to those of the former species, with the long incrassate first joint, the very small second joint, and the broad basal division of the third joint, the last divisions being small and short: it also resembles *H. rubida* in its wings, which are distinguished by the pale streak across them, in this species more marked, owing to the dark brown colour of the wings, and continuous from the round pale spot above the stigma to beyond the apical cell; the pale markings of the apex and the internal border are so placed that, viewed by the naked eye, a second pale streak is seen divided from the first by a brown parallel band, with a few brown markings on it, but, as in *H. rubida*, no rosettes are visible. The fore and hind tibiæ are incrassate; the very hairy tibiæ and femora will easily distinguish this species.

It is placed in the Indian and Ceylon table.

EXPLANATION OF THE PLATES.

PLATE III.

Fig. 1. *H. hirta*, ♀.
Fig. 2. *H. ruficornis*, ♀.
Fig. 3. *H. nigrescens*, ♀.
Fig. 4. *H. longa*, ♀.
Fig. 5. *H. ugandæ*, ♀.
Fig. 6. *H. distincta*, ♀.

PLATE IV.

Fig. 7. *H. brunnescens*, ♀.
Fig. 8. *H. bipunctata*, ♀.
Fig. 9. *H. decora*, ♀.
Fig. 10. *H. guineensis*, ♀.
Fig. 11. *H. brunnipennis*, ♀.
Fig. 12. *H. unicolor*, ♀.

PLATE V.

Fig. 13. *H. similis*, ♀.
Fig. 14. *H. atomaria*, ♀.
Fig. 15. *H. unizonata*, ♂.
Fig. 15 *a*. *H. unizonata*, ♀.
Fig. 16. *H. cingalensis*, ♀.
Fig. 17. *H. tessellata*, ♀.

PLATE VI.

Fig. 18. *H. rubida*, ♀.
Fig. 19. *H. brevis*, ♀.
Fig 20. *H. indiana*, ♀.
Fig. 21. *H. cordigera*, ♀.
Fig. 22. *H. punctifera*, ♀.

XIX.—*On Lamellicorn Coleoptera from Portuguese West Africa, with Descriptions of new Species.* By GILBERT J. ARROW.

THE British Museum collection contains a considerable number of interesting Coleoptera from the little-known region of Angola and the interior of Portuguese West Africa. A few of the Lamellicornia are here described, together with a new genus and some observations on species previously known.

Copridæ.

Copris draco, sp. n.

C. Elphenori et *C. Anceo* affinis, sed multo major, clypeo fere integro, elytris politis, leviter punctato-striatis; maris capite cornu valido curvato, dimidio superiore intus utrinque perspicue serrato, thorace rugoso, medio multo elevato, utrinque excavato et lateraliter lamina maxima alæiformi prædito; fœminæ capite cornu magno bifido, ramis retro curvatis, spatium includentibus fere ad caput æquali, prothorace medio paulo elevato, lateribus minute carinatis.

Long. 29–32 mm.

Hab. Bihe.

This is the largest and most remarkably accoutred species of its large genus yet known. It is allied to *C. Elphenor*, Klug, and *C. Anceus*, Oliv., and represents in its armature a great development of that type. The clypeus is relatively a little less wide than in those species and almost uninterruptedly curved. It is narrower in the male than in the female and the thorax is correspondingly contracted in front. In both sexes the head bears a horn, but without any similarity between the two. That of the male is over 20 mm. long in our specimen, compressed laterally so as to be rectangular in section for most of its length, but beyond the middle it is hollowed out on its inner face and the edges of the channel are strongly dentate. The horn of the female has the form of a crescent attached by a short footstalk to the front of the

Copris draco, ♂ and ♀, nat. size.

head. The two extremities are about 8 mm. apart in our examples and the footstalk about 3 mm. long. The thorax in both sexes is coarsely rugose except for a small median posterior area, which is moderately punctured. In the male this median part is strongly humped and divided in front, where it terminates in three obliquely placed teeth on each side. The lateral margin in the same sex is furnished at the middle with a large leaf-like or wing-like process, curving

upwards and forwards and tapering to a point. Immediately behind this the thoracic margin is deeply excised, and between the wing-like processes and the dorsal hump are deep and very rugose excavations. In the female the lateral processes are very slightly and the dorsal hump rather more strongly indicated. In other respects the sexes are alike. The elytra are highly polished, with feebly punctured striæ, and the pygidium is thinly and shallowly but uniformly punctured.

Catharsius peregrinus, Harold.

We have received this very peculiar species from Bihe and San Salvador. It is remarkable for its depressed form, elongate clypeus, and the proportionately small development of its hind body.

Gymnopleurus azureus, Fabr.

Specimens from Bihe, agreeing with the description of *G. olivaceus*, Qued., seem to belong to this widely distributed Fabrician species. *G. insidiosus*, Péring., is, I believe, also inseparable from it.

Copterrhina angolensis, sp. n.

Nigra, opaca, sat convexa, capite crebre rugoso, clypeo bidentato, dentibus paulo productis; prothorace crebre punctato-rugoso, postice elevato, parte elevata leviter 4-acuminata, lateribus subtiliter marginatis, regulariter arcuatis, antice paulo divergentibus; elytris dense punctatis, subtilissime striatis, lateribus pone humeros sinuatis.

Long. 12–16 mm.

Hab. Huilla (*Welwitsch*).

This species is very closely related to *C. auspicata*, Péring., with which it almost exactly agrees in size, sculpture, and general form. The prothorax, however, is slightly different in shape. In the male of *C. auspicata* it is broadest behind, the sides slightly approximating anteriorly in a sinuous line. In the new species, on the contrary, there is a slight widening towards the front and the sides are uniformly curved. The raised margin is extremely narrow, and not, as in the other species, widened at its posterior part. The dorsal elevation does not extend quite so far forward, and exhibits four angulations, the slight outer ones being entirely absent in *C. auspicata*. This difference is traceable also in the females.

Aphodiidæ.

Notocaulus laticollis, sp. n.

Piceo-niger, opacus, capite antice lævi, obtuse bidentato, fronte longitudinaliter tricarinata, carina media abbreviata, posticeque bituberculata, vertice crebre punctulato; prothorace transverso, carinis tribus integris duobusque lateralibus pone medium evanescentibus, angulis anticis obtusis, posticis rectis, lateribus valde irregularibus, interstitiis duobus interioribus grosse irregulariter punctatis, exterioribus leviter punctulatis; utroque elytro fortiter tricarinato, interstitiis lævibus, bistriatis, striis subtiliter punctatis; abdomine grosse varioloso.

Long. 4·5 mm.

Hab. Huilla (*Welwitsch*).

The unique specimen of this species is rather larger than the type of *N. nigropiceus*, Qued., in M. Oberthür's collection, with which I have kindly been enabled to compare it. Its thorax is relatively rather shorter and much less constricted in front. The front angles in that form are very prominent, but in *N. laticollis* they are truncated and so each replaced by two obtuse angles. The front margin is thickened at each end for a short distance, and at each end of the posterior margin a right angle is formed by a curved longitudinal carina about half the length of the thorax. The broad lateral flange vanishes at about the middle of this carina. In *N. nigropiceus* the posterior carina is continued until it meets the anterior carina, and the outer flange is narrower and more sinuated. The two median thoracic interspaces are coarsely punctured, but scarcely so coarsely as in the allied species, and the outer spaces, which in that are almost smooth, are rather sparsely pitted. There are three strong carinæ on each elytron, each bordered by finely punctured striæ. The six-jointed abdomen is very coarsely pitted, but less coarsely than in *N. nigropiceus*.

Hybosoridæ.

Phœochrous dispar, Qued.

Both sexes of this remarkable species, of which the elytra of the female are shining and those of the male sooty, were brought from Garenganze.

The imperfect female specimen of unknown origin called *Silphodes dubia* by Westwood nearly resembles the female of *P. dispar*, but is rather smaller, the sides of the prothorax are rather more curved and the punctures upon its disk rather less fine.

Melolonthidæ.

ARÆOHOPLIA, gen. nov.

Corpus gracile, paulo depressum. Clypeus planus, lateribus rectis, paulo convergentibus, antice abrupte productis, virguliformibus. Labium omnino corneum, angustum. Palpi robusti, longi. Antennæ 9-articulatæ. Pedes longi, tibiis posticis (maris præcipue) inflatis. Ungues pedum 4 anteriorum duplici, fissi, pedum 2 posticorum unici, integri.

Type, "*Pachycnema*" *Dekindti*, Nonfried.

Both sexes of this very peculiar insect were collected by Dr. Welwitsch at Huilla. Herr Nonfried appears to have described the species from the male alone, the female having the hind tibiæ only slightly swollen and the single hind claw of normal size. The form of the hind tibiæ evidently led him to place it in *Pachycnema*, with which it has really no near relationship. Whereas that genus is the type of the suctorial division of the Hopliinæ with membranous ligula, *Aræohoplia* belongs to the true Hopliinæ, distinguished by entirely horny mouth-organs of the usual biting type. Its most remarkable feature is the form of the clypeus, the outer margins of which are drawn out into long straight compressed rods, as in the Cetoniid genus *Gnathocera*.

Rutelidæ.

Anomala cerea, sp. n.

Elongata, robusta, testacea, clypeo, tibiis posticis, anticorum marginibus externis tarsisque omnibus piceis; capite sat fortiter punctato, clypeo brevi, rugoso, margine valde reflexo, nigro; prothorace subtilissime haud crebre punctato, lateribus leviter arcuatis, haud angulatis, antice approximatis; scutello lato, vix angulato, subtiliter punctato; elytris haud costatis, lævissime punctatis, punctis plerumque irregularibus, seriebus 4 geminatis ordinatis; pygidio modice punctato; pectore pedibusque sat longe fulvo-hirtis; abdomine nitido, parum punctato; unguibus majoribus pedum anticorum, fœminæque pedum mediorum fissis.
Long. 15–18 mm.

Hab. Bihe, Garenganze, Bembe.

This is another member of the African group of *Anomalæ*, pale in colour, with darker tarsi and tibiæ, in which the male has the larger claw of the front foot only cleft and the female those of the front and middle feet. The other species of the group are *A. immatura*, Boh., *clypeata*, Arr., *transvalensis*, Arr., *Distanti*, Arr., *ustulatipes*, Fairm. (= *rufa*, Kolbe, *intrusa*,

Pér.), *pinguis*, Pér., *zambesicola*, Pér., *repensa*, Pér., and *denuda*, Arr. *A. cerea* is the largest and most stoutly built of them all, the female being rather larger and more robust than the male and the puncturation rather stronger.

From specimens in our collection I believe Mr. Péringuey has been misled in recording the claw-structure of *A. repensa* and *intrusa*, an occurrence which is very liable to happen, as specimens abnormal in this respect are not uncommon. In this way I was myself misled into describing the claws of *Nongoma calcarata*, Arr., as differing sexually, whereas they are normally alike.

Anomala funebris, sp. n.

Nigra, capite, prothorace (margine postico angulisque posticis exceptis) et pedibus (femoribus posticis tarsisque omnibus exceptis) læte flavis; pygidio vel rufo-flavo vel fusco, medio pallidiore; capite dense, fere rugose, punctato, clypeo brevi, margine antico recto; prothorace nitido, subtiliter late punctato, lateribus sat regulariter arcuatis, margine postico leviter trisinuato; scutello lato, fere semicirculari, laxe irregulariter punctato; elytris nitidis, irregulariter punctatis, costis parum perspicuis; pygidio crebre transversim rugoso-punctato; pectore fusco, fulvo-hirto.

♂. Tibiis anticis latis, bidentatis, pedum 4 anteriorum ungue majore fisso.

Long. 15–16 mm.

Hab. Garenganze, Bihe.

Seven specimens of this species are all males. In the absence of the other sex I should have refrained from describing it, but for its very well-marked and unusual colouring. The head and thorax are bright yellow, except for the hind margin and a roughly triangular patch in each hind angle of the latter, which are black. The elytra are entirely jet-black and shining, their surface rather thickly punctured. There are no striæ, but some of the punctures form quite indistinct series. The pygidium is closely and aciculately punctured, reddish testaceous, and generally more or less infuscate at the sides.

Nannopopillia Damaræ, Ohaus.

A good series of a very variable insect, which I identify with Dr. Ohaus's Damaraland form, was brought from Huilla by Dr. Welwitsch. Only a few of them show the type of colouring described by Dr. Ohaus, in which there is a large yellow stripe upon each elytron. The greater number have

the elytra testaceous, but slightly paler in the middle, with the suture black and a tendency to a darkening round the scutellum. There is also a variety (male) in which the elytra are entirely black, and no doubt all intermediates occur. The notable disparity in breadth between the sexes given by Dr. Ohaus is not confirmed by our larger series, nor is there a sexual difference in the thickness of the hairy clothing. The latter is scarcely closer at the sides of the segments, as stated by Dr. Ohaus.

Dynastidæ.

Pycnoschema nigra, sp. n.

Modice convexa, nigra, supra sat grosse punctata, subtus rufo-hirta, capite ante oculos utrinque acute angulato.

Long. 13–15·5 mm.

♂. Capite impresso, grosse punctato, cornu gracile armato; prothorace transverso, convexo, æqualiter punctato, antice paulo excavato, postice lævissime longitudinaliter impresso, lateribus fortiter, fere æqualiter arcuatis, margine posteriore utrinque profunde impresso; scutello minute punctulato; elytris linea impressa suturali, punctis grossis parum profundis aliisque minutis interspersis; pygidio valde convexo, glabro, basi et lateribus subtiliter punctato-rugoso.

♀. Capite grosse punctato-rugoso, carina transversa medio magis elevata armato; prothorace minus transverso et convexo, grosse et crebre punctato, lateribus minus æqualiter arcuatis, margine posteriore trisinuato, utrinque impresso; elytris linea suturali punctisque similibus sed fortioribus impressis; pygidio ubique minute rugoso, sat longe rufo-hirto.

Hab. Huilla (*Dr. Welwitsch*).

A small species, rather larger than the South-African *P. Corydon*, Oliv., and quite black above. The cephalic horn of the male is rather slender and a little compressed laterally, and is represented only by a very slight prominence in the female. The thoracic excavation in the male is very small in our only example of that sex and its posterior margin is not sharply defined.

Pycnoschema polita, sp. n.

Paulo depressa, rufo-picea vel rufa, supra polita, fere impunctata, subtus fulvo-setosa, capite ante oculos utrinque acute angulato.

Long. 18–21 mm.

♂. Capite rugoso-punctato, cornu compresso, valde curvato, armato; prothorace polito, impunctato, leviter convexo, antice perparum excavato ibique paulo punctato, lateribus arcuatis, haud

angulatis, angulis anticis fere rectis, posticis obtusis, margine postico trisinuato; scutello parce subtilissime punctulato; elytris brevibus, politis, prope suturam et latera solum lineis punctorum obsoletorum; pygidio convexo, crebre punctato.

♀. Capite punctato-rugoso, carina transversa, medio fere angulata munito; prothorace leviter punctato, punctis dorsi postice fere obsoletis, lateribus medio fere angulatis, margine postico minus sinuato; elytris politis, obsolete punctato-striatis; pygidio dense fulvo-hirto.

Hab. Bihe.

This is a very distinct species owing to the extremely smooth and glossy surface of the prothorax and elytra, especially in the male. Of the four specimens in our collection the two females are a lighter red colour than the male, but this difference may not be constant. The male, as is usually the case in the genus, is shorter and more parallel-sided than the female. It is also almost devoid of punctures upon the thorax and elytra. The thorax is only slightly excavated in front and the hind margin of the cavity is not at all produced or carinated. In the female the sides of the thorax are less uniformly curved, there are punctures which become denser at the front and sides, and the elytra are obsoletely striate-punctate.

All the males in this and the allied genera have the front tarsi thickened and their inner claws strongly hooked and very broad.

The genus *Astaborus*, which has not hitherto been associated with *Pycnoschema* and in the Munich Catalogue is widely separated from it, is really a section in which the thoracic armature has reached its greatest development. As the number of known species increases it may very possibly become inseparable from *Pycnoschema*. I have identified both sexes of *Astaborus Antinorii*, Gestro, the female of which has a curved cephalic horn and bifid thoracic process very much as in the male, but the former is less flattened and the latter less produced and very strongly punctured all over. As there can be no doubt that the very nearly related typical species, *A. armatus*, Thoms., has a similar female, the armature of this sex forms the best distinctive character of *Astaborus*. There is also a slight elongation of the front tibiæ in the male, a feature which is not found in the known species of *Pycnoschema*.

M. Raffray seems to have overlooked the existence of the latter genus when he described four species nearly related to its typical forms, which he placed in *Astaborus* as a new section of that genus. The two species of *Astaborus* I have

mentioned are the only ones really belonging to it. Of *Pycnoschema* seventeen species in all are now known, and those remaining to be discovered in all parts of Africa are no doubt very numerous.

Cetoniidæ.

Sisyraphora cicatricosa, Burm.

Specimens from Huilla and Bihe closely allied to the South-African *S. tomentosa*, G. & P., appear to belong to Burmeister's *Anoplochilus cicatricosus*, which was attributed by him to India, but is referred in the Munich Catalogue to Senegal. It differs from *S. tomentosa* in the absence of the pale markings of the upper surface and the existence of smooth longitudinal ridges upon the elytra. The scutellum, however, is not very obtuse, as it is described by Burmeister, and it is rugose except for smooth lateral and median lines.

Myoderma pusilla, sp. n.

Nigro-picea, vertice prothoraceque nigris, supra glabra, nitida, subtus cum pygidio longe fulvo-hirta; clypeo subquadrato, margine late reflexo, arcuato, medio vix producto, disco parce punctato; prothorace quam longitudinem paulo latiore, sat regulariter haud crebre punctato, antice emarginato, lateraliter et postice sat regulariter curvato, angulis omnibus obtusis; scutello magno, punctato; elytris fortiter sed paulo irregulariter striatis, interstitiis convexis, subtilissime sat parce punctulatis, interstitiis 2° et 4° angustis, minus elevatis; pygidio valde convexo, antice subtilissime rugoso, postice parce transversim strigoso et fulvo-hirto.

Long. 10–11 mm.

Hab. Bihe, Pungo Andongo (*Dr. Ansorge*).

This seems to be an abundant species, as I have seen a considerable number of it. It is smaller than any other described species of the genus, and its glabrous upper surface gives it a very distinctive appearance. It is clothed beneath with very coarse tawny hairs, but above is smooth and shining. The thorax is fairly coarsely but not thickly punctured and the elytra are almost devoid of punctures, only a few very fine ones being traceable upon the broad smooth costæ. The clypeus is not pointed, although the broadly turned up margin is slightly wider in the middle than at the sides.

Diploa tridens, sp. n.

Oblongo-ovata, obesa, fusco-nigra, corpore subtus pygidioque rufis, longe fulvo-hirtis, supra undique creberrime punctato, minute setoso, clypeo subquadrato, crebre punctato, margine valde reflexo, medio paulo angulato; prothorace densissime punctato, lateribus sat regulariter arcuatis, angulis omnibus obtusis, margine postico leviter trisinuato; scutello dense punctato; elytris convexis, vage costatis, subtiliter punctato-striatis atque rugoso-punctatis, lateribus ubique arcuatis; pygidio subtiliter rugoso, longe fulvo-hirto; pedibus piceis, fulvo-setosis, tibiis anticis acute tridentatis.

Long. 14·5-17·5 mm.

Hab. Bihe, Garenganze.

This form is identical in its general appearance with *D.* (*Ligyromorphus*) *rufiventris*, Arrow, inhabiting Mashonaland, but close examination reveals differences which are very slight but sufficient for their separation. The most easily recognizable is in the armature of the front tibiæ, which is alike in the two sexes, but constantly differs in the Eastern and Western forms. In *D. rufiventris* there are two broad and very blunt teeth, and a third is scarcely indicated. In *D. tridens* there are three well-developed teeth, and all are acutely pointed. The sculpture of the upper surface is rather less rugose in the Angola species. The punctures upon the pronotum are coarse and very dense, but are mostly distinct, not completely coalescing as in the Eastern species, and the sculpturing of the elytra is correspondingly rather less indefinite and rugose, producing a rather more shining appearance.

I described this genus as new in 1901, having overlooked the previous existence of *Diploa*, which was placed by its author, Herr Kolbe, in a different subfamily to the genus *Myoderma*, with which it is undoubtedly nearly related. I have not seen *Diploa proles*, Kolbe, but that insect has a bidentate front tibia, and is no doubt very closely allied to *D. rufiventris*, and possibly identical.

The genus *Xiphoscelis* no doubt has some affinity to these forms and should be placed in the Trichiinæ.

XX.—*Descriptions of new Mammals from Mount Ruwenzori.* By Oldfield Thomas.

The first collection sent home by the members of the Ruwenzori Expedition contains examples of the following new species and subspecies. All were collected on Ruwenzori East, at altitudes from 6000′ to 13,000′.

1. *Rousettus lanosus*, sp. n.

A member of the *R. collaris* group; the limbs thickly hairy.

Size and general characters about as in *R. collaris*. Fur loose and shaggy, very abundant, its limits not sharply defined as in *R. collaris*; that on the head about 8 mm. in length, mixed with a large number of much longer hairs, attaining over 20 mm. On the back the fur is thick and woolly, passes out on to the proximal half of the upperside of the forearms, and is continued thickly down the hind limbs and the wing-membrane external to them to the ankles, the feet being also thinly clothed above. Interfemoral thickly furry above, except just along its posterior margin. Below, the wings are thinly hairy to a point level with the middle of the forearm, the hind limbs and interfemoral membrane being also less thickly haired than on the upper surface. Ears narrow, rather longer than the muzzle. Palatal ridges as in *R. collaris*.

General colour above bistre-brown, becoming warmer posteriorly; head darker. Under surface near broccoli-brown, but with a yellowish suffusion; some of the longer hairs quite yellow.

Skull rather more delicately built than in *R. collaris*, the bones thinner and lighter, muzzle rather longer and narrower; postorbital processes very thin; anterior palatine opening unusually broad.

Teeth conspicuously smaller throughout, each molar and premolar slightly shorter and very much narrower than in the allied species.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 88 mm.

Head and body 134; tail 16, tail free from membrane 9; head 46; ear 23; third finger, metacarpus 60, first phalanx 41, second phalanx 57; lower leg and foot (c. u.) 62.

Skull: length to tip of nasals 42; basal length 37·5; zygomatic breadth 25; breadth of brain-case 17·4; palate length from anterior palatine foramina 19; breadth of palatine foramina 3·4; length of upper tooth-row from front of canine 14·5; the same below, 16·2; first upper molar 2·3 × 1·2.

Hab. Ruwenzori East, at 13,000′.

Type. Adult male (in spirit). B.M. no. 6. 7. 1. 2. Collected by R. B. Woosnam. Three specimens obtained.

This species is allied to *R. collaris*, but is at once distinguishable from that and every other species by the thick

woolly covering of its hind limbs and its remarkably narrow molars.

The occurrence of a fruit-bat at such an altitude as 13,000′ is very noteworthy.

2. *Crocidura niobe*, sp. n.

General proportions of *C. maurisca*, Thos., with which it shares the unusual character of the almost entire absence of long bristles on the tail. Fur about 5 mm. long on the back. General colour dark blackish grey ("blackish slate"), with indistinct silvery mottling. Under surface scarcely lighter, the tips of the hairs brown. Hands and feet pale brown: fore claws rather smaller than hind. Tail long, slender, not incrassated, practically without longer bristles—a few present on the base only; uniformly blackish above and below.

Skull normal in build, without the peculiar delicacy of that of *C. maurisca*; the brain-case low, the muzzle stout and conical. Teeth as usual, the unicuspids broader than long, very unlike the narrow slender teeth of *C. maurisca*.

Dimensions of the type (measured in flesh):—

Head and body 68 mm.; tail 63; hind foot 13; ear 10.

Skull: greatest length (including incisors) 20; greatest breadth 9·1; length of upper tooth-row 8·2.

Hab. Ruwenzori East, 6000′. Another from 7000′.

Type. Female. B.M. no. 6. 7. 1. 32. Original number 618. Collected 10th January, 1906, by R. B. Woosnam. Three specimens.

This shrew may be readily distinguished from *C. maurisca*, the only species with its proportions and tail-characters, by its more plumbeous colour and its broader skull and teeth.

3. *Crocidura fumosa montis*, subsp. n.

Size and other essential characters as in the *C. fumosa* of Mount Kenya, but the fur longer (hairs of back 7·0–7·5 mm.) and the general colour a dark plumbeous grey, without the distinct brownish tone so marked in true *fumosa*. The ends of the hairs blackish, with a silvery subterminal ring.

Dimensions of the type (measured in flesh):—

Head and body 77 mm.; tail 61; hind foot 15; ear 11.

Skull: greatest length (including incisors) 22; greatest breadth 10.

Altitude 12,500′.

Type. Female. B.M. no. 6. 7. 1. 28. Original number 78. Collected 16th Feb., 1906, by R. E. Dent. Three specimens, all from about the same altitude.

4. *Myosorex blarina*, sp. n.

A dark short-tailed species with the mole-like appearance of *M. Sclateri talpinus*.

Size rather less than in *M. Sclateri*. Fur thick and mole-like; hairs of back about 8 mm. in length; a number of interspersed longer hairs on the rump attaining 12–13 mm. General colour blackish brown, slightly iridescent, very much as in *M. Sclateri talpinus*; under surface scarcely lighter, more smoky brown than in *talpinus*. Hands, feet, and tail blackish, the anterior claws very large. Ears very short, quite hidden in the fur.

Skull stout and heavily built—compared with that of *M. Sclateri* it is smaller, shorter in the muzzle, but proportionally broader, the interorbital region and brain-case as broad as in the larger species.

Teeth rather small throughout, the anterior incisors particularly delicate; relative proportions of the unicuspids as in *M. Sclateri*, the minute posterior one about one tenth the size of the second, which is half the size of the third, the latter being about three fourths the size of the first.

Dimensions of the type (measured in the flesh) :—

Head and body 74 mm.; tail 42; hind foot 14; ear 7.

Skull: condylo-basal length 22·1; basal length 19·6; anterior breadth 7; interorbital breadth 5·5; greatest breadth across brain-case 12; length of upper tooth-series 10·8; height of i^1 2.

Altitude 10,000′.

Type. Male. B.M. no. 6. 7. 1. 35. Original number 252. Collected 27th January, 1906, by Douglas Carruthers. One specimen only.

"Caught in bog and rock region."—*D. C.*

The interest of this animal lies in the immense extension its discovery gives to the range of the genus *Myosorex*, which (since the species without the extra tooth in the lower jaw were separated as *Sylvisorex*) has been only known from South Africa, the Zoutpansberg district of the Transvaal being there the most northern recorded locality. That the genus should turn up again at 10,000′ on Ruwenzori is a most interesting fact.

The velvety mole-like fur of *M. blarina* will distinguish it from all other forms except the decidedly larger *M. Sclateri talpinus* of Zululand.

5. *Sylvisorex lunaris*, sp. n.

A large slaty-grey species, with a long slender muzzle.

Size much larger than in *S. morio*, about equal to middle-

sized species of *Crocidura*. Fur rich and velvety; hairs of back about 6 mm. in length. General colour dark slaty grey, without variegation, but with a slight iridescence on the tips of the hairs. Under surface little lighter, the tips of the hairs pale brown. Upper surface of hands and feet brown, but the flesh along their inner halves is paler than the outer; fore and hind claws about equal in size. Tail much shorter than head and body, very finely haired, without longer bristles; brown above, rather paler below.

Skull markedly different from that of *S. morio* by its much larger size, slender build, and long muzzle.

Teeth delicate. Unicuspids narrow, the anterior about twice the area in cross-section of the other three, which are subequal. Lower incisors uniform in thickness, not tapering, their upper edges strongly serrated, with three well-marked notches.

Dimensions of the type (measured in the flesh) :—

Head and body 86 mm.; tail 54; hind foot 14·5; ear 10.

Skull: condylo-basal length 22; basal length 19·8; anterior breadth 6·4; greatest breadth across brain-case 10; length of upper tooth-series 10.

Hab. Ruwenzori East, 12,500′. Other specimens from altitudes of 7000′ upwards.

Type. Male. B.M. no. 6. 7. 1. 38. Original number 643. Collected 30th January, 1906, by R. B. Woosnam.

This distinct species may be readily distinguished from its W.-African allies *S. morio* and *S. Preussi* by its larger size.

6. *Funisciurus Carruthersi*, sp. n.

A handsome yellowish-green species, with a bluish-grey belly; something like a gigantic *F. poensis*.

Size about as in *F. pyrrhopus*. Fur soft and rich; hairs of back about 13–15 mm. in length. General colour above bright yellowish olivaceous green, the hairs blackish with rich yellow subterminal bands. Along the sides of the back a suggestion of yellow lateral lines, in the position of those of the *pyrrhopus* group, can be made out, but these are very faint and scarcely to be distinguished from the yellow of the flanks. Under surface and inner sides of limbs bluish grey, the hairs dark slaty with whitish tips. Head like back; eyes rimmed above and below with dull whitish or orange-whitish; ears short, rounded, their inner surface greenish yellow like the flanks, their outer surface and a small post-auricular patch dull yellowish white. Upper surface of hands and feet grizzled yellowish. Tail coloured like the body, the

hairs black at base and on a broad subterminal ring, the middle ring and the ends greenish yellow; a pencil of long hairs at the tip of the tail wholly black.

Skull of about the size and general shape of that of *F. erythrogenys* and other members of the *pyrrhopus* group. Nasals square, parallel-sided. Postorbital processes further forward on the skull than in *erythrogenys*. Teeth apparently of the same general type as in *F. erythrogenys*, but m^3 considerably larger.

Dimensions of the type (measured in flesh) :—

Head and body 198 mm.; tail 192; hind foot 47·5; ear 20.

Skull: greatest length 49; basilar length 38; greatest breadth 28; nasals 13 × 7·5; interorbital breadth 12·2; palatilar length 20·2; length of upper tooth-series exclusive of p^3 8·8.

Another specimen (a male) has head and body 204 mm.; tail 205.

Hab. Ruwenzori East, 6500′.

Type. Female. B.M. no. 6. 7. 1. 53. Original number 262. Collected 7th February, 1906, by Douglas Carruthers.

The affinities of this handsome and distinct species are by no means clear. Its size and the indistinct lateral dorsal lines suggest a relationship to the non-rufous members of the *pyrrhopus* group, although it has not their characteristically marked tail, and the bluish-grey belly is unlike anything found among them.

7. *Otomys Dartmouthi*, sp. n.

Lower incisors double-grooved. M^3 with only six laminæ.

Size rather larger than in *O. Jacksoni*. Fur very fine, long and woolly; ordinary hairs of back about 17 mm. in length. General colour above finely grizzled "mummy-brown," not so coarsely marbled as in *O. Jacksoni*. Under surface drab-brown, the ends of the hairs pale clay-colour. Head and ears of the prevailing body-colour. Upper surface of hands and feet pale buffy. Tail black along its upper surface, dull buffy on the sides and below.

Skull larger than in *O. Jacksoni*, its profile convex above the orbits.

Upper incisors with a deep median and a fine internal groove. Lower incisors with two well-marked subequal grooves, as in *O. Jacksoni* and *typus*. Laminar formula of molars $\frac{3-2-6}{4-2-2}$.

Dimensions of the type (measured in the flesh) :—

Head and body 150 mm.; tail 93; hind foot 26·5; ear 25.

Skull: greatest length 37·5; basilar length 30·3; zygomatic breadth 19·5; nasals 16·5 × 6·7; interorbital breadth 4·2; palatilar length 17; palatal foramina 7; length of upper molar series (grinding-surface) 7·3.

Hab. Ruwenzori East, 12,500′ ("seen up to 13,000′").

Type. Male. B.M. no. 6. 7. 1. 54. Original number 653. Collected 18th February, 1906, by R. B. Woosnam. Six specimens obtained.

This animal is related to the corresponding mountain-form of Mt. Elgon, *Otomys Jacksoni*, from 13,200′, but differs by its larger size, more uniform coloration, and the possession of only six laminæ on the last upper molar.

I have had great pleasure in naming this distinct species in honour of the Earl of Dartmouth, to whose generosity this splendid exploration of Mount Ruwenzori is primarily due.

8. *Otomys Denti*, sp. n.

Incisive grooves as in *O. irroratus*, but m^3 with five laminæ only. Colour very dark.

Size rather smaller than in *O. irroratus*. Fur long and fine; ordinary hairs of back about 20 mm. in length. General colour dark blackish brown (darker than "bistre") with a coppery tinge, the rump almost black, the light rings on the hairs dark tawny. Under surface and inner aspect of limbs slaty black, a few only of the belly-hairs tipped with dull buffy. Upper surface of hands and feet uniformly brownish black. Tail black throughout, above and below.

Skull smaller than that of *O. irroratus*, more flattened above, its profile not so convex above the orbits, the height from tooth-row to supraorbital ridges markedly less.

Incisive grooves as in *O. irroratus*. Molar laminæ $\frac{3-2-5}{4-2-2}$.

Dimensions of the type (measured in flesh):—

Head and body 157 mm.; tail 89; hind foot 27; ear 21.

Skull: greatest length 36·6; basilar length 30·3; zygomatic breadth 18·6; nasals 14·7 × 6·8; interorbital breadth 4·5; height from alveolus of m^2 to supraorbital ridge 10·8; palatilar length 17; palatal foramina 7·2; upper molar series (grinding-surface) 7.

Hab. Ruwenzori East, 6000′.

Type. Female. B.M. no. 6. 7. 1. 69. Original number 56. Collected 27th January, 1906, by R. E. Dent. Three specimens.

This striking swamp-rat is readily distinguishable by its dark coppery colour, flat skull, and the presence of only five laminæ on the last upper molar.

9. *Dasymys montanus*, sp. n.

A very long-haired species, with short tail.

Size medium. Fur very long and fine; the ordinary hairs of the back about 15 mm. in length. General colour above uniformly finely speckled mummy-brown, the light rings on the hairs near clay-colour. A number of the longer hairs with a greenish iridescence. Sides but little paler than back. Under surface bluish grey, the slaty bases of the hairs little hidden by the dull pale drab tips. Ears large, black, contrasting with the general brown colour. Upper surface of hands and feet pale brown, the digits lighter. Tail practically naked, the scales quite unhidden, blackish throughout.

Skull shorter and broader and the zygomata more squarely expanded anteriorly than in other species.

Dimensions of the type (measured in the flesh):—

Head and body 137 mm.; tail 105; hind foot 27; ear 19.

Skull: length of upper molar series 7·3.

Another skull measures:—Greatest length 35; basilar length 30·6; greatest breadth 21·2; nasals 12·3 × 4·3; palatilar length 17·8; length of upper molar series 7·1.

Hab. Ruwenzori East, 12,500′.

Type. Female. B.M. no. 6. 7. 1. 79. Original number 255. Collected 30th January, 1906, by Douglas Carruthers.

I refer four specimens to this species, two of them of a normal colour and two apparently melanoid, rather darker than de Winton's *D. incomtus fuscus*. Unfortunately the skulls of the normal-coloured specimens are much damaged, but I do not think there is any reason to suppose the blackish specimens are different from the brown ones.

D. montanus is readily distinguishable from all other species by its long fur and short tail.

10. *Dasymys medius*, sp. n.

A grey species allied to *D. Bentleyæ*.

Size medium, rather larger than in *D. Bentleyæ*. Fur comparatively coarse and shaggy; hairs of back about 12–13 mm. in length. General colour above greyish "hair-brown," greyer on the head and fore-back, warmer and browner on the rump; darkened throughout by the black ends to the longer hairs. Sides greyer, passing gradually into the grey of the under surface, where the tips of the hairs are dull greyish white, their slaty bases showing through. Ears well-haired, greyish brown, not markedly darker than the general tone. Upper surface of hands and feet pale brown.

Tail rather long, thinly clothed with fine hairs, not hiding the scales, brown above and below.

Skull larger than that of *D. Bentleyæ* and markedly higher in the brain-case. Interorbital region parallel-sided, evenly narrow throughout, not broadening posteriorly as in *D. Bentleyæ*. Bullæ decidedly larger than in that species.

Dimensions of the type (measured in the flesh) :—

Head and body 143 mm.; tail 128; hind foot 28·5; ear 19.

Skull: greatest length 34·3; basilar length 30; greatest breadth 18·5; length of nasals 12; diastema 10·3; palatilar length 17·5; palatal foramina 7·6; length of upper molar series 7.

Hab. Ruwenzori East, 6000′.

Type. Female. B.M. no. 6. 7. 1. 75. Original number 38. Collected 16th January, 1906, by R. E. Dent.

No species of *Dasymys* have been hitherto described from this part of Africa, the nearest being the Lower Congo *D. Bentleyæ*, from which the present animal differs by the characters above mentioned. From the *D. montanus* of the higher altitudes of Ruwenzori it is, of course, at once distinguishable by its shorter coarser fur and much longer tail.

11. *Mus Dennie*, sp. n.

A small long-tailed species allied to *M. Alleni*. Mammæ 2—2=8.

Size about as in *M. Alleni* and *M. carillus*. Fur soft and rather woolly; hairs of back about 9–10 mm. in length. General colour not unlike that of *M. carillus*, soft buffy fawn, varying a good deal in the richness of the tone. Sides clearer and more buffy. Under surface well defined whitish, sometimes tinged with buffy. Head greyer than back; lower part of sides of muzzle white; area round eyes black. Ears large, naked, dark brown throughout. Upper surface of hands and feet thinly haired, dull whitish. Tail much longer than head and body, fairly well haired terminally, greyish brown throughout.

Skull of the same delicate shape as in *M. Alleni* and *carillus*, and the zygomatic plate similarly little projected forward. Supraorbital edges sharply square, but not beaded. Palatal foramina much longer than in the two western species.

Dimensions of the type (measured in skin) :—

Head and body 96 mm.; tail 154; hind foot 21; ear 21.

Skull: greatest length 27; basilar length 22·5; greatest breadth 13·5; nasals 9·5; interorbital breadth 4·1; breadth of brain-case 12·2; palatilar length 12; diastema 8; palatal foramina 6·4 × 2·3; length of upper molar series 4.

Hab. Ruwenzori East. Altitude of type 7000′; other specimens up to 12,000′.

Type. Male. B.M. no. 6. 7. 1. 112. Original number 235. Collected 15th January, 1906, by Douglas Carruthers. Ten specimens.

This pretty mouse is no doubt allied to *Mus Alleni*, with which it shares the general proportions, shape of skull, and number of mammæ; but it differs by its softer, more buffy fur and longer palatine foramina. In *Mus carillus*, otherwise allied, there are only 1—2 = 6 mammæ.

I have been in some doubt as to whether this or a larger species obtained by the Ruwenzori Expedition should be referred to de Winton's *M. Jacksoni*, founded on a young specimen from Entebbe, but the teeth of the type are more as in the larger form, and there is a distinct projection forward of the zygomatic plate, practically absent in the present form.

A mouse from Mount Kenya, obtained by Prof. Mackinder in 1899, and referred by me to *M. Jacksoni*, would also seem to be assignable to *Mus Denniæ*.

12. *Mus univittatus lunaris*, subsp. n.

General characters of the typical western *M. univittatus*, but size smaller and colour more olivaceous, not turning rufous on the rump, which is blackish olivaceous. Belly-hairs greyish tipped with buffy; a line down outer edge of thighs also buffy. Dorsal streak not sharply defined and not extending on to neck and head. Upper surface of hands blackish brown, of feet rufous brown. Tail practically naked, black above, rather lighter below.

Skull similar to that of true *univittatus*, but smaller and lighter throughout. Molars decidedly narrower.

Dimensions of the type (measured in flesh) :—

Head and body 108 mm.; tail 115; hind foot 25; ear 17.

Skull: greatest length 32; basilar length 24; greatest breadth 15·3; nasals 13; interorbital breadth 5·2; breadth of brain-case 14; palatilar length 13·2; palatal foramina 6; length of upper molar series 5·1.

Hab. Ruwenzori East, 6000′.

Type. Old female. B.M. no. 6. 7. 1. 137. Original number 217. Collected 2nd January, 1906, by Douglas Carruthers.

13. *Leggada bufo*, sp. n.

A large dark species with a rich buffy belly.

Size rather less than in *Mus musculus*. Fur close and

crisp, about 5·5 mm. in length on the back, profusely mixed with fine spines. General colour above dark coppery brown (nearest to "bistre"), more blackish on the rump; the light rings on the hairs dark buffy. Under surface strongly contrasted rich buffy ochraceous, the hidden bases of the hairs slaty grey. Head rather darker than back. Ears naked, uniformly blackish. Outer side of limbs brown like sides, inner sides buffy like belly; upper surface of hands and feet brown, with a tinge of buffy. Tail finely scaled (20 rings to the centimetre), practically naked, blackish throughout, or rather lighter below proximally.

Skull stoutly built, with broad, squarely edged but not ridged, interorbital region. Palatal foramina long, extending nearly to the level of the middle of m^1. First upper molar with its anterior lobe less developed than in the smaller forms.

Dimensions of the type (measured in flesh) :—

Head and body 70 mm.; tail 68; hind foot 16; ear 13.

Skull: greatest length 22; basilar length 17; greatest breadth 11; interorbital breadth 4; palatilar length 9·6; palatal foramina 5·1; length of upper molar series 3·4.

Hab. Ruwenzori East, 6000′.

Type. Old female. B.M. no. 6. 7. 1. 116. Original number 215. Collected 2nd January, 1906, by Douglas Carruthers. Six specimens.

This species is related to *L. musculoides*, Temm., but may be readily recognized by its rich buffy under surface.

14. *Lophuromys Woosnami*, sp. n.

An olive-grey species with large ears and long tail.

Size about as in *L. aquilus*. Fur straight; hairs of back about 10–11 mm. in length. General colour above between "olive" and "bistre," without the warmer rufous tone generally present in the East-African forms; the bases of the hairs are, however, of a rufous-brown colour. Mixed with the ordinary hairs of the back there are a variable number of buffy-white hairs, which produce a speckling somewhat similar to that of the grysbuck (*Nototragus melanotis*), but are almost absent in some specimens. Sides rather paler than back. Colour of under surface not sharply defined laterally, very variable, ranging from near wood-brown to tawny clay-colour; the throat rather whiter. Head like back; area round eyes nearly black. Ears very large, finely haired, black, with whitish edges. Upper surface of hands and feet pale brownish white. Tail long, slender, almost naked, markedly less hairy than in the other species; blackish above, whitish flesh-colour below.

Skull with a long slender muzzle; interorbital region broad, edged with well-defined ridges, but without postorbital projections; outer wall of anteorbital foramen reduced to a narrow bar less than half the breadth of the corresponding part in *L. aquilus* and *flavopunctatus*; it is, however, similarly narrow in the W.-African *L. sikapusi*.

Incisors more as in *Mus* than in other *Lophuromys*, their anterior surface not curved round in the way generally characteristic of the present genus. Molars very broad, with well-defined cusps; their pattern as usual.

Dimensions of the type (measured in flesh):—

Head and body 118 mm.; tail 111; hind foot 22·5; ear 23.

Skull: greatest length 30·5; basilar length 24; greatest breadth 14·3; nasals 14 × 3·2; interorbital breadth 6·7; diastema 8; palatilar length 12·4; palatine foramina 6·5; length of upper molar series 4·8.

Alt. 6000′.

Type. Adult male. B.M. no. 6. 7. 1. 170. Original number 608. Collected 31st December, 1905, by R. B. Woosnam. Nine specimens.

This striking species is widely different from any of the Central- and East-African forms of *Lophuromys*, and might almost be considered generically distinct were it not that the West-African *L. sikapusi* also possesses some of its characters. Its large ears, long tail, and peculiar olive-coloured white-speckled fur readily distinguish the species from all its allies, and I have much pleasure in naming it after Mr. R. B. Woosnam, to whose abilities so much of the success of the Ruwenzori expedition is due.

XXI.—*On a second Species of the Siluroid Genus* Mochocus.

By G. A. Boulenger, F.R.S.

When dealing in these 'Annals,' a few years ago *, with the little-known genus *Mochocus*, Joannis (*Rhinoglanis*, Günther), I was acquainted with one species only, as I consider *Rhinoglanis typus*, Gthr., from Gondokoro, and *R. Vannutellii*, Vincig., from Lake Rudolf, as specifically identical with the incorrectly described *Mochocus niloticus* of de Joannis, of which I had then received a few specimens from Assuan, where the fish had been rediscovered by Mr. Loat. The

* Vol. vi. 1900, p. 525.

little fish has since been found by the same collector at various localities on the Nile, between Beni Souef and Gondokoro, and a second species has been discovered by him at Fashoda and at Lake No, White Nile. For this new species I propose the name of

Mochocus brevis.

Easily distinguished from the preceding by the shorter caudal part of the body, the first dorsal fin being equally distant from the end of the snout and from the root of the caudal, or only a little nearer the former. Depth of body $3\frac{1}{2}$ to $4\frac{1}{3}$ times in the total length, length of head 3 to $3\frac{1}{2}$ times. Occiput and nuchal shield slightly tectiform, but without a keel. Maxillary barbel reaching the extremity of the ventral fin or a little beyond. First dorsal I 6, the spine without any serration and always shorter than the head; second dorsal 9–17; anal 9–10. Caudal peduncle only a little longer than broad. Coloration as in *M. niloticus*, but pectoral, ventral, and anal fins often with some brown spots.

Total length 31 mm.

Forty-two specimens from Fashoda and one from Lake No.

In *M. niloticus* there is a series of three or four small bony scutes, ankylosed to the interneural bones, on each side of the base of the soft rays of the first dorsal fin; these little scutes, which have hitherto been overlooked, are absent in *M. brevis*.

XXII.—*On a new Pigmy Antelope obtained by Col. J. J. Harrison in the Semliki Forest.* By Oldfield Thomas.

The British Museum owes to Col. J. J. Harrison the skull of a pigmy antelope from the Semliki Forest allied to the Cameroon species described by de Winton as *Neotragus Batesi* *. I have also had the opportunity of examining the skin of the specimen, which is now in Col. Harrison's collection.

Neotragus Batesi, as shown by de Winton, is in many respects allied to both *Neotragus* and *Nesotragus*, and in the light of the present examination of the new material, including an additional example from the Cameroons, I am disposed to consider it as representing a distinct genus, whose range

* P. Z. S. 1903, i. p. 192.

would be coextensive with the great Congo Forest. This genus may be called

HYLARNUS*, gen. nov.

Intermediate between *Neotragus* and *Nesotragus*. Premaxillo-maxillary vacuities present, as in the latter. Nasals very broadly expanded posteriorly. Muzzle in front of orbit comparatively short, the anterior wall of the orbit vertically above p^4, as in *Neotragus*, above m^1 or m^2 in *Nesotragus*. Palation (back of bony palate) about level with the hinder corner of m^3, as in *Nesotragus*, opposite its front edge in *Neotragus*.

Horns short, laid back nearly in the line of the frontal profile, almost as in *Neotragus*; stout, conical, smooth except just at their base.

Type. *Neotragus Batesi*, de Wint.

The Eastern species obtained by Col. Harrison seems to be specifically separable from *H. Batesi*, and I would propose for it the name of

Hylarnus Harrisoni, sp. n.

External characters very much as in *H. Batesi*, but the colour-contrasts are more marked, the dark colours darker and the light brighter.

General colour nearer to "cinnamon" of Ridgway, that of *Batesi* approaching "russet"; central dorsal area darkened by the black tips to the hairs. Forehead and crown dark brown, a fine lightish line over each eye. Hairs of outer surface of ears black, of inner white. Chin and interramia nearly pure white. Throat-band brownish cinnamon. Belly sharply defined white. Front of limbs dark brown, interrupted over the metapodials and basal phalanges by an ill-defined elongated whitish patch, which is succeeded again by brown on the penultimate phalanges. Tail imperfect in the type, its basal portion coloured like the body.

Skull with the nasals even broader posteriorly than in *H. Batesi*, running out on each side to a well-marked angle. Premaxillo-maxillary vacuity larger in the single specimen. Horns longer and set at a slightly greater angle upwards.

Dimensions of the typical skull:—

Greatest length 110 mm.; basal length 96·5; greatest breadth 52; muzzle to orbit 51; nasals 37 × 23; breadth of brain-case 36; muzzle to front of p^2 36; palate length 66; length of upper tooth-series 32.

* *ἀρνός*, a lamb.

Length of horns 38, of horn-core 27.

Hab. Semliki Forest, Eastern Congo.

Type. Adult male. The skull is B.M. no. 5. 10. 21. 3. Collected and presented by Col. J. J. Harrison. The mounted skin remains in the latter's collection.

XXIII.—*Preliminary Descriptions of new Species of Amphipoda from the 'Discovery' Antarctic Expedition, 1902–1904.* By Alfred O. Walker, F.L.S., F.Z.S.

[Concluded from p. 18.]

Iphimedia echinata, sp. n.

W.Q. 24/9/02, Hut Point, one; 24/8/03, Hole 12, three large, 30 mm., and about twenty-five young; 26/9/03, Hole 12, one 45 mm. long.

Body: first segment of the mesosome longer than the second; posterior angles almost rectangular; next four segments subequal, with acute posterior angles; the fifth and sixth segments more or less dentate behind; seventh dorsally depressed and narrowed below, postero-dorsal dentition coarser. The pleon-segments have a strongly dentate dorsal carina, with smaller teeth on each side of it; posterior angle of the second and third acute and upturned, the latter with a longer curved tooth above it. The first urus-segment is as long as the two next united, and has a dorsal depression followed by a group of upright teeth; the second and third are smooth. *Side-plates*: the first three pairs narrow downwards to a point, the second and third curved; the fourth, fifth, and sixth have a strong tooth with serrate edge directed outwards.

Head: rostrum as long as the rest of the head, acute, decurved; ocular lobes rounded; eyes prominent, round, colourless.

Upper antennæ: first joint with two parallel distal teeth on the upper margin; second with a long serrate tooth on the upper and a short one on the lower margin; third joint short, simple. First joint of flagellum as long as the next three.

Lower antennæ subequal to the upper; a prominent curved tooth on the upper side of the *basal* joint.

First gnathopods: first joint widest in the middle; wrist rather shorter than the hand, which is chelate, with short spines on the end of the produced hind margin.

Second gnathopods: first joint as long as the remainder; wrist and hand subequal, the latter chelate, with long plumose setæ on the hind margin.

Third peræopods: first joint oblong, with a median ridge and five subequal teeth on the hind margin. In young specimens these are fewer and unequal.

Fourth peræopods: first joint rather wider than in the third pair, with fewer and more unequal teeth; posterior angle acute and upturned.

Fifth peræopods: first joint wider than in the fourth pair, with four unequal teeth on the hind margin and the posterior angle still more acute and produced.

Third uropods: rami widely lanceolate, the outer slightly longer and wider than the inner, which is much longer than the peduncle.

Telson emarginate, the outer angles rounded, reaching the end of the peduncles of the third uropods.

Iphimedia longipes, sp. n.

Coulman Island, 100 fath., 13/1/02; one specimen.

Body: mesosome wide; pleon and urus compressed. First segment longer than the second, third, fourth, and fifth, and subequal to the sixth; seventh as long as the fifth and sixth united, with two long subdorsal teeth directed backwards. The first side-plates rather deeper than the segment, wider and rounded below; second and third bluntly pointed; fourth sharply pointed below, with the hind margin produced backwards in a spur; fifth and sixth with a short trigonal spur; seventh small and subquadrate. The first two pleon-segments have each two long subdorsal teeth; the lower margin of the first is narrowed, with the posterior angle obtuse; the third segment is smooth, the posterior angle forming a short blunt tooth with a longer curved tooth above it. First segment of the urus dorsally depressed, much longer than the remaining two united.

Head exclusive of the rostrum longer than the first segment; rostrum as long as the rest of the head, deflexed and pointed; ocular lobe rounded in front and terminating below in a strong tooth directed downwards. Eyes round-oval, dark, widely separated.

Upper antennæ: first joint with a strong distal tooth on the inner side reaching almost to the end of the second joint.

First gnathopods with a chelate hand.

Last three pairs of *peræopods* increasing in length successively, the last pair extending much beyond the ends of the

uropods; hind margin of the first joints smooth, more or less concave, and ending below in a subacute tooth.

Telson reaching to the base of the peduncles of the third uropods, wider at the base than long, rather deeply notched.

Length 30 mm.

Iphimedia Hodgsoni, sp. n.

Coulman Island, 13/1/02, 100 fath.; one.

The whole body is clothed with fine spine-like teeth directed backwards and arranged in zones on the segments of the mesosome and pleon; the side-plates are also densely spinous and appear to be a little deeper than the segments. The body is but little compressed laterally and is widest over the first and second segments. The antennæ are rather short, subequal, and directed outwards; the basal joints of the upper are thickly covered with branching spines. The rostrum is almost straight and about as long as the rest of the head.

Length about 25 mm.

Eusirus microps, sp. n.

W.Q. 10/5/03, 10 fath., one, and 1/6/03, one. Penguin Rookery, Mount Erebus, Feb. 1904; one, large.

Body: last segment of mesosome and first two of pleon carinate, with a postero-dorsal tooth; carina of the third pleon-segment rounded behind; hind epimeral margin rather convex, faintly crenate, posterior angle produced and acute; one or two small teeth on the lower margin in front of it. First urus-segment dorsally depressed. Side-plates rather small, the first subquadrate, crenate below.

Head: eyes dark, *almost round, diameter less than that of the first joint of the upper antennæ.*

Upper antennæ reaching to the base of the uropods; first joint shorter than the second, with a distal prominence on the lower margin terminated by an acute tooth; the second joint expands distally and is furnished with two or three sharp teeth; the third is rather shorter than the first of the flagellum. Appendage as long as the first joint of the flagellum.

First gnathopods: first joint robust; hinder angle of the third joint acute and, as also the carpal spur, densely setose; *hand much longer than wide.*

Second gnathopods rather longer than the first; the front margin of the second joint produced over the third.

First and second peræopods very slender, the first joint about six times as long as wide and subequal to the next two.

Last three pairs of peræopods increasing in length back-

wards; the first joint in the last two pairs with the hind margin ending below in a sharp tooth; all the joints spinous and *clothed with long plumose setæ*; point of the dactylus blunt, with a curved secondary tooth.

Telson reaching beyond the end of the peduncles of the third uropods, the tip notched, divisions acute.

Length of large specimen 48 mm.

Gammaropsis longicornis, sp. n.

W.Q. Jan. to Mar. 1902, 10 fath.; several specimens, male and female.

Body: first four side-plates not so deep as the segments. Third pleon-segment dorsally depressed behind, posterior angle rectangular. First urus-segment dorsally depressed in front.

Head almost as long as the first two segments; ocular lobe not much produced, angular. Eyes round, red in the centre.

Upper antennæ in the female reaching beyond, in the male not so far as, the end of the peduncle of the lower. Appendage 1-jointed, about one third of the length of the first joint of the flagellum.

Lower antennæ in female barely reaching to the pleon, *in the adult male almost as long as the whole animal*. Flagellum shorter than the last joint of the peduncle.

First gnathopods: side-plates oblong, rounded below, deeper than wide. Wrist subequal in length and width to the hand; the hind margin of the latter evenly convex, palm defined by two spines, spinulose.

Second gnathopods.—Female: wrist subtriangular, half as long as the hand; palm of the hand subequal to the rest of the hind margin, crenulate, the proximal half concave, the distal convex; palmar angle rounded, with three unequal spines. *Male*: wrist very short, hind margin a little produced, subangular, and setose; hand widening distally, hind margin rather longer than the palm and terminating in a strong tooth; palm almost transverse, with a strong tooth separated from the palmar one by a deep sinus; an irregularly dentate and setose space between it and the base of the dactylus which is carried over the side of the hand.

Peræopods: last three pairs increasing in length successively, the last pair not exceeding the uropods; posterior angles of the first joints of the fourth and fifth pairs rectangular, the joints narrowing suddenly in the middle.

Third uropods: peduncles twice as long as the styliform rami.

Length 6 mm.

Very near *G. nana*, G. O. Sars, from which it differs in the smaller antennular appendage and the form of the first joint of the last two pairs of peræopods, and especially in the much greater length of the lower antennæ.

Seba antarctica, sp. n.

W.Q. Oct. to March, 1902: in sponges. Two large males, 19/3/02; 10 fath.

The females and young males (which differ from the females only by the absence of the incubatory lamellæ) cannot be distinguished from *S. Saundersi*, Stebbing, with which this species may be identical *. The two large males mentioned above, however, show such a marked difference in the great development of the meral joints of the last three pairs of peræopods, that at first sight I took them for a distinct species. As, however, they were associated with the smaller form, with which they agree in the rest of their structure, I have no doubt that they are only full-grown males. It may be remembered that in the adult male of our own *Orchestia littorea* (Mont.) we have a similar enlargement of the meral joint in the last pair of peræopods.

XXIV.—*Description of a new Cyprinodont Fish of the Genus* Jenynsia *from Argentina.* By C. Tate Regan, B.A.

Jenynsia maculata.

Depth of body $3\frac{1}{2}$ to 4 in the length, length of head $3\frac{2}{5}$ to 4. Snout as long as or shorter than eye, the diameter of which is $3\frac{1}{3}$ to 4 in the length of head, interorbital width 2 to $2\frac{1}{3}$. Body regularly and completely scaled; 28 to 30 scales in a longitudinal series. Dorsal 8–9; origin equidistant from extremity of operculum and base of caudal or from eye and end of caudal. Anal 8–9, opposite to the dorsal (♀) or a little in advance of it (♂). Caudal rounded or subtruncate. Pectoral about $\frac{3}{4}$ the length of head; ventrals extending to the vent. Sides with 3 or 4 irregular series of more or less oblong blackish spots.

Several examples, measuring up to 73 mm. in total length, from Cachi, Salta, Argentina, at an elevation of 2500 metres, collected by Herr J. Steinbach.

This species is very close to *Jenynsia lineata*, Jenyns, which has the dorsal fin a little more advanced and has the spots on the sides smaller and more numerous, forming regular longitudinal lines along the series of scales.

* Ann. & Mag. Nat. Hist. ser. 7, vol. xvii. (1906) p. 569.

BIBLIOGRAPHICAL NOTICES.

The Fauna of British India, including Ceylon and Burma. Published under the authority of the Secretary of State for India in Council. Edited by Lt.-Col. C. T. Bingham. — *Rhynchota.* Vol. III. (*Heteroptera — Homoptera*). By W. L. Distant. London: Taylor & Francis. Pp. xiv, 503; text-figs. 266.

Col. Bingham has prefixed a preface to this volume (the first published under his editorship) expressing the general regret felt at the death of Dr. Blanford, the originator of the series of works on the Fauna of British India, and noticing the arrangements made for future volumes, comprising works on Coleoptera, Lepidoptera, and Mollusca.

The present volume contains the conclusion (families 17 to 24) of the Heteroptera, chiefly including the not very extensive but extremely interesting Water-Bugs, and the first two families of Homoptera—the Cicadidæ (three subfamilies) and Fulgoridæ (twelve subfamilies). It will thus be seen that the largest, and in the case of the Homoptera the handsomest and most conspicuous, species fall into the present volume. These sections are, however, very poorly represented in Britain. Of the great and vociferous family Cicadidæ we have only a single rare and local representative, and even this one of the smaller species, measuring under 2 inches in expanse, though from 3 to 6 or even 7 inches is no uncommon size in India and other warm countries. Even so, however, our own species is the largest British species of its order, except the curious aquatic *Ranatra* belonging to the Heteroptera. The Water-Bugs and Fulgoridæ are somewhat better represented in Britain, but the latter only by comparatively small and insignificant species, whereas the Indian Fulgoridæ are as large and brightly coloured as butterflies and tiger-moths, which, indeed, some of the species resemble, while others are remarkable for the large and often curiously shaped protuberance on the head, which, however, finds its greatest development not in an Indian species, but in the large South-American lantern-fly, which sometimes measures nearly 6 inches across the wings. It is curious that both the South-American lantern-flies and the East-Indian candle-flies should be reputed luminous, and yet that modern entomologists should not have been able to confirm the statement in either one case or the other.

We hope that the high standard of excellence which the 'Fauna of British India' has exhibited since its commencement will be maintained permanently by the combined efforts of editors, authors, and artists.

A Synonymic Catalogue of Homoptera.—Part I. *Cicadidæ.* By W. L. Distant. London: Printed by Order of the Trustees of the British Museum, 1906. 8vo. Pp. 207.

This is one of the familiar brown-covered Catalogues that have been so useful to entomologists since the Trustees of the British Museum decided to adopt that form, instead of the long series of publications

in a smaller size with blue paper covers which preceded them. The present Catalogue is devoted to the very interesting family of the Cicadidæ, which includes the largest species of the suborder Homoptera, but which is entirely unrepresented in the British Islands, except by a single rare and local species, found chiefly in the New Forest.

The loud stridulation of many of the foreign species is a great feature of forest life abroad; and even in Greece the Cicada's "song" has been famous from classical times onwards.

Mr. Distant has long been one of the leading authorities on this family, having published a 'Monograph of Oriental Cicadidæ' as long ago as 1889, and having also included it in the third volume on Rhynchota in the 'Fauna of British India,' published during the present year.

The Catalogue before us extends to 188 pages, exclusive of Index, which fills 19 pages in triple columns. The number of genera admitted is 179, and, besides the full synonymy, useful tables are given of the genera in each division.

The enormous increase in entomological literature renders the frequent publication of monographs and catalogues (which are as grammars and dictionaries) indispensable to working entomologists; and we cannot have too many of them, provided they are written by men well up in their subject and are fairly complete and up to date.

Opinions on details differ; but there are three particulars in which we think Mr. Distant's book might have been improved. First, we think that the species under each genus should have been numbered as well as the genera. Secondly, the species contained in the Natural History Museum should have been marked, and all names the types of which are included in the series should have been specially indicated. Thirdly, we find a list of undetermined species at the end of the book; but we should have preferred to see all these, except those absolutely unrecognizably described without figures, assigned to their probable places, if necessary with a query. In the case of Walker's species not in the Museum, the types perhaps still exist in other British collections.

We do not make these remarks as criticisms, but as suggestions, and have no hesitation in recommending Mr. Distant's work as absolutely indispensable to all students of the Cicadidæ.

W. F. K.

MISCELLANEOUS.

Locusts in Hungary.

It is stated in a morning paper to-day that locusts are committing ravages in some parts of Hungary. I should be much obliged to some Hungarian entomologist if he would kindly send me specimens for identification. W. F. Kirby.

Natural History Museum,
S. Kensington, London,
July 27, 1906.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 105. SEPTEMBER 1906.

XXV.—*Natural History Notes from R.I.M.S. 'Investigator.'* —Series III., No. 10. *On Mollusca from the Bay of Bengal and the Arabian Sea.* By Edgar A. Smith, I.S.O.

Ten communications to these 'Annals' upon the Mollusca obtained by the 'Investigator' have already appeared—two by the late Professor Wood-Mason and Professor Alcock (1891, vol. vii. pp. 15–19, and vol. viii. pp. 443–448), and eight by the present writer (1894, vol. xiv. pp. 157–174; *l. c.* pp. 366–368; 1895, vol. xvi. pp. 1–19; *l. c.* pp. 262–265; 1896, vol. xviii. pp. 367–375; 1899, vol. iv. pp. 237–251; 1904, vol. xiii. pp. 453–473; vol. xiv. pp. 1–14). The new and more interesting species have been figured in the above papers or in the "Illustrations of the Zoology of the Investigator,'" edited by Prof. Alcock. The species still unfigured and those described in the following pages will eventually be illustrated in the latter work.

Of the numerous species now described the most interesting, perhaps, is the *Morio Alcocki*, which may be regarded as an Indian-Ocean representative of the Mediterranean and North-Atlantic *M. rugosa*. The occurrence of *Oocorys sulcata*, another Atlantic form, off Ceylon, is also extremely interesting. Other fine shells are *Bathybembix Nevilli*, *Gaza Frederici*, *Dentalium cornu-bovis*, and *Nucula* (*Acila*) *granulata*. What is especially noticeable in all these collections is the absence of many new generic types—indeed, up to the

present only two have been discovered, namely, *Pontiothauma* *, described in 1895, and *Manaria*, in the present paper.

List of Stations.

Station Nos.	Latitude North.	Longitude East.	Station Nos.	Latitude North.	Longitude East.
	° ′ ″	° ′ ″		° ′ ″	° ′ ″
232	7 17 30	76 54 00	291	26 22 00	56 10 00
237	13 17 00	93 7 00	295	26 20 30	54 16 00
244	14 31 15	73 10 00	297	25 11 30	57 15 00
246	11 14 30	74 57 15	299	23 43 00	58 51 30
248	8 37 00	75 37 30	301	24 37 30	62 2 30
249	7 0 00	76 36 15	310	13 29 30	95 29 00
256	7 58 00	79 23 00	316	5 43 30	80 05 30
258	8 23 00	76 28 00	317	7 04 00	79 32 00
259	10 08 43	75 33 30	318	7 28 00	79 19 30
260	8 28 15	76 07 00	321	5 4 8½	80 22 00
261	8 10 00	76 26 00	322	11 26 30	92 53 45
263	8 56 00	81 09 00	323	16 25 00	93 43½
265	9 32 00	80 59 30	324	18 0 15	93 30 45
267	7 02 30	79 36 00	325	18 18 00	93 25 00
268	7 36 00	78 05 00	327	17 7 30	94 5 30
269	8 09 00	76 30 00	328	14 46 00	95 52 00
271	13 19 00	74 26 00	329	14 50 00	96 0 00
273	12 47 00	73 44 45	331	11 46 30	93 16 00
275	8 27 00	75 35 00	332	10 21 00	92 64¼
276	7 11 00	76 35 30	333	6 31 00	79 38¾
277	5 48 15	80 56 00	336	7 37¼	76 41 00
278	6 52 00	81 11 00	337	9 43 00	75 35 00
280	11 29 45	80 02 30	340	23 44 30	58 52 15
281	11 15 15	80 07 00	341	23 47 00	58 30 30
282	10 08 00	80 49 30	343	23 46 15	58 31 50
283	8 53 15	81 20 30	345	26 20 30	54 52 30
289	23 56 45	58 34 00	346	26 37 30	53 03 30

Conus planiliratus, Sowerby.

Conus planiliratus, Sowerby; Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 159, pl. iii. fig. 2; 1904, vol. xiii. p. 454.

Hab. Persian Gulf, 27 fath. ('Investigator'); Persian Gulf, Shaikh Shuaib Island, 7 fath.; and 125 miles W.S.W. of Bombay, 45 fath.

Conus Sieboldii, Reeve.

Conus Sieboldii, Reeve; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 455.

* The anatomy of this genus has been described by S. Pace, Journ. Linn. Soc., Zool. vol. xxviii. pp. 455–462, pl. xlii.

Hab. Station 260, W. of Cape Comorin, 487 fath., green mud and sand; Station 333, Gulf of Manar, 401 fath.

The specimens from Station 260 are much larger than any examples which I have seen from Japan, the original locality of this species. The largest is 80 mm. long and 37 broad.

Like the specimens mentioned at the above reference all those in the present series have the top of the spire eroded. The operculum is narrow, 17 mm. in length, and has the right margin serrated.

Pontiothauma? abyssicola, Smith.

Pontiothauma abyssicola, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 2, pl. i. fig. 2; Illust. Zool. 'Investigator,' Mollusca, pl. v. figs. 2, 2 *a* (enlarged); Pace, Journ. Linn. Soc., Zool. vol. xxviii. p. 459, pl. xlii. figs. 10–14 (anatomy).

Hab. Station 268, S.E. of Cape Comorin, 556–595 fath., green mud and sand.

According to Mr. Pace this species should be removed from *Pontiothauma*, although in many respects it closely agrees with that genus.

Pontiothauma minus, sp. n.

Testa ovato-fusiformis, alba; anfractus 8?, superiores detriti, cæteri supra concavi, infra convexiusculi et costati, costis subangulatis, spiraliter tenuiter lirati lineisque incrementi tenuibus striati, ultimus costis infra medium evanidis, antice contractus; apertura alba, longit. totius $\frac{1}{2}$ æquans; labrum tenue, supra vix sinuatum; columella lævis, callo albo circumscripto induta; canalis anterior latus, brevis, subrecurvus.

Longit. 30 mm., diam. 14; apertura cum canali 15 longa, 5 lata.

Hab. Station 318, off W. of Ceylon, 1085 fath.

Another specimen, in worn condition, is rather larger than the type, being 39 mm. in length. The costæ in this species are about eighteen in number, somewhat acute, and do not reach to the suture above, but terminate at the depression at the upper part of the whorls. The transverse liræ are fine, contiguous, and continuous over and between the costæ. Animal without eyes or operculum, and the foot is much flattened behind.

Pontiothauma Pacei, sp. n.

Testa late fusiformis, alba: anfractus 10?, superiores detriti, cæteri supra concave declives, in medio leviter angulati, oblique costati, spiraliter tenuiter lirati lineisque incrementi flexuosis sculpti, ultimus paulo inflatus, antice angustatus; apertura cum canali

longit. totius $\frac{1}{2}$ adæquans, intus fusceseens ; labrum tenue, supra late sed haud profunde sinuatum, ad medium arcuatim prominens ; columella lævis, callo tenui pallide corneo circumscripto induta ; canalis brevis, latus, obliquus, subrecurvus.

Longit. 60 mm., diam. 27 ; apertura cum canali 29 longa, 13 lata.

Hab. Station 249, S.W. of Cape Comorin, 1022 fath., green mud and Globigerina ooze; also Station 318, off W. of Ceylon, 1085 fath.

This species differs from *P. mirabile*, Smith, in having the whorls angulated in the middle, in the finer spiral liræ, more slender costæ, &c. The ribs are nineteen in number upon the body-whorl and only slightly developed in the concavity or upper part of the whorls.

A specimen from Station 318 has only sixteen costæ and the aperture is white within.

Animal apparently without eyes or opereulum.

Named after Mr. S. Pace, who kindly reported upon the soft parts of the genus *Pontiothauma* (Journ. Linn. Soc., Zool. 1903, vol. xxviii. pp. 455–462, pl. xlii.).

Clavatula navarchus (Melvill and Standen).

Pleurotoma (*Gemmula*) *navarchus*, Melvill and Standen, Ann. & Mag. Nat. Hist. 1903, vol. xii. p. 310, pl. xxi. fig. 15.

Hab. Station 258, West of Travancore, 102 fath., sand ('Investigator'); Persian Gulf, 140 fath. (*M. & S.*).

Several specimens rather smaller than the type, now in the British Museum, but otherwise the same. The opereulum is rather thick, semioval, having one side straight and the outer margin curved. The nucleus is at the middle of the straight edge, the outer surface being finely concentrically striated and the underside with a raised edge, with some concentric wrinkles in the middle. In general form the shell bears a resemblance to *C. bimarginata*, Lamarck, and *C. diadema*, Kiener.

Pleurotoma carinata, Gray.

Pleurotoma carinata, Gray; Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 368.

Hab. Stations 328, 329, S. of Lower Burmah, 61 and 46 fath.

Pleurotoma congener, Smith.

Pleurotoma congener, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 160, pl. iii. figs. 4, 5.

Hab. Station 258, W. of Travancore, 102 fath., sand;

Station 259, W. of Malabar coast, 295–360 fath., green mud and sand; Station 341, Gulf of Oman, 230 fath.

These specimens have the peculiar nodule or swelling on the upper part of the columella referred to in the case of the Ceylon examples. Operculum normal, unguiculate.

Pleurotoma vagata, Smith

Pleurotoma vagata, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 3, pl. i. fig. 3; 1904, vol. xiii. p. 456.

Hab. Station 259, W. of Malabar coast, 295–360 fath., green mud and sand; also Station 337, off Malabar coast, 271 fath.

Pleurotoma optata, Smith.

Pleurotoma optata, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 238; 1904, vol. xiii. p. 456; Illust. Zool. 'Investigator,' pl. ix. figs. 1, 1 *a*.

Hab. Same as preceding species, and Station 332, off S. of Andaman Islands, 279 fath.

Pleurotoma præsignis, Smith.

Pleurotoma præsignis, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 4, pl. i. fig. 4.

Hab. Station 281, off Coromandel coast, 300 fath.

One specimen agreeing exactly with the type from deep water off Ceylon.

Pleurotoma (*Surcula*) *Nereis*, sp. n.

Testa fusiformis, alba, epidermide tenui grisea induta; anfractus 9 ?, superiores detriti, reliqui supra declives, in medio angulati, infra angulum constricti, rectiusculi, leviter plicati, spiraliter tenuiter lirati, plicis inferne attenuatis, vix ad suturam producti, ultimus antice angustatus, undique transversim liratus; apertura elongata, antice angustata, producta, canaliculata; labrum tenue, supra prope suturam minime profunde sinuatum; columella rectiuscula, leviter sinuosa.

Longit. 35 mm., diam. 13½; apertura cum canali 18 longa, 6 lata.

Hab. Station 331, off Andaman Islands, 369 fath.

A single specimen only. The longitudinal costæ are very fine, obliquely arcuate above the angle, subnodose at the angulation, and attenuated below, so that they hardly reach to the suture. The labral sinus is very shallow indeed and the shell has a general Bela-form aspect.

Pleurotoma (*Surcula*) *subcorpulenta*, Smith.

Pleurotoma (*Surcula*) *subcorpulenta*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 161, pl. iii. fig. 6.

Hab. Station 321, off S. of Ceylon, 660 fath.

Two half-grown specimens, differing from the type in having the costæ more numerous and in their rather more slender form.

Pleurotoma (*Surcula*) *vepallida*, Martens.

Leucosyrinx vepallida, Martens, Deutsch. Tiefsee-Exped. 'Valdivia,' vol. vii. p. 80, pl. ii. fig. 6.

Hab. Station 281, off Coromandel coast, 300 fath.; Gulf of Aden, in very deep water (*Martens*).

One specimen, agreeing in all respects with the type. Said to have no operculum.

Pleurotoma (*Surcula*) *Thisbe*, sp. n.

Testa fusiformis, turrita, sordide albida; anfractus 10?, superiores erosi, cæteri supra concavi, in medio convexiusculi, oblique tenuiter plicati, plicis vel costis inferne attenuatis ad suturam vix productis, lineis incrementi tenuissimis sinuosis sculpti, infra concavitatem, supra et infra costas, transversim tenuiter striati, ultimus antice valde contractus, transversim striatus; apertura elongata, antice canaliculata; labrum tenue, ad suturam late et subprofunde sinuatum, in medio arcuatim prominens; columella curvata, callo tenui lævi circumscripto induta.

Longit. 44 mm., diam. 14; apertura cum canali 18 longa, in medio 6 lata.

Hab. Station 283, off E. of Ceylon, 1086 fath.

The chief characteristics of this species, represented by a unique specimen, are the smooth concavity at the upper part of the whorls, exhibiting only very delicate lines of growth and faint traces of spiral striæ, the numerous slender oblique costæ upon the lower two thirds of each whorl, and the distinct close wavy striæ on and between the ribs. These are nineteen in number upon the penultimate volution, thickest at their upper ends, obliquely curved, attenuated below, and only just reach to the suture. The body-whorl, excepting in the concavity above, is delicately wavy striated throughout.

Pleurotoma (*Surcula*) *agalma*, sp. n.

Testa parva, fusiformis, turrita, alba, epidermide tenui grisea induta; anfractus 11?, superiores erosi, cæteri lente accrescentes, supra ad

suturam carina tuberculata cincti, in medio angulati, serie nodulorum ornati, liris tenuibus spiralibus paucis lineisque incrementi flexuosis sculpti, liris infra angulum minute nodulosis, anfr. ultimus infra peripheriam liris transversis 14–15, partim nodulosis, cinctus; apertura parva; labrum tenue, supra angulum haud profunde sinuatum, infra arcuatim prominens; columella subrecta, callo tenui induta; canalis brevis.

Longit. 18 mm., diam. 6; apertura cum canali 6 longa, 2½ lata.

Hab. Station 269, W. of Cape Comorin, 464 fath., green mud and sand.

Only a single example obtained. The lines of growth are rather strong and very flexuous, and on passing the delicate spiral liræ, except in the concavity above the angle of the whorls and at the base of the body-whorl, are delicately nodulous. The last volution below the nodose periphery has about fifteen liræ, of which about six of the upper ones are nodulous, the rest, around the anterior contracted portion, being simple and thread-like. The tubercles on the angle are about eighteen in number, and the liræ above it three or four.

Pleurotoma (*Surcula*) *exstructa*, Martens.

Surcula exstructa, Martens, Deutsch. Tiefsee-Exped. 'Valdivia,' vol. vii. p. 81, pl. i. fig. 4.

Hab. Station 280, off Coromandel coast, 446 fath.; also Station 331, off Andaman Islands, 569 fath.; off the Nicobar Islands (*Martens*).

Pleurotoma (*Surcula*) *arcana*, Smith.

Pleurotoma (*Surcula*) *arcana*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 239; 1904, vol. xiii. p. 458; Illust. Zool. 'Investigator,' pl. ix. figs. 6, 6 *a*.

Hab. Station 276, W. of Ceylon, 1006 fath.; also Station 310, N.E. of Andaman Islands, 960 fath.

Only two specimens, with the apical whorls eroded.

Pleurotoma (*Ancistrosyrinx*) *travancorica*, Smith.

Pleurotoma (*Ancistrosyrinx*) *travancorica*, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 368; 1904, vol. xiii. p. 459; Illust. Zool. 'Investigator,' Mollusca, pl. vii. figs. 1, 1 *a*.

Hab. Station 259, W. of Malabar coast, 295–360 fath., green mud and sand.

Pleurotoma (*Bathytoma*) *Oldhami*, Smith.

Pleurotoma (*Bathytoma*) *Oldhami*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 238; 1904, vol. xiii. p. 459; Illust. Zool. 'Investigator,' Moll. pl. ix. figs. 2, 2 *a*.

Hab. Station 259, W. of Malabar coast, 295–360 fath., green mud and sand.

One dead specimen. This species is placed by Martens in *Dolichotoma* as a subgenus of *Genota*.

Pleurotoma (*Bathytoma*) *urania*, sp. n.

Testa ovato-fusiformis, alba; anfractus 10?, reliqui septem supra concavi, infra ad suturam tuberculato-carinati, transversim undique tenuiter lirati, lineis incrementi tenuibus flexuosis striati, ultimus infra angulum convexiusculus, antice contractus; apertura elongata, supra acuminata, antice canaliculata, alba, lævis; columella in medio arcuato, callo albo lævi tenui induta; canalis brevis, subobliquus et leviter recurvus; labrum tenue, supra minime profunde sinuatum.

Longit. 23 mm., diam. 11; apertura cum canali 13 longa, 4 lata.

Hab. Station 280, off Coromandel coast, 446 fath.; also Station 332, off S. of Andaman Islands, 279 fath.

The tubercles just above the suture are crossed by two or three sulci, so that each of them is tripartite or quadripartite. In some of the upper whorls the upper margin just beneath the suture is also more or less nodose.

Drillia mindanensis, Smith.

Drillia mindanensis, Smith, Ann. & Mag. Nat. Hist. 1877, vol. xix. p. 493.

Hab. Persian Gulf, 35 fath.

A single specimen, agreeing in all respects with the type from the Philippine Islands excepting that the spire is a little shorter.

Tritonidea agalma, sp. n.

Testa fusiformi-ovata, albida, epidermide fuscescente pilosa induta; anfractus 8, convexi, superiores longitudinaliter costati (costis in anfr. penultimo et ultimo sensim evanidis), spiraliter tenuiter lirati, lineis incrementi conspicue striati; apertura alba, longit. totius $\frac{1}{2}$ vix æquans; labrum extra varice incrassatum, intus tenuiter liratum; columella arcuata, callo tenui induta, antice subdentata.

Longit. 24 mm., diam. 11; apertura 12 longa, 5 lata.

Hab. Station 258, W. of Travancore, 102 fath., sand.

The epidermis is thick, longitudinally striated, and more or less hairy upon the spiral liræ. The ribs upon the upper whorls are ten or twelve in number, thick and rounded, and crossed by the spiral threads.

Metula andamanica, sp. n.

Testa angusta, elongata, albida, zonis interruptis fuscis (in anfr. penultimo duabus, in ultimo quatuor) picta, costulis numerosis longitudinalibus exilibus et liris transversis tenuibus decussata, varicibus paucis hic illic instructa; anfractus 9, primus lævis, convexus, secundus in medio transversim carinatus, tertius lævis, bicarinatus, cæteri convexiusculi, infra suturam marginati, ultimus pone descendens, sed ad labrum breviter ascendens; apertura elongata, utrinque angustata; labrum extra incrassatum, intus ad marginem tenuiter crenulatum; columella leviter arcuata, callo tenui circumscripto induta.

Longit. 26 mm., diam. 9; apertura 13 longa, 3 lata.

Hab. Off Port Blair, Andaman Islands, 100 fath.

In some respects resembling *Metula daphnelloides*, Melvill and Standen, from the Gulf of Oman, but larger and more finely sculptured. That species also exhibits variciform swellings at intervals, although they are not referred to in the description.

Phos roseatus, Hinds.

Phos roseatus, Hinds; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 463.

Hab. Station 291, Gulf of Oman, 49 fath.

Two specimens having the spire rather produced and the spiral liræ finer than usual. Also recorded from the Gulf of Oman by Melvill and Standen (Proc. Zool. Soc. 1901, vol. ii. p. 417).

Phos (*Strongylocera*) *textum*, Gmelin.

Phos textum, Gmelin; Tryon, Man. Conch. vol. iii. p. 217, pl. lxxxiii. figs. 498, 503, 504 (bad).

Hab. Andaman Islands, 60 fath.; Andaman Islands (*Smith*), Proc. Zool. Soc. 1878, p. 811.

Nassa subsimilis, sp. n.

Testa parva, ovata, supra acuminata, albo-fuscescens, zonis duabus indistinctis dilute rufis supra anfractum ultimum ornata, cancellata; anfractus 9, superiores læves, in medio angulati et carinati, cæteri convexiusculi, turriti, costis longitudinalibus numerosis et

liris spiralibus (in anfr. penultimo 6, in ultimo circiter 20) cancellati, nodulis subquadratis, sutura profunda canaliculata sejuncti; apertura acuminate ovata, albo-fuscescens; labrum ad marginem denticulatum, extra incrassatum, intus liris brevis circiter 12 instructum; columella valde arcuata, callo tuberculato circumscripto induta; canalis anticus brevis, obliquus.

Longit. 17½ mm., diam. 7½; apertura cum labro 7½ longa, 4 lata.

Hab. Station 244, off west coast of India, 119–124 fath.

Somewhat recalling *N. eucomista*, Melvill and Sykes, from the Andaman Islands (Proc. Malac. Soc. vol. ii. p. 169, pl. xiii. fig. 11), but with a longer spire, shorter body-whorl, with the granules closer and squarer, and the margin of the labrum more denticulate. *N. ravida*, A. Adams, is another allied form, but much more globose. As in many other species of *Nassa*, the upper row of nodules below the suture are slightly larger than the rest.

Nassaria lævior, Smith.

Nassaria lævior, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 242; 1904, vol. xiii. p. 464; Illust. Zool. 'Investigator,' pl. x. figs. 6, 6 *a*.

Hab. Off Port Blair, Andaman Islands, 100 fath.

Nassaria coromandelica, Smith.

Nassaria coromandelica, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 163, pl. iv. fig. 3.

Hab. Station 276, W. of Ceylon, 1006 fath.; Station 258, W. of Travancore, 102 fath., sand; N.W. of Calicut, 100 fath.

In some of these specimens the longitudinal costæ are less numerous than in the type figured, and a few of them are larger than the rest and varieiform.

Nassaria nodicostata (A. Adams).

Nassaria nodicostata (A. Adams), Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 463.

Hab. Off Port Blair, 100 fath.; Andamans, 60 fath.

Fusus robrolineatus, Sowerby.

Fusus rubrolineatus, Sowerby, Proc. Zool. Soc. 1870, p. 252; Thesaur. Conch. vol. iv. p. 80, pl. cccexi. fig. 68.

Hab. Station 337, off Malabar coast, 271 fath.; also "Indian Seas," 1055 fath. ('Investigator'); Agulhas Bank (*Sowerby & Martens*).

The figure of this species in the 'Thesaurus' is very bad, the costæ being represented too broad and too few in number. I have a very strong impression that *F. rufinodis*, Martens *, is only a variety of this species.

Fusus incertus, sp. n.

Testa fusiformis, alba; anfractus 8?, superiores detriti, cæteri convexi, costati, costis in anfractu penultimo circiter 13, liris filiformibus confertis undique spiraliter cincti lineisque incrementi striati, ultimus infra medium contractus, costis antice evanidis; apertura inverse piriformis, cum canali longit. totius ½ æquans; columella tortuosa, callo lævi induta; canalis angustus, obliquus, recurvus.

Longit. 51 mm., diam. 22; apertura cum canali 25 longa, 9 lata.

Hab. Station 317, off W. of Ceylon, 590 fath.

A single specimen in dead condition. It somewhat recalls the British *Tritonofusus* (*Siphonorbis*) *fusiformis* (Broderip), except that the body-whorl is produced into a longer rostrum anteriorly.

The spiral thread-like lines are very fine and close-set, and occasionally two or three form slightly raised ridges. Three or four such ridges are noticeable on the upper whorls and almost form nodules upon the costæ. The lines of growth are close together, and on crossing the transverse liræ give them a minutely crispate appearance.

Manaria, gen. nov.

Testa fusiformis, longitudinaliter costata, periostraco induta; columella in medio plica unica intrante instructa; labrum ad marginem tenue, intus incrassatum et liratum. Operculum unguiforme, corneum.

This genus has the general aspect of a costate *Tritonofusus*, but is distinguished by the fold on the columella and the lirate aperture.

Manaria Thurstoni, sp. n.

Testa breviter fusiformis, alba, periostraco luteo induta, longitudinaliter costata et spiraliter striata; anfractus 9?, superiores abrupti, reliqui leviter convexi, sensim accrescentes, ultimus costis 16–17 infra medium evanidis instructus, antice breviter rostratus; apertura elongata, alba; labrum ad marginem acutum,

* Deutsch. Tiefsee-Exped. 'Valdivia,' vol. vii. p. 103, pl. ii. fig. 10.

intus inerassatum et denticulatum ; columella supra arcuata, infra obliqua, in medio plica unica intrante munita, callo albo induta.
Longit. 33 mm., diam. 12·5 ; apertura cum canali 14 longa, 5 lata.
Operculum unguiforme, fusco-corneum.

Hab. Station 333, Gulf of Manar, 401 fath.

The longitudinal costæ are not very thick and do not vary much in stoutness, and they are crossed by the spiral sulci or striæ, which are about eight in number on the penultimate whorl. The periostracum is rather thick and longitudinally striated with the lines of growth. The denticles within the labrum are six or seven in number, and from them faint liræ run inwards. The fold on the columella is peculiar and forms a prominence at the middle. It is somewhat oblique, but how far it is continued up the columella I cannot say, as only a single specimen is at hand, and that is too precious to break up. Named in honour of Mr. Edgar Thurston, of the Madras Museum.

Trophon (*Boreotrophon*) *planispina*, sp. n.

Testa fusiformis, alba ; spira elongata, turrita ; anfractus 10 ?, superiores abrupti, cæteri supra declives, in medio angulati, infra contracti, longitudinaliter lamellati, lamellis appressis, ad angulum spinas planas sursum inclinatas formantibus ; anfr. ultimus antice rostratus ; apertura alba irregulariter triangularis, cum canali longit. totius $\frac{1}{2}$ subæquans ; labrum tenue, ad angulum canaliculatum ; columella contorta, supra arcuata, callo tenui induta ; canalis haud reetus, leviter recurvus.
Longit. 37 mm., diam. 25 ; apertura cum canali 18 longa, 6 lata.

Hab. Station 327, W. of Burmah, 419 fath.

Very like *T. cardnelis*, Watson *, from off Sydney in 410 fath., but with a longer spire and compressed or flattened spines at the angle of the whorls. The lamellæ which form the spines are quite closely appressed to the shell, whereas in *cardnelis* they stand away quite free from the general surface of the whorls. A very similar form, *T. actinophorus*, Dall, occurs in the West Indies in 110–218 fath.

Murex axicornis, Lamarck, var.

Murex axicornis, Lam. ; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 462.

Hab. Andaman Is., 53 fath.

* 'Challenger' Gasteropoda, p. 167, pl. x. fig. 7.

Murex rectirostris, Sowerby, var.

Murex rectirostris, Sowerby, Proc. Zool. Soc. 1840, p. 138; Reeve, Conch. Icon. vol. iii. fig. 91.
Murex rectirostrum, Sowerby, Conch. Illust. sp. 11, fig. 111.

Hab. Station 328, S. of Lower Burmah, 61 fath.

The specimens from this locality differ from the type only in having the transverse lirae red. The specimens in the Cuming collection appear to have been over-cleaned with acid, and consequently this red lineation, of which, however, I can still find traces, may have been destroyed. The locality given by Reeve, "West Colombia," I regard as a mistake, for Mr. G. B. Sowerby informs me that he knows it for a certainty as a Hong Kong species.

Bursa rana, Linn.

Ranella albivaricosa, Reeve, Conch. Icon. vol. ii. fig. 2.

Hab. Off Port Blair, Andaman Is., 100 fath.; Ceylon (*Reeve*).

Bursa (*Bufonaria*) *lampas* (Linn.).

Hab. Andaman Is., 60 fath.

A young, finely granose example of this species, so remarkable on account of such great variation both in size and sculpture.

Gyrineum bituberculare (Lamarck).

Ranella bitubercularis, Lam.; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 470.

Hab. Andaman Is., 60 fath.

Gyrineum (*Biplex*) *perca* (Perry).

Ranella (*Biplex*) *perca* (Perry), Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 6; 1904, vol. xiii. p. 470.

Hab. Off Port Blair, 100 fath.

Distortrix cancellinus (Roissy), var.

Distortrix cancellinus (Roissy), Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 263; 1904, vol. xiii. p. 470.

Hab. Station 246, W. of Calicut, 68–148 fath., sand and stones; Station 341, Gulf of Oman, 230 fath.

The specimens from the above locality are nearest the var. *decipiens* and are rather shorter and more stumpy than Reeves's type.

Pirula ficoides, Lamarck.

Pirula ficoides, Lam.; Smith, Journ. Malac. vol. iii. p. 67.

Hab. Station 248, W. of Travancore, 224–284 fath., sand.

Morio Alcocki, sp. n.

Testa ovato-fusiformis, ventricosa, tenuis, alba, periostraco tenui olivaceo griseo induta, spiraliter tenuiter lirata, lineis incrementi tenuibus arcuatis striata; anfractus 9, sensim accrescentes, convexi, sutura profunda canaliculata sejuncti, ultimus antice contractus, ad aperturam ascendens; apertura obliqua, alba, subauriformis; labrum vix incrassatum, leviter expansum; columella in medio arcuata, callo tenui lato labro juncta; canalis anterior obliquus, recurvus.

Longit. 99 mm., diam. max. 61; apertura cum canali 64 longa, 27 lata.

Operculum corneum, dilute fuscescens, elongatum, concentrice striatum, prope nucleum paucispirale; nucleus haud centralis. Longit. 37 mm., diam. 18.

Hab. Station 280, off Coromandel coast, 446 fath.

In form rather like the *M. rugosa*, Linn., of the Mediterranean and N. Atlantic, but with a rather longer spire, a broader aperture, finer liration, and a more deeply channelled suture. It is also imperforate, the columellar callus being appressed to the shell throughout its length, and not free and prominent as in the species referred to.

Oocorys sulcata, Fischer, var. *indica*.

Oocorys sulcata, Fischer, J. de Conch. 1883, p. 392; Dall, Bull. Mus. Comp. Zool. Harvard, vol. xviii. p. 228; Watson, 'Challenger' Gasteropoda, p. 412, pl. xvii. fig. 11; Locard, Moll. 'Travailleur' and 'Talisman,' p. 288, pl. xv. figs. 4–6.

Hab. Station 278, off S. of Ceylon, 1912 fath.

A single specimen, length 42·5 mm., diam. 28, differs from the 'Challenger' Atlantic form in size and in possessing an unclosed umbilical opening. The latter, however, might possibly be concealed if the columellar callus were not broken at that part or had the specimen lived a little longer and so completed the reflection of the callosity. The spiral liræ appear to be rather more remote from one another, but this results from the larger size of the specimen. The remarkable lines of growth, causing the liræ to be crenulated, are of the same character in both specimens, and the operculum is horny and spiral, as described and figured by Verrill * of his genus *Benthodolium*, which is evidently

* Trans. Connect. Acad. vol. vi. p. 177, pl. xxxi. fig. 12 *a*.

synonymous with *Oocorys*; indeed, it seems almost certain that *O. sulcata*, Fischer, *O. Fischeri*, Locard, and *B. abyssorum*, Verrill, are varieties of one and the same species. The last-named species is described both by Dall and Verrill as having an umbilical chink, a feature present in the Indian Ocean shell. It is essentially a deep-water genus, having been recorded by Verrill from 2221 fath., by Fischer from 1980 fath., by Watson from 1850 fath., by Dall from 955 fath., and the present specimen is from 1912 fath. Dall, however, has mentioned the occurrence of *O. abyssorum* in 169 fath. in the northern part of the Gulf of Mexico.

In connexion with similar forms in the Indian Ocean and the Atlantic, I might recall the fact of the occurrence of *Lucina spinifera* (Montagu) * and *Poromya tornata* (Jeffreys) in both oceans, and that *Turbo indicus*, Smith, from off Ceylon in 597 fath., is scarcely separable from *T. peloritanus*, Cantraine.

Rostellaria Powisii, Petit.

Rostellaria Powisii, Petit; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 469.

Hab. Station 237, off Andaman Islands, 90 fath., stones; and off Port Blair, 100 fath.

Mitra (*Turricula*) *melongena*, Lamarck.

Mitra turricula, Lamk.; Reeve, Conch. Icon. vol. ii. figs. 47 *a*, *b*; Sowerby, Thes. Conch. vol. iv. pl. cccliii. figs. 18, 19.

Hab. Andaman Islands, 60 fath.; Molucca and Philippine Islands.

The single specimen agrees with the figures given by Sowerby.

Columbella suavis, sp. n.

Testa parva, ovato-fusiformis, sordide albida, lineis longitudinalibus opaco-albis, infra medium anfractus ultimi rufis, obscure picta, nitida, subprismatica; spira conica; anfractus 7, superiores tres convexi, cæteri fere plani, ultimus ad medium rotunde subangulatus; apertura irregulariter ovalis; labrum ad marginem acutum, extra varice instructum, intus læve; columella fere recta, haud callosa.

Longit. 5 mm., diam. 2·25; apertura 1·5 longa, 1 lata.

Operculum minutum, ovatum, nucleo laterali.

* See A. Alcock's 'A Naturalist in Indian Seas,' 1902, p. 280, fig. 77.

Hab. Off Sacramento Shoal, off the Delta of the Godavari River, 70 fath.

A small smooth species with peculiar markings and a prismatic surface. Possibly the latter feature may have been produced by the medium in which they have been preserved. Two indistinct pale brownish blotches can be traced upon the labral varix, one at the middle, the other below.

Columbella (*Meta*) *philippinarum*, Reeve.

Columbella philippinarum, Reeve (1842), Conch. Icon. vol. xi. figs. 207 *a–c*.

Columbella epamella, Duclos, Chenu's Illust. Conch. pl. v. figs. 19–20 (1846–1858).

Hab. Andaman Is., 60 fath.

Marginella grisea (Jousseaume).

Marginella grisea (Jousseaume), Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiii. p. 468.

Hab. Station 328, S. of Lower Burmah, 61 fath.

Ancilla Alcocki, sp. n.

Testa ovato-cylindracea, fusca, antice saturate fusco balteata, supra spiram callo albo induta; anfractus 4–5, ultimus supra medium linea impressa obliqua bisectus, transversim tenuiter striatus, lineisque incrementi exilissimis sculptus; spira obtusa, ad apicem mucronata; apertura elongata, angusta, albida; columella superne callo crasso supra producto amicta, antice alba, oblique sulcata; labrum leviter incrassatum, ad marginem fuscum, supra late sed haud profunde sinuatum.

Longit. 38 mm., diam. 16.

Operculum magnum, nigro-fuscum, elongatum, apice terminali, costa rotundata marginem versus externum instructum. Longit. 16 mm., diam. 5.

Hab. Station 322, Andaman Is., 378 fath.

This species is well distinguished by its very remarkable form, no other species having such a peculiar obtuse spire. The operculum also is remarkable on account of its narrow form and the rounded ridges almost parallel with the outer margin, which is also thickened.

Natica dimidiata, sp. n.

Testa globosa, anguste umbilicata, alba, rufo-fusco late fasciata, infra suturam alba, lineis incrementi oblique striata; anfractus 4, convexi, ultimus globosus; apertura semicircularis, supra rufescens, infra alba; columella callo crassiusculo instructa, in umbilico

porcam mediocriter prominentem formans. Operculum testaceum planum, margine externo curvato liris duabus instructo.
Longit. 19·5 mm., diam. 19.

Hab. Station 333, Gulf of Manar, 401 fath.

The umbilical callosity forms a not much raised swelling at the lower part of the opening ; in *N. rufa* it is higher up. The flat operculum is not thick, and the two ridges upon the curved margin are raised above the general surface and are separated by a narrow deep groove. Within the inner ridge and parallel with it the flat surface exhibits a few obscure shallow sulci. Viewed from the front the upper part of the shell is brown and the lower half white.

Natica simulans, sp. n.

Testa globosa, late umbilicata, alba, epidermide tenui olivacea induta, lævis, lineis incrementi obliquis striata ; anfractus 5–6, convexi, celeriter crescentes, ultimus supra subhumerosus ; apertura obliqua, semicircularis, alba ; columella callo mediocriter tenui labro juncta. Operculum corneum.
Longit. 29 mm., diam. 27 ; apertura 20 longa, 11 lata.

Hab. Stations 324 and 327, W. of Burmah, 448 and 419 fath. ; Station 280, off Coromandel coast, 446 fath.

In form resembling the British *N. catena*, but thinner, without markings, and rather more widely umbilicated. The lines of growth are slightly plicate beneath the suture and upon the margin of the umbilicus, and there are faint traces of very fine transverse striation upon the body-whorl.

In the specimens from Station 280 the plicæ upon the margin of the umbilicus are conspicuously strong, but in other respects agree with the larger shell described from Station 327. They are only 21 mm. in diameter, but may not be full-grown.

Natica incerta, sp. n.

Testa obliqua, subglobosa, late umbilicata, alba, fascia latissima dilute fuscescente circa anfractum ultimum ornata, lævis, lineis incrementi obliquis striata ; anfractus 5, celeriter accrescentes, leviter convexi, ultimus magnus, antice paulo descendens ; apertura oblique semicircularis, intus pallide purpureo-fusco tincta ; columella obliqua, fere rectilinearis, vel in medio leviter prominens, superne callo crasso reflexo labro juncta.
Longit. 26 mm., diam. 24 ; apertura 19 longa, 10 lata.

Hab. Station 248, W. of Travancore, 224–284 fath., sand.

A widely umbilicated form, without any callous ridge

within the opening. Besides the obscure broad zone above referred to, the suture also is bordered beneath with the same colour.

Natica apertissima, sp. n.

Testa subglobosa, latissime umbilicata, tenuis, sordide albida, lævis, lineis incrementi striata; anfractus 5, perconvexi, sutura profunda sejuncti, ultimus circa umbilicum pervium obtuse angulatus; apertura alba, oblique semicircularis; columella tenuis, callo tenui reflexo labro juncta. Operculum corneum.

Longit. 15 mm., diam. 15; apertura 10 longa, 6 lata.

Hab. Station 343, Gulf of Oman, 609 fath.

This species is remarkable for its thinness and the very open pervious umbilicus. Upon the upper whorls the lines of growth beneath the suture are rather strong or subplicate.

Natica inutilis, sp. n.

Testa ovato-globosa, mediocriter late umbilicata, alba, lævis, lineis incrementi oblique striata; anfractus 5, convexi, ultimus antice oblique descendens; apertura obliqua, semicircularis, alba; columella rectilinearis, obliqua, supra callo reflexo appresso labro juncta.

Longit. 19 mm., diam. 17; apertura 12 longa, 6 lata.

Hab. Station 259, W. of Malabar coast, 295–360 fath., green mud and sand.

A smaller thinner shell than *N. incerta*, more ovate in form, and apparently without any colour. The lines of growth are more conspicuous below the suture than elsewhere. Under a lens the surface is seen to be very finely spirally striated.

Only a single specimen obtained.

Natica albospira, Smith.

Natica albospira, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 6, pl. i. fig. 8.

Hab. Station 269, W. of Cape Comorin, 464 fath., green mud and sand; Station 259, W. of Malabar coast, 295–360 fath., green mud and sand; Station 337, off Malabar coast, 271 fath.

This species somewhat resembles the widely distributed *N. maroccana*, but has a different operculum.

Natica rufa, var.

Natica rufa, var., Smith, Ann. & Mag. Nat. Hist. 1894, p. 165, pl. iv. figs. 14, 14 *a*.

Hab. Station 248, W. of Travancore, 224–284 fath., sand.

Quite similar to the specimens previously described, but rather larger and with a wider umbilicus. Diam. 27 mm., alt. 27.

Natica apora, Watson.

Natica (*Amauropsis*) *apora,* Watson, 'Challenger' Gasteropoda, p. 454, pl. xxvii. fig. 11.

Hab. Station 318, off W. of Ceylon, 1085 fath. ('Investigator'); off Arrou Is., 800 fath. ('Challenger').

One specimen only, a little larger and more globose than the type, but otherwise similar.

Siliquaria muricata, Born.

Serpula muricata, Born, Test. Mus. Cæsar. Vindobon. p. 440, pl. xviii. fig. 16; Tryon, Man. Moll. vol. viii. pl. lviii. figs. 23–25 (*S. anguina*).

Hab. Andaman Islands, 60 fath.

Radius volva (Linn.).

Hab. Station 328, S. of Lower Burmah, 61 fath.

Also quoted from China, Philippine Islands, Japan.

Trifora corrugata, Hinds.

Triforis corrugatus, Hinds; Tryon, Man. Conch. vol. ix. p. 189, pl. xxxix. fig. 59.

Hab. Station 291, Gulf of Oman, 48–49 fath.

Originally described by Hinds from New Guinea. The species is also quoted by Messrs. Melvill and Standen (P. Z. S. 1901, vol. ii. p. 376) from the Persian Gulf, Maskat, coast of India, and Karachi. It is also known from the Straits of Malacca, Kingsmill Is., and New Caledonia.

[To be continued.]

XXVI. — *Notes on the Genus* Tamarrha, *Wkr.* [Lep.—Tineina]. By the Rt. Hon. Lord Walsingham, M.A., LL.D., F.R.S.

Mr. Busck (Pr. U.S. Nat. Mus. xxx. 728–30) discusses the genus *Tamarrha,* Wkr., and quotes a paragraph for which I am responsible (Proc. Zool. Soc Lond. 1897, p. 114).

I wrote of *T. nivosella*, Wkr.:—"At the time [when I had wrongly sunk *Tamarrha* as a synonym of *Psecadia*] I had seen only the type of Walker's other species *nivosella*, which is a ♀." Had I used the word "examined" for "seen" the meaning of the paragraph would have been more apparent.

Mr. Busck is now able to say that *T. gelidella*, Wkr., is not a *Psecadia* (as I had supposed), but is congeneric with the type of *Tamarrha*, a conclusion which he founds on his study of West-Indian specimens; and, after admitting the synonymy of his own genus *Babaiaxa*, which consequently sinks, he writes it "is evidently the species which Zeller subsequently described as *Psecadia exornatella*."

Zeller described (Hor. Soc. Ent. Ross. xiii. pp. 238–40) *Psecadia exornata* (not *exornatella*) from two males taken at Chanchamayo, Peru, with which he associated under a separate description two smaller males from Cuba, all in Museum Staudinger. I have a single male from the same Peruvian collection, purchased from Staudinger in 1891, which agrees absolutely with Zeller's figure and with his first description, and has a smooth head. It seems more than probable that the Cuban specimens are not identical with those from Peru. I have also a female from Jamaica in which the costal shade reaches the base instead of being broken up into spots; the central band is distinctly continuous with the costal shade, not separated from it, the white patches much more clearly defined and separated from each other; this specimen agrees absolutely with the type of *T. gelidella*, Wkr., and is certainly not the Peruvian *exornata*, Zell. It may be interesting to observe that the locality "Chanchamayo" is not to be found in maps; the collector Thamm is known to have referred to a valley on the eastern slopes of the Andes; "Dr. Staudinger schreibt mir darüber: Thamm sammelte in den Cordilleren in einer Höhe von 2000–3000′, selten noch höher, am Chanchamayo, einem Nebenfluss des sich in den Amazonenstrom ergiessenden Ucayale, unter dem 12 Grad südlicher Breite" [Z., Hor Soc. Ent. Ross. xiii. 4 (1877)]. "Chanchamayo" is said to mean "Humming-bird" in the local language. Such confusion is not unfrequent among travellers, as when Captain Cook tried to ascertain the native name for a well-known animal and received the answer "Kangaroo," signifying "I don't know what you mean."

We now come to *Tamarrha nivosella*, Wkr., the type of the genus, or, rather, the selected exponent when *Tamarrha* was revived. Zeller, in describing his *Psecadia adustella*, which I have identified as a synonym of *nivosella*, Wkr.,

regarded his species as sexually dimorphic, and pointed out the differences between the ♂ and the ♀, especially the greater extent of the grey colouring in the ♂, which in the ♀ was cut off by the white costal area above the dorsal patch. I have both these from Jamaica, with both sexes of each, and they are distinct species. The less clouded form, of which Zeller had only the ♀, is not the same as the ♀ described by Walker, and seems uniformly smaller and paler than the other; but there is one point which now enables me to identify without doubt Zeller's ♂ *adustella*—he specially mentions "Fühler beim ♂ mit auffallend verlängerten . . . . Wurzelgliede." This applies to the darker form only, precisely as seen by Zeller, and is most remarkable. Walker's two ♀ ♀ are undoubtedly this species, of which I have now a ♂ with the long basal joint, but his ♂ differs in the short basal joint of the antennæ as well as in the details of the markings.

There are at least three other species, differing very slightly, from Cuba, Jamaica, and Domingo. Zeller's Portorico females may probably come to be identified with one of these and possibly with the genus *Euarne*, Mschl. + Saalm.

I send these notes at once, since I have no leisure at present to study in further detail the interesting papers on Microlepidoptera lately published and kindly sent by Mr. Busck. No one can more highly appreciate the excellent work he is doing; but it seems a pity that facilities are not afforded to authors of scientific papers published by the American Government for correcting proofs. Had the proofs passed through the author's hands, such errors as "Zellar" for "Zeller," "Floræ" for "Horæ," "*nievosella*" for "*nivosella*," "Hyponementidæ" for "Hyponomeutidæ," &c., &c., would certainly have been avoided: all these and "Yponomeutidæ," to which *I* am said to have referred *Tamarrha*, are on p. 729.

If I were wrong in placing the genus *Tamarrha* in the Hyponomeutidæ, additional material obliges me to take exception also to associating it with the Œcophoridæ. Does Mr. Busck know the African genus *Gymnogramma* and others with veins 7+8 of the fore wings stalked, or *Trichostibas*, Zeller, (= § *Penthetria*, H. Edw.) ? and would these affect his opinion as to the extent of the Hyponomeutidæ? I would now rather incline to placing *Tamarrha* with the Azinidæ, founded on an Asiatic genus and characterized by the continuation of the discoidal vein direct to vein 8.

I cannot conclude without drawing attention to a quotation on p. 733, where the author cites Dr. Dietz's reference to

"the apparently heretofore overlooked" character, the more or less furcation of "vein 1 *b* in the hind wings," which he finds in several genera of the Tineinæ. In Tr. Ent. Soc. Lond. 1891, 102, when criticising de Peyerimhoff's reliance on this character as distinguishing the Tortricidæ from the Tineidæ, I remarked that the furcation of vein 1 *b* occurred in a number of Tineid genera, and even in "*Tinea tapetzella*, L., itself."

May I suggest that the application of the word "overlooked" is capable of extension, but not in the direction indicated (*vide l. c.* pl. vii.)?

XXVII.—*Description of a new Tineid Moth infesting Cotton-pods in Egypt.* By the Rt. Hon. Lord Walsingham, M.A., LL.D., F.R.S.

Tineina.

Tineidæ.

Stagmatophora, H.-S.

Stagmatophora gossypiella, sp. n., Wlsm.

Antennæ rather more than $\frac{1}{2}$, slightly biserrate; yellowish white, with two rather broad brown bands on the outer fourth; the basal joint rather stout, elongate, with a dark brown band across the upperside before its apex and bearing a thin and fugitive pecten. *Labial Palpi* moderately long, recurved, median joint slightly roughened beneath, terminal joint longer than median, slender, acute; whitish ochreous. *Maxillary Palpi* short, converging. *Head* and face smooth; whitish ochreous. *Thorax* whitish ochreous. *Forewings* narrow, elongate, acute; whitish, somewhat smeared with pale brownish ochreous, of which a sinuate diffused streak, commencing below the costa at two fifths, runs to the apex; a similar more slender streak indicated below it parallel with the upper edge of the fold; at the base of the costa is a narrow elongate blackish patch, abruptly and obliquely terminated at its outer end; a patch of blackish scales lies at the end of the cell upon the brownish ochreous scaling, which is somewhat intensified beyond it; other black scales, forming an inwardly oblique costal streak before the apex,

are extended through the cilia above it, a few more black scales tending to form another diverging streak running through the cilia below the apex; apical cilia brownish ochreous, terminal cilia paler, but tipped with black, dorsal cilia smoky. *Exp. al.* 11·5 mm. *Hindwings* at the base ½, tapering outward to an acute apex: of a slightly paler shade and more shining than their long smoky grey cilia, which only become slightly paler at the apex. *Abdomen* smoky grey. *Legs* whitish, spotted with black.

Type ♂. Mus. Wlsm.

Hab. Egypt. Larva in cotton-pods.

When the forewings are denuded transverse striæ are observable, between the veins, giving a reticulated appearance. These are due to lines of thickening from which the majority of the highly-developed scales arise; they are almost perpendicular and extend from costa to dorsum. This structure occurs also in *Opoyona aurisquamosa*, Btl., and in *Staymatophora* (*Pyroderces*) *argyrogrammos*, Z.; if not overlooked it is apparently unrecorded.

The specimens are broken and in poor condition. The habits of the species are particularly interesting, as being apparently similar to those of *Batrachedra Rileyi*, Wlsm., discovered in Georgia among rotten cotton-bolls. The similarity in colour and markings between the two insects is so close as to suggest the idea of mimicry (which, in this case, can of course be only synchromatism); but the form of the palpi and the breadth of the hind wings, apart from the question of neuration, are at once sufficient to distinguish them and to place them in different genera.

Note.—In February last Mr. Walter Draper, of the Government Gardens, Delta Barrage, Egypt, sent to the British Museum some cotton-pods infested with a Hemipterous insect (*Oxycarenus hyalinipennis*, Costa) and numerous small caterpillars. Lately on looking at the bottle I found a number of small moths, all dead, and mostly with all their scales rubbed off. As Mr. Draper, who discovered this new pest in the cotton, wished to have its name, I sent specimens to Lord Walsingham for determination, and these are the subjects of the foregoing description.—Chas. O. Waterhouse.

XXVIII.—*On new Species of* Histeridæ *and Notices of others.* By G. Lewis, F.L.S.

This paper, the twenty-eighth, follows one published last April, and the series as a whole will in a measure serve as a supplement to Marseul's Monograph of 1853–1864. Marseul established very few genera, less than forty in all, and apparently he was reluctant to increase their number, although, had he had more material at his hand, there is little doubt he would have founded others. He would not, for instance, have associated *Phylloma bahiense* and *corticale*, F., or *Sternaulax zelandica* and *Edwardsi*, Mars., in the same genera if he had known more than a single species of each kind. To-day our knowledge of the family is but a little more advanced, as the Histeridæ belong to a class of insects which, being small and of secretive habits, do not come within the observation of general collectors, and they also require special methods of search, as some attach themselves to other insects, such as ants, termites, wood-boring Coleoptera, &c. It is a matter for regret that collectors, while overlooking the Histeridæ, miss many curious species of Colydiidæ and others which are commensal with them; this applies especially to collections made in the tropics.

One of the most curious discoveries of recent years is the finding of one of the Saprinini, *Chelyoxenus xerobatis*, Hubb., which has asymmetrical claws, in the galleries made by a tortoise, *Gopherus polyphemus*, in Florida, and another of nine or ten species of *Monoplius* in the tenements raised by the termite *Hodotermes Havilandi*, Sh., in S. Africa.

In my recent Catalogue varietal names (Ann. & Mag. Nat. Hist. vol. xvi. p. 340, 1905) appear as part of the synonymy, and I observe with satisfaction that the Recorder of the 'Zoological Record,' 1904, remarks that "the naming of varieties is at present carried to a great extent, and we have not space to record them all, but we endeavour to point out all that appear to be of real importance." Any name reasonably and purposely omitted in the annual register of the 'Record' is practically deleted, and a recognized method of deletion of superfluous names is annually becoming more and more desirable. The Recorder also says: "It may not be superfluous to add that the study of variation is by no means dependent for advancement on the naming of varieties."

List of Species.

Lioderma patulum.
Teretrius rectistrius.
Plæsius edentulus.
Apobletes excavatus.
—— mitis.
Platylister placitus.
Idister mendax.
Contipus fractistrius.
—— proximus.
Hister æneus.
—— multidens, *Sch.*
Notolister unistrius.
—— catenatus.
—— ovatus.
Asolenus, gen. nov.
Pachycrærus laticeps.
Pelorurus ruptistrius.

Lioderma patulum, sp. n.

Lato-ovatum, subdepressum, nigrum, nitidum; fronte plana absque striolis, mento longitudinaliter canaliculato antice utrinque minute tuberculato; pronoto lateribus parce punctato, stria marginali basi multum abbreviata et ad angulos subfoveolata; elytris margine inflexo lævi, striis subhumerali lata profunde excavata, 1 dorsali brevi, 2 integra basi incurvata; propygidio circum parce punctulato; pygidio leviter punctulato; prosterno modice lato; tibiis anticis 4-dentatis.

L. 9 mill. (absque mandibulis).

This species is very similar to *L. latum*, Mars., but it differs by being more oval, by the canaliculation of the mentum, on the anterior edge of which are two small tubercles, by the shorter mandibles, by the thoracic stria being shortened behind the middle (not at the base only), and by the stria terminating at the anterior angle, not close to the eyes, where it widens out into a small and shallow fovea. The punctuation of the propygidium is also finer. *L. patulum* particularly agrees with *P. latum* in the second dorsal stria being markedly incurved at the base, by the prosternum being broad, and in having the mentum of an exceptional structure. As regards the width of the prosternum, both species agree with those of *Hololepta*, but Marseul placed *latum* in *Lioderma*, and it is known that these genera are not at present well defined. The pygidium of *L. latum* is finely punctulate, not smooth, as stated by Marseul in his Monograph, p. 215.

Hab. Marcapata, Peru.

I have not seen the female.

Teretrius rectistrius, sp. n.

Cylindricus, undique punctatus, rufo-brunneus, nitidus; elytris fusco-marginatis; prosterno bistriato, striis rectis; tibiis anticis 5-dentatis.

L. $1\frac{3}{4}$ mill.

Cylindrical, uniformly and rather densely punctured above,

reddish brown, with the margins of the elytra, sterna, and base of the first segment of the abdomen infuscate; the forehead is convex and the marginal stria of the thorax complete; the prosternum, the lobe is marginate and the striæ of the keel are parallel to each other throughout their length; the mesosternum, the marginal stria is complete and well marked, and its surface rather sparsely punctured, and the metasternum is somewhat similarly punctured, except that the punctures are larger posteriorly; the anterior tibiæ are 5-dentate.

Hab. Madagascar. Northern Androy, Imanombo (*Dr. J. Decorse*, 1901).

In the Paris Museum and my own collection.

Plæsius edentulus, sp. n.

Oblongus, niger, nitidus; fronte stria obsoleta, mandibulis haud dentatis; pronoto, stria marginali antice late, stria laterali basi, interruptis; elytris striis dorsalibus punctiformis.
L. 12½ mill.

Oblong, parallel at the sides, black and shining; the head, mandibles not dentate, frontal stria short and scarcely visible; the thorax, marginal stria widely interrupted behind the head, the lateral stria is not deeply impressed (like those of the other species of the genus) and it is broken near the base; the elytra, striæ, outer humeral very short and near the middle, inner humeral commences near the middle and becomes punctiform near the apex, 1 dorsal punctiform and apical and scarcely reaches the middle, 2–3 punctiform and half the length of the first, 4 is represented only by two or three punctures, and the marginal stria is well marked and ceases at the suture; the pygidia are coarsely and densely punctate; the prosternum is not striate and the anterior lobe is impunctate, with the marginal stria widely interrupted in front; the anterior femora are smooth.

In its general outline this species resembles *P. javanus*, Er., except that it is rather more parallel laterally; it is remarkable for its simple mandibles and interrupted lateral thoracic stria. The anterior femora of *javanus* are transversely rugose and the anterior prosternal lobe is punctured and the marginal stria complete.

Hab. New Britain (*A. Willey*, 1895–97).

Apobletes excavatus, sp. n.

Ovalis, deplanatus, niger, nitidus; fronte punctulata, anterius excavata, stria transversa tenuiter impressa leviter recurva; pronoto

lateribus punctato, pone angulos paulo rugoso, stria marginali antice anguste interrupta; elytris striis dorsalibus 1–2 integris, 3 late interrupta; propygidio sparse minime profunde, pygidio grosse haud dense, punctatis; mesosterno bisinuato, stria marginali in medio interrupta; tibiis anticis 4-dentatis.
L. 4–4½ mill.

There is a close resemblance between this species and *A. tener*, Mars., but the forehead is markedly excavated, the frontal stria is not straight, the lateral thoracic band of points being large and more dense and behind the anterior angle some are confluent, close to the anterior angle is a small red mark; the elytra, the fourth stria is represented by only a single puncture; the propygidium is chiefly punctate along its basal edge and the punctures are large and very shallow; the pygidium, the punctures are larger but similarly dense to those of *tener*.

Hab. Nilgiri Hills, S. India (*T. R. Bell*).

Apobletes cavifrons, Lew., first described from specimens from Assam, has been found by Mr. Bell in Kanara.

Marseul says (Mon. pp. 857–858) that the mesosterna of *A. tener* and *Schaumi* are marginate; but they are not wholly marginate, the striæ are interrupted like those of *A. excavatus*, and the mesosternal stria in *excavatus* being deeper, the interruption is more conspicuous.

Apobletes mitis, sp. n.

Oblongo-ovatus, depressus, niger, nitidus; fronte punctulata, stria transversa nulla; pronoto stria marginali late interrupta; elytris striis 1 postice paulo abbreviata, 2–3 integris, 4–6 apicalibus; tibiis anticis 4-dentatis.
L. 5–5½ mill.

Oval, rather oblong, depressed, black and shining; head finely and minutely punctulate, feebly impressed anteriorly, and not striate; the thorax, marginal stria very fine and not continuing behind the head; the elytra, humeral striæ wanting, 1 dorsal shortened apically, 2–3 complete, 4–6 apical, the fourth being longest and nearly dimidiate, the fifth is shorter at both ends, the sutural is somewhat oblique and also shorter than the fifth; the propygidium and pygidium are clearly but not densely punctate, the latter has a feeble impression on each side of its base and the outer edge is slightly elevated; the prosternum is bistriate, the striæ diverge slightly anterior and do not quite reach the base; the mesosternum is bisinuous anteriorly, with a short bent stria on either side.

This species is larger than *A. taciturnus*, Mars., and it has three inner apical dorsal striæ, which are wanting in Marseul's species. The form of the mesosternum is like those of *A. taciturnus*, Mars., and *A. latiusculus*, Sch., although Marseul says (Mon. p. 244) that the mesosternum of *taciturnus* is without a marginal stria, meaning that the stria along the border is incomplete.

Hab. Madagascar. Région de l'Androy, Ambovombe (*Dr. J. Decorse*).

In the Paris Museum and my own collection.

Platylister placitus, sp. n.

Oblongo-ovalis, subdepressus, niger, nitidus; fronte concava, stria tenui in medio sinuata; pronoto stria laterali basi continuata; elytris striis 1–2 integris, 3 interrupta; pygidio parum dense punctato; mesosterno stria marginali interrupta.

L. 6–6¼ mill.

Oblong-oval, somewhat depressed, black and shining; the head smooth and the forehead concave, with a fine transverse stria which is sinuous in the middle; the thorax, the marginal stria is very fine, the lateral is also somewhat fine but well marked, and it continues along the base to a point opposite the third dorsal stria, anteriorly it is interrupted behind the middle of the neck; the elytra, there are two fine sinuous epipleural striæ, the dorsal, 1–2 complete and well marked, 3 finer and interrupted in the middle, the humeral and other striæ are wanting; the propygidium is transversely punctured, but smooth along its edges; the pygidium is wholly punctured, there is a depression on either side at the base, and the outer rim is smooth but not much raised; the prosternum is smooth and somewhat truncate anteriorly and the lobe is clearly marginate; the mesosternum, the marginal stria is interrupted at the emargination; the anterior tibiæ are 4-dentate.

The lateral thoracic stria continuing along the greater portion of the base constitutes a good specific character.

Hab. Herbertshöh, German New Guinea.

One example in the Berlin Museum and one in my collection.

Idister mendax, sp. n.

Ovalis, subconvexus, niger, nitidus; fronte bistriata; elytris striis 1 integris, 2 antice abbreviata, 3 apicali subdimidiata, cum appendice brevi; tibiis denticulatis.

L. 6½ mill.

Oval, a little convex, black and shining; the head is smooth, with two bent striæ on the forehead, clypeus is slightly impressed; the thorax, the marginal stria is very fine and apparently commences behind the anterior angle and is continued behind the head, the lateral stria is clearly marked, it joins the marginal stria behind the eyes and is slightly hamate inwardly at the base; the elytra, striæ, 1 complete, 2 shortened before the base, 3 basal not quite reaching the middle and it has a short apical appendage; the propygidium has a few punctures arranged transversely; the pygidium, the outer border is elevated into a thickened smooth rim and the surface within is densely punctate; the prosternum is bistriate, the striæ joining anteriorly; the mesosternum is sinuous and marginate; the anterior tibiæ have 6 or 7 small teeth and the intermediate and hind tibiæ are spinose, especially near the tarsi.

This is the largest species of the genus at present known.

Hab. Mentawei I. (*Modigliani*, 1894).

In the Genoa Museum and my own collection.

Contipus fractistrius, sp. n.

Contipus proximo simillimus, sed differt minus convexus et pronoto stria laterali interna post oculos interrupta.

L. 10 mill.

Oval, convex, black and shining; the frontal stria complete and nearly straight anteriorly; the thorax, marginal stria complete, outer lateral evanescent at the anterior angles, inner arched behind the eye, and after a small interruption is continued almost in a straight line behind the neck; the elytra, the dorsal striæ are didymous and are like those of *proximus*, except that the first stria is not incurved at the base; the propygidium and pygidium are very finely punctulate, the former is without foveæ, the latter has a raised margin which is longer than that of *proximus*; the mesosternum is slightly sinuous, with a well-marked marginal stria; the anterior tibiæ are 3-dentate.

This species is more oval in outline and less convex than *proximus*, and the form of the inner thoracic striæ will distinguish it from the other three similar species. *Contipus sinuosus*, Lew. (Ann. Mus. Genova, 1906), is the largest and most convex species with didymous striæ, and it has the fifth dorsal stria conspicuously sinuous apically.

Hab. Calabar.

One example in the British Museum from the Murray Collection.

Contipus proximus, sp. n.

C. didymostrio simillimus, sed differt striis lateribus internis integris ad angulos haud evanescenti.
L. 8 mill.

Shortly oval, rather convex, black and shining; the head faintly punctulate, transverse stria complete and straight anteriorly; the thorax, marginal stria very fine and complete, outer lateral ceases after passing the anterior angle, inner lateral is complete, continuing unbroken behind the head; the elytra, outer humeral stria fine and dimidiate, inner complete, dorsal striæ didymous, 1–4 and sutural complete, first stria is incurved at its base, 5 a little shortened at the base, the sutural turns outwards anteriorly; the propygidium is bifoveolate and slightly punctulate along its base; the pygidium is smooth, with a basal raised margin along half of its length; the mesosternum is marginate and feebly sinuous; the anterior tibiæ are 3-dentate.

There are now four species of *Contipus* known with didymous dorsal striæ, viz. *C. didymostrius*, Mars., and *C. sinuosus*, *proximus*, and *fractistrius*, Lew.

Hab. Warri, Niger River (*Dr. Roth*).

Hister æneus, sp. n.

Ovatus, convexus, æneus, nitidus; fronte plana, stria integra antice leviter sinuata; pronoto striis duabus pone oculos coalescentibus, lateribus late punctatis; elytris striis 1–4 integris, 5 basi abbreviata, suturali magis longa, humerali interna integra, externa brevi; propygidio leviter bifoveolato, pygidioque dense punctatis; mesosterno obtuso et marginato; tibiis antice 3-dentatis.
L. $7\frac{1}{2}$–8 mill.

Oval, convex, brassy, shining; the head, the frontal stria is feebly sinuous anteriorly; the thorax, surface very finely punctulate, with a rather broad lateral band of punctures, which are largest, and some are confluent, behind the anterior angle, the lateral striæ are complete and turn towards each other at the base, and the interstice behind the anterior angle is punctate; the elytra, the outer humeral stria is short but well marked and is about one third of the elytral length, the inner humeral stria is complete and similar to the first dorsal, dorsal 1–4 complete, but the fourth is finer before the middle, 5 is abbreviated before the base, the sutural is bent and does not reach the base; the pygidia are densely and coarsely punctate.

The above belongs to a section of the genus in which the

inner humeral stria is similar to the first dorsal, the other species being *afer*, Payk., *africanus* and *crenulatus*, Lew.; and there are some species of *Contipus* which also have similar striæ. From *Hister africanus* this species differs by the colour, its greater convexity, the punctate thorax, and the presence of an outer though shortened humeral stria. According to Paykull's figure of *afer*, the thorax and the pygidia are similarly and not coarsely punctured.

Hab. Bihe, Angola.

Hister multidens, Sch. Ent. Nachr. xv. p. 94 (1889).

This species may be added to the faunistic list of Japan; it was found there by the late Mr. J. H. Leech.

Notolister, Lewis.

Owing to the discovery of more species of this genus, the following additional characters may be given:—The antennal fossettes are a little behind the anterior angles, the forehead has no transverse stria, the deep lateral thoracic sulcus is a very important character and always terminates abruptly at both ends, the apices of the elytra are constantly punctate, and the anterior tibiæ are 7-dentate.

Notolister unistrius, sp. n.

Ovalis, convexiusculus, niger, nitidus; thorace lateribus profunde sulcato; elytris striis 1–3 integris, 4–5 nullis, suturali antice multo abbreviata; mesosterno stria transversali unica.
L. $7\frac{1}{2}$ mill.

Oval, rather convex, black and shining; the head, there is no frontal stria and the vertex is uneven, surface finely punctulate; the thorax, marginal stria complete, with a widened interstice behind the head, where the stria is feebly crenulate, lateral sulcus rugose and wider and deeper than that of *N. Edwardsi*, Mars., and resembles that of *sulcicollis*, Lew.; the elytra, epipleura 5-striate, outer humeral stria shortened well before the base, inner apical and almost obsolete, 1–3 dorsal complete and punctate-striate towards the apex, 4–5 are wanting, sutural punctate apical and reaching just beyond the middle, apex punctate, the punctures do not extend along the interstices of any of the striæ; the propygidium is wholly covered with large, round, evenly-set punctures; the pygidium, the punctures are less close and less coarse; the prosternum is like that of *catenatus*; the

mesosternum is sinuous, with a short bent stria at either angle and a single line of punctures (fig. 1) broken in the middle; the anterior tibiæ are 7-dentate.

Fig. 1.

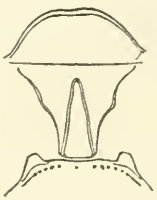
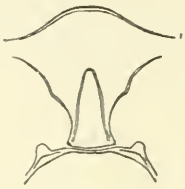


Fig. 2.



Notolister sulcicollis (fig. 2) has one simple stria only on the mesosternum.

Hab. Diego Suarez, N. Madagascar.

Notolister catenatus, sp. n.

Breviter ovatus, convexiusculus, niger, nitidus; fronte inæquali, haud striata; thorace profunde sulcato; elytris striis 1–3 integris, interstitiis parte punctatis, 4–5 nullis, suturali basi abbreviata; mesosterno bistriato; tibiis anticis 7-dentatis.

L. $5\frac{3}{4}$ mill.

Shortly oval, rather convex, black and shining; the head, vertex uneven, finely punctulate; the thorax, marginal stria complete, with a widened interstice behind the neck, sulcus as in the last species; the elytra, epipleura 5-striate, outer humeral stria shortened just before the base, the inner humeral is apical, rough on its edges and nearly reaches the middle, 1–3 dorsal are punctate-striate and are obliterated apically by the punctures, the apical punctures extend along the interstices of the three striæ nearly to the middle of the dorsum, the punctures also extend nearly to the middle of the elytra in the region of the fourth and fifth striæ, which apparently is represented by some of the points, the sutural stria is longer than that of *unistrius*, being shortened only just before the base; the pygidia are punctured like those of the last species; the prosternum, surface of the keel is sparingly and very finely punctulate, lateral striæ gradually converge and join anteriorly; the mesosternum is feebly sinuous in the middle, with a short stria on either angle and a deeply impressed line of punctures along its base and a second line close to it (fig. 3), very similar, but broken in the middle, which

probably denotes the suture between it and the metasternum. These last striæ are very similar to those of *ovatus*.

Hab. Tamatave, Madagascar.

Fig. 3.

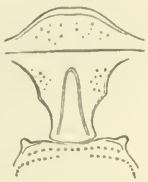
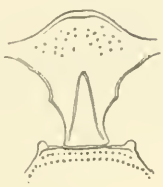


Fig. 4.



Notolister ovatus, sp. n.

Ovatus, convexiusculus, supra tenuissime punctulatus; fronte inæquali haud striata; pronoto parum profunde sulcato; elytris striis 1–3 integris, interstitiis punctatis, suturali basi abbreviata; mesosterno bistriato; tibiis anticis 7-dentatis.

L. 6½–7 mill.

Oval, rather convex, black and shining; the head, surface unequal and without a transverse stria; the thorax, marginal stria complete, widening out a little behind the head, sulcus less wide than that of the last species; the elytra with five epipleural striæ, outer humeral shortened before the base, inner humeral as in *catenatus*, 1–3 dorsal entire but merging apically in the punctures, the apical punctuation extends beyond the middle between the first and second striæ and scarcely to the middle between the second and third, the 4–5 striæ are either absent or represented by apical punctures, the sutural is punctate-striate and is shortened just before the base; the pygidia are punctate like those of the last species; the prosternum is similar to that of *catenatus*; the mesosternum is feebly sinuous and has two transverse lines of points (fig. 4), the second stria probably indicates the suture between the meso- and metasterna.

In outline this species is oval and resembles *N. Edwardsi*, Mars., but the dorsal sculpture of the two species is different, and *Edwardsi* has probably but one sternal stria, as Marseul merely says "mesosternum entirely margined," which would not apply to two rows of punctures.

Hab. Madagascar (Sikora).

ASOLENUS, gen. nov.

The genus is established to receive *Notolister sanguinosus*,

Fairm., as the type, and *N. 5-striatus*, *nodicornis*, *dux*, and *imitans*, Lew. Some of the generic characters correspond to those in *Notolister*, especially in the form of the sterna, but the antennal fossettes are in the anterior thoracic angles, not just behind them; the antennæ have a nodule on the scape; the body is more convex and sometimes gibbous; there is no transverse frontal stria and the thoracic lateral sulcus, so conspicuous in *Notolister*, is wanting; the mesosternum is sometimes sinuous and sometimes not; the anterior tibiæ are multidentate.

Pachycrœrus laticeps, sp. n.

Subcylindricus, niger, nitidus, pedibus piceis; capite lato, fronte punctata, stria integra, clypeo impresso; thorace stria marginali antice interrupta; elytris striis 1–3 integris, 5 dimidiata, 4 et suturali ante basi abbreviatis; prosterno bistriato, striis rectis; mesosterno marginato; tibiis anticis 5-dentatis.

L. 4–4¼ mill.

Somewhat cylindrical, black and shining; the head is large and clearly but not densely punctate, frontal stria complete; the thorax is rather irregularly punctured, the punctures on the scutellar region being very fine and few, marginal stria is interrupted behind the middle of the head; the elytra, striæ, outer humeral apical and dimidiate, inner wanting, 1–3 dorsal complete, 4 and sutural are shortened before the base, 5 dimidiate or a little longer, the interstice between the second and third striæ widens out at the base; the propygidium and pygidium are clearly but not densely punctate; the prosternum, anterior lobe coarsely punctured, keel rather wide and bistriate, striæ are feebly carinate and parallel to each other in front of the coxæ; the mesosternum, its projection is somewhat robust and prominent and the marginal stria complete.

The form and colour of the species resemble those of *P. facetus*, Mars., but its head is much more robust and more coarsely punctured, the fourth dorsal stria is not complete, and the prosternal keel is much wider and the marginal striæ are parallel, not joined anteriorly, and the mesosternal projection is more robust and prominent.

Hab. Kilima Njaro, East Africa (*A. Grandidier*, 1897).

In the Paris Museum and my own collection.

Pelorurus ruptistrius, sp. n.

Breviter ovalis, nigro-cupreus, nitidus; elytris viridi-cæruleis, fronte tenuiter impressa vix dense punctulata: pronoto stria integra,

lateribus punctato ; elytris striis 1–2 geminatis integris, 3 parte interrupta, 4–5 apicalibus, suturali integra ; propygidio parum dense punctato ; prosterno bistriato ; mesosterno bisinuato, marginato ; tibiis anticis denticulatis.
L. 4 mill.

This species closely resembles *P. formosus*, Sch., but differs by the head being more closely punctured, the thorax is more deeply and closely punctate laterally, and there are two arched clusters of points in the scutellar region, the third dorsal stria is not completely double, being broken in the middle of its inner line, and the propygidium is much more distinctly and closely punctured.
Hab. Abyssinia (*Raffray*).

XXIX.—*Rhynchotal Notes.*—XXXIX.

By W. L. Distant.

In the preparation of these notes I have been much indebted for the loan of specimens or drawings of unique types to Dr. Aurivillius of Stockholm, Dr. Handlirsch of Vienna, Herr Kuhlgatz of Berlin, and Mons. Schouteden of Brussels. The latter has shown me the types of the species of Fulgorinæ in his collection which have been lately described by Herr Schmidt, so that I have with advantage been able to compare much hitherto somewhat inaccessible material with the collection contained in the British Museum.

Fam. Fulgoridæ (continued from p. 30).

Subfam. *Fulgorinæ.*

Pyrops intricatus.

Pyrops intricatus, Walk. List Hom., Suppl. p. 43 (1858).
Pyrops basilacteus, Schmidt, Stett. ent. Zeit. lxvii. p. 184 (1906).

Zepasa, gen. nov.

Head broadly, roundly, and prominently produced in front of eyes, centrally about or almost as long as pronotum; vertex with its base to a short distance before eyes straightly truncate, somewhat conically produced anteriorly, centrally longitudinally carinate; face a little broader than long, obscurely centrally carinate, the lateral margins strongly sinuate behind eyes; clypeus about as long as face, with a

central ovate elevation which is inwardly depressed; pronotum with its anterior margin straightly truncate before base of head, its posterior margin a little angularly sinuate at middle, centrally longitudinally carinate; scutellum about as long as pronotum, with two arcuate and a central carination; abdomen broad and robust; tegmina about three times longer than broad, the venation more or less reticulate, the apical area thickly and finely reticulate; wings much broader than tegmina; posterior tibiæ with four spines.

Type, *Z. Aurivilliana*, Dist.

Zepasa Aurivilliana, sp. n.

Head, pronotum, sternum, and legs brownish olivaceous or testaceous; vertex with four minute black spots in transverse series, pronotum with two small discal black spots; mesonotum with two small black spots on anterior margin, two before apex, two (a little larger) on each apical area, and a minute spot near each anterior angle; abdomen above ochraceous, the basal area and a double central series of spots black; abdomen beneath black, the segmental margins ochraceous; tegmina pale testaceous, the apical area paler, inwardly bounded by a waved pale transverse fascia and containing some small pale spots, the costal membrane greyish, with elongate black spots; wings ochraceous, the apical area and posterior margin fuscous, the first containing a large hyaline spot; tibiæ very pale olivaceous, with fuscous annulations or suffusions.

Long., excl. tegm., 13½ mm.; exp. tegm. 33 mm.

Hab. Brazil; St. Catherine (Brit. Mus.); Brazil (*Boucard*, Stockholm Mus.).

Genus Anecphora.

Anecphora, Karsch, Berl. ent. Zeitschr. xxxv. p. 63 (1890).

Type, *A. aurantiaca*, Karsch.

Anecphora torrida.

Aphæna torrida, Walk. List Hom. ii. p. 281 (1851).
Anecphora olivacea, Schmidt, Stett. ent. Zeit. lxvi. p. 370 (1905).

Genus Malfeytia.

Malfeytia, Schmidt, Stett. ent. Zeit. lxvi. p. 366 (1905).

Type, *M. flavopunctata*, Schmidt.

Malfeytia Monteiri sp. n.

Head and thorax above, face and body beneath, and legs brownish ochraceous; abdomen above sanguineous, with a broad, central, longitudinal, black fascia, and the apical area thickly covered with white waxy secretion; anterior and intermediate legs and posterior femora castaneous brown; tegmina with rather more than anterior half ochraceous, with black fasciate macular markings which contain inner green ocellate spots with testaceous centres; this area is followed by a transverse very pale ochraceous fascia, the apical area being purplish red, with internal areas of the reticulate veins piceous; wings very pale bluish green for about basal two thirds, the venation virescent and with some short fuscous streaks at base, apical area broadly fuscous brown; vertex of head somewhat deeply excavate; face obscurely tricarinate, division between face and clypeus profound, the latter arched; rostrum reaching the posterior coxæ; posterior femora with five spines, the basal spine very minute.

Long., excl. tegm., 18 mm.; exp. tegm. 41 mm.

Hab. Angola (*Monteiro*, Coll. Dist.).

Genus Echetra.

Echetra, Walk. Ins. Saund., Hom. p. 36 (1858).
Rhonicia, Stål, Stett. ent. Zeit. xxiv. p. 238 (1863).
Amilavaca, Dist. Biol. Centr.-Am., Rhynch. Hom. i. p. 29 (1887).

Type, *E. semilutea*, Walk.

I did not examine Walker's genus when working out the Central-American specimens, as that writer gave the locality for his typical species as "Hindostan," whereas I find it is distinctly localized as "Para." Dr. Handlirsch having kindly allowed me to examine the type of Stål's genus *Rhonicia*, I find it congeneric with Walker's *Echetra*, and Stål was probably similarly misled by Walker's erroneous habitat.

Echetra fuscata.

Amilavaca fuscata, Dist. Biol. Centr.-Am., Rhynch. Hom. i. p. 30 t. v. fig. 18 *a* (1887).

Genus Alphina.

Alphina, Stål, Stett. ent. Zeit. xxiv. p. 243 (1863).

Type, *A. nigrosignata*, Stål.

Alphina Fryi, sp. n.

Head with the vertex olivaceous, two small spots at apex, a small marginal spot on each margin in front of eyes, and a fascia behind the eyes, black; pronotum olivaceous anteriorly, testaceous posteriorly, two small spots on anterior margin, and a central discal curved fascia, black; metanotum black; abdomen above ochraceous, its apex black; face piceous, with some olivaceous spots, of which the most prominent are three on basal margin—one central and one at each lateral angle; clypeus olivaceous, the central carination, two spots at base and two near apex, piceous; body beneath olivaceous, lateral margins of sternum and abdomen and apex of the latter black; legs olivaceous, more or less annulated with black; tegmina purplish red, with fuscous mottlings; extreme apical area hyaline, with the veins fuscous; claval area paler, more ochraceous, and spotted with fuscous; costal membrane paler, with four or five piceous spots, some of which contain smaller ochraceous spots; wings pale fuliginous, the venation darker and with a large apical hyaline spot; tegmina only slightly longer than wings; mesonotum distinctly tricarinate; rostrum slightly passing the posterior coxæ; clypeus distinctly centrally carinate, posterior tibiæ with five spines and their bases distinctly dilated.

Long., excl. tegm., 10 mm.; exp. tegm. 25 mm.

Hab. Brazil (Fry Coll., Brit. Mus.).

A smaller species than *A. nigrosignata*, Stål, the tegmina in particular shorter and little longer than the wings, the posterior tibiæ dilated at base, &c.

Radamana, gen. nov.

Head much narrower than pronotum, vertex excavate, its margins and a central line carinate; face shorter than clypeus and almost equally broad throughout, the lateral margins a little sinuate or undulate, with a strong longitudinal carination on each lateral area; rostrum long, almost reaching the abdominal apex; pronotum longer and broader than head, with a very fine and obscure central carinate line; mesonotum fine, centrally carinate, its greatest length equal to that of head and pronotum combined; abdomen broad and short; posterior tibiæ with five spines; tegmina three times as long as broad, costal margin moderately sinuate at about two thirds from base, claval veins uniting before claval apex, near which they terminate in a single vein; wings broader than tegmina.

Type, *R. varicolor*, Dist.

Radamana varicolor, sp. n.

Body ochraceous; anterior margins of vertex, pronotum, mesonotum, and metanotum, a central longitudinal fascia to mesonotum, base, central fascia and lateral spots to abdomen above, basal margin of face, two broad fasciæ to face and clypeus (almost fused on the former and posteriorly united on the latter), lateral areas of prosternum, rostrum, coxæ, legs, and a marginal fascia on each side of abdomen beneath, black; posterior coxæ and bases of posterior femora and tibiæ ochraceous; tegmina testaceous for about two thirds from base, apical third pale ochraceous; an elongate spot at base of costal membrane and a curved elongate spot beneath it, a spot near centre of elaval margin, a round discal spot, two irregular spots which almost form a transverse fascia before the paler apical third, and three submarginal apical spots, black; wings sanguineous, anal, outer, and apical margins piceous.

Long., excl. tegm., 12 mm.; exp. tegm. 38 mm.

Hab. Madagascar; Ankafina Forest, N.E. of Fianarantsoa (*C. Shaw*, Brit. Mus.).

Genus Kalidasa.

Kalidasa lanata.

Cicada lanata, Drury, Ill. Ex. Ent. ii. Index, t. xxxvii. fig. 3 (1773) (excl. habitat).
Aphæna albiflos, Walk. List Hom. ii. p. 280 (1851).

Although Drury gave the habitat "Jamaica" for this species, there can be no doubt that it is the Indian insect described by Walker and recorded from Malabar and Bombay.

Genus Calyptoproctus.

Calyptoproctus, Spin. Ann. Soc. Ent. Fr. viii. p. 266 (1839).

Type, *C. stigma*, Fabr.

Calyptoproctus confusus, sp. n.

Calyptoproctus guttipes, Dist. (nec Walk.) Biol. Centr.-Am., Rhynch. Hom. i. p. 36, t. v. fig. 9 *a* (1887).

Head, thorax, body beneath, and legs brownish ochraceous; legs spotted with fuscous; front of head with a central longitudinal black fascia; pronotum with two central anteriorly converging black fasciæ not extending much beyond middle; abdomen above black, the segments with broad transverse greenish-ochraceous fasciæ on each lateral area, the anal segment with a spot of the same colour on each side;

tegmina uniformly pale brownish ochraceous, spotted with pale fuscous, the spots on costal margin piceous; wings hyaline, with the venation piceous; head (including eyes) as wide as pronotum; front moderately concave, with the marginal ridges prominent; face rugose, the most prominent ridges being two central which anteriorly diverge; rostrum reaching the posterior coxæ.

Long., excl. tegm., 12 mm.; exp. tegm. 38 mm.

Hab. Guatemala, San Isidro, Pantaleon (Godman Coll., Brit. Mus.).

When I identified this species as *C. guttipes*, Walker's type specimen was in an unset condition; since then it has been set out, with the result that the Guatemalan specimens are found to constitute a distinct species. *C. guttipes*, by the colour of the tegmina, is somewhat closely allied to *C. stigma*, Fabr., but the colour of the dorsal surface of the abdomen (in a somewhat mutilated condition) appears to be ochraceous and unicolorous.

Calyptoproctus coloratus, sp. n.

Head, thorax, body beneath, and legs dull ochraceous, more or less spotted with fuscous; front of head with a central longitudinal black fascia; pronotum with two converging black central fasciæ on its anterior half, between which is a stramineous spot; mesonotum with four stramineous spots on the anterior margin, the two central ones piceous at base, the lateral margins (narrowly) and apex (broadly) stramineous; abdomen above black, the segments with a broad transverse green fascia on each lateral area and the anal segment with a spot of the same colour on each side; abdominal appendage beneath bluish black; tegmina with about basal half testaceous, remaining apical area more ochraceous, with the venation fuscous, costal membrane stramineous spotted with piceous, the testaceous area more or less suffused with piceous, the most prominent suffusion being in the form of an irregular broad transverse fascia near middle of tegmen, apical area with piceous suffusions principally near apex, outer posterior angle, and as an oblique costal patch just beyond the testaceous area; wings hyaline, green at extreme base, the venation black; eyes slightly projecting beyond the anterior margin of the pronotum; rostrum reaching the posterior coxæ; abdomen above with a fine but distinct central longitudinal ridge; posterior tibiæ with four spines, the basal spine shortest.

Long., excl. tegm., 15 mm.; exp. tegm. 42 mm.

Hab. N.W. Ecuador; Rio Durango (*Rosenberg*, Brit. Mus.).

Calyptoproctus fuscipennis, sp. n.

Body and legs pale ochraceous; front of head with a central linear black spot; abdomen above with the segmental margins and anal appendage black; legs spotted with fuscous; tegmina pale purplish red for nearly basal half, the remaining apical area, costal membrane, and claval margin pale dull ochraceous, more or less spotted with fuscous, more prominently so on costal margin; wings subhyaline, very pale fuliginous, darker towards apex, the venation black, extreme base virescent; basal segment of abdomen above with central small rounded callosities; rostrum reaching the posterior coxæ, its apex black; posterior tibiæ with four spines, three beyond middle, one near base.

Long., excl. tegm., 12 mm.; exp. tegm. 31 mm.

Hab. N.W. Ecuador; Rio Durango (*Rosenberg*, Brit. Mus.).

Genus Pelidnopepla.

Pelidnopepla, Stål, Hem. Fabr. ii. pp. 88 & 89 note (1869).

Type, *P. obscura*, Fabr.

Pelidnopepla obscura.

Lystra obscura, Fabr. Syst. Rhyng. p. 59. 9 (1803).
Pelidnopepla obscura, Stål, Hem. Fabr. ii. p. 89 (1869).
Poiocera nigrifrons, Walk. Ins. Saund., Hem. p. 34 (1858).

Genus Scaralis.

Scaralis, Stål, Stett. ent. Zeit. xxiv. p. 241 (1863).

Type, *S. picta*, Germ.

Scaralis versicolor, sp. n.

Head, thorax, and legs olivaceous brown; pronotum with two large central spots and two smaller spots on each lateral area; mesonotum with two large, central, contiguous, curved and angulated spots, a small spot near each side of them near base, and two spots on each lateral area, margins of metanotum, about posterior half of face, two central fasciate spots to clypeus, tibiæ, tarsi, and apex of rostrum, piceous or black; abdomen testaceous red, above with a broad central black fascia and the whole of apical segment (excluding posterior margin) black, beneath with black lateral spots and apical segment olivaceous brown; tegmina with about basal two thirds black, opaque, with the venation ochraceous, a

broad transverse fascia a little beyond base, and a spot near apex of costal membrane, stramineous, apical third hyaline, the venation fuscous towards apex and with a fuscous costal suffusion before apex which reaches middle of tegmen; wings with basal two thirds black, with two oblong upper basal violaceous streaks and the reticulate veins on basal area of the same colour, apical third hyaline, the venation fuscous; rostrum considerably passing posterior coxæ; posterior tibiæ with four spines; face with two curved central carinations on posterior half.

Long., excl. tegm., 22 mm.; exp. tegm. 63 mm.

Hab. Bolivia (*J. Steinbach*, Brit. Mus.).

Matacosa, gen. nov.

Head (including eyes) only a little narrower than anterior margin of pronotum, vertex excavated, its anterior margin broadly rounded, the marginal ridges very prominent; face much as in *Scaralis*, but clypeus with a percurrent central carination as in *Domitia*; anterior tibiæ longer than the femora, posterior tibiæ with four spines; abdomen short, about as long as space between apex of head and base of cruciform elevation, with a distinct central longitudinal ridge, the apical segment broadly truncate; pronotum with a central longitudinal ridge, its anterior margin broadly subtruncately produced between the eyes, its posterior margin centrally sinuate and with a central basal transverse ridge; mesonotum tricarinate, the lateral carinations anteriorly forked; tegmina more than twice but not three times as long as broad, with reticulate veins over the whole surface; wings reticulately veined except on basal area.

Type, *M. miscella*, Dist. (*Domitia*?).

This genus is somewhat intermediate between *Scaralis* and *Domitia*; to the first it is allied by the length of the anterior tibiæ, but differs by the narrower pronotum, the shorter and broader tegmina, and by the percurrent carination to the clypeus.

Matacosa miscella.

Domitia? miscella, Dist. Biol. Centr.-Am., Rhynch. Hom. i p. 33, t. v. fig. 7 *a* (1887).

Genus Jamaicastes.

Domitia, Stål, Hem. Afr. iv. p. 138 (1866). nom. præocc.
Jamaicastes, Kirk. Entomologist, xxxiii. p. 243 (1900), n. nom.

Type, *J. constellata*, Guér. (*Lystra*, *Poiocera*).

Jamaicastes Baroni, sp. n.

Head, pronotum, mesonotum, and body beneath dark ochraceous; abdomen above bright ochraceous; eyes, metanotum, and base of abdomen above piceous; legs pale sanguineous; tegmina testaceous for more than basal half, stramineous on apical area, all the veins virescent, on the basal area are three transverse series of large spots which almost form fasciæ, the two innermost series being dark testaceous, the outer series virescent; wings with about basal third sanguineous, linearly streaked with fuscous, the remaining area pale bronzy brown, apex of anal area tawny brown; face finely granulose, finely transversely ridged between anterior margins of eyes, on each side obliquely ridged to about centre of posterior margin, and with a central longitudinal ridge; clypeus with a central longitudinal ridge; posterior tibiæ with three spines; pronotum with a central longitudinal carination not reaching anterior margin; mesonotum tricarinate.

Long., excl. tegm., 12 mm.; exp. tegm. 35 mm.

Hab. Ecuador (*Baron*, Brit. Mus.).

Jamaicastes Steinbachi, sp. n.

Head, pronotum, and mesonotum dark ochraceous; metanotum and abdomen above black, its apex narrowly bluish green, anal appendages covered with white waxy secretion; face, clypeus, and sternum dark ochraceous; abdomen beneath pale ochraceous; lateral and posterior margins of the abdominal segments and the legs pale virescent; anterior and intermediate tarsi fuscous; tegmina for about basal two thirds dark ochraceous, with large macular, dark, testaceous suffusions, the venation virescent, apical area pale bronzy, and separated from the darker basal area by a pale virescent transverse fascia; wings with about basal two thirds black, the apical area bronzy, apical half of anal area tawny brown; face somewhat reticulately granulose, the anterior transverse and central carinations distinct, the oblique lateral carinations indistinct; clypeus centrally carinate; posterior tibiæ with three spines; pronotum centrally carinate; mesonotum tricarinate.

Long., excl. tegm., 15–16 mm.; exp. tegm. 40 mm.

Hab. Bolivia (*J. Steinbach*, Brit. Mus.).

Genus Alaruasa, gen. nov.

Head broad, including eyes almost as broad as anterior margin of pronotum, vertex short, broad, excavate, the

margins carinate; face broad, its lateral margins sinuate, with three central carinations, the lateral ones oblique and continuous, the central one straight, only extending through half the length of face; clypeus with two very coarse longitudinal ridges united into one from middle to apex; rostrum reaching posterior coxæ; anterior tibiæ longer than femora, posterior femora with four spines; abdomen short, about as long as space between apex of head and base of cruciform elevation; tegmina long, three times as long as broad; tegmina and wings reticulately veined.

Type, *A. lepida*, Spin. (*Poiocera*).

Genus Hypæpa.

Hypæpa, Stål, Berl. ent. Zeitschr. vi. p. 306 (1862).

Type, *H. costata*, Fabr. (*Lystra*).

Genus Florichisme.

Pœcilostola, Stål, Stett. ent. Zeit. xxxi. p. 291 (1870), nom. præocc. Dipt.

Florichisme, Kirk. Entomologist, xxxvii. p. 279 (1904), n. nom.

Type, *F. venosa*, Germ. (*Lystra*).

Some confusion appertaining to these genera, as Stål had not given the type of his genus *Pœcilostola*, I sought the assistance of Dr. Aurivillius, who kindly examined the specimens in the Stockholm Museum, and informed me:—"The genus *Pœcilostola*, Stål, is not in our collection. Under the heading of *Hypæpa* there are, however, three species—*costata*, Fabr., *semivitrea*, Stål *, and *venosa*, Germ. Only the first two of these species agrees with Stål's description of *Hypæpa*; the third, *venosa*, agrees, as it seems to me, well with the description of *Pœcilostola*, and was probably the species on which Stål founded that genus." There seems scarcely a doubt that Dr. Aurivillius has solved the problem.

Zeunasa, gen. nov.

Head (including eyes) much narrower than pronotum, vertex excavate, its marginal ridges very prominent; face broader than long, its posterior margin concave before clypeus, transversely ridged before base, from the lateral angles of this ridge are two oblique carinations which are bent and obliquely carried to near middle of apical margin, between

* Sunk by Stål as a synonym of *H. costata*, Fabr. (Berl. ent. Zeitschr. vi. p. 306, 1862).

the upper part of these a short longitudinal carination; other characters generally as in *Acræphia*, Stål, from which it is differentiated by the structure of the head; rostrum variable in length, often reaching the penultimate abdominal segment.

Type, *Z. irrorata*, Blanch. (*Pœocera*).

Zeunasa irrorata.

Pœocera irrorata, Blanch. in d'Orbigny, Voy. vi. (2) p. 221, t. xxxi. fig. 1 (1846).
Poiocera arrosa, Walk. List Hom. ii. p. 294 (1851).

Genus Acmonia.

Acmonia, Stål, Hem. Afr. iv. p. 137 (1866).

Type, *A. dichroa*, Germ. (*Lystra*).

Acmonia Fiebrigi, sp. n.

Vertex of head, face, and clypeus ochraceous; pronotum and mesonotum dark olivaceous, very finely and minutely speckled with grey; abdomen above sanguineous; metanotum, broad central basal fascia and apical margin to abdomen black; body beneath and legs ochraceous; apex of clypeus, coxæ, spots and suffusions to legs, and lateral and posterior margins to abdominal segments, black; tegmina with about basal two thirds piceous, the venation and base of costal membrane ochraceous and with a few ochraceous spots near its termination at inner angle, apical area subhyaline, with the venation ochraceous; wings with about basal third reddish ochraceous outwardly margined with black, the apical half of anal area piceous, apical two thirds hyaline with the venation black; marginal ridges of vertex undulate; face granulose, very obsoletely tricarinate; clypeus centrally broadly subfoveate; rostrum just passing posterior coxæ; pronotum transversely wrinkled, strongly centrally longitudinally ridged; mesonotum distinctly tricarinate, the lateral carinations strongly sinuate.

Long., excl. tegm., 11 mm.; exp. tegm. 28 mm.

Hab. Paraguay; San Bernardino (*K. Fiebrig*, Brit. Mus.).

Acmonia Crowleyi, sp. n.

Head, pronotum, mesonotum, face, and clypeus olivaceous brown; abdomen above, apex of clypeus, and legs black; abdomen beneath, lateral margins of abdomen above, and spots and streaks to legs ochraceous, posterior abdominal segmental margins above sanguineous; tegmina olivaceous

brown to near apex, which is hyaline, before the pale apex is a transverse, narrow, dull ochraceous fascia, costal membrane and costal area very finely and minutely speckled with greyish; wings with about basal half piceous, sanguineous at base, apical half hyaline, with the venation piceous; pronotum transversely wrinkled and centrally longitudinally ridged, the ridge not reaching the anterior margin; mesonotum tricarinate, the lateral carinations curved and meeting anteriorly; face finely rugulose; clypeus broadly centrally subfoveate; rostrum reaching the posterior coxæ.

Long., excl. tegm., 9 mm.; exp. tegm. 30 mm.

Hab. Brazil; St. Catherine (Crowley Bequest, Brit. Mus.).

TABOCASA, gen. nov.

Closely allied to *Learcha*, Stål*, but differing in the following particulars:—Face without the subapical transverse undulated ridge; clypeus distinctly centrally carinate; mesonotum of moderate length, longer, but not nearly twice as long as pronotum.

Type, *T. lineata*, Walk. (*Poiocera*).

Tabocasa sanguinolenta, sp. n.

Head, pronotum, mesonotum, body beneath, and legs olivaceous or ochraceous; abdomen above ochraceous, with the segmental margins and apical segment carmine-red; tegmina with more than basal half testaceous, its venation, the costal membrane, apical area, and apical half of claval margin pale virescent; wings sanguineous, their apices very pale virescent, some of the longitudinal veins in the sanguineous area piceous; pronotum and mesonotum obsoletely tricarinate, the central carination in each case distinct; face rugulose, about as long as broad, the lateral margins strongly concavely sinuate; clypeus centrally longitudinally carinate; rostrum scarcely passing the intermediate coxæ; posterior femora with four spines.

Long., excl. tegm., 13 mm.; exp. tegm. 37 mm.

Hab. N.W. Ecuador; Rio Durango (Brit. Mus.).

Tabocasa lineata.

Poiocera lineata, Walk. List Hom., Suppl. p. 51 (1858).

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* By the kindness of Dr. Handlirsch I have been allowed to examine the type of this genus, *Learcha sponsa*, Stål, which is contained in the Hof-Museum, Vienna.

Subfam. *Eurybrachydinæ*.

Genus Messena.

Messena, Stål, Rio Jan. Hem. ii. p. 67 (1858).

Type, *M. pulverosa*, Hope.

Messena Mouhoti, sp. n.

Body ochraceous; metanotum, base of abdomen, sternum, and legs violaceous; apex of abdomen with a long white waxy secretion; tegmina pale ochraceous, pale purplish on basal area, with two very large oblique piceous spots beneath middle, before apex there is a very large fuscous suffusion crossing the tegmen and a submarginal apical series of small black spots, the largest near outer angle; wings lacteous white, with an apical submarginal series of five black spots and an obscure fuscous transverse fascia beyond middle; posterior tibiæ with six spines; face smooth, paler than vertex; wings a little narrower than tegmina, narrowly pale violaceous at extreme basal angle.

Long., excl. tegm., 13 mm.; exp. tegm. 46 mm.

Hab. Cambodia (*Mouhot*, Brit. Mus.).

Most nearly allied to *M. sinuata*, Atkins.

Genus Purusha.

Purusha, Dist. Faun. B. I., Rhynch. iii. p. 236 (1906).

Type, *P. reversa*, Hope (*Eurybrachis*).

I was unable (*suprà*) to properly describe this genus, as I only knew it then by Hope's figure.

Head broad, but including eyes not reaching the anterior angles of the pronotum, vertex with the margins prominently ridged, eyes distinctly spined; face with the lateral margins obliquely directed outwardly to about middle and then more acutely directed obliquely inwardly to base of clypeus, which is as long as face; rostrum about reaching the posterior coxæ; pronotum a little longer than vertex, its lateral margins subacutely produced; mesonotum longer than pronotum, with a distinct central ridge not quite reaching either anterior margin or apex; femora moderately flattened and dilated, anterior and intermediate tibiæ outwardly laminately dilated, the former more strongly so, posterior tibiæ with five spines; tegmina of moderate length, widened from base to apex, apical margin obliquely rounded, venation reticulate throughout; wings long, about as long as tegmina, but obliquely lobately posteriorly produced, apical margin rounded, posterior margin sinuate.

Purusha reversa.

Eurybrachis reversa, Hope, Trans. Linn. Soc. xix. p. 134, t. xii. fig. 8 (1845).
Purusha reversa, Dist. Faun. B. I., Rhynch. iii. p. 236, fig. 102 (1906).

Purusha paradoxa.

Messena (?) *paradoxa*, Gerst. Mitt. Ver. Vorpomm. xxvii. p. 33 (1896).

Purusha rubromaculata, sp. n.

Body ochraceous brown, abdomen much covered with white waxy secretion; legs piceous, posterior femora brownish ochraceous; apex of clypeus piceous; tegmina dark castaneous, the apical margin broadly tinged with ochraceous, a white costal spot a little beyond middle of costal membrane, and three prominent testaceous-red spots in transverse series a little beyond middle; wings cretaceous white, the outer margin narrowly brownish ochraceous, and with a broad submarginal dark castaneous fascia, above this on apical half some small spots of the same colour; vertex of head with a faint central longitudinal ridge; pronotum with a cluster of small tubercles on each lateral area; face with an arcuated series of minute tubercles; eyes with a prominent lateral spine.

Long., excl. tegm., 15 mm.; exp. tegm. 54 mm.

Hab. Siam; Chantabun (*Mouhot*, Brit. Mus.).

Genus Paropioxys.

Paropioxys, Karsch, Berl. ent. Zeitschr. xxxv. p. 57 (1890).

Type, *P. opulentus*, Karsch.

Paropioxys negus, sp. n.

Head and thorax above ochraceous, vertex with the anterior margin and two spots near base black; pronotum with a transverse series of four black spots; mesonotum with two small transverse linear spots on anterior margin, four discal subtransverse spots, and a spot near apex, black; abdomen above pale sanguineous, slightly greyishly tomentose and tinged with ochraceous on basal half; face stramineous with the basal margin black; clypeus ochraceous, black at base and with a central longitudinal sanguineous line; anterior and intermediate legs pale ochraceous, coxæ, trochanters, the whole of posterior legs, and abdomen beneath,

sanguineous; tarsi black, the base of apical joint sanguineous; tegmina tawny brown, more palely finely maculate and paler on costal and apical areas, four large spots on costal area, two on inner area, and a double series (some 15 in number) of apical spots black; wings bronzy brown, fuscous on apical area, where there are nine or ten marginal black spots, and subviolaceous on posterior and anal margins; anterior tibiæ dilated, much spotted with black, and with a sanguineous apical spot.

Long., excl. tegm., 11 mm.; exp. tegm. 31 mm.

Hab. Abyssinia; Atbara (Brit. Mus.)

Genus Aspidonitys.

Aspidonitys, Karsch, Ent. Nachricht. xxi. pp. 210 & 215 (1895).

Type, *A. casta*, Karsch.

Aspidonitys admirabilis, sp. n.

Head, pro- and mesonota, sternum, and legs castaneous; abdomen brownish testaceous; tegmina castaneous to beyond middle, with a whitish transverse fascia a little beyond base, apical area stramineous, greyishly tomentose, suffused with indigo-blue and with an outer transverse series of three spots of the same colour, beyond these spots the colour is bright stramineous and non-tomentose, the apical margin fuscous brown; wings piceous; vertex of head thickly longitudinally striate; pronotum transversely striate near anterior margin; face very finely rugulose; clypeus smooth, with a distinct central carination; posterior tibiæ with four spines.

Long., excl. tegm., 13 mm.; exp. tegm. 32 mm.

Hab. British East Africa (Coll. Dist.).

Genus Metoponitys.

Metoponitys, Karsch, Berl. ent. Zeitschr. xxxv. p. 59 (1890).

Type, *M. Morgeni*, Karsch.

Metoponitys pennatus, sp. n.

Body above brownish ochraceous; body beneath and legs pale castaneous; tegmina brownish ochraceous, costal area beyond middle castaneous and containing four or five oblique piceous spots, the apex piceous and containing three small ochraceous spots on apical margin, disk with scattered obscure piceous spots; wings dark fuliginous with two paler

longitudinal streaks; tegmina with their apices narrowed but broadly truncate; pronotum with a distinct foveate spot on each side of the central carination; mesonotum distinctly tricarinate, a foveate spot inside each lateral carination; posterior tibiæ with three spines; face with an arcuated macular line near each lateral margin; clypeus obliquely transversely darkly striate on each lateral area.

Long., excl. tegm., 6 mm.; exp. tegm. 18 mm.

Hab. Sierra Leone; Sherboro Island (*Salmon*, Brit. Mus.).

The specific characteristic of this species is the broad truncate apices to the tegmina.

Genus Platybrachys.

Platybrachys, Stål, Eugenies Resa, p. 280 (1860).

Type, *P. decemmacula*, Walk. (*Eurybrachys*).

Platybrachys barbata.

Cicada barbata, Fabr. Syst. Ent. p. 684. 11 (1775).
Eurybrachys rubiginea, Walk. List Hom. ii. p. 386 (1851).

Genus Olonia.

Olonia, Stal, Öfv. Vet.-Ak. Förh. 1862, p. 488.

Type, *O. rubicunda*, Walk. (*Eurybrachys*).

Olonia marginata, sp. n.

Head, pronotum, mesonotum, face, rostrum, and legs black; abdomen and sternum sanguineous; lateral areas of sternum and lateral and apical segmental margins of abdomen beneath black; apical area of abdomen cretaceously tomentose; tegmina castaneous, with scattered small paler spots, the costal and apical margins broadly and the claval margin narrowly black; wings piceous, the venation black; head (including eyes) reaching the anterior lateral angles of the pronotum; face broad, finely granulose, its lateral angle broadly obtusely prominent; clypeus smooth, not carinate; vertex of head almost as long as pronotum; mesonotum distinctly tricarinate.

Long., excl. tegm., 6 mm.; exp. tegm. 18 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

Yarrana, gen. nov.

Head (including eyes) as wide as pronotum; vertex transverse, slightly excavate, the margins distinctly ridged, eyes

unarmed; antennæ cylindrical, extending beyond the eyes; face with its base slightly sinuate, lateral margins outwardly oblique to beyond eyes and then inwardly oblique to base of clypeus, where it is angularly sinuate, with a curved carinate line between the region of the eyes; pronotum and mesonotum combined very slightly shorter than broad; pronotum shorter than mesonotum, the latter tricarinate; posterior tibiæ with three spines; tegmina three times longer than broad, with the costal margin sometimes strongly sinuate before apex, and with the apical margin either obliquely rounded or strongly sinuate; wings about as broad but much shorter than tegmina.

Allied to *Olonia*, Stål, but differing principally by the antennæ projecting beyond the eyes.

Type, *Y. sinuata*, Dist.

Yarrana sinuata, sp. n.

Head, pro- and mesonota, face, clypeus, sternum, and legs fuscous brown with paler macular mottlings; abdomen sanguineous, its apex with a white waxy secretion; bases of posterior tibiæ ochraceous; tegmina with the basal half greenish ochraceous, at extreme base there are two large costal spots, a central spot, and the claval area black, apical half fuscous, with a large triangular costal spot near apex and a large subapical marginal spot pale hyaline, extreme apical margin piceous; wings piceous; tegmina with the costal margin strongly sinuate before apex, the apical margin very strongly concavely sinuate; face coarsely reticulately granulose and slightly greyishly pubescent; pronotum with some scattered granules, its posterior margin sinuate; mesonotum with the central carination almost obsolete, the space between the carinations piceous.

Long., excl. tegm., 5½ mm.; exp. tegm. 18½ mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.); Karanda, Cairns (*W. S. Day*, Brit. Mus.).

Yarrana continuata, sp. n.

Head, pronotum, mesonotum, face, clypeus, sternum, and legs piceous; basal margin and two discal linear spots to vertex, anterior margin to pronotum, and posterior margin to mesonotum brownish ochraceous; abdomen sanguineous, its apex with a white waxy secretion; tegmina pale brownish with small fuscous spots, base of costal margin, base of claval margin, a broken fascia before apex, and the apical margin piceous, a pale stramineous transverse fascia a little beyond

base, a large costal spot near apex, and a transverse apical fascia pale hyaline; wings piceous, with two slender oblique paler lines; tegmina with the costal margin not or very obscurely sinuate, the apical margin obliquely rounded; face coarsely reticulately granulose; mesonotum distinctly tricarinate.

Var. Tegmina without the basal transverse pale fascia.

Long., excl. tegm., 5 to 5½ mm.; exp. tegm. 17 mm.

Hab. Queensland (*F. P. Dodd*, Brit. Mus.).

XXX.—*Description of a new Species of Mangabey* (Cercocebus Hamlyni). By R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

[Plate VII.]

Cercocebus Hamlyni, sp. n. (Pl. VII.)

Face pale flesh-coloured, with darker and lighter, larger and smaller spots of brown pigment, most plentiful round and below the eyes and on the bare part of the cheek, but absent on the upper and lower lips and on the nose. Upper lids whiter than surrounding skin, with white eyelashes. Iris of eyes olive-brown; ball of the eye, where visible, white, with brown pigment-spots. Brow-ridge white, with a few pigment-spots. Ears flesh-coloured, with a few pigment-spots. Summit of head thickly hairy, the hairs longest along the middle and forming posteriorly a parieto-occipital crest, for the most part blackish to the roots, with greyish tips. In front and at the sides this black crown is sharply defined by the greyish-white hair forming a narrow brow-band and by the hair of the same colour clothing the cheeks and the area behind the ear. The hairs on the cheek forming a long backwardly directed tuft concealing and projecting beyond the lower half of the ear. A similar white tuft formed by the hairs behind the ear. Extending backwards from the head over the nape of the neck and between the shoulders there is a broad pale brown band, which becomes broader and at the same time fainter, less well defined, and more diffused over the thoracic area of the back, and finally dies away on the lumbar region, leaving the sacral region and the sides of the body greyish white. Throat, fore part of chest, and belly whitish; a large ashy grey patch on the area of the chest

behind the mammæ. Tail entirely greyish white. Outside of upper arm greyish white tinted with brown, of forearm blackish iron-grey between the elbow and wrist; inner side of forearm infuscate. Hands yellowish grey above, the palms and nails pinky flesh-coloured. Outer and inner side of legs and upper side of feet greyish white. Soles of feet and nails pinky flesh-coloured. Coat thick, almost woolly, the long hairs glistening.

Head and body about 16 English inches (=400 mm.); tail about 20 inches (=500 mm.).

Locality. Upper Congo, exact area unknown.

The above-given diagnosis is taken from a living female specimen, still with milk-dentition, brought to London with an example of Wolf's guenon (*Cercopithecus Wolfi*) and of Brazza's guenon (*C. neglectus*). I am indebted to Mr. J. D. Hamlyn, the well-known importer of wild animals, for the opportunity to describe it, and I have great pleasure in associating the new species of which it is the type with his name.

With its pointed head-crest and long whiskers this species falls into the category typified by *Cercocebus albigena*, Gray, subsp. *Rothschildi*, Lydd., and *C. congicus*, Sclater. From the former it may be distinguished by its yellowish or greyish-white coloration. To the latter it has many points of resemblance, notably the pink fleshy hue of the face, hands, and feet, the white throat, cheeks, and tail. But whereas in *C. congicus* the arms, the legs down to the knees, and the entire body with exception of the chest are black, in *C. Hamlyni* the hind-quarters are entirely whitish grey, the arms are merely ashy grey (especially between the elbow and wrist), and the entire body is whitish grey except for the ashy tint of the back and chest.

It is regrettable that only one specimen of each of these two species, namely *C. congicus* and *C. Hamlyni*, has been seen, and also that no exact locality is known for either. That the difference between the two specimens is not sexual is proved by the feminine gender of both; that it is not assignable to age is rendered probable by the approximate similarity in coloration between young and adult examples of other species of *Cercocebus*, namely of *C. fuliginosus*, *lunulatus*, *æthiopicus*, *chrysogaster*, *Hagenbecki*, and *albigena*.

It must be freely conceded that the pinkiness of the face, of the soles of the feet, palms of the hands, and especially, perhaps, of the nails, suggests partial albinistic variation both in *congicus* and *Hamlyni*. If this were so, the two might be dismissed as piebald sports of the form of *C. albigena* described

as *Rothschildi*, which these resemble in length of whisker, absence of frontal fringe, and, at least in the case of *Hamlyni*, in the shape of the crest on the crown of the head. I do not, however, think that such a conclusion is warranted by the evidence; for, in the first place, the normal colour of the eyes and the bilateral symmetry of the pattern formed by the white patches in *congicus* and the black patches in *Hamlyni* are not suggestive of albinism. Moreover, the absence of black pigment under the skin of the face, hands, and feet in some races of man and of chimpanzee and in some species of macaques is opposed to the view that this defect is necessarily or even probably indicative of albinos in the higher Primates. Finally, although black is the prevalent colour of the face in the genus *Cercocebus*, the face of *C. fuliginosus* is often to a great extent flesh-coloured. As for the yellowish-grey hue of the hairs in *C. Hamlyni*, this colour occurs too commonly in quadrumanous Primates, *e. g.* in some species of langurs (*Semnopithecus*), the young of some species of *Colobus*, and in some gibbons (*Hylobates*), to be regarded as of pathological import.

Another possible explanation of the coloration of these two mangabeys is that *C. albigena Rothschildi*, or an allied form, is an extremely variable animal, and that the types of *C. congicus* and *C. Hamlyni* merely represent two of its phases. The ascertained constancy in the coloration of other species of this genus is, however, entirely opposed to such an hypothesis.

For the above-given reasons I think it desirable to describe the monkey in question as the type of a new species. If the opinion that its peculiarities are of specific value prove well founded, its departure from the ordinary dusky style of coloration prevalent in the genus is probably connected with a difference of habitat demanding different procryptic attributes. In looking for an explanation of this, one is reminded of Dr. Gregory's assertion that the white-mantled guerezas (*Colobus*) of East Africa are concealed when sitting in the trees by the harmonizing of their white plumes with masses of white epiphytic lichens which clothe the branches. It is possible that this new mangabey finds concealment in the same way.

EXPLANATION OF PLATE VII.

Cercocebus Hamlyni, sp. n. (Drawn from a photograph of the living animal.)

XXXI.—*On a new Species of Coral-infesting Crab taken by the R.I.M.S. 'Investigator' at the Andaman Islands.*

By J. R. Henderson, M.B., F.L.S., Professor of Biology, Madras Christian College.

[Plate VIII.]

The species described below is an interesting addition to a small family of crabs which take up their abode on living corals, thereby causing abnormal growth in the latter, with the production of a partially closed chamber or cavity in which the crab is finally imprisoned. For its discovery we are indebted to Major A. R. Anderson, I.M.S., formerly Surgeon-Naturalist of H.M. Indian Marine Survey Steamer 'Investigator,' who as far back as 1899 forwarded specimens to the present writer.

The new species exhibits very striking sexual dimorphism; the dwarfed male, which is less than one fourth the size of the female, reaching a total length of 1·25 mm., a length which probably constitutes a record for diminutive size among adult Decapod Crustacea. Another unique peculiarity of the male is his habit of attaching himself to the ventral surface of the female, thus suggesting a comparison with the condition existing in so many of the parasitic Crustacea belonging to lower groups, though the more or less temporary nature of this attachment has not led to any degeneration in the case of the male crab. In some at any rate of the parasitic Crustacea, e. g. *Bopyrus*, the great reduction of the male has perhaps arisen as a result of the female taking up her abode in a confined space, and here, as in so many other animal groups, similar habits have produced similar structural peculiarities in genera not connected by near relationship.

There can be little doubt that the coral-infesting crabs are more common than the published records of their occurrence would lead one to suppose, and both their small size and peculiar habitat have led to their being overlooked by collectors. They have hitherto only been recorded from the Hawaiian Is. (*Stimpson, Verrill*), Red Sea (*Heller*), Réunion (*A. Milne-Edwards*), Philippine Is., and an undescribed form from the West Indies (*Semper*), and Torres Straits (*Calman*). On the other hand, deformities on coral attributed to these crabs, which were first aptly compared to plant-galls by Ehrenberg*, have been described by numerous writers from

* Ehrenberg, in his work on the Corals of the Red Sea, refers to a small "Pagurus" which forms "galls" on *Seriatopora*. The only

widely separated localities in the Indo-Pacific region. The previously known species are two in number, viz. *Hapalocarcinus marsupialis*, Stimpson, and *Cryptochirus coralliodytes*, Heller; and Semper, who has studied both alive, has given, in 'The Natural Conditions of Existence as they affect Animal Life' (1881), an account of the malformations which they produce on living coral.

Hapalocarcinus was originally described, somewhat imperfectly, by Stimpson (Proc. Boston Soc. Nat. Hist. vol. vi. 1856–59) from specimens "found clinging to the branches of living Madrepores, at the depth of one fathom in the harbour of Hilo, Hawaii, March 1856." It is roughly figured by Semper, who describes the "galls" which it produces on branching corals belonging to the genera *Sideropora*, *Seriatopora*, and *Pocillopora*. An upward growth of coral is formed on either side of the crab, and in time the latter becomes surrounded and enclosed so that it cannot escape. Two fissures or slits at opposite ends of the "gall" serve for the entrance and exit of water, and remain open so long as the crab is alive. More recently *Hapalocarcinus* has been fully described and figured by Calman (Trans. Linn. Soc., ser. 2, Zool. vol. viii. 1900), who gives a valuable *résumé* of previous work on the coral-crabs.

Cryptochirus was first described by Heller from the Red Sea ("Beitr. z. Crust. Fauna d. roth. Meeres," SB. Akad. Wien, xliii. (1) 1861), where it was found inhabiting holes in coral. According to Semper it lives only in massive corals, such as *Goniastræa*, *Astræa*, and *Trachyphyllia*, on which it does not form "galls," but lives simply in funnel-shaped cavities or cylindrical pits due to arrested upward growth in the coral. With regard to the habits of the crab, Semper makes the interesting statement that the cavities or pits "are never closed during the lifetime of the crab, so that it certainly would be able to quit its position. Nevertheless it as certainly does not do so; but the species I have observed living thrust the fore part of their bodies very far out of their peculiar cave-dwellings, so that only their pouches, *i. e.* the hind part of the body, remained within." The species described by A. Milne-Edwards under the name of *Lithoscaptus paradoxus* (in Maillard's 'Notes sur l'Isle de la Réunion,' 2e éd. 1863, ii. Annexe F, p. 10) is apparently, as has been pointed out by both Paulson and Calman, identical

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Pagurid which, so far as I know, inhabits coral is *Troglopagurus manaarensis* of the present writer (Trans. Linn. Soc., ser. 2, Zool. vol. v. pt. 10, 1893); but I am unable to state if it causes abnormal growth.

with or closely allied to *Cryptochirus coralliodytes*. Calman has shown that *Hapalocarcinus* and *Cryptochirus* must be placed in the same family, and for this has proposed the name Hapalocarcinidæ, in place of A. Milne-Edwards's term "Lithoscaptes," as the latter is based on a synonym of *Cryptochirus*, the later described of the two genera.

The females of *Hapalocarcinus* and *Cryptochirus* agree in their elongated form, and in the possession of a more or less extended semi-membranous abdomen, which forms a brood-pouch for the eggs; in the former genus the abdomen is loosely bent under the cephalothorax, while in the latter, owing to its greater extension, the eggs are freely exposed below. In both genera there are striking peculiarities in the external (third) maxillipedes, which are widely separate, and thus leave a considerable portion of the enlarged buccal cavity exposed. The ischial joint is wide and has a large rounded internal lobe, while the merus is greatly reduced and resembles the three terminal joints; the exopod is reduced to a rudiment. In spite of superficial resemblances to certain of the Anomura, the position of the female sexual openings on the sternum shows that the family must be relegated to the Brachyura. The general elongation of the body is evidently an adaptation to the narrow space in which the crab is confined, and the greater exposure of the eggs than is usual in the Brachyura, is perhaps due to the increased difficulties which would be experienced in their aeration, and diminished need for protection in such an unusual dwelling-place. The general softness of the integument, more particularly of the abdomen, in both genera, is a feature which they share with many of the burrowing or specially protected forms.

While the male of *Hapalocarcinus* is still unknown, that of *Cryptochirus* is noteworthy for the great reduction in size which it has undergone, and this is particularly the case in the new species about to be described, a reduction which is probably an adaptation to the peculiar habitat. With the female ensconced in a tunnel-like cavity closed at one end, from which she is unable to escape, reduction in the size of the male would obviously be of great advantage to the species; but so little is known as to the relation of the female crab to the dwelling, that her inability to exhibit free movement in the tunnel can only be conjectured. Further observation is necessary to determine whether or not each female is generally accompanied by a male, but it seems highly probable that the male, on account of his small size, is able to pass freely from one tunnel to another. While

the two sexes have thus simultaneously undergone modification in different directions, the general appearance of the male suggests that he is less modified than the female, and consequently any attempt to determine the relationships of the anomalous family Hapalocarcinidæ will probably have to be based largely on the characters of the male.

In more than one account these crabs have somewhat loosely been referred to as parasites on the living corals, whereas there is no reason to suppose that the condition is one other than that of commensalism. There is nothing to indicate that they obtain any part of their nutriment at the expense of the coral colony, though doubtless the crab deprives the polyps of many food-particles which would otherwise have fallen to their portion. Stimpson's suggestion that *Hapalocarcinus* feeds upon the coral polyps is negatived by the observation of Semper that colourless polyps exist on the inner surface of the "gall."

Family **Hapalocarcinidæ**.

Cryptochirus dimorphus, sp. n. (Pl. VIII.)

Characters of the female.—The carapace is elongated and practically four-sided, with the length less than twice the breadth; the surface is everywhere roughened by short acute spinules with rather broad bases, which are more crowded together posteriorly, but somewhat reduced in size near the hind margin; in some cases on the posterior fourth or so of the carapace the spinules are represented by small crowded granules. The regions of the carapace are not defined, and the surface is practically level, with the exception that the gastric region is sometimes slightly circumscribed, and a slight hollow on either side, in which the spinules are comparatively few, separates it from the hepatic regions. The carapace is slightly convex from side to side and distinctly convex from end to end; when the crab is viewed from the lateral aspect, the greatest height is seen about the middle of the branchial regions or a little behind the middle of the carapace. The anterior or frontal margin has four subequal, equidistant, rounded, spinule-capped lobes; the two submedian or, properly speaking, frontal lobes project forwards to a slightly greater extent than the other pair situated at the antero-lateral angles of the carapace. The amount of projection of the four lobes, or, to state the same fact in another way, the extent of the three intervening indentations, varies in different individuals; in most cases

the indentations which lodge the eyes extend further into the carapace than the median indentation. All four lobes, but especially the frontal ones, carry moderately large spinules on their upper surface. The gap between the frontal and antero-lateral lobe on either side is occupied by the eye, which carries several spinules on the inner surface of the stalk, near the corneal margin. Immediately in front of the frontal lobes are seen the prominent and spinulose basal joints of the antennules, with their folded terminal joints nearer the middle line. In the comparatively narrow interval, seen from above, between the basal antennular joint and the eye on each side is found the small antenna with its rudimentary flagellum. The lateral margins of the carapace, which form a continuous line on either side, are subparallel for the first third or so of their length, but have an outward convexity in the branchial regions; the posterior margin is about the same width as the frontal margin, and has a slight forward curve. The lateral margins of the carapace are everywhere spinulose, but spinules are scarcely represented on the posterior margin. The pterygostomial regions are without spinules and terminate below each eye-stalk in a pointed angle.

Viewed from below the large basal antennular joints lie parallel to one another, separated by an interval in which the two terminal joints of each antennule are perpendicularly folded; spinules are present on the basal joints and reach a comparatively large size towards their apices. The antenna occupies a narrow interval between the basal antennular joint and the eye on each side; the peduncle is composed of three free joints, of which the first, articulated to the edge of the epistome, is longer and stouter than the other two, and carries two or three small spinules at its lower distal end; the flagellum is represented only by the merest rudiment and terminates in a few minute setæ. The eyes are placed immediately external to and practically parallel to the antennæ; the inner surfaces of the stalks are spinulose, and the spinules extend as far as the corneal margin. The edge of the pterygostomial region, contiguous to the insertion of the eye-stalk, shows a distinct indentation, but otherwise the orbit is deficient below. The epistome is somewhat hollowed out, owing to the projection of the pterygostomial angle on each side; the renal tubercle is distinctly visible below the first free joint (second true joint) of the antennal peduncle.

When the eyes, antennæ, and antennules are completely removed, a comparatively deep and continuous cavity

extends from side to side, the median portion of which lodges the antennules, which are incompletely separated by a projecting median spine springing from the epistome, while the outer portions represent the orbits. The orbit, as now seen, is a cavity with somewhat rounded outline, continuous internally with the space or fossette in which the antennule is lodged; the upper orbital margin is the rounded indentation between the submedian and outer lobe on the frontal margin of the carapace; the posterior and lower margin is formed by the notch in the pterygostomial edge already referred to, and terminates in the pointed pterygostomial angle or spine which lies immediately external to the basal antennal joint. The eyes, as already indicated, are not completely retractile into these orbits, for when viewed from below a large portion of their stalks is always visible. The antennular fossettes are continuous, and a separation is only faintly indicated by the median epistomial spine.

The epistome, which is not sharply demarcated from the palate, appears somewhat deeply excavated, owing to the prominence of the pterygostomial angles. The external or third maxillipedes are separated by a considerable median space, in the upper part of which the mandibles are partly exposed; the ischium is broad and suboperculiform, produced internally into a rounded lobe which extends well beyond the insertion of the merus; the merus is greatly reduced in size, being even slightly shorter though a little broader than the carpus, and it springs from a notch at the antero-external angle of the ischium. The exopod of the external maxillipedes is not visible in its usual position at the outer side of the appendage, and in more than one specimen no trace of it could be found; in one preparation, however, a minute filament was found concealed behind the coxal joint, which probably represents the missing exopod. The first and second pairs of maxillipedes are normal, with well-developed exopods.

The chelipedes and ambulatory legs are of moderate length, with a few spinules on the upper surface of the meral and carpal joints. The chelipedes are slightly longer than the first pair of ambulatory legs, as a result of the lengthening out of the four terminal joints; the propodus is more slender than the carpus, and its palmar portion is about one fourth longer than the dactylus; the fingers are slender, acutely pointed, and distinctly incurved. The ambulatory legs are moderately stout, and there is no such special diminution in thickness of their propodi as is noticeable in the chelipedes. The legs gradually diminish in size on passing backwards,

but there is no special reduction in regard to one or other of the last two pairs; the dactyli are short, stout, and strongly curved, with a yellow horny apex to each.

The sternal plastron is subpentagonal in outline, and is not specially excavated mesially; the posterior margins of the sternal pieces opposite the penultimate pair of legs meet together in the middle line, and thus isolate the small triangular sternal pieces of the last pair of legs, as the latter sternites do not reach the middle line. The openings of the oviducts are seen towards the inner limits of the sternal pieces belonging to the third pair of legs.

The abdomen is semi-extended and composed of seven distinct segments, including the telson, of which the first five are visible from above in the natural condition; in some cases the abdomen viewed from above is almost equal in length to the carapace. The first two segments are about equal in width to the posterior margin of the carapace, but from the third onwards there is a gradual increase up to the fifth, which is broader than the broadest part of the carapace. All the segments are smooth and semimembranous; their free edges form a thin continuous membrane which bounds a deeply concave subabdominal cavity or brood-pouch, in which the eggs are placed. The eggs are of large size for so small a species.

The average total length of the body, including the semi-extended abdomen, is about 5·5 mm.

Characters of the male.—The carapace is roughly four-sided, with the length about one and a half times the breadth; it is regularly arched, or convex, from end to end, less so from side to side, and the downward slope of the convexity is most marked at the extreme anterior end. The surface is glabrous and without spinules, but roughened by very minute tubercles; the margins are entire, with the exception of a few minute spinules near each antero-lateral angle and on the edge of the frontal lobes. In some individuals, though not in all, the submedian frontal lobes project further forwards than the antero-lateral angles of the carapace, and are somewhat closer together than in the female, with the result that the orbital notches are relatively wider; the frontal notch is shallow. The posterior margin of the carapace is straight in its median portion, while the lateral margins of the carapace have practically the same course as in the female. The lateral or protogastric portions of the gastric area are slightly elevated. The arrangement of the antennules, antennæ, and eyes, as seen from above, is similar to that in the female, with the exception that the spinules are almost obsolete on the basal antennular joints

and reduced on the eye-stalks; the eyes are relatively large.

The chelipedes and ambulatory legs are relatively better developed than in the female, but the spinules on the meral and carpal joints are almost obsolete; a few very minute spinules are visible on the upper surface of the palm. The propodus of the chelipedes is slightly wider than the carpus; the fingers are incurved, with acute apices, and are about equal in length to the palmar portion of the propodus. The ambulatory dactyli are strongly incurved, doubtless for attachment to the female, and their horny apices are very slender and acute; they are more than half the length of the relatively stout propodi.

The arrangement of the antennules, antennæ, eyes, and external maxillipedes, seen from below, is similar to that in the female. The basal antennular joint is somewhat laterally compressed, and, when viewed from the side, exhibits five or more terminal spinules.

The sternal plastron is somewhat similar in outline to that of the female. The male sexual openings are seen on the small sternal pieces belonging to the last pair of legs, and these pieces, as in the case of the female, do not meet together in the middle line; no grooves are visible in the neighbourhood of the openings.

All seven abdominal segments (including the telson) are distinct, and they gradually diminish in width from the third backwards to the telson, so that the general outline of the abdomen is triangular. The first abdominal segment, which is distinctly narrower than the hind margin of the carapace, and a portion of the second segment, are alone visible from above. Both pairs of sexual appendages are well developed, and the first pair extend as far forwards as the sternal pieces of the first pair of ambulatory legs.

The average total length is about 1·25 mm.

The species described above differs in the following important respects from *C. coralliodytes*, Heller. In Heller's species, which is of much larger size, the female measuring about 17·5 mm. in total length, and the male about 6·5 mm., the entire body is narrower; the regions of the carapace are more distinctly circumscribed, and the frontal lobes more prominent, with acuter apices. The chelipedes are more slender, and are shorter than the first pair of walking-legs; the propodal joint of the chelipedes is very short, and, judging from Heller's figure, is apparently not larger than the carpus; the last pair of legs are longer than the penultimate pair. The male abdomen is narrow and linear, with the proximal segments not wider than the distal ones. The

ischial joint of the outer maxillipedes is narrower, and the merus, which is almost double the length of the carpus, is prolonged at its antero-external angle into an almost spinose point; the exopod is a small leaf-like lobe distinctly seen in the usual position. In other respects the two species agree more or less closely. It may be that some of the above differences, more particularly those in the external maxillipedes, relative length of the different pairs of legs, and male abdomen, are of generic value, and that the new species may eventually require a new genus for its reception. At present, however, it seems safer to include it in *Cryptochirus*.

Locality.—Living in cylindrical holes in growing reef-coral, at a depth of 12 fathoms, on Invisible Bank, 40 miles off the east side of the southern extremity of the Andaman Islands.

The following particulars were noted by Major Anderson at the time of capture. The crabs were found living in a large branching Madrepore, in cylindrical cavities, somewhat wider at the closed end than at the mouth, which latter was too narrow to permit of the exit of the female. The holes were most numerous near the extremity of the coral branches, but also frequently occurred at the points where the branches bifurcated. In the great majority of the cavities the two sexes were found together, the male generally sheltering under the female, attached to her ventral surface, but in some cases free. In a very few cavities careful searching revealed only the female, but as the crabs were obtained by fracturing the coral with a hammer, it was possible that some of the males disappeared during the process. The colour of the female during life is a dull yellow, while the male shows a mixture of dull brown and yellow.

In conclusion I would thank my friend Major Anderson for the opportunity thus afforded me of examining this interesting species.

EXPLANATION OF PLATE VIII.

Cryptochirus dimorphus, sp. n.

Fig. 1. Dorsal view of female. × 9.
Fig. 2. Ventral view of female showing male *in situ*. × 12.
Fig. 3. Cephalic region of female from below.
Fig. 4. Left external (third) maxillipede of female.
Fig. 5. Left chelipede of female.
Fig. 6. Second left leg (first ambulatory leg) of female.
Fig. 7. Sternum of female.
Fig. 8. Sternum of male.
Fig. 9. Abdomen of male.

XXXII.—*Three new Palæarctic Mammals.*

By Oldfield Thomas.

Myotis Bechsteini favonicus, subsp. n.

A smaller-eared Spanish representative of *M. Bechsteini*.

Size decidedly less than in true *Bechsteini*. General colour darker, the tips of the hairs, both above and below, less conspicuously lighter than the dark bases. Ears considerably shorter than in true *Bechsteini*; laid forward they only surpass the muzzle by about 5 mm., as compared with 9 or 10; their shape apparently quite similar. Tragus rather less attenuated above, and with practically no tendency to an outward curvature. Wings to the base of the toes. Calcar extending halfway towards the tip of the tail, its end marked by a projecting lobule. Terminal vertebra of tail projecting from membrane. Edge of membrane finely serrated, not fringed.

Skull quite like that of true *Bechsteini*, except that it is slightly smaller, and the bullæ, in correlation with the smaller external ears, are less swollen.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 41 mm.

Head and body 55; tail 38; head 20; ear, from notch 22·5, from lobe at base of internal edge 19·8, breadth when flattened 13·5; tragus on inner edge 9; third finger, metacarpus 35, first phalanx 13, second phalanx 11; lower leg and hind foot (c. u.) 30; calcar 18.

Skull: greatest length 17·7.

Hab. La Granja, on the northern side of the Sierra de Guadarrama, Central Spain.

Type. Old male in alcohol. Collected by Sr. M. de la Escalera.

This bat, while conspicuously different from true *M. Bechsteini* by its much smaller ears, is so evidently the Spanish representative of that species, that I prefer to give it a trinomial rather than a binomial designation.

Hungarian examples of *Myotis Bechsteini* have been kindly ceded to the British Museum for the purpose of this comparison by Prof. L. von Méhely, our National Museum possessing hardly any good examples of this rare bat.

Glis glis spoliatus, subsp. n.

A small form of *G. glis*.

General colour quite as in Central European examples of

true *glis*, and similarly with a white line along the underside of the tail. Upper surface of hands white and of feet white with a dark metatarsal patch, but this is less strongly defined than in true *glis*. Tail of about the same bushiness and colour as in *glis*, not as in *italicus*.

Skull very like that of *glis*, but smaller in all dimensions, lower in the brain-case, and with smaller bullæ.

Dimensions of the type (measured in the flesh) :—

Head and body 145 mm.; tail 120; hind foot 27; ear 14.

Skull: greatest length 35·5; basilar length 28; zygomatic breadth 12; length of nasals 11·4; interorbital breadth 4·9; height from alveolus of m^2 to supraorbital edge 8·1; palatilar length 14·3; diastema 8·7; palatal foramina 4 × 2; length of bullæ 8·2; length of upper tooth-series 6·2.

Hab. Khotz, near Trebizond. Alt. 100 m.

Type. Adult male. B.M. no. 6. 5. 1. 38. Original number 2437. Collected 24th Feb., 1906, by Alphonse Robert.

This dormouse is readily distinguishable from true *G. glis* by its smaller size, falling almost as far short of that animal as the latter in turn is inferior to the large Italian species *G. italicus*, B.-Ham.

Dr. Satunin's *G. g. caspius* from Aschabad is based on a specimen fully as large as true *G. glis*, and, bearing in mind the difference between the faunas of Trebizond and Transcaspia, the present form is not likely to be *caspius*. Dr. Satunin speaks of the white line under the tail as a differential character of *caspius*, as compared with Blasius's description of *glis*; but Blasius was notoriously indifferent to colour details, and, as a matter of fact, every *glis* I have seen has a white line in this situation. Possibly the Transcaucasian specimens referred by Satunin to *caspius* may prove to be referable to *G. g. spoliatus*.

Evotomys Nageri hallucalis, subsp. n.

Similar in general characters to typical Swiss *E. Nageri*, but tail longer, skull larger, and incisors narrower.

Colour as in true *Nageri*, the belly perhaps rather whiter than usual. Tail comparatively long, rather shorter-haired, sharply bicolor, brown above, dull white on sides and below.

Skull decidedly longer than in the Swiss form, the brain-case long, smooth and rounded, though the anterior angles are well marked. Interorbital region broad, smooth, not

markedly concave above. Nasals comparatively broad behind. Palatal foramina unusually short, falling nearly a millimetre short of the level of the front of m^1; well open, not narrowed behind.

Incisors slender, narrow, bevelled laterally. Molars as usual, the length of the tooth-row noticeably greater than in Swiss specimens.

Dimensions of the type (measured in flesh) :—

Head and body 115 mm.; tail 66 ; hind foot 21 ; ear 13.

Skull: greatest length 27; condylo-basilar length 24·3; zygomatic breadth 14·5; nasals, length 7·5, breadth behind 2·2; interorbital breadth 4; palatilar length 12; palatal foramina 4·5; length of upper molar series (grinding-surface) 5·8.

Hab. Aspromonte, Calabria, extreme South Italy. Type from S. Euphemia. Altitude 1000 m.

Type Male. B.M. no. 6. 8. 4. 9. Original number 2575. Collected 18th July, 1906, by A. Robert.

When Mr. Miller wrote his revision * of the European forms of *Evotomys* no species of the genus was known from the south of Italy, and the capture of a specimen in the Aspromonte mountains by Mr. Robert is therefore of much interest. I am, however, informed by Dr. Forsyth Major that Dr. Cavanna obtained an example on Monte Pollino about 1880, so that this is not absolutely the first discovery of the genus in the "great toe" of Italy.

E. N. hallucalis may be readily distinguished from its Swiss relative by its large size, long tail, long skull, short palatal foramina, narrow incisors, and long molar series.

XXXIII.—*Two new Genera of small Mammals discovered by Mrs. Holms-Tarn in British East Africa.* By Oldfield Thomas.

The British Museum owes to Mrs. Holms-Tarn a small collection of mammals obtained by her in British East Africa not far from Nyeri. Although only ten species were obtained altogether, it is remarkable that two of them are not only new, but represent new genera, thus showing how much more there is still to be done in this rich region in spite of all that Dr. and Mrs. Hinde have achieved in the same district.

The other animals collected were *Funisciurus Jacksoni*, de Wint., *Graphiurus murinus*, Desm., *Otomys irroratus*

* Proc. Wash. Ac. Sci. ii. p. 83 (1900).

tropicalis, Thos., *Lophuromys aquilus*, True, *Arvicanthis* sp., *Leggada minutoides*, Sm., *Mus Hindei*, Thos., and *Dendromus insignis*, Thos. The two last-named are rare species, and these additional examples are most welcome.

The prize of the collection is the remarkable little mole-like shrew trapped on the Aberdare Mountains at 9500′, to which I propose to apply the following name:—

SURDISOREX, gen. nov. (*Soricidæ*).

Most nearly allied to *Myosorex*, but with no external ear-conches, with the fore claws enormously enlarged, with only three upper unicuspids, the minute penultimate premolar absent, and with the minute lower supplementary tooth more normal in shape and position.

Type *S. Norœ*.

This genus is clearly related to *Myosorex*, but is more fossorial in character, as evidenced by the aborted ear-conches, long fore claws, and short tail, all of which tend to make it look more like a mole than a shrew. The comparatively normal position of the extra lower unicuspid shows an even more primitive condition than in *Myosorex*, which is the only other genus of Soricidæ that has retained this tooth.

Surdisorex Norœ, sp. n.

Size rather larger than in any known species of *Myosorex*. Fur close and mole-like, rather coarser than in average *Myosorex*; hairs of back about 6 mm. in length. General colour above dark bistre with a greenish iridescence; individual hairs slaty grey for five-sixths their length, their ends pale brown with darker tips. Under surface similar but rather paler, without line of demarcation. Ear-conches absent. Upper sides of hands and feet dark brown; fore claws very long and powerful, those of the second, third, and fourth digits subequal, about 5·5 mm. in length (measured from the base above); pollex with a pointed claw over 2 mm. long; median hind claws about 2·5–2·8 mm. in length. Tail very short, not twice the length of the hind foot, closely hairy, without longer bristles, dark brown above and below.

Skull longer than in any known species of *Myosorex*, but more slender, the palatal area actually narrower than in the smaller *M. Sclateri talpinus*, though decidedly longer. Teeth much as in *Myosorex*, but the second upper unicuspid is proportionally larger, about one third the size of the first in cross section, and the third is more elongated and nearly touches the large pm^4, leaving no space for a fourth unicuspid. Below

there is a marked difference in the shape and position of the minute extra tooth characteristic of *Myosorex*. In the latter it is nearly in the centre line of the tooth-row, jammed closely between the two usual unicuspid teeth, its transverse several times greater than its longitudinal diameter, and looking more like a piece of the cingulum of the first unicuspid than a separate tooth. On the other hand in *Surdisorex* the tooth is nearly circular in section, and is placed in a more normal position in the inner angle between the two larger teeth—in fact, almost exactly as in the bat *Trachops*.

Dimensions of the type (measured in the flesh):—

Head and body 108 mm.; tail 25; hind foot 14.

Skull: greatest length, including incisors, 26·5; basal length 23; greatest breadth 12·8; front of i^1 to back of m^3 11·2; breadth of palate between outer corners of m^2 7; length of lower tooth-row 10.

Hab. East side of the Aberdare range, near Nyeri, British East Africa. Alt. 9500′.

Type. Adult female. B.M. no. 6. 7. 8. 1. Original number 7. Collected 5th November, 1905, by Mrs. Holms-Tarn. One specimen.

This mole-like shrew is a most interesting little animal, and Mrs. Holms-Tarn is to be congratulated on its discovery. She states that it appeared to be rare, as she only saw this one example, although trapping in the locality for some little time.

Mylomys, gen. nov. (*Muridæ*).

General external characters and skull not markedly different from those of *Pelomys*. Fore limbs slender, the forearms long and thin; fifth finger rudimentary, with a short nail instead of a claw, like the pollex. Hind feet long, the fifth toe shortened, little longer than the hallux.

Upper incisors each with a single clearly defined groove; the grooves more external than in *Pelomys*, the outer portion of the tooth only about one half the breadth of the inner. The outer part is also at a lower level, the groove and inner part clearly visible in a lateral view.

Molars large, the space between the two upper first molars less than their breadth. Their structure peculiar, somewhat as in *Œnomys*, though more modified. In each lamina of the upper series the centre cusp is raised in the middle to a point and curved backwards, its grinding-surface pointing backwards and deeply concave, its enamel walls sharp and angular; inner cusp in each case about two thirds the size of the central

one. M^2 with a large antero-internal and a minute antero-external secondary cusp; inner cusp of main lamina (and also the corresponding cusp of m^1) large, projected backwards to the level of the posterior lamina, which has no postero-internal cusp. M^3 with its antero-external cusp almost obsolete; its main cusp longer antero-posteriorly than broad, sharply separated from its large inner cusp, with which it does not fuse.

Lower molars with their deeply concave grinding-surfaces facing forwards, their beak-like hinder edges highly raised. M_1 with its two anterior cusps unusually small in proportion to the others, perhaps in cross section one third the area of the cusps next succeeding them. No external cingular cusps present.

Type *Mylomys Cuninghamei*.

The highly modified teeth of this rat compel me to distinguish it from *Pelomys*, which it resembles in its general appearance and in the grooving of its upper incisors. The molars of *Pelomys* are much more rounded in all respects, with low central cusps and without angular projections connecting the laminæ. In some respects the molars of the Abyssinian rats which in 1902 * I assigned with doubt to *Pelomys*—"*P.*" *dembeensis* and *Harringtoni*—are intermediate between those of *Mylomys* and *Pelomys*; but I am now convinced that these animals should not be included in *Pelomys*, and think they may be provisionally looked upon as aberrant members of *Œnomys*, the so-called grooving of their upper incisors being hardly worthy of the name, and their molars being very similarly formed to those of that group.

In any case the striking rat discovered by Mrs. Holms-Tarn cannot be assigned to any known genus, and needs a special one to be formed for its reception.

Mylomys Cuninghamei, sp. n.

General appearance very much as in *Pelomys fallax*. Fur coarse and harsh; hairs of back about 15 mm. in length. Colour above coarsely grizzled brown or dull buffy, becoming rather more rufous on the rump. Under surface dull whitish, the bases of the hairs slaty. Ears broad, rounded, uniformly brown. Arms grizzled brown and buffy; hands dark buffy. Legs and feet reddish buffy, the skin of the feet brownish. Tail well haired throughout, the hairs almost hiding the scales, which are large, about ten to the centimetre; in colour it is markedly bicolor, blackish brown above, dull buffy below.

* P. Z. S. 1902, ii. p. 313.

Skull strongly built, arched above, the zygomata not widely spread, tapering forwards. Supraorbital edges finely beaded. Palatal foramina extending to the level of the front lamina of m^1. Parapterygoid fossæ deep, ending some way behind the front of the mesopterygoid, whose ledge is level with the middle of m^3. Bullæ fairly large. Teeth as described above.

Dimensions of the type (measured in the flesh) :—

Head and body 155 mm. ; tail 102 ; hind foot 33·5 ; ear 17.

Skull : greatest length 34·5 ; basilar length 28 ; greatest breadth 17 ; nasals 13 × 4·5 ; interorbital breadth 4·6 ; palatilar length 16 ; diastema 9 ; palatal foramina 8 × 2·4 ; length of upper molar series 7·7 ; breadth across outside m^1 6·8, breadth of m^1 2·3.

Hab. British East Africa, east of the Aberdare Mts. Alt. 4480′.

Type. Adult male. B.M. no. 6. 7. 8. 9. Original number 2. Collected September 1905. One specimen.

I have named this interesting rat after Mr. R. J. Cuninghame, to whose tuition Mrs. Holms-Tarn owes her skill in the capture and preservation of small mammals, and to whom the Museum is indebted for many valuable specimens.

XXXIV.—*The Morphology of the Madreporaria.*—VIII. *The Primary Septa of the Rugosa* *.

By J. E. Duerden, Ph.D., A.R.C.S.(Lond.), Professor of Zoology, Rhodes University College, Grahamstown, Cape Colony.

In the first paper of this series, published in 1902, entitled "The Relationships of the Rugosa (Tetracoralla) to the Living Zoantheæ," I confirmed Count de Pourtalès's observation that the rugose coral *Lophophyllum proliferum*, E. & H., has six primary septa (protosepta), all equal in size and situated at

* The first two parts of this series of papers appeared in the 'Johns Hopkins University Circulars,' vol. xxi. nos. 155 & 157, and were reprinted in the Ann. & Mag. Nat. Hist. ser. 7, vols. ix. & x., May and August 1902 ; the third and fourth parts appeared in the Ann. & Mag. Nat. Hist. vol. x., November 1902, and vol. xi., February 1903 ; the fifth and sixth parts in the 'Biological Bulletin,' vol. vii., July 1904, and vol. ix., June 1905 ; the seventh part in the Ann. & Mag. Nat. Hist. vol. xvii., May 1906. The work is being carried out with the assistance of an appropriation from the Carnegie Institution, Washington. I am under great obligations to Prof. Sydney J. Hickson, F.R.S., for seeing the paper through the press in England.

equal distances apart. Also, by means of a series of microscopic sections, I established that the subsequent principal septa (metasepta) are added in a bilateral manner within four of the six primary interseptal chambers, the two middle and the two ventro-lateral chambers; further, that the additions are made at only one region within each chamber, immediately dorsal to the alar or ventro-lateral septum in the case of the middle chambers, and immediately next to the cardinal or ventral directive septum in the ventro-lateral chambers. I then proceeded to show that of all modern Anthozoa the Rugosa find their nearest representatives in the zoanthid actinians. In the Zoantheæ the secondary mesenteries (metacnemes) are added bilaterally at one region within each of the primary ventro-lateral intermesenterial chambers or exocœles, exactly as are the septa in the Rugosa, but no mesenteries are added within the primary middle and dorso-lateral exocœles. From our knowledge of the relationship of the septa and mesenteries in modern corals, it was assumed that the two cycles of septa of the rugose corals were formed within mesenterial chambers similar to those characteristic of the zoanthids, the principal or larger septa within entocœles and the secondary or smaller septa within exocœles; hence the former are termed entosepta and the latter exosepta.

In the sixth paper of this series, published in 1905, with the subtitle "The Fossula in Rugose Corals," I endeavoured to show, from a series of developmental stages in *Streptelasma rectum*, Hall, the true nature of the alar fossulæ, and also that of the cardinal or ventral directive fossula. I demonstrated that the latter fossula is composite in character, at any rate during the early stages; that it is made up of a series of incomplete septa on each side of the ventral directive septum, while the ventral directive septum is itself smaller than the other principal septa. It was suggested that the small ventral directive septum is to be correlated with the presence in the rugose polyp of a ventral siphonoglyph or gonidial groove, similar to that characteristic of modern zoanthid polyps. This interpretation I considered as greatly strengthening the earlier suggestion that the Rugosa are nearly related to the Zoantheæ, and expressed it in the following terms (p. 40): "In the absence of the rugose polyp itself, no surer proof of the relationship of the group to the zoanthids could, to my mind, by adduced than that which admits of the correlation of the simple cardinal fossula with a ventral stomodæal groove." Figures were given (*l. c.* figs. 2–11) showing that in *Streptelasma rectum*, as in *Lophophyllum*, there are six primary septa, and that the subsequent

septa are added in the same bilateral manner at four distinct regions.

Within the present year, Mr. C. E. Gordon, working in the Palæontological Laboratory of Columbia University, New York, has published a paper, "Studies on Early Stages in Paleozoic Corals" (Amer. Journ. Science, vol. xxi. Feb. 1906), devoted almost exclusively to a discussion of my first contribution. By inverting my figures Gordon shows that the sections of *Lophophyllum* can be brought into harmony with Kunth's oft-repeated figure representing the schematic septal plan of a zaphrentoid coral, a fact of which there could be no possibility of dispute. Further, while admitting the hexameral nature of *Lophophyllum*, he attempts to show that it does not represent the true primary character of the Rugosa, but is to be explained as a departure from a primary tetramerism, due to acceleration in time of appearance of the third pair of septa. Moreover, from his own observations on a decalcified silicified specimen of *Streptelasma profundum* (Owen), he presents what he considers as evidence in support of a primary tetramerism. He concludes "that the primitive condition of these [primary] septa in the Rugosa is not yet settled," and that exception must be taken to my statement that "studies on the septal development of extinct Palæozoic corals reveal that in these early forms the primary septal plan was hexameral like that of modern forms."

These assertions of Gordon are so opposed to what I hold to be the truth with regard to the Rugosa that it becomes necessary to re-open the question. The problem is one of greatest importance if we are to arrive at a proper appreciation of the phylogenic relationships of the Rugosa.

Since the appearance of my first paper I have obtained much additional evidence in support of my contentions, and I shall attempt to show that Gordon's assertions are not warranted by the evidence he submits. In the first place, it must be admitted that the figures of *Lophophyllum* given in 1902 are unsatisfactory, from the fact that the microscopic sections upon which they were founded where not all taken from the same individual coral. Exception might be taken to their representing the actual development of the septa, while the stages depicted are not always those best adapted for illustrating the sequence. In my later investigations I have pursued a different method of study, the results from which are far more reliable than those obtained from the old method of sections. In preparing separate sections much loss of material is entailed, only a few sections can be obtained from any one corallum, and the

individuality of the septa is somewhat uncertain owing to possible loss of orientation. To remedy these defects a method was devised by which, with suitable material, one can follow step by step all the developmental stages from beginning to end without any uncertainty of orientation, and secure drawings of all desirable stages. The process involves the grinding down of an individual fixed corallum from one end to the other, and the study and drawing of all the stages as revealed. The broad end of a corallum is first ground smooth, and fixed by Canada balsam to a glass slide, in the manner usually followed by geologists in preparing microscopic sections of rocks; grinding down with fine emery or on a ground-glass plate is then commenced at the opposite end, the narrow tip, and continued all the way. With favourable specimens the septa can be most clearly recognized under a low power of the microscope, and their arrangement outlined by the aid of a camera lucida. The distinctness of the septa can be often emphasized by etching the exposed surface with a little weak acid, and to secure the best reflection of the light from the ground surface while drawing the latter may be smeared with weak glycerine or balsam.

By these devices the whole septal development of a simple corallum can be followed almost as satisfactorily as if one had watched its actual growth day by day. It was from such a series that the ten stages representing the septal development of *Streptelasma rectum* given in the paper on the Fossula were secured, and also the series here reproduced (figs. 1–8), depicting the septal development of *Lophophyllum proliferum*, and intended to replace those given in 1902.

For purposes of the present paper it is not necessary to describe the sections of *Lophophyllum* at greater length than is given in the explanation to each. They reveal nothing fundamental beyond what was brought forward in the first paper, but a confusion in the latter of main and counter septa, alluded to by Gordon, is corrected. In place of the older terminology I think the time has come to adopt that founded upon more modern knowledge of the relationships of the group and accepted for the Anthozoa generally. With the exception of unimportant details, the septal sequence of *Lophophyllum* here given bears the closest relationship to that of *Streptelasma rectum* in the sixth part of these contributions; moreover, it is that found to be characteristic of a large number of other species of rugose corals which I have studied by the same method (*cf.* figs. 9–12; 13–16). Septal and mesenterial development is unquestionably one of the most reliable means zoologists possess for determining the

Fig. 1.

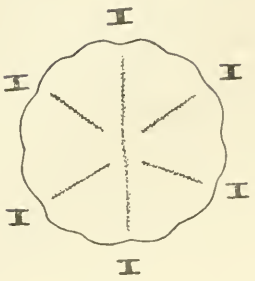
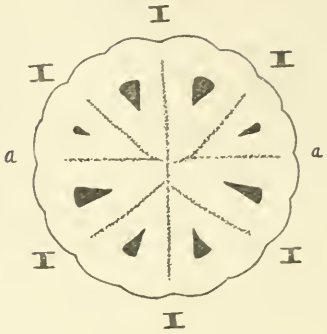


Fig. 2.



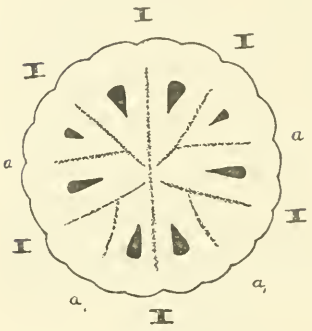


Fig. 3.

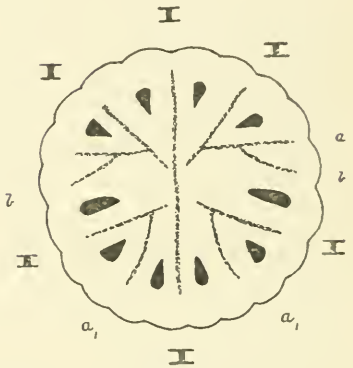


Fig. 4.

Fig. 1.—*Lophophyllum proliferum* (Septal Sequence, Figs. 1–8). Transverse section immediately above the tip of a corallum. The lines of calcification of six primary septa (protosepta) are clearly seen, those of the two median septa being continuous. At this level all the septa are thickened to such a degree that there are no interseptal spaces remaining, and in such a surface view as that from which the figure was taken there is no indication of the boundary surfaces between two adjacent septa. According to the accepted terminology, the upper border is dorsal and the lower ventral.

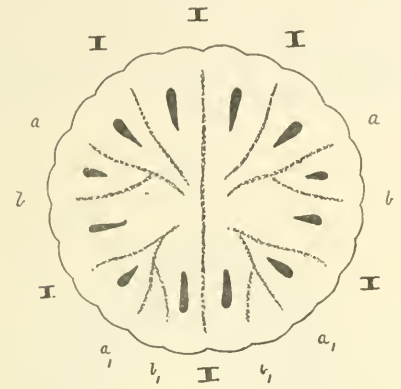
Fig. 2.—Section above that of Fig. 1. An interseptal chamber, represented by the black wedge-shaped areas, now occurs between all the septa. The lines of calcification of an additional pair of septa (metasepta, *a*, *a*) are seen, situated within the two middle of the six primary interseptal chambers (the counter quadrants of palæontologists). The number of external ridges and grooves is double the number of internal septa, a septum corresponding with each alternate groove.

Fig. 3.—Section above that of Fig. 2. A pair of metasepta (a_1, a_1) has now appeared within the two ventro-lateral of the six primary interseptal spaces (the principal or chief quadrants), corresponding with the metasepta (*a*, *a*) of the middle primary chambers.

Fig. 4.—A section still higher. Another pair of septa (*b*, *b*) is now appearing within the two middle primary chambers. At first the new septa are sharply turned towards the older septum on their dorsal aspect and there is no interseptal space.

phylogenic relationships of the Anthozoa, and the Rugosa so far have been found to be remarkably uniform as regards their septal sequence.

Fig. 5.



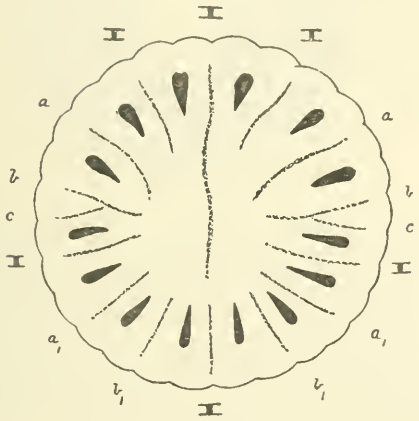


Fig. 6.

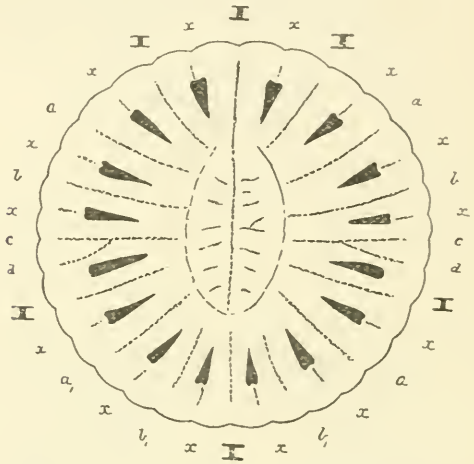
Fig. 5.—A corresponding septum (b_1, b_1) has appeared within each of the ventro-lateral primary chambers.

Fig. 6.—Another septum (c) occurs within each middle chamber, and the line of calcification of the dorsal and ventral directive septa (the *Gegenseptum* or counter septum and the *Hauptseptum* or cardinal septum) are now discontinuous.

The fundamental contention raised by Gordon centres in the number of primary septa characteristic of the Rugosa, that is, whether four or six; and upon this mainly depends

the possibility of firmly establishing the relationships of the group. The ingrained idea of a primary tetrameral plan for the rugose corals rests upon the fact that in the mature corallite there are frequently four primary septa, which by their greater or less size stand out more or less conspicuously among the rest and divide the calice into quadrants; and, in addition, it is easily seen that new septa are added at four regions, one within each quadrant. As demonstrated in my two earlier papers, these suggestions of tetramerism in both

Fig. 7.



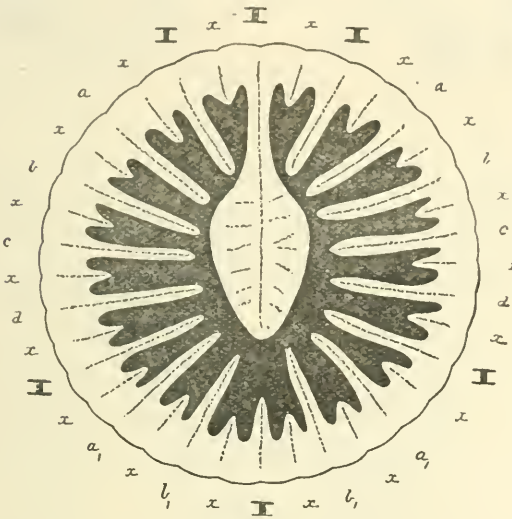
A further septum (*d*) occurs within each middle chamber, without a corresponding pair being added within the ventro-lateral chambers. The central part of the dorsal directive septum is beginning to be freed from the inner ends of the other septa, and appears something like a columella, with distinct centres of calcification. In the space between any two adjacent principal septa the first traces of the centres of calcification of the exosepta (*x*) are now displayed, their appearance all round the calice being nearly simultaneous. The exosepta have thus no ordinal value, such as the principal septa or entosepta possess: they correspond with alternate external grooves alternating with the principal septa.

the developing and mature corallite are not at all proofs of a primary tetramerism; moreover, Gordon produces no proofs beyond a suggestive condition in *Streptelasma profundum* to be discussed later. According to my interpretation, *in the Rugosa a secondary tetramerism has been impressed upon a primary hexamerism.*

At first sight it would seem to be a simple matter to determine the number of primary septa in a corallum. It is

rarely, however, that one secures examples of these ancient corals having perfect tips, and otherwise of such a character that the arrangement of the earliest septa can be made out, either from microscopic sections or grinding down. Specimens of *Lophophyllum proliferum*, the species first studied in this connection, are usually remarkably favourable for such an investigation. Where, in other species, the tips are perfect, it is often found that the septa are not determinable until one or more metaseptal pairs have appeared, in addition

Fig. 8.



The interseptal spaces are now greatly enlarged, and all the septa are free from each other and from the dorsal directive septum with its columella-like free end. Exosepta regularly alternate with the entosepta all round the calice, and the ventral directive septum is a little smaller than the other principal septa, thus giving rise to a fossula. The stage represented is practically that characteristic of the fully developed corallum.

to the protosepta ; sometimes partial or entire silicification of the corallum has taken place, and rendered the preparation of sections practically impossible ; while in such as *Duncanella borealis* the original tip is wanting, and when first collected four, five, or six pairs of septa are frequently exposed to view (fig. 17).

Since the publication of my first paper I have made considerable efforts to secure from various sources specimens of

rugose corals particularly adapted for investigating this special problem. The number now available has enabled me to demonstrate the presence of six primary septa in

Fig. 9.

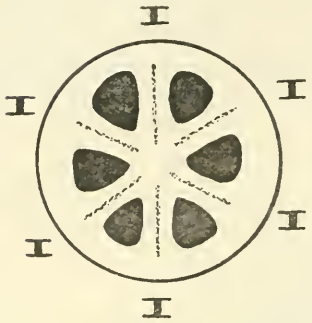


Fig. 10.

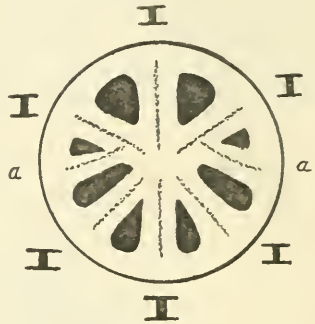


Fig. 9.—*Cyathaxonia cynodon* (Septal Sequence, figs. 9–12). Section immediately above the tip, showing six primary equal septa, separated by six primary interseptal chambers.

Fig. 10.—The first pair of metasepta (*a*, *a*) has appeared, a septum within each of the middle interseptal chambers.

(In the next section a corresponding pair of metasepta is seen within the ventro-lateral chambers: *cf.* fig. 4, a_1, a_2, and fig. 11, a_1, a_1.) *

Fig. 11.

An additional pair of septa has appeared within the two middle chambers (*b*, *b*), and also within the two ventro-lateral chambers (b_1, b_1). Certain of the exosepta (*x*) are also present.

(In the next section a pair of septa (c_1, c_1) is developing within the ventro-lateral chambers in advance of the corresponding pair within the middle chambers.) *

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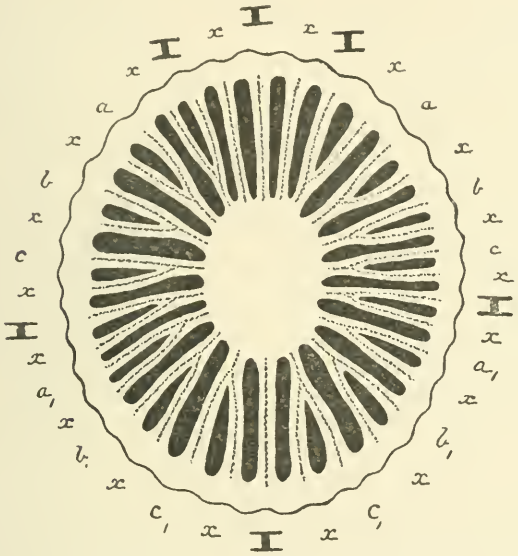
* [The figures intended to follow fig. 10 and fig. 11 were not found among the drawings forwarded by Prof. Duerden. I have added these notes to explain the points that should have been illustrated by the missing figures.—S. J. H.]

several species, in addition to *Lophophyllum proliferum*; in fact, *wherever the specimens have been such as to admit of the proseptal stage being determined six septa have been revealed. Streptelasma rectum*, Hall, is a species of which examples are frequently obtained having perfect tips, and the whole corallum preserved in such a way that the septal development can be followed throughout. All the principal stages have been described and figured in my paper on the Fossula, and in the present connection the fact of supreme interest is that six primary septa occur, all of equal size and situated at equal distances apart (*l. c.* fig. 2). It may be mentioned that in one specimen of *S. rectum* only five primary septa

Fig. 12.



The same number of septa occur within the middle primary chamber (a, c) as within the ventro-lateral chamber (a_1, c_1). In the subsequent growth all the entosepta become free from the central mass, and the exosepta become free from the entosepta.

were present, and the later septa were added in an order different from that of the examples with six primary septa. Manifestly one must be prepared for irregularities in the septal formation of fossil corals just as much as in living corals.

Coralla of *Cyathaxonia cynodon*, E. & H., are also well adapted for the determination of the number of primary

septa, as their tips are usually perfect. On grinding down a corallum for a short distance six equal septa are disclosed, radially arranged, and separated by comparatively large equal interspaces. On pages 234-235 four figures are given (figs. 9–12) displaying the early stages in the septal development of this species, starting as before with a primary hexamerism.

In the above and other species, in which the septal constitution has been established by the process of grinding, it may be objected that if earlier stages than those first represented could be obtained four primary septa might then be disclosed, and the other two would be seen to be but later additions to a tetrameral group; in other words, that the earliest septal stage is not that indicated as such. Were this the case the dorso-lateral pair here regarded as protosepta would be really the first pair of metasepta. Against this reasonable objection it can be affirmed that in all cases as soon as any of the primary septa are determinable they are already six in number, all fully developed, practically equal in size, and radially disposed at equal distances apart. Two pairs never appear in advance of a third pair. Moreover, there is never any hint of the third pair being inclined at its origin towards the others, after the manner of development invariably characteristic of the first and later pairs of metasepta. All the sections representing the appearance of the metasepta indicate that the new septa first arise within the wall of the calice. Their free end is then turned towards the older septum dorsal to them, and as they become larger and extend higher they seem gradually to travel, as it were, along the older septum, until they nearly reach the middle of the calice. The centripetal end then becomes independent of the adjacent septum, and is either free or united in a columellar mass. Thus the metasepta are not truly radial until they are fully formed. These stages are presented by all the metasepta and also exosepta in their devolopment, but, as already stated, they are never represented by any of the first six septa. All the studies on the development of the corallum of recent hexameral corals, conducted by Lacaze-Duthiers, G. von Koch, and myself, indicate that six equal septa are formed simultaneously in a radiate manner, and such would appear to have been the case with the corals of Palæozoic times.

Among a large collection of rugose corals lent me for study by the United States National Museum, through the assistance of Prof. C. Schuchert, are several specimens labelled *Zaphrentis pusilla*, n. sp. These have proved to be

very satisfactory for the present study, having perfect tips and septa clearly displayed. Four of the early stages are reproduced in figs. 13–16. Here, again, on the earliest appearance of the septa six members are present, equal in size, situated at equal distances apart, and disposed approximately in a radial manner; the metasepta are added at four regions in the manner just described, the newer as they appear being inturned towards the older.

Fig. 13.

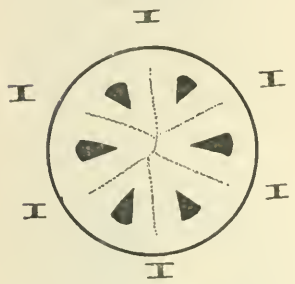
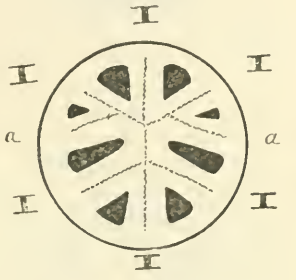


Fig. 14.



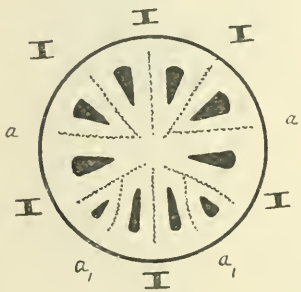


Fig. 15.

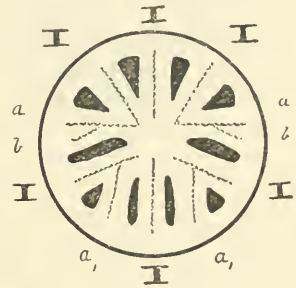


Fig. 16.

Figs. 13–16.—Series of sections showing four early stages in the septal development of *Zaphrentis pusilla*. The general relationships very closely resemble those of the two series already described.

In addition to these four very decided cases of hexamerism, secured from several specimens of each species, six primary septa have been demonstrated in *Hadrophyllum glans* (White), *Hadrophyllum pauciradiatum*, E. & H., and *Microcyclus discus*, Meek & Worthen, though, largely on account of their squat form, these species are not so well adapted for displaying the entire septal development as those figured. Still other rugose corals have been examined in which it has been found impossible to secure the protoseptal stage alone, yet when the earliest stage is reached at which septa are exposed their

Fig. 17.

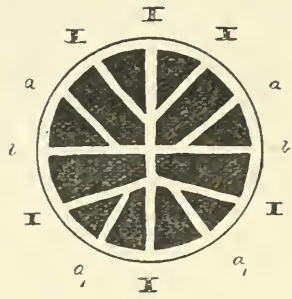


Fig. 18.

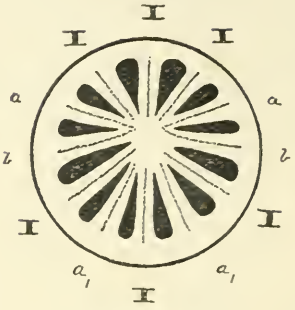


Fig. 19.

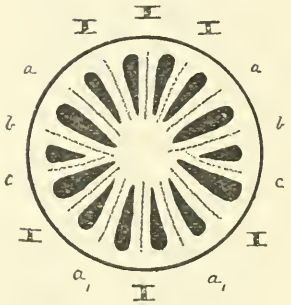


Fig. 20.

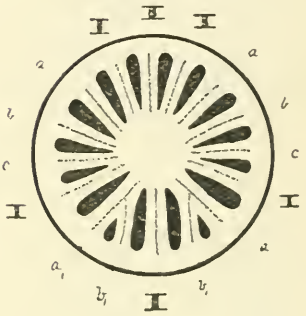


Fig. 21.

Figs. 17–21.—Series of sections showing four stages in the septal development of *Duncanella borealis*. The earliest stage available in the corallum figured already shows six pairs of septa, as naturally exposed in fig. 17 and as seen on grinding smooth in fig. 18; the subsequent septa are added as in the three previous species, with the exception that in the last figure the number of septa within each middle chamber (*a*–*d*) exceeds by two that within the ventro-lateral chambers (a_1, b_1).

arrangement is such as to leave no uncertainty that the primary condition was hexameral, and that the later septa have been added in the same manner as in other forms where the sequence is determinable from the beginning. Such are *Streptelasma profundum*, *Streptelasma wayensis*, and *Duncanella borealis* (figs. 17–21).

It seems unnecessary to multiply examples. Wherever the tip is sufficiently well preserved to display the primary septa they are found to be six in number; in no case has even a suggestion of a primary tetrameral condition been encountered. With all these definite facts available there would seem to be no longer a possibility of any reasonable doubt as to the primary hexamerism of the Rugosa.

In his paper Gordon does not attempt to dispute the hexamerism of *Lophophyllum proliferum*, but endeavours to explain it as the result of the precocious appearance of what, according to him, should be the first pair of metasepta. This pair, here regarded as the primary dorso-lateral pair, Gordon supposes to belong not to the protoseptal, but to the metaseptal series, and owing to its accelerated appearance it gives a false hexameral character to the primary stage. This idea of acceleration is altogether hypothetical, and its author does not produce a single acceptable fact in its support. He considers that a departure from the original tetrameral type is likely to occur in a form such as *Lophophyllum* which appears in Carboniferous times, that is, towards the close of the geological distribution of the rugosids. This argument, unsatisfactory in itself, now fails altogether in view of the fact that comprised in the list of corals given above, in which six primary septa have been definitely established, there are representatives of almost all ages in the chronological extension of the rugose corals.

Gordon draws attention to the fact that in the older stages of growth of a corallum there is no difference in character between the dorso-lateral pair of primary septa and the principal septa which arise later, that the interseptal spaces between these septa and the adjacent septa differ in no ways from the other interspaces, and that exosepta appear in the dorso-lateral primary interseptal spaces just as in others. Were these really primary septa he expects that they would present some feature distinguishing them from the later principal septa. Such an expectancy, however, is altogether contrary to what we actually know of development and growth in the Anthozoa. All studies in this group, particularly among the actinians and corals, reveal that the growth tendency is everywhere towards a perfectly cyclic plan, with all the parts

in any cycle alike in size and other characters; however strongly bilateral or otherwise varied may be the course of development, the final result is an approximation towards radial symmetry, such as is characteristic of most sessile organisms where the environmental forces act equally all round. Most rugose corals have an almost perfect cyclic plan in the uppermost part of the calice, though we know that this is founded upon decidedly bilateral developmental stages; likewise the cyclic disposition of the organs in the adult stages of nearly all actinians and corals gives scarcely any hint of their strongly bilateral developmental sequence. Hence any argument as to the primary or development relationships of the septa founded upon adult appearances has little or no value.

Gordon errs with Kunth and others in assuming that each of the external grooves on the surface of a rugose corallum represents a septum formed in orderly sequence within each quadrant (see Gordon's fig. 15). As a matter of fact only alternate grooves correspond with principal septa (entosepta), and it is these alone which have any sequence value. This is manifest from the series of sections represented in figs. 1–8. In figs. 1–6 only entosepta are yet present, and correspond with alternate external grooves, while figs. 7 and 8 show that the smaller septa (exosepta) arise almost simultaneously at a rather late developmental stage, and are thus of no significance as regards septal sequence.

Attention may now be directed to the proof which Gordon has to offer in support of his contention that the primary septal plan of the rugosids is tetrameral. He fully recognizes the difficulties attendant upon securing sections through the tips of the coralla, and apparently has not succeeded in obtaining such; for the only evidence he adduces rests upon a couple of decalcified silicified specimens of *Streptelasma profundum*, one of which was broken during examination; with such material study must necessarily be limited to surface views. He states that "of the four primary septa represented in the drawing [*l. c.* fig. 16], the counter septa extended farthest down, the cardinal next, and the alar next," and claims that these four septa extended farthest down into the base of the calice and are the only true primary members.

I likewise have in my possession about a dozen decalcified specimens of *S. profundum*, of all sizes, which present all the appearances described by Gordon, and in some the earlier stages are more completely preserved than Gordon's figures and remarks indicate his two examples to be. I have already

figured the septal plan of one of these young forms (Biol. Bull., June 1905, p. 39). The figure shows that in this particular specimen the details of the early septal growth are so well preserved as to display the septa turned towards one another in the regular manner revealed by serial sections, but such are not indicated in Gordon's drawings; the exosepta can also be seen in their initial relationships with the entosepta, which is likewise not the case in Gordon's example. Gordon himself suggests that absorption has taken place in the lower parts of the septa of his specimen, and in the case of the tertiary septa (*exosepta* of the present paper) acknowledges (p. 124) that "it was impossible in all cases to tell to what length they extended down into the coral." His own figure and statements would prove that even the primary septa were not all formed at the same time, though such is certainly the evidence from all well-preserved material of other species. Taking into account all the details which Gordon offers, and studying along with them my own much better series of the same species of coral, I am convinced that little or no value can be placed upon his specimen as an aid in solving the present problem. Moreover, I consider that the evidence from none of my specimens could be regarded as conclusive as far as concerns the number of primary septa; to a certain extent the actual details would for ever remain a matter of individual interpretation. Assistance from decalcified silicified specimens must, in my opinion, always be unsatisfactory, largely on account of possible imperfect silicification of the earliest stages. The details obtainable from sections or grinding of the actual tip afford by far more convincing evidence, and manifestly, from the additional evidence produced in this paper, there is no occasion for any uncertainty in the matter; there can now be no reasonable doubt that the hexameral plan is that characteristic of the group.

To sum up, Gordon, in my opinion, (1) has failed to produce any evidence in favour of a primary tetrameral plan in the rugosids, and (2) his attempt to explain the hexameral character of *Lophophyllum proliferum* as resulting from precocity of the first metaseptal pairs is altogether unsupported by facts. The demonstration of six primary septa in many other species is proof beyond doubt that *L. proliferum* is not exceptional in its hexamerism, but conforms to the rugosid type.

Gordon is not in a position to discuss the view that the Rugosa find their nearest modern representatives in the Zoantheæ. One of the necessary arguments for the main-

tenance of this is the establishment of their primary hexamerism, and unless very weighty evidence to the contrary should be forthcoming this must now be regarded as accomplished. The facts in support of the relationship may be summarized as follows :—

1. The Rugose corals and the Zoanthid actinians have both a primary hexamerism.

2. The septa in the Rugosa and the mesenteries in the Zoantheæ are added in bilateral pairs at only one region, a vertical zone within the primary exocœles, there being four such regions—middle and ventro-lateral chambers—in the Rugosa, and two—ventro-lateral chambers—in the Zoantheæ.

3. The septa in the Rugosa and the mesenteries in the Zoantheæ are never polycyclic, as in modern corals and ordinary actinians ; at most there are only two cycles of septa, large entosepta and small exosepta, disposed in such a manner as could only have been produced in polyps with a mesenterial arrangement similar to that of the Zoantheæ.

4. The presence of a ventral directive fossula in the Rugosa, usually persisting in the fully developed and otherwise perfectly radial calice, can be explained by the occurrence within the living rugose polyp of a single ventral siphonoglyph or gonidial groove, such as is characteristic of zoanthid polyps.

XXXV.—*Notes on the Habits of Tsetse-flies.*

By F. Creighton Wellman, Benguella, West Africa.

Having recently had opportunity to make some observations on tsetse-flies in the Esupua "fly-belt," about thirty-five miles inland from the seaport town of Benguella, West Africa, I present here some of my findings. Our knowledge of these flies is as yet very far from complete, and first-hand observations, including mention of the date, habitat, and species studied, should be recorded.

The following notes were a few of them made in November 1904, but most of them date from October 28th and 29th and November 9th and 10th, 1905. The Esupua "fly-belt" is, as I have said, about thirty-five miles inland from the port of Benguella (13° S. on the west coast of Africa) and twenty miles from the city of Catumbella. The fly studied by me is a subspecies of *Glossina palpalis*, Robineau-Desvoidy, which

was last year described in the Ann. & Mag. Nat. Hist. as *Glossina palpalis Wellmani*, Austen (1905) *.

Although the district in which the flies were taken was found to contain some game, including eland (*Oreas canna Livingstonei*), roan antelope (*Hippotragus equinus*), kudu (*Strepsiceros kudu*), the duyker (*Cephalolophus Grimmi*), and Speke's tragelaph (*Limnotragus Spekei*), yet I believe that human blood forms the greater part of their food. This is undoubtedly true over at least a part of the "belt." Along the north bank of the lower Katumbela River from Esupua to a point half a day's march up the river lies the great Benguella caravan-route, near which there is little or no game, but over which constantly pass great caravans of half-naked Bantus. At Esupua one may see half a dozen of these large caravans camping in one place. It is here that the flies are the most plentiful. They hide in the tall grass and sedges near the river, and also on stones, trunks of trees and vines, and among the leaves of shrubs and bushes on the bank. When a native is sent to the river for water the flies rise from their resting-places as he passes and follow him, seeking for an opportunity to bite. On several different occasions I followed natives going to the river to fetch water. One of these I saw bitten twice, three were bitten once each, and seven I did not see bitten at all. The Bantus say that the bite is painful, and I noticed that if a fly settled on a porter's back the man generally slapped himself as it began to insert its proboscis. Some of the specimens I took had abdomens greatly distended with blood. The flies do not always remain so close to the river. The first one I saw in November 1904 was between three and four hundred yards from the river in thin "desert" bush, consisting of *Acacia refeciens* and other thorny shrubs, which afford practically no shade. *Gl. palpalis Wellmani* certainly does not share the dislike for human ordure which has been ascribed to its congeners. I have frequently seen it in and around the filthiest native camps at some distance from the river and from shade, where it had evidently gone for the purpose of sucking human blood. The fly bites most viciously during the heat of the day, and, as I have said, goes considerable distances in search of food. It bites less readily in the evening and early morning. The native blacks claim that it occasionally bites at night. The one observation that I made in view of this statement leads me to suspect that it is

* Ser. 7, vol. xv., April 1905, p. 390.

not true, at least for the time of year mentioned at the beginning of these notes. All three of my visits to Esupua were made during the heaviest rains of the year, which, according to native reports, do not seem to have the effect which has been claimed for them in reducing the numbers of "fly."

I have elsewhere shown that *Gl. palpalis Wellmani* is a disseminator of human trypanosomiasis, and that this disease is unfortunately on the increase in Benguella District.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

April 25th, 1906.—J. E. Marr, Sc.D., F.R.S., Vice-President, in the Chair.

The following communications were read:—

1. 'Trilobites from Bolivia, collected by Dr. J. W. Evans in 1901–1902.' By Philip Lake, M.A., F.G.S.

Several horizons are represented by these fossils. Two specimens of *Peltura*, probably from the Upper *Lingula*-Flags, were collected at Cochaiya, about 3 miles north-east of Pata. New species of *Symphysurus* and *Trinucleus*, probably of Arenig age, were found about a mile from Apolo, Province of Caupolican. An indeterminable species of *Ogygia* was obtained from the right bank of the River Caca, in the same province. *Phacops* cf. *arbuteus*, *Dalmanites Paituna*, and *D. Maecurua* were collected in the track from Apolo to San José de Chupiamonas, also in the province of Caupolican. The nodules from which they were derived are probably of Lower Devonian age. Descriptions are given of the new species and other forms mentioned. It is worthy of remark that, while the earlier forms show affinities with the contemporaneous European fauna, the Devonian species are much more closely allied to those of South Africa and North America.

2. 'Graptolites from Bolivia, collected by Dr. J. W. Evans in 1901–1902.' By Ethel M. R. Wood, D.Sc.

In black pyritic shales from three localities several specimens of *Didymograptus* were collected: one referable to *bifidus*, one of the type of *affinis*, and one of the *Nicholsoni*-type. *Phyllograptus*, *Glossograptus*, *Cryptograptus*, and *Diplograptus* were also obtained. A pale, silky grey shale shows also rare graptolites, belonging to a species comparable with *Climacograptus confertus*. These forms indicate that both the black and the pale shales belong to horizons in the Upper Arenig rocks (Lower Llanvirn of Hicks).

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 106. OCTOBER 1906.

XXXVI.—*Natural History Notes from R.I.M.S. 'Investigator.'*—Series III., No. 10. *On Mollusca from the Bay of Bengal and the Arabian Sea.* By Edgar A. Smith, I.S.O.

[Concluded from p. 175.]

Bathybembix Nevilli, sp. n.

Testa turbinata, imperforata, alba, periostraco tenui griseo induta; spira conica, pagodiformis; anfractus 8–9, supra concave declives, infra medium angulati, ad angulum acute tuberculati, supra ad suturam tuberculati, infra ad suturam minute denticulati, lineis incrementi obliquis striati, ultimus infra angulum tuberculatum liris quinque crenulatis cinctus; apertura obliqua, irregulariter rotundata, intus sulcis levibus 4–5 sculpta; labrum tenue, basi subexpansum; columella alba, incrassata, reflexa, callo tenui labro juncta.

Alt. 30 mm., diam. maj. 26, min. 22; apertura 12 longa, 13 lata.

Hab. Station 277, south of Ceylon, 859–880 fath.

The minute tuberculation or crenulation at the suture and the crenulation of the five basal liræ are caused by the lines of growth. The acute tubercles are about twenty in number upon the last whorl, and become smaller and closer together as they ascend the spire.

Rather like *B. argenteo-nitens*, Lischke, from Japan, but smaller, with a thicker external calcareous surface, more

acute tubercles, and stronger lines of growth making the basal lirae more distinctly crenulated.

Named *B. Nevilli* in remembrance of my late friend Geoffrey Nevill, formerly of the Indian Museum, Calcutta.

Gaza (*Callogaza* ?) *Frederici*, sp. n.

Testa breviter conica, late umbilicata, albo-margaritacea ; anfractus 8, regulariter lente accrescentes, plani, supra et infra serie tuberculorum acutorum ornati, lineisque incrementi obliquis sculpti, sutura canaliculata sejuncti, ultimus ad peripheriam carina secunda pulcherrime serrata cinctus, infra liris concentricis quinis minute serratis ornatus ; apertura oblique subquadrata, intus irridescens, margaritacea ; labrum leviter incrassatum, album, subexpansum; columella reflexa, umbilicum partim obtegens, callo tenui labro juncta.

Diam. maj. 25 mm., min. 23 ; alt. 20.

Hab. Station 333, Gulf of Manar, 401 fath.

A single specimen only. It is a very beautiful form and well characterized by its nacreous surface, the rows of acute tubercles at the upper and lower part of the whorls, the deep channelled suture, the wide pervious umbilicus, partly covered by the reflection of the columella, and the bicarinate character of the body-whorl The lower keel, which forms the periphery, is very finely serrated by the clearly developed lines of growth. Of the five basal lirae, which are also minutely serrated, that which borders the umbilicus is stouter than the rest.

Basilissa patula, Martens, is more widely umbilicated, has a third row of acute nodules, only four on the base, and a less raised spire, and the characters of the peristome appear to be different if Martens's shell was mature.

Named after my friend Mr. F. Beavis, who was much impressed with the beauty of this shell.

Calliostoma admirandum, sp. n.

Testa elate acute conica, imperforata, pallide cornea, maculis saturatioribus irregulariter picta ; anfractus 9, plani, seriebus quinque granulorum minimorum, seriebus minoribus intercalantibus, ornati, ultimus ad peripheriam acute angulatus, infra concentrice liratus, liris circiter 12, subgranulatis, rufo punctatis ; apertura obliqua, subquadrata ; columella alba, incrassata, obliqua, leviter arcuata, reflexa.

Diam. 17 mm., alt. 20.

Hab. Station 258, W. of Travancore, 102 fath., sand.

The series of granules on the last and penultimate whorls are alternately larger and smaller, but on the upper volutions the finer granules are wanting.

Glyphis delicata (Smith).

Fissurella delicata, Smith, Ann. & Mag. Nat. Hist. 1890, vol. iv. p. 249; Illust. Zool. 'Investigator,' Mollusca, pl. xii. figs. 8, 8 *a*.

Hab. Station 333, Gulf of Manar, 401 fath.

A single specimen, differing from the type only in its greater size. It is 39 mm. long, 24 broad, and 14 high.

Puncturella (*Cranopsis*) *asturiana* (Fischer).

Puncturella (*Cranopsis*) *asturiana*, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 371; 1904, vol. xiv. p. 5.

Hab. Station 333, Gulf of Manar, 401 fath.

This is another instance of the same species occurring in the Indian and Atlantic Oceans. The only slight difference between the shells from the above locality and those obtained by the 'Challenger' Expedition in the West Indies in 390 fath. is that the slit is perhaps a little nearer the apex in the Manar shells than in those from Culebra Island.

Scaphander mundus, Watson, var.

Scaphander mundus, Watson, Gasteropoda 'Challenger' Exped. p. 643, pl. xlviii. fig. 2.

Hab. Station 276, W. of Ceylon, 1003 fath.; off Arrou I., 800 fath ('Challenger').

The 'Investigator' specimens are rather more finely punctate than the types, but are similar in other respects.

Scaphander andamanicus, Smith.

Scaphander andamanicus, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 167, pl. iv. fig. 15; 1904, vol. xiv. p. 5.

Hab. Station 256, W. of Ceylon, 937 fath., green mud; Station 273, off Malabar coast, 823–870 fath.; Station 321, S. of Ceylon, 660 fath.

Scaphander cancellatus, Martens.

Scaphander cancellatus, Martens, Deutsch. Tiefsee-Exped. 'Valdivia,' vol. vii. p. 131, pl. v. fig. 19.

Hab. Station 322, Andaman Islands, 378 fath.; Station 259, W. of Malabar coast, 295–360 fath., green mud and sand; W. of Sumatra, 470–646 metres (*Martens*).

Although varying somewhat in form, some examples being narrower than others, the strong cancellated sculpture will distinguish this species from its congeners.

Scaphander vicinus, sp. n.

Testa ovata, mediocriter tennis, alba, periostraco tenui pallido lutescenti induta, lævis, nitida, interdum lineis elatis transversis vel carinis instructa, lineis incrementi striata, et spiraliter transversim leviter punctata, punctis elongatis gracilibus; apertura alba, supra anfractum producta; columella valde arcuata, incrassata, reflexa, callo tenui apici juncta.
Longit. 36 mm., diam. 24.

Hab. Station 318, W. of Ceylon, 1085 fath.

More delicately punctate than *S. mundus*, Watson, *S. andamanicus*, Smith, or *S. cancellatus*, Martens. *S. alatus*, Dall, is closely allied, but has the lip peculiarly produced, and *S. nobilis*, Verrill, has a different columella and sculpture.

Dentalium magnificum, Smith.

Dentalium magnificum, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 371; 1904, vol. xiv. p. 7; Illust. Zool. 'Investigator,' Mollusca, pl. vii. figs. 5, 5*a*; Pilsbry, Man. Conch. vol. xvii. pp. 78, 251.

Hab. Station 232, off Travancore coast, 430 fath., grey mud; Station 265, off N. of Ceylon, 225–594 fath., mud; Station 323, N. of Andaman Islands, 463 fath.; Station 327, W. of Burmah, 419 fath.

The specimens from Station 232 are a trifle more slender than the typical form, but in other respects quite similar. A young specimen from Station 327, 73 mm. in length and 8 at its broadest end, tapers to a fine point only 1 mm. in diameter, and there exhibits a very narrow slit 5 mm. in length.

Dentalium keras, Watson.

Dentalium keras, Watson, 'Challenger' Scaphopoda, p. 3, pl. i. fig. 4; Dall, Bull. Mus. Comp. Zool. Harvard, vol. xviii. p. 425; Pilsbry, Man. Conch. vol. xvii. p. 68, pl. iii. fig. 41.

Hab. Station 316, S. of Ceylon, 1500 fath.

These specimens are much finer than the 'Challenger' type from the mid-Pacific, E. of Japan. The largest is 62 mm. in length and 11 in diameter at the aperture.

Dentalium profundorum, Smith.

Dentalium profundorum, Smith, Ann. & Mag. Nat. Hist. 1891, vol. xiv. p. 167, pl. iv. fig. 18; Pilsbry, Man. Conch. vol. xvii. p. 79, pl. vi. fig. 82.

Hab. Station 283, off E. of Ceylon, 1086 fath.; Station 331, off Andaman Islands, 569 fath.

The single very slender specimen from Station 331, although 80 mm. in length, is only 6 mm. at the broadest diameter. This results from its perfect growth from the very young state, the young shell not being broken as is generally the case in these large *Dentalia*. It tapers to a point less than a millimetre broad, and exhibits in the usual position a very fine slit 4 mm. in length. The examples from Station 283 are quite like the original type from off Colombo.

Dentalium serrulatum, sp. n.

Testa solidiuscula, leviter arcuata, lente attenuata, longitudinaliter tenuiter lirata, liris sæpe plus minus minute serratis, transversim tenuiter striata, striisque longitudinalibus indistincte decussata, alba, postice breviter fissurata; apertura circularis.
Longit. 56 mm., diam. max. 6.

Hab. Andaman Islands, 60 fath.

The distinguishing feature of this species is the peculiar fine serration of the fine riblets, especially those upon the concave curve of the shell. Probably this character would be lost in worn specimens. Judging from the gradual tapering of the shell, I do not think it would attain much larger dimensions than those here given. The fine decussation of the surface is only observable in well-preserved examples. The riblets number sixty to sixty-six at the larger end and about thirty at the narrow extremity. Only one of the two specimens exhibits a slight terminal notch, but probably the young shell would have a narrow slit. The curve of shell is different in the two examples at hand, one being straighter than the other.

Dentalium cornu-bovis, sp. n.

Testa magna, valde curvata, celeriter accrescens, alba, nitida, solidiuscula, tenuissime longitudinaliter striata, striis antice fere obsoletis, lineis incrementi oblique flexuosis sculpta, postice breviter vel vix fissa; apertura circularis, ad marginem tenuis, intus alba.
Longit. 59 mm., diam. max. 12.

Hab. Indian Ocean, 1154 fath.; var. from Station 248, W. of Travancore, 224–284 fath., sand.

The greater part of the surface of this interesting shell is merely finely striated, but the younger portion is somewhat distinctly lirate. It enlarges more rapidly than *D. keras* and is more finely sculptured. The variety from Station 248 has the striation continued to the aperture.

Dentalium usitatum, Smith.

Dentalium usitatum, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 168, pl. iv. figs. 16, 16 *a*; Pilsbry, Man. Conch. vol. xvii. p. 29, pl. x. figs. 68, 69.

Hab. Station 325, W. of Burmah, 843 fath.

The largest specimen is 58 mm. in length, 1 mm. in diameter at the tip, and 5 anteriorly. The apex was originally described as "haud fissa," but the present examples exhibit a very narrow slit, varying in length from 1 to 3 mm. The presence or absence of an apical fissure is known to be a variable character in some other species of this genus.

Dentalium insolitum, Smith.

Dentalium insolitum, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 168, pl. iv. figs. 17, 17 *a*; Pilsbry, Man. Conch. vol. xvii. p. 109, pl. xxii. figs. 56, 57.

Hab. Station 282, off N. of Ceylon, 498–726 fath.

Dentalium lubricatum, Sowb.

Dentalium lubricatum, Sowerby, Thes. Conch. vol. iii. p. 97, pl. ccxxv. fig. 56; Reeve's Conch. Icon vol. xviii. fig. 55; Pilsbry, Man. Conch. vol. xvii. p. 110, pl. xix. fig. 22.

Hab. Station 331, off Andaman Islands, 569 fath.

A single specimen about the same size as the type from Australia, but a trifle more curved, agreeing in this respect with the two other specimens received together with the figured shell in the Cuming Collection.

Dentalium eburneum, Linn.

Dentalium eburneum, Linn.; Pilsbry, Man. Conch. vol. xvii. p. 115, pl. xx. figs. 33, 34.

Hab. Station 271, off Malabar coast, 22 fath.

The single specimen, 47 mm. in length, differs only from the normal form in being a pale flesh-colour instead of white. It exhibits the raised rings and longitudinal striæ so characteristic of the species.

Dentalium subcurvatum, sp. n.

Testa gracilis, lente accrescens, parum arcuata, alba, haud nitida, longitudinaliter tenuiter lirata, liris filiformibus, antice circiter 32, striisque incrementi conspicuis supra et inter liras continuis sculpta.

Longit. 63 mm., diam. max. 6.

Hab. Station 275, S.W. of Cape Comorin, 731–771 fath.

Only a single specimen obtained. It tapers very slowly, is only slightly curved and delicately ribbed, the fine ribs being in places almost crenulate, caused by being cut through or crossed by the strong lines of growth.

Lepidopleurus andamanicus, sp. n.

Testa parva, sordide albida, elongata, mediocriter alta, in medio fere carinata, intus albida, undique minute punctulata, epidermide quasi deciduа punctata induta; valva antica angusta, intus incrassata, margine posteriore in medio angulato; valvæ centrales angustæ, apice distincto instructæ, margine utrinque apicem leviter concavo; areæ laterales leviter elatæ, sulco arcuato transverso utrinque sæpe sculptæ; laminæ suturales parvæ, substriatæ; sinus mediocriter profundus; valva postica anteriore longior, in medio mucronata; ligamentum angustum, dense et microscopice spiculosum.

Longit. 13 mm., diam. 7, alt. 3·5.

Hab. Off N. Sentinel Island, Andaman Islands, 240 fath.

Rather like *L. arctica*, Sars (Moll. Reg. Arct. Norveg. pl. vii. figs. 7 *a*, 7 *d*–7 *g*), but not quite so broad, more sharply angled down the back, with a narrower sinus between the sutural laminæ, more distinct apex to the central valves, &c. The sculpture is peculiar. The surface seems to be covered with a minutely shagreened epidermis, which is easily rubbed off, leaving, however, the impression of the shagreening. The curved sulcus at the sides of the valves being continuous round the shell marks off a narrow encircling zone; it is not, however, present in every specimen.

Nucula (*Acila*) *granulata*, sp. n.

Testa valde inæquilateralis, ovato-subtrigonalis, antice oblique subtruncata, ad extremitatem subacute angulata, postice acute rotundata, modice convexa, albida, periostraco tenui olivaceo-flavo induta, seriebus confertis arcuatis granorum postice divergentibus instructa; umbones incurvati, ad apicem læves, longe ante medium siti; lunula infra umbones excavata, dein prominens; area postica angusta, lanceolata, lævis, circumscripta.

Longit. 15 mm., alt. 11, diam. 7.

Hab. Station 324, W. of Burmah, 448 fath.

One specimen only. Remarkable on account of the radiating series of granules or small pustules. The extreme tips of the umbones are smooth, then comes a small defined umbonal cap with about nine plain radiating riblets, after which commence the rows of granules These are as broad as, or even in some cases broader than, the grooves between them. On the anterior slope they become ridges rather than rows of pustules and are at right angles to the margin of the valves. They are also very much of the same character on the lunular slope.

Nucula Layardi, A. Adams.

Nucula Layardi, A. Adams; Hanley, Sowerby's Thes. Conch. vol. iii. p. 160, pl. ccxxx. fig. 153.

Hab. Persian Gulf, 47 fath. ('Investigator'); Ceylon (*Adams*).

The single shell is probably adult and measures 15 mm. in length, whereas the type in the "Cuming" Collection is only 10½, the figure above quoted being enlarged. The Ceylon shells are evidently young, from their thinness. The present example is moderately thick, white beneath the periostracum, and beautifully white-nacreous within. The hinge-teeth are long, acute, six in front and nineteen behind.

Yoldia vicina, sp. n.

Testa *Y. nicobaricæ* similis, sed postice magis acuminata, striisque obliquis minus confertis insculpta; valvæ tenues, pellucidæ, periostraco flavo-olivaceo induta, nitida; pagina interna nitens, cærulco-albida; dentes posteriores circiter 26, anteriores ad 19, paulo validiores; umbones lævigati, aliquanto antemediani.

Longit. 20·5 mm., alt. 11·5, diam. 7.

Hab. Persian Gulf, 35 and 47 fath.

This species is very like *Y. nicobarica*, Brug., but is more sharply pointed at the posterior extremity, which is not so high up as in that species. The oblique striæ are much fewer and further apart, and terminate in an oblique line nearer the middle of the valves. Two specimens only were obtained.

Malletia brevis, sp. n.

Testa oblonga, antice rotundata, postice subquadrata, multum convexa, periostraco nitente flavescenti induta, apices versus pallidior, incrementi lineis tenuibus sculpta, striis postice magis conspicuis,

confertioribus; lunula angusta, concava, carinis circumscripta; area postica nulla; dentes erecti, acuti, anteriores circiter 14, posteriores ad 21.

Longit. 14 mm., alt. 10, diam. 7.

Hab. Station 318, off W. of Ceylon, 1085 fath.

Differs from *M. conspicua*, Smith, in form and sculpture, being more rounded in front, shorter, and squarer posteriorly. A single specimen.

Solenomya patagonica, Smith.

Solenomya patagonica, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 11.

Hab. Station 260, W. of Cape Comorin, 487 fath., grey mud and Globigerine ooze; Station 327, W. of Burmah, 419 fath.

A single specimen from the latter station is remarkable for its great size. The shell, exclusive of the extension of the periostracum, is 100 mm. in length and 33 in height, being much larger than any of the other known species.

Arca (*Acar*) *domingensis*, Lamarck.

Hab. Station 291, Gulf of Oman, 48–49 fath.

A very widely distributed species, occurring in various localities in the Atlantic, Indian, and Pacific Oceans.

Arca (*Barbatia*) *pteroessa*, Smith.

Arca (*Barbatia*) *pteroessa*, Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiv. p. 12.

Hab. Station 316, S. of Ceylon, 1500 fath.

Arca (*Barbatia*) *incerta*, Smith.

Arca (*Barbatia*) *incerta*, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 251; Illust. Zool. 'Investigator,' Mollusca, pl. xiii. figs. 3, 3 *a*.

Hab. Station 333, Gulf of Manar, 401 fath.

These specimens are larger than the type, measuring 29 mm. in length, 15 in height, and 11·5 in diameter.

Arca (*Barbatia*) *innocens*, sp. n.

Testa parva, oblonga, valde inæquilateralis, mediocriter convexa, utrinque obliqua, alba, radiatim tenuiter confertim costulata, costis subnodulosis, posterioribus quam anticis magis distantibus, periostraco tenui, inter costas plus minus hirsuto, induta; latus anterius oblique curvatum, supra acute angulatum, posticum

primo recte obliquum, ad extremitatem acute rotundatum ; margo ventris rectiusculus; valvæ haud crassæ, intus cæruleo-albidæ, radiatim subsulcatæ, ad marginem denticulatæ ; area dorsalis lanceolata, periostraco fusco induta ; umbones longe antemediani, circiter in $\frac{1}{5}$ longitudinis collocati; dentes cardinis parvi, circa 30–32.

Longit. 18 mm., alt. 11·5, diam. 7.

Hab. Station 258, W. of Travancore, 102 fath., sand.

This species may be separated from *A. incerta*, Smith, both by its form and sculpture. That species is narrow anteriorly and widens behind, whereas the present form is almost equally broad at both ends. The surface of the valves is less distinctly granulated and the ribs upon the posterior slope are fewer, broader, and further apart than in *incerta*. The hinge-teeth are different in the two species, those at the hinder end of *incerta* being peculiarly oblique, whereas in this species they are more upright and coarser.

Limopsis indica, Smith.

Limopsis indica, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 171, pl. v. fig. 7 ; 1895, vol. xvi. p. 15 ; 1904, vol. xiv. p. 12.

Hab. Station 249, S.W. of Cape Comorin, 1022 fath., green mud and Globigerine ooze ; Station 269, W. of Cape Comorin, 464 fath., green mud and sand ; Station ?, 1055 fath.

Some of the specimens from the above localities are considerably larger than the type, being 30 mm. in length, 27 high, and 14 in diameter.

Modiola philippinarum, Hanley.

Modiola philippinarum, Hanley, Proc. Zool. Soc. 1844, p. 15 ; Cat. Recent Shells, p. 235, pl. xxiv. fig. 26 ; Reeve, Con. Icon. vol. x. fig. 1.

Hab. Persian Gulf, 27 fath.

The single specimen is rather narrowed posteriorly, but agrees in every other respect with the typical form.

Modiola (*Amygdalum*) *Watsoni*, Smith.

Modiola Watsoni, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 14 ; 1904, vol. xiv. p. 11.

Hab. Station 265, off N. of Ceylon, 225–594 fath. ; Station 267, off W. of Ceylon, 457–589 fath. ; Station 310, Gulf of Oman, 261 fath.

Modiola (*Amygdalum*) *arborescens* (Chemnitz).

Modiola arborescens, Chemnitz; Reeve, Conch. Icon. vol. x. fig. 30; Clessin, Conch.-Cab., Mytilidæ, p. 100, pl. xxix. fig. 10.

Hab. Station 346, Persian Gulf, 47 fath. ('Investigator'); Tasmania and off Sydney (*Brazier*).

Crenella persica, sp. n.

Testa parva, irregulariter ovata, globosa, tenuis, sordide pellucido-albida, liris tenuissimis radiantibus aliisque concentricis paulo remotis cancellata; umbones læves, incurvati, albi, contigui, terminales; pagina interna nitida, structuram cancellatam externam exhibens, ad marginem undique denticulata; dens cardinis unicus, plus minus bifidus in utraque valva; ligamentum gracile, intra marginem situm.

Longit. 6 mm., alt. 4·5, diam. 4.

Hab. Persian Gulf, 47 fath.

The very delicate radiating costellæ have a tendency to bifurcate at the outer margin.

Amussium caducum, Smith.

Amussium caducum, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 173; 1895, vol. xvi. p. 18; 1904, vol. xiv. p. 13.

Hab. Station 269, W. of Cape Comorin, 464 fath., green mud and sand; Stations 289, 297, Gulf of Oman, 667–811 fath.; Station 322, Andaman Islands, 378 fath.; Station 327, W. of Burmah, 419 fath.

Amussium Alcocki, Smith.

Amussium Alcocki, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 172, pl. v. figs. 15, 16.

Hab. Station 275, S.W. of Cape Comorin, 731–771 fath.

Amussium investigatoris, sp. n.

Testa subcircularis, compressa, fragilis; valva dextra albido-pellucida, radiis opaco-albis circiter 10 picta, concentrice regulariter et tenuiter striata, intus costis ad 10 albis mediocriter crassis haud ad marginem attingentibus instructa; valva sinistra convexior, flavescens, radiis decem aurantiacis ornata, radiatim tenuiter costulata et concentrice delicate lamellata, lamellis supra costulas squamulatis, intus flavescens, costis albidis 10 tenuioribus munita; auriculæ parvæ, subæquales; umbones acuti, lateribus ad angulum circa 113° convergentibus.

Longit. 26 mm., alt. 26·5, diam. 5·5.

Hab. Station 218, W. of Travancore, 224–284 fath., sand.

The sculpture of the two valves in this beautiful species is altogether different, that of the right valve, which is a little flatter than the left, consisting of very delicate and close-set regular lamellæ or striæ, whilst the left valve has numerous fine radiating riblets, which are minutely squamose through being crossed by the very fine concentric lamellæ. The internal riblets, ten in number in each valve, do not reach to the margin, and those of the left valve are a little finer than those of the right. The colour of the valves is also different. The deeper valve is more or less orange-tinted within and without, whereas the right valve is almost white, with only a trace of colour on each side towards the dorsal slopes.

Amussium manaricum, sp. n.

Testa fragilis, pellucido-albida, opaco-albo radiata, inæquivalvis, leviter obliqua, et paulum inæquilateralis, valva sinistra convexiuscula, concentrice tenuiter lamellata, lirisque radiantibus tenuibus plus minus cancellata, valva dextra concentrice lamellata, versus marginem concava; umbones acuti, ad angulum circa 115° convergentes; liræ internæ circiter 15, haud ad marginem continuæ. illis in valva sinistra tenuioribus; auriculæ inæquales, anticis paullum majoribus.

Longit. 24·5 mm., alt. 26, diam. 4·5.

Hab. Station 333, Gulf of Manar, 401 fath.; Station 322, Andaman Islands, 378 fath.

The valves are fairly strong up to the ends of the radiating liræ, but beyond that point they become very fragile and easily break away. The concentric fine lamellæ are very similar in both valves, but the left valve, which is gently convex from the umbo to the opposite margin, also exhibits fine radiating liræ. These, however, gradually disappear about the middle of the valve, so that only the upper half of the surface is cancellated. The auricles, of which the anterior are a trifle larger than the posterior, exhibit fine lines of growth and a few radiating threads also, excepting the hinder auricle of the right valve, which hardly shows any trace of this radiating sculpture. The front auricle of the same valve is bounded below by a narrow groove at the byssal sinus.

Loripes victorialis (Melvill).

Cryptodon victorialis, Melvill, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 98, pl. ii. fig. 8.

Hab. Station 346, Persian Gulf, 47 fath.

The presence of hinge-teeth, as described by Mr. Melvill,

at once removes this species from *Cryptodon*, which is edentulous. I am inclined to refer it to the genus *Loripes*, with which it is practically identical in dentition, but the ligament is not quite so deeply placed within the dorsal margin.

Lucina dentifera, Jonas.

Lucina dentifera, Jonas; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiv. p. 10.

Hab. Station 346, Persian Gulf, 47 fath.

Lucina bengalensis, Smith.

Lucina bengalensis, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 171, pl. v. figs. 1, 2; 1904, vol. xiv. p. 10.

Hab. Station 261, W. of Cape Comorin, 386–445 fath., green mud and sand; Station 323, N. of Andaman Islands, 463 fath.

Cryptodon investigatoris, Smith.

Cryptodon investigatoris, Smith, Ann. & Mag. Nat. Hist. 1895, vol. xvi. p. 13, pl. ii. figs. 6, 6*a*; 1896, vol. xviii. p. 374; 1904, vol. xiv. p. 10.

Hab. Station 336, W. of Ceylon, 603 fath.

Cryptodon omanensis, sp. n.

Testa quadrato-rotundata, compressa, inæquilateralis, alba, lineis incrementi tenuibus ornata, striisque radiantibus tenuissimis umbones versus sculpta; lunula parva, excavata, circumscripta; umbones antemediani, acuti, approximati, ad apicem læves; linea cardinis leviter incrassata, lævis, edentula; ligamentum in sulco angusto profundo intra marginem situm; valvæ subtenues, intus radiatim tenuiter striatæ, cicatrice angusta, haud profunda, ab umbone marginem ventralem versus extendente sculptæ; cicatrix antica angusta, longit. 10 mm., intra lineam pallii sita, postica brevior, latior.

Longit. 26 mm., alt. 24, diam. 10.

Hab. Station 341, Gulf of Oman, 230 fath.

A flat compressed species like *C. barbatus* (Reeve), but thinner, lighter, and different in form. The concentric sculpture is very fine and at each side is slightly lamellated. The anterior and posterior ends are both somewhat roundly angulated and the ventral margin sharply arcuate.

Cardita elegantula, var. *conferta*, Smith.

Cardita elegantula, Deshayes; Smith, Ann. & Mag. Nat. Hist. 1904, vol. xiv. p. 9.

Hab. Station 328, S. of Lower Burmah 61 fath.

The two specimens from the above locality and those already recorded in the 'Annals' are not quite identical with Deshayes's type. They have a few more ribs, the sulci between them are not quite so deep, and the nodules on the costæ are closer together. However, I am of opinion that a more extended series of specimens would show that these differences were not of specific value.

Crassatellistes omanensis, sp. n.

Testa *C. abruptæ*, Sowb.*, similis, sed major, magis compressa, costis concentricis postice haud interruptis; valvæ mediocriter crassæ, intus et extra albidæ.

Longit. 35 mm., alt. 28, diam. 17.

Hab. Station 341, Gulf of Oman, 230 fath.

Beyond its superior size, rather compressed form, and continuous costæ there is little to distinguish this form from its South-African congener. The outline is very similar, the radiating microscopic striation is the same, the strength of the costæ, the character of the lunule, the escutcheon, the hinge, the scars, and the crenulation of the edge of the valves are all very much alike in both forms.

Abra maxima (Sowerby).

Abra maxima, Sowerby; Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. pl. v. figs. 5, 6; 1895, vol. xvi. p. 10; 1904, vol. xiv. p. 11.

Hab. Station 263, off N.E. coast of Ceylon, 665–771 fath., sand and soft green mud; Station 265, off N. of Ceylon, 225–594 fath., mud; Station 299, Gulf of Oman, 1299 fath.; Station 301, off Mekran coast, 1000 fath.; Station 321, off S. of Ceylon, 660 fath.; Station 327, W. of Burmah, 419 fath.

Abra affinis, Smith.

Abra affinis, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 250; 1904, vol. xiv. p. 11; Illust. Zool. 'Investigator,' Moll. pl. xiii. figs. 2, 2*a*.

Hab. Station 265, off N. of Ceylon, 225–594 fath., mud.

A single specimen, with the preceding species.

* 'Marine Invert. S. Africa,' vol. iv. Mollusca, p. 10, pl. vi. fig. 15, as *Crassatella*.

Tellina travancorica, Smith.

Tellina travancorica, Smith, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 249; 1904, vol. xiv. p. 11; Illust. Zool. 'Investigator,' Moll. pl. xiii. figs. 1, 1 *a*.

Hab. Stations 259, 337, W. of Malabar coast, 271–360 fath., green sand and mud.

These specimens, which appear to be adult, are somewhat smaller than those originally described, and the concentric sculpture is a little finer and closer together.

Tellina (*Arcopagia*) *Isseli*, H. Adams.

Tellina (*Arcopagia*) *Isseli*, H. Adams, Proc. Zool. Soc. 1870, p. 790, pl. xlviii. fig. 10.

Hab. Station 291, Gulf of Oman, 48–49 fath.

A single specimen without colour-rays as in the type from the Gulf of Suez, but like it in being marked with a red rust-like stain at the posterior end.

Tellina (*Arcopagia*) *altissima*, sp. n.

Testa parva, triangulatim rotundata, fere æquilateralis, valde convexa, dilute fusco-albida; latus anticum acute rotundatum, posticum magis acuminatum, subrostratum; margo dorsi utrinque valde declivis, anterior arcuatus, posterior rectiusculus; ventris margo multum curvatus; valvæ haud crassæ, leviter nitentes, lineis incrementi tenuibus sculptæ, striisque radiantibus tenuissimis subobsoletis ornatæ, intus distinctius radiatim striatæ, et plus minus albo-fusco tinctæ.

Longit. 16 mm., alt. 14, diam. 10.

Hab. Off Port Blair, Andaman Islands, 100 fath.

Somewhat resembling *T. robusta*, Hanley, but less solid and not quite of the same form. It is remarkably high in proportion to the length. The lateral teeth are long, slender, and remote.

Macoma blairensis, sp. n.

Testa oblonga, valde inæquilateralis, compressa, antice rotundata, postice oblique truncata, sordide albida, concentrice tenuissime striata, striis postice tenuiter lamellosis; margo dorsi anticus arcuatim descendens, posterior magis obliquus, rectus, brevior, ventralis late curvatus; valvæ mediocriter tenues, subnitentes, et radiatim microscopice striatæ; plica postica, ab umbone valvæ dextræ radians, vix conspicua; cicatrix antica elongato-piriformis, postica rotundata; sinus pallii latus, profundus.

Longit. 44 mm., alt. 31, diam. 11.

Hab. Off Port Blair, Andaman Islands, 100 fath.

Something like *M. gubernaculum* (Hanley) in shape, but with a broader truncate end. The very fine lamellate sculpture behind the feeble posterior radiating plication is peculiar, the rest of the surface being smoother.

Psammobia micans (Hanley).

Tellina micans, Hanley, Sowerby's Thesaur. Conch. vol. i. p. 309, pl. lix. fig. 106; Römer, Conch.-Cab., *Tellina*, p. 120, pl. xxviii. figs. 5–7.

Hab. Persian Gulf, 31 fath. ('Investigator'); Philippine Islands (*Hanley*).

On account of the absence of lateral teeth and the oblique sculpture I am inclined to believe that this species should be referred to *Psammobia*. Römer considers *Tellina depauperata*, Martens, the same as the present species.

Cardilia semisulcata (Lamarck).

Cardilia semisulcata, Lamk.; Sowerby, in Reeve's Conch. Icon. vol. xix. fig. 1; H. & A. Adams, Gen. Rec. Moll. vol. iii. pl. cxii. figs. 6, 6 *a*; Deshayes, Traité élément. Conch. vol. i. pt. 2, p. 254, pl. viii. *bis*, figs. 16–18.

Hab. Off Port Blair, Andaman Islands, 100 fath.

Only a single valve of this rare but widely distributed species was obtained. It has been recorded from South Australia (*Lamarck*), Straits of Malacca (*Deshayes*), China (*Sowerby*), Japan (*Lischke*), and specimens in the Cuming Collection are said to be from the Philippine Islands.

Mactrinula tryphera, Melvill.

Mactrinula tryphera, Melvill, Ann. & Mag. Nat. Hist. 1899, vol. iv. p. 97, pl. ii. fig. 7.

Hab. Station 345, Persian Gulf, 35 fath. ('Investigator' and *Melvill*).

An odd valve or two, the largest being 28·5 mm. in length, or 6 more than the type.

Meretrix (*Caryatis*) *pudicissima* (Smith).

Cytherea (*Caryatis*) *pudicissima*, Smith, Ann. & Mag. Nat. Hist. 1894, vol. xiv. p. 169, pl. v. figs. 3, 4.

Hab. Station 341, Gulf of Oman, 230 fath.; Station 244, off W. coast of India, 119–124 fath.

The type originally described was evidently only a young specimen, for the examples from the above locality (341) are

considerably larger and more solid shells, but agree in other respects. The largest is 23 mm. long, 20 in height, and 15 in diameter. The specimens from Station 244 are smaller and shorter than those from Station 341 : length 16·5 mm., height 16, diameter 12·25.

Vesicomya cretacea, sp. n.

Testa ovalis, valde inæquilateralis, mediocriter convexa, antice late rotundata, postice magis acuta, alba, cretacea, periostraco tenuissimo sordide flavescente hic illic induta, striis incrementi subrugose sculpta; lunula elongata, cordiformis, linea impressa circumscripta; area ligamenti elongata, profunda, utrinque carinata; valvæ mediocriter crassæ, intus albæ; cicatrix antica elongata, lævis, postica latior; linea pallii lata, lævis, haud sinuata; dentes cardinis duo in utraque valva, illis valvæ sinistræ conjunctis, divergentibus.

Longit. 57 mm., alt. 40, diam. 25.

Hab. Station 327, W. of Burmah, 419 fath.; Station 318, off W. of Ceylon, 1085 fath.

Beneath the ligament there is in each valve a rather deep groove, which starts a little behind the umbo and extends backwards about 8 mm., becoming gradually broader. It does not, however, appear to be for the reception of a resilium, the ligament being distinctly external.

More inæquilateral than *V. lepta,* Dall, from California, with the posterior dorsal margin more curved, the anterior more descending, and the hinge rather stronger.

The specimens from Station 318, the largest of which is only 44 mm. in length, and perhaps not adult, are thinner than the unique type, with a less strong hinge and only a faint indication of the groove in the nymphæ described above.

Vesicomya brevis, sp. n.

Testa brevis, subquadrata, multum convexa, valde inæquilateralis, utrinque late rotundata, postice supra subangulata, striis incrementi aspere sculpta, rufescenti-albida; valvæ haud crassæ, infra marginem dorsi posticum sulco lato, haud profundo et parum conspicuo instructæ, intus albæ, radiatim obscure striatæ; lunula cordiformis, linea impressa circumdata; area dorsalis posterior profunda, lata, utrinque carinata; dentes duo in utraque valva, illis valvæ sinistræ conjunctis, antico valvæ dextræ erecto, postico irregulari.

Longit. 36 mm., alt. 30, diam. 22.

Hab. Station 259, W. of Malabar coast, 295–360 fath., green mud and sand.

The muscular scars and pallial line are the same as in *V. cretacea*. There is a slight indication of the sulcus beneath the ligament mentioned as occurring in that species, and in the left valve there is an elevated ridge below it which might almost be regarded as a tooth. The dorsal escutcheon is both broader and deeper than in *V. cretacea*.

V. indica, Smith, has the anterior end more produced and more narrowed, the posterior end more sharply curved and not so distinctly angulated at its junction with the dorsal outline. The escutcheon in the present species, which may be only a variety of *indica*, is broader and deeper.

Cardium exasperatum, Sowerby.

Cardium exasperatum, Sowerby; Reeve, Conch. Icon. vol. ii. fig. 107; Römer, Conch.-Cab. p. 27, pl. ix. figs. 2, 3.

Hab. Off Port Blair, Andaman Islands, 100 fath. ('Investigator'); Swan River (*Sowerby*); Hong Kong (*Garrett*).

Cardium fornicatum, Sowerby.

Cardium fornicatum, Sowerby; Reeve, Conch. Icon. vol. ii. pl. xx. fig. 110.

Hab. Andaman Islands, 60 fath.

Also known from the Red Sea.

Corbula crassa, Hinds.

Corbula crassa, Hinds; Reeve, Conch. Icon. vol. ii. figs. 8 *a–c*; Smith, Lamellibranchiata 'Challenger' Exped. p. 30.

Hab. Off Port Blair, Andaman Islands, 100 fath.

Also known from Torres Straits, Port Essington, Straits of Macassar, and the Philippine Islands.

Corbula persica, sp. n.

Testa parva, valde inæquivalvis, paulum inæquilateralis, subtriangularis, postice truncata, alba, ad apices flavescens; valva dextra transversim fortiter et confertim costulata, sinistra concentrice tenuiter striata, epidermide fibrosa propo marginem induta, lirisque paucis radiantibus instructa; umbones lævigati, flavescens.

Longit. 7 mm., alt. 6, diam. 4·5.

Hab. Station 346, Persian Gulf, 47 fath.

This species in size, form, and sculpture is rather like *C. Philippii*, Smith*, a West Indian species. The young

* Lamellibranchiata 'Challenger' Exped. p. 33, pl. vii. figs. 4–4 *b*.

shell, however, is different in size and shape and the right valve is less distinctly keeled posteriorly. *C. bifrons*, A. Adams, is another allied form. The white ribs, which contrast strongly with the yellow nuclear shell, are about seventeen to twenty in number. The right valve exhibits a faint rounded angle from the umbo to the lower corner of the posterior end, but less pronounced than that in *C. Philippii*.

Corbula andamanica, sp. n.

Testa *C. persicæ* similis, sed postice minus distincte truncata, valva dextra ad umbonem magis producta, costis tenuioribus, magis numerosis instructa.
Longit. 6·5 mm., alt. 6, diam. 4.

Hab. Off Port Blair, Andaman Islands, 100 fath.

Very like *C. persica*, yet differing in the points indicated. The ribs, which are dirty yellowish, are about twenty-five in number. *C. albuginosa*, Hinds, is closely allied, but longer, and with the right valve more finely sculptured.

Solecurtus (*Azor*) *coarctatus* (Gmelin).

Solecurtus (*Azor*) *coarctatus* (Gmelin); Smith, Lamellibranchiata 'Challenger' Exped. p. 79.

Hab. Station 295, Gulf of Oman, 37–40 fath.

Also known from the Nicobar and Philippine Islands. The synonymy and some remarks upon this species are given at the above reference.

Lyonsiella papyracea, Smith.

Lyonsiella papyracea, Smith, 'Challenger' Lamellibranchiata, p. 73, pl. xxv. figs. 2–2 *b*; Pelseneer, Anat. 'Challenger' Deep-sea Moll. p. 18, pl. ii. fig. 8.

Hab. Station 276, W. of Ceylon, 1006 fath. ('Investigator'); about 1100 miles south-west of Australia, in 1950 fath. ('Challenger').

The single specimen differs from the type in having more numerous radiating threads, about fifty-six altogether. It is rather larger and less fragile, and has a somewhat thicker and coarser periostracum. The form is very similar, although not absolutely identical; but that is a character which is liable to considerable variability.

Cuspidaria approximata, Smith.

Cuspidaria approximata, Smith, Ann. & Mag. Nat. Hist. 1896, vol. xviii. p. 373; Illust. Zool. 'Investigator,' Moll. pl. viii. figs. 2–2*a*.

Hab. Station 322, Andaman Islands, 378 fath.

A single specimen 2 mm. longer than the type. Specimens from the Gulf of Oman have been presented to the British Museum by Mr. J. C. Melvill.

XXXVII.—*Notes on the Genus* Otomys. By R. C. Wroughton.

The material available to me for examination in the collection of the Natural History Museum amounts to about 150 specimens (skins and skulls) from some 30 localities. Though Africa north of the Equator is very poorly represented, yet, at first sight, the total material seems sufficient for a fairly exhaustive classification; but, on careful comparison, I am convinced that this is not so, and that the area south of the Zambesi, which is especially well represented by series from many different localities, is just that in which the results I have obtained are the furthest from finality.

All but two species of the genus have the anterior molar in the lower jaw composed of four laminæ or their equivalents. Setting aside for the moment these two aberrant forms as Section III., the genus may be easily further divided into two sections, according as the lower incisors are smooth (or but faintly grooved), or are markedly grooved; and each of these Sections falls again naturally into two groups. In Section I., comprising the forms with smooth lower incisors, those in which the posterior molar in the upper jaw is composed of four laminæ (or their equivalents) and large bullæ form the *Brantsi* group, and those in which m^3 is composed of five laminæ and the bullæ are quite small form the *unisulcatus* group. In Section II., comprising the forms with grooved lower incisors, those with a single groove as in *irroratus*, Brants, are readily separated from those with a double groove as in *Jacksoni*, Thos.

The geographical distribution fairly closely agrees with these main divisions of the genus. Thus Section I. is found in a strip of country running across S. Africa between 28° and 32° S. lat. Of Section II. the *Jacksoni* group is found

north of the Equator, while the *irroratus* group inhabits the whole eastern half of the continent from Cape Town to the Equator, the forms south of the Zambesi showing normally six laminæ in m^3, with about 5 per cent. of exceptional individuals having seven laminæ, while those north of that river show exactly the reverse. The western half of Africa is unfortunately unrepresented in the collection, so far as Section II. is concerned, except by a single specimen from Angola and a skull from the Cameroons, both showing seven laminæ in m^3. This would seem to show that the rule of seven laminæ in m^3 in the northern forms holds good also of the west coast. But the Angola specimen probably reached that country *viâ* the Congo Valley (the common *Otomys* of Angola seems to be the aberrant *Anchietæ* of Bocage), and therefore is no indication of the truly indigenous fauna of western South Africa.

I arrange the forms I have been able to distinguish in a key as follows:—

Key.

A. m_1 composed of four laminæ or their equivalents.
  a^1. Lower incisors not or very faintly grooved.
    a^2. m^3 composed of two complete laminæ and a modified posterior portion. Bullæ large (11 mm.).
      a^3. Tail long, $\frac{2}{3}$ of head and body; hind foot 28 mm.; lower incisors with a faint groove; length of upper molar series* 8 mm. (Namaqualand.) .. (1) *Brantsi*, Sm.
      b^3. Tail shorter, little more than $\frac{1}{2}$ as long as head and body; hind foot 25 mm.; lower incisors smooth; length of upper molar series 7 mm. (Deelfontein, C.C.) ..... (2) *B. luteolus*, Thos. & [Schw.
    b^2. m^3 composed of three complete laminæ and a modified posterior portion in the shape of a trefoil.
      a^3. Two anterior laminæ of m_1 modified and showing a "spiral" or "kidney-shaped" pattern; tail long, stout, black.
        a^4. Grooves of upper incisors distinct.
          a^5. Larger; head and body 175 mm.; tail shorter, 90 mm.; ears

* The length of the upper molar series is a very difficult measurement to take in this genus, owing to the sloping laminæ which constitute the crown of each tooth. I have here and throughout this paper used a measurement from the posterior point of the crown to the base of the enamel on the front of the anterior tooth.

smaller; bullæ 7. (S. Africa, E. coast.) ..... (3) *unisulcatus*, Cuv.

b^3. Smaller, head and body 150 mm.; tail longer, 100 mm.; ears larger; bullæ 8. (Namaqualand.) ..... (4) *u. Broomi*, Thos.

b^4. Grooves of upper incisors obsolescent. (Deelfontein.) ..... (5) *u. Granti*, Thos.

b^3. All four laminæ of m_1 complete; tail short, slender, pale. (Deelfontein.) ..... (6) *Sloggetti*, Thos.

b^1. Lower incisors distinctly grooved.

a^2. Lower incisors with one deep and one shallow groove.

a^3. m^3 normally with six laminæ. (South of Zambesi.)

a^4. Colour black, grizzled with yellowish white; individual hairs black, with short pale tips. (Cape Town &c.) ..... (7) *irroratus*, Brants.

b^4. Colour much paler; individual hairs with distal $\frac{1}{3}$ pale buff. (O.R.C. and Mashonaland.) .... (8) *i. auratus*, subsp. n.

c^4. Colour much warmer; individual hairs black, with distal $\frac{1}{3}$ brown. (Zoutpansberg, Transvaal.) .... (9) *i. cupreus*, subsp. n.

b^3. m^3 normally with seven laminæ (except *irroratus orestes* and *irroratus Denti*). (North of Zambesi.)

a^4. Size larger; hind foot 30 mm.

a^5. Skull longer, more stoutly built, with narrower brain-case and broader nasals. (Mkombuie.).. (10) *i. angoniensis*, [subsp. n.

b^5. Skull shorter, more slenderly built, with broader brain-case and narrower, subterminally compressed, nasals. (Mt. Kenya, B.E.A., 8000–10,000′.) ..... (11) *i. tropicalis*, Thos.

b^4. Size smaller; hind foot 27 mm.

a^5. Narrow nasals; m^3 with five laminæ. (Ruwenzori.) ..... (12) *i. Denti*, Thos.

b^5. Narrow nasals; m^3 with six laminæ. (Mt. Kenya, B.E.A., 13,000′.) ..... (13) *i. orestes*, Thos.

c^5. Broad flat nasals; m^3 with seven laminæ. (Nyika, B.C.A.).... (14) *i. nyikæ*, subsp. n.

b^2. Lower incisors with two deep grooves.

a^3. m^3 composed of eight laminæ. (Shoa.) ..... (15) *typus*, Heuglin.

b^3. m^3 composed of seven laminæ. (Mt. Elgon, 13,000′.) ..... (16) *Jacksoni*, Thos.

c^3. m^3 composed of six laminæ. (Ruwenzori, 12,500′.) ..... (17) *Dartmouthi*, Thos.

B. m_1 composed of more than four laminæ.

a^1. m_1 composed of five laminæ. (Angola.). (18) *Anchietæ*, Boc.

b^1. m_1 composed of seven laminæ. (Zululand.)..... (19) *laminatus*, Thos. & [Schw.

Section I.

The forms in this Section, as will be seen from the key (A. a^1), are characterized by the smooth lower incisors and, in most cases, the modification of the anterior two laminæ of m_1. The exact structure of the molars of *Otomys* has never, I believe, been worked out. It is not, therefore, certain whether the modified portion of m_1 in this Section represents one or two laminæ; but in view of the almost universal presence of four laminæ in m_1 throughout the rest of the genus, and the fact that *Sloggetti*, which undoubtedly belongs to this Section, has four complete laminæ in that tooth, I have accepted the probability that the modified area represents two laminæ. This modification takes two forms, which, in well-marked cases, are quite distinct and cannot have been produced the one from the other by wear. In both forms the inner ends of the two anterior laminæ are produced in a curve, the anterior backward and the posterior forwards, and fused into one continuous strip of enamel in the shape of a horseshoe with the open end outwards. In what I have called the "kidney"-shaped form the two free ends of the horseshoe are doubled inwards, showing a heart-shaped or kidney-shaped pattern; in the "spiral" form the free end of the posterior lamina is not or scarcely produced, while that of the anterior is produced boldly inwards and again doubled on itself, thus showing a distinct spiral pattern.

These forms of modification, though one form is found in a large majority of individuals of a given species or subspecies, are not quite constant, and I have therefore not relied upon them in my key.

(1) *Otomys Brantsi.*

Euryotis Brantsi, A. Smith, Ill. S. Afr. Zool. 1839, pl. xxiv.
Euryotis pallida, Wagner, Wiegm. Arch. Naturg. 1841, p. 134.
Otomys rufifrons, Rüppell, Verzeichn. Mus. Senck. i. 1842, p. 28 (nom. nud.); Wagner, Schreb. Säug., Suppl. iii. 1843, p. 507.

158 *a* (41. 803). Mouth of Orange River (skull 764 *c*) (*A. Smith*, type).

764 *b* (no skin). S. Africa (*A. Smith*).

98. 9. 6. 1 (in. al.). Namaqualand. (Cape Town Museum.)

4. 2. 3. 81–88. Klipfontein &c., Namaqualand. (Rudd Exploration.)

The type is very young and immature, and although it seems in some respects to resemble suspiciously the eastern form, still, all things considered, I am constrained to agree with and follow Thomas (P. Z. S. 1904, vol. i. p. 178) in

accepting the Namaqualand series as quoted above as topotypes of true *Brantsi*.

From this series I deduce the following as normal dimensions of this species :—

Head and body 150 mm.; tail 100; hind foot 28; ear 17.

Skull: greatest length 38; basilar length 31; zygomatic breadth 20; length of upper molar series 8; bullæ 11.

Smith describes the colour as ". . . . sienna-yellow variegated with black or umber-brown"—a fairly exact description, only that the sienna-yellow fades to white except in the central dorsal area, *i. e.* in a band, from the nose to the base of the tail, about as wide as the ears are apart. The individual hairs are all slate-coloured basally, the majority being broadly tipped paler; this pale tip is white except in the central dorsal line, where it is tinged with brown; the minority are black-tipped. The belly, as stated by Smith, is pale grey.

All the individuals from Klipfontein, without exception, show the modification in the "spiral" pattern of the two anterior laminæ of m_1, as also does 764 *b*, the second of Smith's specimens. On the other hand, Smith's specimen 158 *a* (skull 764 *c*), selected by Mr. Thomas (*l. c. suprà*) as the type, shows a modified form in which the inner end of the anterior lamina is produced into the "spiral" form, but the inner end of the penultimate lamina is also slightly produced and doubled inwards as in the "kidney" pattern. One specimen only (98. 9. 6. 1, received from the Cape Town Museum, and labelled "Namaqualand") shows a distinct "kidney" pattern.

Both *Brantsi* and its subspecies *luteolus*, forming group 1 of this Section, are easily distinguishable from group 2 by the huge bullæ and m^3 composed of the equivalents of only four laminæ.

(2) *Otomys Brantsi luteolus*.

Otomys Brantsi luteolus, Thos. & Schw. P. Z. S. 1904, i. p. 178.

1. 7. 9. 28–29. Deelfontein, C.C.
2. 9. 1. 35–47. Deelfontein, C.C. (*Col. Sloggett*).
3. 1. 4. 42. Deelfontein, C.C. (*Col. Sloggett*).

This form differs from true *Brantsi* in its darker, more brownish fulvous colouring (the whole upperside being tinged with brown, and not only a dorsal band as in *Brantsi*, and the brown is much darker than in that species), shorter hind foot, and shorter upper molar series.

The following may be taken as normal dimensions for this species :—

Head and body 145 mm. ; tail 80 ; hind foot 25 ; ear 17.

Skull : greatest length 38 ; basilar length 30 ; zygomatic breadth 20 ; length of upper molar series 7 ; bullæ 11.

In all the individuals of this subspecies, quoted above, the modification of the first two laminæ of the anterior lower molar shows distinctly the "spiral" pattern.

(3) *Otomys unisulcatus.*

Otomys unisulcatus, Cuvier, Mamm. 1829, pl. cclxiv.

41. 805, 41. 806 (skull 59. 5. 7. 2). S. Africa (*Dr. A. Smith*).

There is unfortunately no really satisfactory specimen of *unisulcatus* in the Natural History Museum collection. It is probable that the above are the specimens on which Dr. Smith based *his* description of *unisulcatus* (Zool. S. A. pl. xxiii.). Basing on these and on this description, the following may be taken as normal dimensions of this species :—

Head and body 175 mm. ; tail 90 ; hind foot 25 ; ear (no data).

Skull : greatest length 38 ; basilar length 30 ; zygomatic breadth 21 ; length of upper molar series 8.

The shorter tail and hind foot and a much warmer colouring seem to be the chief characters distinguishing this species from *unisulcatus Broomi*, while its larger size and much shorter tail differentiate it from *unisulcatus Granti*.

m^3 (in this and the following members of this group) is composed of three complete laminæ and a posterior portion in the shape of a trefoil ; in *unisulcatus* the modified anterior portion of m_1 shows a "kidney"-shaped pattern.

(4) *Otomys unisulcatus Broomi.*

Otomys Broomi, Thos. Ann. & Mag. Nat. Hist. vol. x. p. 313 (1902).

98. 9. 3. 3–4. Port Nolloth, Namaqualand (*R. Broom*).

4. 2. 3. 75. Klipfontein, Namaqualand. Alt. 3104′. (Rudd Exploration.)

The normal dimensions for this species are :—

Head and body 160 mm. ; tail 105 ; hind foot 28 ; ear 24.

Skull : greatest length 38 ; basilar length 31 ; zygomatic breadth 18 ; length of upper molar series 8 ; bullæ 8.

This form differs from typical *unisulcatus* by its paler, less rufous colouring and its rather larger hind foot, ears, and

bullæ, and from *unisulcatus Granti* in addition it differs by its larger size.

The modification of m_1 shows a close approximation to the spiral pattern even in the younger specimens. m^3 is quite as in *unisulcatus*.

Mr. Thomas described this form as a distinct species, but I do not think it should rank as more than a subspecies of *unisulcatus*, to which it is quite as closely related as *Granti*.

(5) *Otomys unisulcatus Granti*.

Otomys unisulcatus Granti, Thos. Ann. & Mag. Nat. Hist. vol. x. p. 312 (1902).

97. 11. 5. 22. Fish River (Grahamstown Museum, C.C.).

1. 7. 9. 30. Deelfontein, C.C. (*E. Seimund*).

2. 9. 1. 48–59, 95; 3. 1. 4. 38–41; 3. 3. 6. 9. Deelfontein (*Col. Sloggett*).

The type is a very old male; more normal dimensions than those given by Mr. Thomas are as follows:—

Head and body 105 mm.; tail 100; hind foot 25; ear 22.

Skull: greatest length 37; basilar length 30; zygomatic breadth 19; length of upper molar series 8; bullæ 7·5.

The only well-marked character distinguishing this local race from true *unisulcatus* is the obsolescence of the grooves on the upper incisors, and therefore the Fish-River specimen must be placed here.

The modification of the anterior portion of the first lower molar in the younger specimens shows the "kidney" pattern, but in older specimens it seems to approximate to the spiral pattern owing to wear. The third upper molar is quite as in *unisulcatus*—*i. e.* is composed of three distinct laminæ and a posterior portion in the form of a trefoil.

(6) *Otomys Sloggetti*.

Otomys Sloggetti, Thos. Ann. & Mag. Nat. Hist. vol. x. p. 311 (1902).

2. 9. 1. 60–61.
3. 3. 6. 10. } Deelfontein (*Col. Sloggett*).

The following are normal dimensions for this well-marked species:—

Head and body 135 mm.; tail 65; hind foot 22; ear 19.

Skull: greatest length 35; basilar length 28; zygomatic breadth 18; length of upper molar series 7·5; bullæ 8.

This species, though evidently very closely related to *unisulcatus*, is easily differentiated by its small size, short

weak tail, the presence of faint grooves on the lower incisors, &c.

m_1 is composed of four complete laminæ, while m^3 is quite the same as that tooth in *unisulcatus*.

Section II.

The forms of this Section are easily distinguished from those of the last by the grooving of the lower incisors, and the two groups of the section from one another by the character of this grooving. Group 1, with forms which have only one *deep* groove in the lower incisors, comprises the larger number of the individuals in the genus. As usual in the classification of the mammal fauna of S. Africa, the species (*irroratus*) representing Group 1 can be broadly divided into two forms inhabiting opposite sides of the Zambesi River. Individuals from localities south of the river are found to have an m^3 made up of six laminæ, but in about 5 per cent. of the specimens in the Natural History Museum are found seven laminæ; in specimens from north of the Zambesi exactly the converse is found to be the case, except only in the case of the very high-level form from Mount Kenya, which at the northern limit of the species has uniformly six laminæ, and the Ruwenzori form *Denti*, which has only five. Some such geographical division of the species is also indicated by the colouring, the southern forms being black speckled with white, while the northern substitute a brown for the white of the southern forms. It is in dealing with the S.-Zambesi form of *irroratus* that I have found that, notwithstanding the very considerable quantity of material available for examination, it is all too small for any really satisfactory result to be arrived at. So far as skull-characters go, the whole species seems to be in an unstable condition. I have failed to find in the southern specimens a single series in which any one distinctive character is really constant. I have already said that the laminæ composition of m^3 presents exceptions to an otherwise general rule. In size there is similar variation: specimens (quite mature) from Cape Town, De Kaap, Transvaal, &c., show a greatest skull-length of 36 mm.; others, from King William's Town, Kuruman, &c., show 44 and even 46 mm.; while the normal size is 40–41 mm. Similar in-and-out variation could be shown for almost any character. Under the circumstances I have decided to leave all these forms under *irroratus*, only distinguishing, south of the Zambesi, a couple of colour-forms as subspecies.

(7) *Otomys irroratus.*

Otomys irroratus, Brants, Muiz. 1827, p. 94.

95. 9. 3. 9. Rondebosch, Cape Town.

3. 7. 2. 18–21. Tokai, Cape Town. Alt. sea-level to 600′.

5. 5. 7. 59–65. Knysna, C.C. (Rudd Exploration.) Alt. 1400–1500′.

97. 11. 5. 23–25. Grahamstown, C.C.

98. 10. 8. 9–10. King William's Town, C.C.

3. 6. 2. 12. Port St. John, Pondoland.

4. 6. 6. 6–11. Notinsila, Pondoland. Alt. 2300′.

94. 6. 29. 2; 4. 8. 31. 6. Zululand. Alt. 3000′.

49. 4. 13. 6. Durban, Natal.

4. 12. 5. 18–19. Estcourt, Natal. Alt. 4500′.

4. 12. 5. 41–42. Maseru, Basutoland. Alt. 5000′.

4. 9. 1. 43–44. Wakkerstroom, Transvaal. Alt. 5900′.

4. 9. 1. 45–47. Zuurbronn, Transvaal. Alt. 4400–4700′.

96. 3. 30. 5. Rustenberg, Transvaal. Alt. 4900′.

97. 8. 51–2. Krugersdorp, Transvaal. Alt. 4700′.

4. 4. 8. 10–14; 4. 10. 1. 30–31, 59, 60, 92. Kuruman, Bechuanaland. Alt. 4000′.

98. 3. 23. 3–4. Potchefstroom, Transvaal.

Brants' description is a long one, but does not furnish any strikingly characteristic characters, and gives no type locality. The upper incisors have one deep groove towards the outer edge and a shallow inner one, and the lower incisors one deep groove. The dimensions given are:—Head and body 222 mm., tail 100. Allowing for the exaggerated measurements (according to the method of taking these measurements at the present day) of the head and body, the following may be taken as normal dimensions of *irroratus*:—

Head and body 180 mm.; tail 100; hind foot 29; ear 23.

Skull: greatest length 41; basilar length 32; zygomatic breadth 20; length of upper molar series 9; bullæ 7.

The colouring is black, with a minute speckling of very pale buff, the belly grey. m^3 is composed normally of six laminæ, but in isolated cases, without any rule as to size, age, or locality, seven laminæ are found.

(8) *Otomys irroratus auratus*, subsp. n.

4. 3. 1. 30–35; 4. 3. 1. 81. Vredefort, O.R.C. (*Barrett-Hamilton*).

95. 7. 1. 19; 95. 11. 3. 12–13. Mazoe, Mashonaland (*Darling*).

The colouring is much as in *irroratus*, but the pale buff speckling is in such quantity as to overpower the dark ground and to give the effect of a dull golden colour.

The normal dimensions are as follows:—

Head and body 170 mm.; tail 85; hind foot 30; ear 20.

Skull: greatest length 41; basilar length 35; zygomatic breadth 20; length of upper molar series 9; bullæ 7·5.

The following are some actual measurements (in mm.):—

	4.3.1.33. Old ♂. (Type.)	4.3.1.30. Ad. ♂.	4.3.1.31. Yg. ♂.	95.7.1.19. Old ♂.
Head and body	176	158	137	193(?)
Tail	85	75	74	115(?)
Hind foot	30	27	27	29
Ear	22	19	18	21
Skull:				
Greatest length	42	41	38	42
Basilar length.....	35	?	31	35
Zygomatic breadth .	21	20	19	20
Upper molar series..	9·3	9·3	9	9
Bullæ	7·5	?	7·5	7·5

It is interesting to note that while the O.R.C. specimens have all, without exception, six laminæ in m^3, two out of three of the Mazoe specimens, which come from what I regard as the northern limit of this form of tooth, have seven laminæ in m^3.

(9) *Otomys irroratus cupreus*, subsp. n.

6.4.3.43–48, 148–9. Zoutpansberg, Transvaal. (Rudd Exploration.) Alt. 4500–5000′.

More resembling *irroratus* in the proportionally longer tail, but shorter in the hind foot and smaller in the skull than either *auratus* or typical *irroratus*.

The colouring is like that of the northern forms, *i. e.* the place of the pale buff of *auratus* is taken by deep brown, giving a generally coppery look to the specimens.

The normal dimensions are:—

Head and body 170 mm.; tail 100; hind foot 28; ear 20.

Skull: greatest length 39; basilar length 32; zygomatic breadth 20; length of upper molar series 9; bullæ 7.

Some actual measurements are (in mm.):—

	6.4.3.44. Old ♂. (Type.)	6.4.3.47. Ad. ♀.	6.4.3.48. Yg. ♂.
Head and body	172	155	127
Tail	97	97	76
Hind foot	28	26	24
Ear	20	19	16
Skull:			
Greatest length	40	38	?
Basilar length	33	31	?
Zygomatic breadth	20	20	?
Upper molar series	9	9	8·8
Bullæ	7	7	?

(10) *Otomys irroratus angoniensis,* subsp. nov.

2.1.6.20–24. M'Kombhuie, B.C.A. (*Sir H. Johnston*). Alt. 8000′. (Type B.M. no. 2.1.6.22, a fully adult ♀.)

A large *Otomys* with the characteristic dark brown colouring of the northern forms. Unfortunately the dimensions were not recorded by the collector and the skulls are much broken, but the following may be accepted as the dimensions of the species:—

Head and body 175 mm.; tail 90; hind foot 30; ear 21.

Skull: greatest length 42; basilar length 34; zygomatic breadth 20; length of upper molar series 9; bullæ 7·5.

The size is much as in typical *irroratus,* but the warm northern colouring distinguishes it markedly from this species; the southern form *cupreus* which resembles it in colouring is much smaller. From its more immediate neighbours it may be distinguished, from *nyikæ* by the shorter hind foot, much broader, flatter, nasals, and the much smaller bullæ of that species, and from *tropicalis,* which it resembles in size and length of hind foot, by its narrower, stouter skull, rather wider, compressed nasals, and rather larger bullæ.

(11) *Otomys irroratus tropicalis.*

Otomys irroratus tropicalis, Thos. Ann. & Mag. Nat. Hist. vol. x. p. 314 (1902).

0.2.1.18–20, 22, 23. Mt. Kenya, B.E.A. (*Mackinder*). Alt. 10,000′.

93.2.3.29. Mianziui, B.E.A. (*Jackson*). Alt. 8500′.

Thomas in his description quotes from the collector's label 195 and 93, for the head and body and tail measurements respectively, but I am confident there is some error in these. It is, in fact, a rather short-tailed *Otomys* of about the size of typical *irroratus,* and I therefore give as normal dimensions of this species:—

Head and body 180 mm.; tail 80; hind foot 30; ear 23.

Skull: greatest length 44; basilar length 35; zygomatic breadth 22; length of upper molar series 9; bullæ 7·5.

In addition to the characters recorded by Mr. Thomas, a subterminal compression of the nasals is most marked, and with the generally narrower nasals serves to distinguish *tropicalis* from *angoniensis* at a glance. The Mianzini series shows this compression of the nasals very strongly, and the brain-case is even broader and deeper than in the specimens from Mt. Kenya; but the skins seem to belong to a much smaller animal and, moreover, vary a good deal in colour. No measurements, however, were recorded by the collector; I therefore reluctantly place them under this species.

(12) *Otomys irroratus Denti.*

Otomys Denti, Thos. Ann. & Mag. Nat. Hist. vol. xviii. p. 142 (1906).

6. 7. 1. 68–70. Ruwenzori Exploration. Alt. 6000–10,000′.

A rather small dark-coloured *Otomys*, with the tail wholly black, above and below, and black feet.

The dimensions are:—

Head and body 165 mm.; tail 95; hind foot 27; ear 21.

Skull: greatest length 37; basilar length 30; zygomatic breadth 19; length of upper molar series 7·5; bullæ 7.

The presence of only five laminæ in m^3 is sufficient to distinguish this from any other member of the northern group or, indeed, of Section II.

Mr. Thomas has described this form as a species, but as I have ranked all the other forms as subspecies of *irroratus* I feel it more convenient to treat *Denti* in the same way, notwithstanding the laminæ formula of m^3.

(13) *Otomys irroratus orestes.*

Otomys irroratus orestes, Thos. P. Z. S. 1900, p. 175.

0. 2. 1. 21. Teliki Valley, Mt. Kenya, B.E.A. (*Mackinder*). Alt. 13,000′.

The dimensions of this species as recorded by Mr. Thomas are:—

Head and body 175 mm.; tail 62; hind foot 27; ear 20·5.

Skull: greatest length 39; basilar length 31·3; zygomatic breadth 20; length of upper molar series 8; bullæ 7·5.

The smaller size, comparatively narrow nasals, and presence of only six laminæ in m^3 serve to distinguish it from any of its neighbours.

(14) *Otomys irroratus nyikæ*, subsp. nov.

97. 10. 1. 107, 112–114, 117, 277, 290, 291. Nyika Plateau, B.C.A. (*Sir H. Johnston*). Alt. 6500′. (Type B.M. no. 97. 10. 1. 107, an adult ♂.)

Rather smaller than typical *irroratus*, with the usual brown colouring of the northern species. Unfortunately the body-dimensions were not recorded by the collector, but the following may be accepted as normal for the species:—

Head and body 170 mm.; tail 70; hind foot 27; ear 20.

Skull: greatest length 41; basilar length 34; zygomatic breadth 20; length of upper molar series 9; bullæ 7.

The extraordinarily broad, flat, spatulate nasals serve to separate at once this from all other forms.

(15) *Otomys typus*.

Oreomys typus, Heuglin, Reis. N.Ost.-Afr. ii. 1877. p. 76.
Oreinomys typus, Trouess. Cat. Mamm. i. p. 469 (1899).
Otomys Degeni, Thos. P. Z. S. 1902, ii. p. 311.

2. 9. 9. 19. Shoa, Abyssinia.

When describing his *Degeni*, Thomas seems to have had some doubt that it was identical with *Otomys typus* of Heuglin: more recently the receipt of the type skull from the Stuttgart Museum for examination has confirmed this doubt. The dimensions recorded by Mr. Thomas for *Degeni* are:—

Head and body 160 mm.; tail 90; hind foot 28·5; ear 22.

Skull: greatest length 38; zygomatic breadth 19·7; length of upper molar series 9·5; bullæ (absent).

This species is easily distinguishable from other forms of the group with a double groove on the lower incisor by the presence of eight laminæ in m^3.

(16) *Otomys Jacksoni*.

Otomys Jacksoni, Thos. Ann. & Mag. Nat. Hist. vol. vii. p. 2 (1891).

93. 2. 3. 34–35. Mount Elgon, Uganda (*Jackson*). Alt. 13,200′.

A rather small *Otomys* with the warm northern colouring. The dimensions are:—

Head and body 120 mm.; tail 50; hind foot 26.

Skull: greatest length 36; basilar length 28; zygomatic breadth 18; length of upper molar series 8·5; bullæ 6.

The small size and long soft fur are marked characters, but the presence of seven laminæ in m^3 is of itself amply sufficient to distinguish *Jacksoni* from either of the other

two known forms of the group with doubly grooved lower incisors.

(17) *Otomys Dartmouthi.*

Otomys Dartmouthi, Thos. Ann. & Mag. Nat. Hist. vol. xviii. p. 141 (1906).

6. 7. 1. 61–67. Ruwenzori Exploration. Alt. 12,500′.

Rather smaller and darker in colour than *typus*. The normal dimensions are :—

Head and body 150 mm. ; tail 90 ; hind foot 26·5 ; ear 25.

Skull : greatest length 39 ; basilar length 31 ; zygomatic breadth 20 ; length of upper molar series 8 ; bullæ 7.

The presence of only six laminæ in m^3 suffices to separate this species from any other known member of the group with double grooves on the lower incisors.

Section III.

The two aberrant species in this Section seem to be found isolated in the midst of normal forms : *laminatus* has been taken only from Sibudeni, Zululand (and, it is stated, from a locality in Pondoland), and we have quite normal *irroratus* from the same place ; *Anchietæ* is recorded by Bocage from Caconda, &c., Angola, and has not been found elsewhere outside Angola ; while we have a specimen from Braganza which is apparently a normal *irroratus*, and Bocage records several other localities in Angola in which *irroratus* has been found.

(18) *Otomys Anchietæ.*

Otomys Anchietæ, Bocage, Jorn. Sc. Acad. Lisb. ix. 1882, p. 26.

92. 1. 9. 12 ; 97. 3. 6. 10 (in al.). Caconda, Angola.

A large *Otomys* with the brown colouring of the northern forms of *irroratus* and in addition an almost red colouring (*roux ardent* of Bocage) on face and rump. The dimensions are :—

Head and body 200 mm. ; tail 120 ; hind foot 37 ; ear 24.

Skull : greatest length 47 ; basilar length 39 ; zygomatic breadth 26 ; length of upper molar series 11 ; bullæ 10.

This is the largest form so far recorded in the genus ; it is larger even than the biggest *irroratus* from Kuruman both in body and skull dimensions, yet the Kuruman specimens are very old, while the specimens of *Anchietæ* though mature are not by any means old. But for its aberrant m_1 *Anchietæ* would fall into Group 1 of Section II., *i. e.* the forms having one deep and one shallow groove on each lower incisor.

(19) *Otomys laminatus.*

Otomys laminatus, Thos. & Schw. P. Z. S. 1905, i. p. 267.

4. 5. 1. 45; 4. 8. 31. 5. Sibudeni, Zululand. (Rudd Exploration.)

An *Otomys* rather larger than typical *irroratus* with the colouring of southern specimens of that species. The dimensions are :—

Head and body 180 mm.; tail 120; hind foot 30; ear 22.

Skull: greatest length 43; basilar length 35; zygomatic breadth 23; length of upper molar series 10; bullæ 7·5.

The extraordinary multiplication of laminæ in m_1 and m^3 distinguishes this species at a glance from any other known *Otomys*.

XXXVIII.—*On the Genus* Cercocebus, *with a Key to the known Species.* By R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

In Trouessart's Cat. Mamm., Suppl. p. 15 (1904), the described species and subspecies of *Cercocebus* are referred to two subgeneric groups, *Cercocebus* (s. s.) and *Leptocebus*. The latter name appears here for the first time in literature to replace *Semnocebus*, Gray (nec Lesson), restored by Mr. Lydekker for *C albigena*, Gray, on the strength of the blackness of the eyelids and the presence of an upstanding crest on the crown of the head. Although considerable latitude in opinion as to what constitutes a generic or subgeneric character must be allowed, there seems to me to be no particular reason for regarding elongation of the hairs on the crown as of higher systematic value than elongation of those on the brow, the cheeks, or the end of the tail, features which, happily, no one has as yet claimed to be more than of specific importance within the group.

As for the whiteness of the eyelids, this is most pronounced in the western species (*C. lunulatus, æthiopicus, fuliginosus*), much less marked, or, according to Mr. Lydekker himself, sometimes absent, in specimens referred to *C. Hagenbecki*, and also, according to the same author, absent in *C. albigena Rothschildi*. Moreover, in *C. congicus* and *C. Hamlyni* the eyelids are white, and, at least in *C. Hamlyni*, whiter than the skin of the face. Yet these two species are certainly more nearly related to *C. albigena Rothschildi* than to any one of the three typically white-eyelidded species.

It was formerly held, even by authors familiar with *C. fuliginosus*, that uniformity in the colour of the hair, or, to be accurate, the absence of the subapical pale annuli so common in the hairs of *Cercopithecus*, was characteristic of the genus *Cercocebus*, yet in *C. fuliginosus* there is a patch on the crown of the head due to a broad yellowish area on the hairs of this region; and since the discovery of *C. galeritus*, *C. agilis*, and *C. chrysogaster*, speckled species all three, it has been tacitly admitted that the absence of the speckling has only a specific importance.

So far, then, as the colour of the hair and of the eyelids is concerned, a gradation may be traced between the species debarring generic or subgeneric subdivision even on the part of those wishing to attach such weight to the particulars in question; and it appears to me there is just as much or as little reason for regarding the elongated whiskers of *C. congicus*, or the brow-fringe of typical *C. albigena*, or the long and parted scalp-hairs of *C. galeritus* as supplying a basis for subgenera as for considering the crown-tuft of *C. albigena* to have that value. The truth is, if the genus *Cercocebus* be divided into subgenera at all, it may with as much justification be split into three or four as into two. But since no beneficial end is, in my opinion, served by giving subgeneric names to isolated species or groups of species in so small and, comparatively speaking, homogeneous a genus as *Cercocebus*, and useful names are thereby put out of court for other nomenclatural purposes, I propose to regard *Leptocebus* as a genuine synonym of *Cercocebus* *.

1. The Sooty Mangabey.

Cercocebus fuliginosus, Geoff.

Loc. Sierra Leone and Liberia.

2. The White-crowned Mangabey.

Cercocebus lunulatus, Temm.

Cercocebus æthiops, Geoffroy, and of recent authors; nec *Simia æthiops*, Linn.

Cercocebus lunulatus, Temminck, Esquiss. Guin. p. 37 (1853); de Winton, in Anderson's Mammals of Egypt, p. 15 (1902).

* The pity of introducing new names like *Leptocebus* into a catalogue compiled by an author who cannot claim an intimate acquaintance even with all the genera, much less with all the species he records, is well exemplified by the case under consideration; for one of the alleged species, *Hagenbecki*, figures in the subgenus *Cercocebus*, and another, *agilis*, in *Leptocebus*; yet the two names were in all probability applied to specimens only subspecifically distinct from each other.

Loc. Gold Coast.

In Trouessart's Catalogue (1904) and, I believe, in all previous literature this species figured as *æthiops*, Linn.; but since, as Mr. de Winton pointed out, this name was originally given to a species of the genus *Cercopithecus*, it cannot stand for the mangabey in question, for which *lunulatus* seems to be the correct title.

3. The White-collared Mangabey.

Cercocebus æthiopicus, F. Cuv.

Cercopithecus æthiopicus, F. Cuvier, Mamm. ii. livr. xxxv. (1821).
Cercocebus collaris, Gray, List Mamm. Brit. Mus. p. 7 (1843); and of subsequent authors.

Loc. Nigeria, Cameroons, and French Congo.

Although this species is usually known by the appropriate title "*collaris*," the oldest available name seems to be *æthiopicus*.

4. The Yellow-bellied Mangabey.

Cercocebus chrysogaster, Lydd.

Cercocebus chrysogaster, Lydekker, Novit. Zool. vii. p. 279, pl. iii. (1900).

Loc. Congo: exact area unknown.

I have seen a few living specimens of this species, but Mr. Rothschild has kindly afforded me the opportunity of examining the type, which lived for about one year in the Zoological Gardens. This may account for certain discrepancies between the description and the specimen. Between the drawing up of the description which was published on Aug. 20th, 1900, and the death of the specimen in February 1901 certain colour-changes must presumably have taken place in the hair, for it is asserted that the speckling disappears on the flanks and outer sides of the limbs, which tend to slate-grey, and that the inner surface of the limbs is rather paler than the outer surface. In the specimen at the present time the flanks and outer sides of the limbs down to the hands and feet are distinctly speckled, though not so strongly as the head and back, and the inner surface of the limbs is orange like the lower surface of the head and body, though paler. The describer's statement that this species differs from all other species of *Cercocebus* as well as from all species of *Cercopithecus* in the bright orange coloration of the under surface was made in forgetfulness of the fact that Pousargues had already ascribed a similar coloration to the belly of

Cercocebus agilis, and that *Cercopithecus Wolfi*, *Grayi*, *pogonius*, and *nigripes* have been known for many years to be so coloured below *. My only reason for commenting now on the fact is the great interest attaching to the similarity in the colouring in the lower parts in all these monkeys, which inhabit, broadly speaking, the same area of tropical West Africa, namely the Congo. There must be an explanation of this, but I am unable to suggest what it may be.

5. Hagenbeck's Mangabey.

Cercocebus Hagenbecki, Lydd.

Cercocebus Hagenbecki, Lydekker, Novit. Zool. vii. p. 594 (1900); id. *op. cit.* viii. pl. i. fig. 1 (1901).

Loc. Upper Congo: exact area unknown.

I am indebted to Mr. Rothschild for the chance of seeing the type of this species. On the forehead, rather less than an inch behind the brow, there is a very conspicuous parting, whence the hairs radiate, those directed forwards forming a conspicuous postsuperciliary fringe. This important feature, attesting close relationship between *C. Hagenbecki* and *C. agilis*, is not mentioned in the description and only imperfectly suggested in the figure. The prevailing colour is a smoky grey above, relieved on the head, whiskers, neck, shoulders, and fore part of the back by the yellowish annulation of the hairs. These annuli practically die out on the sides of the body, the outer sides of the legs, and on the tail, which is merely indistinctly speckled in its basal portion above. The throat, chest, belly, and the inner sides of the limbs are dirty greyish white. There is a complete absence in the hair of the brown or fawn or rusty yellow hue mentioned by the two principal describers of *C. agilis*. It is solely on this account that I separate the two forms specifically, although strongly suspecting they will ultimately prove to be at most merely local races (that is to say, subspecies) of one and the same species. But of this there is as yet no proof.

According to Mr. Lydekker, the eyelids were black in the living type specimen, whereas another example living in the Gardens at the same time had them flesh-coloured. In the living specimens I have seen they are neither flesh-coloured nor black, but somewhat greyish—that is to say, decidedly darker than in *C. æthiopicus*, for example. I suspect they are pale in the young and gradually darken with age.

* The rufous belly of *C. erythrogaster* must also be remembered in this connexion.

In the speckling of the coat and the appearance and gradual extension of the yellow of the underside a gradation may be traced in the order named between *C. fuliginosus*, *Hagenbecki, agilis,* and *chrysogaster*, whereas in the direction of growth of the hairs on the head *C. chrysogaster* resembles *C. fuliginosus*.

6. Agile Mangabey.

Cercocebus agilis, A. Rivière.

Cercocebus agilis, A. Rivière, Rev. Sc. sér. 3, xii. p. 15 (1886); Pousargues, Ann. Sci. Nat., Zool. (8) iii. pp. 229-235 (1896); Trouessart, Le Naturaliste, 1897, p. 9.

Loc. French Congo: confluence of the Oubangui and the Congo; "Poste des Ouaddas" (according to Pousargues).

The specimen, now in the Paris Museum, to which Rivière gave the name *Cercocebus agilis,* without adequate diagnosis, was subsequently described by both Pousargues and Trouessart. I have not seen any specimen which exactly fits the descriptions, though the latter apply pretty closely to mangabeys we commonly receive from the Congo and call *C. Hagenbecki.* The arrangement of the hairs on the forehead is the same and the speckling of the fur also, but the general tint is apparently different in the two; for example, Trouessart says that the hairs of the head and back are more distinctly annulated than those of the sides, so that the tint passes insensibly into fawn-brown ("fauve-brun"), then into clear fawn, then into white under the belly. And according to Pousargues the hairs of the upper parts are dark brown ("brun sombre") and marked on the distal third with two yellowish-green annuli especially distinct upon the head, neck, and arms, much less defined upon the cheek, shoulders, back, sides, and outer face of the legs; the hairs of the chest and belly are scanty and yellowish red at the extremity, but the throat and the inner sides of the arms and legs are silvery grey. The discrepancies between the two descriptions taken by two authors of repute from the same specimen are difficult to reconcile. They are also highly instructive as emphasizing the magnitude of the personal equation to be reckoned with in judging of species from published diagnoses. The reddish-yellow ("jaune roussâtre") hue of the chest and belly must be very faint, one would imagine, to admit of Trouessart's failing to detect it and describing the belly as white, unless his examination was made by gas- or candle-light. That Pousargues was probably correct may be inferred from the circumstance that he saw four specimens in addition to the

type, making a total of two adult males and one adult and two young females.

7. Helmeted Mangabey.

Cercocebus galeritus, Pet.

Cercocebus galeritus, Peters, Mon. Akad. Berlin, 1879, p. 830, pls. i.[a] & iii.; Matschie, Säugeth. Deutsch. Ost-Afr. p. 145 (1895); Pousargues, Ann. Sci. Nat. (8) iii. pp. 229–235 (1897).

Loc. Brit. E. Africa: Tana River.

This species is known to me only from the figure and description published by Peters and from the remarks upon it Matschie and Pousargues have published.

The general colour both above and below seems to resemble that of *C. agilis*; but the arrangement of the hair on the crown of the head is quite different from that of *C. agilis* and *C. Hagenbecki*. Judging from the figure, which, according to Matschie, quoted by Pousargues, is correct, the parting is not, as in those species, a small circular area from which the hair radiates, but almost Y-shaped; the hairs on the forehead turn forwards over the brows and are separated by a transverse parting running from temple to temple from the hairs of the top of the head, which are long and directed outwards from a median longitudinal parting, so that their ends overhang, like a roof, the tops of the ears. The description Pousargues gives of this arrangement does not express at all clearly, in my opinion, what the illustration in Peters's paper shows. Trouessart's interpretation is much more in keeping with the figure. But the two species, *C. agilis* and *galeritus*, are, I should say, much less nearly related than these French authors believed.

8. The Black Mangabey.

Cercocebus albigena, Gray.

Presbytes albigena, Gray, P. Z. S. 1850, p. 77.

Loc. Basin of the Congo and E. Africa (Uganda, Tanganyika).

Mr. Lydekker (Nov. Zool. vii. pp. 594, 596, 1900) admits the following subspecies of this form:—

albigena, Gray, P. Z. S. 1850, p. 77, pl. xvi.

Loc. French Congo.

aterrimus, Oudemans, Zool. Gart. xxxi. p. 267 (1890).

Loc. Stanley Falls; north or right bank of Congo.

Rothschildi, Lydd. Nov. Zool. vii. pp. 595–596 (1900), and viii. pl. i. fig. 2 (1901).

Loc.?

Johnstoni, id. *loc. cit.* pp. 595–596.

Loc. Lake Tanganyika (northern extremity).

The best-marked of these forms appears to be *Rothschildi*, of which I have seen no specimens.

The remaining examples examined and named by Mr. Lydekker are in the Natural History Museum, as well as three others received since his paper was written. Two of these three are from Budzi (3000 feet) in Uganda; the third is labelled "Cameroons," but this locality is, I think, open to grave suspicion. This specimen is long-coated. The mantle on the nape and shoulders is brown strongly tinged with iron-grey. There is also a considerable quantity of grey in the hair on the fore part of the chest and outer side of the thigh. Except that there is more grey in the coat, this example is very like the type of *albigena*, which is young. I believe it represents the adult phase of that species, and Mr. Lydekker has given it the name *albigena*. In its greyness it differs from the two examples from Uganda, in which there is no grey in the brown mantle or on the outer sides of the legs, which are black. One of these specimens is browner than the other and both are rather browner than the type of *Johnstoni*. Nevertheless I believe the three specimens, which appear to be adult, are representatives of one and the same subspecies.

From an examination of all these skins, no two of which are absolutely alike, I am compelled to believe that two, and only two, subspecies are involved, namely a western and an eastern, the former being *albigena* and the latter *Johnstoni*. Neumann identified the eastern form from Uganda as *aterrimus*; but for geographical reasons it appears to me more probable that the type of *aterrimus* was a young example of *albigena*. If so, *aterrimus* falls as a synonym of *albigena*. If, on the other hand, Neumann is right in his determination, *Johnstoni* falls as a synonym of *aterrimus*.

It must be borne in mind that Neumann discovered the young of the Uganda form to be uniformly black (Zool. Jahrb. xiii. p. 533, 1900). From this it may be inferred that the young of the Congo form (*albigena*) is also black. The skins I have seen bear out this inference. Hence, so far as colour is concerned, the type of *aterrimus* might be the young or the brown- or grey-mantled race. It cannot, on

the evidence, be admitted as the representative of a distinct form.

9. Sclater's Mangabey.

Cercocebus congicus, Sclater.

Cercocebus congicus, Sclater, P. Z. S. 1899, pp. 827-828, fig.

The diagnosis runs as follows:—"Niger, subtùs nudiusculus, cristâ extante longâ nigrâ: genarum pilis productis albis: manibus et pedibus cum facie carneis: mento et pectore albis, ventre nigricante, tibiis albis: brachiis nigris, caudâ albicante. Long. corp. 2, caudæ 3, totâ 5 ped. Angl.

"*Hab.* Terra Congica."

This species was based upon a single female specimen living in the Antwerp Gardens and believed to have come from the district of Stanley Falls on the Upper Congo.

The reproduced photograph published by Dr. Sclater shows that the crest on the head was long and rose nearly vertically from the crown like a column, presenting an appearance quite unlike that of the crest of *C. albigena* or *C. Hamlyni*.

10. Hamlyn's Mangabey.

Cercocebus Hamlyni, Pocock.

Cercocebus Hamlyni, Pocock, Ann. & Mag. Nat. Hist. 1906, xviii. p. 208, pl. vii.

Loc. Congo: exact locality unknown.

Key to the Species and Subspecies, showing their apparent Affinity.

a. No upstanding tuft of hair on the posterior portion of the crown of the head.
  b. Hairs on body a uniform blackish grey or nearly black, not annulated.
    c. No distinct white collar; summit of head not red-brown.
      d. No white patch on summit of head; lower surface slaty grey ..... *fuliginosus*.
      *d*¹. A white patch on summit of head; lower surface whitish ..... *lunulatus*.
    *c*¹. A white band extending on each side from the eye beneath the ear on to the back of the head and continued down the nape of the neck; top of head red-brown ..... *æthiopicus*.
  *b*¹. Hairs, at least on the head, fore limbs, and fore part of the body, distally annulated with yellow, giving a speckled appearance to the coat.
    e. No parting in the hairs on the forehead to form a brow-fringe; throat and inner side of limbs yellow like chest and belly ..... *chrysogaster*.

e^1. A parting in the hairs on the forehead to form a forwardly directed brow-fringe; at least the throat and the inner sides of the limbs not yellow (? in *C. galeritus*).
f. Hairs on crown of head short, directed backwards, without median longitudinal parting; no tail-tuft.
g. Prevailing colour smoky grey; no yellow on flanks, chest, or belly ..... *Hagenbecki.*
g^1. Prevailing colour brown, yellowish on the flanks, chest, and belly..... *agilis.*
f^1. Hairs on crown of head long, separated by a median longitudinal parting, whence they diverge to the right and left, overlapping the tops of the ears; tail apically tufted ..... *galeritus.*
a^1. Hair on summit of head forming an upstanding parietal crest or tuft.
h. Skin of face, of hands and feet, and the nails black; prevailing colour of coat also black, though brown or iron-grey in parts ..... *albigena.*
i. Whiskers short; a very distinct superciliary fringe.
k. Mantle and chest and outer side of legs brown with grey tinge ..... subsp. *albigena.*
k^1. No grey tinge in the hairs of the mantle, chest, and outer side of legs, the latter being black ..... subsp. *Johnstoni.*
i^1. Whiskers long, partially concealing ears; no superciliary fringe ..... subsp. *Rothschildi.*
h^1. Skin of face, nails, and underside of hands and feet flesh-coloured, at least the cheeks, throat, tail, and lower half of legs whitish.
l. Arms, body, and thighs black ..... *congicus.*
l^1. Arms, body, and legs mostly greyish white, the arms and shoulders partly ashy black.. *Hamlyni.*

XXXIX.—*On some Ethiopian Rhynchota, and Synonymical Notes.* By W. L. Distant.

The following descriptions refer to South-African specimens which I have recently received from various sources. Those from the Transvaal will be subsequently figured in 'Insecta Transvaaliensia.'

Fam. **Pentatomidæ.**

Subfam. *Pentatominæ.*

Hermolaus Swierstræ, sp. n.

Brownish testaceous, coarsely punctate; head with the punctures on lateral lobes arranged in somewhat longitudinal

series, the central lobe almost impunctate, the outer margins of the lateral lobes narrowly olivaceous; antennæ with the joints 1–3 stramineous, 4–5 darker, first joint not nearly reaching apex of head, second and third subequal in length, shorter than fourth and fifth; pronotum with the lateral margins narrowly ochraceous, levigate on each side, bordered with a dark line, the surface coarsely punctate excepting on a transverse anterior and a central longitudinal, ochraceous, narrow, levigate fascia; scutellum coarsely punctate, transversely wrinkled on anterior area, its lateral and apical margins narrowly ochraceously levigate, with a small ochraceous levigate spot in each basal angle, and with two similar but much smaller spots on basal margin; corium coarsely punctate; connexivum ochraceous, with large black spots; membrano dusky grey; body beneath and legs ochraceous, a broad castaneous fascia near each lateral margin; an abdominal marginal segmental series of small black spots; rostrum reaching the third abdominal segment.

Long. 5 mm.

Hab. Transvaal; Pretoria (*C. I. Swierstra,* Pret. Mus. and Coll. Dist.).

This makes the third described (and the first known Ethiopian) species of the genus, the other two being *H. typicus,* Dist. (S. India), and *H. amurensis,* Horv. (Siberia).

Antestia atrosignata, sp. n.

Pale testaceous, more or less coarsely punctate; lateral and anterior margins and usually anterior disk of pronotum, base, two central longitudinal lines, and apex to scutellum pale ochraceous; two transverse lines on anterior disk of pronotum, two large spots near base and two smaller spots near apex of scutellum, and a longitudinal linear spot on corium, black; membrane black, its apex paler; body beneath ochraceous, thickly punctured with brown; legs dark ochraceous; antennæ ochraceous, second and third joints subequal and shorter than fourth and fifth, which are moderately thickened; head rugosely punctate, the lateral margins sinuate; pronotum with the anterior and lateral margins moderately raised and levigate, coarsely punctate, more thickly so behind anterior margin; scutellum with coarse scattered punctures, the base impunctate; corium thickly coarsely punctate; rostrum reaching the posterior coxæ, its apex black; sternum with small black outer costal spots.

Long. 5½–6 mm.

Hab. S. Africa; no precise locality (S. Afr. Mus. and Coll. Dist.).

Mr. Péringuey sent me three examples of this distinctly marked species. Its exact locality is yet to be determined.

Subfam. *Asopinæ*.

Dorycoris Rutherfordi.

Dorycoris Rutherfordi, Dist. Ent. Month. Mag. (2) iii. p. 187 (1892).

In 'Rhynchota Æthiopica,' t. i. p. 135 (1905), my friend M. Schouteden has placed this species as a synonym of the *Pentatoma miniata*, Westw., which he figures and enumerates as a var. of *Dorycoris pavoninus*, Westw. M. Schouteden writes :—"*D. Rutherfordi* est forma nitidissima, marginibus pronoti vix constrictis, a *D. miniato* tamen, ut videtur, haud distinguenda." So far from this being the case, the species I described as *D. Rutherfordi* differs from Schouteden's figure of *D. miniatus* (lettered as *D. fuscosus*, Germ.) in having the head wholly metallic green, basal half of scutellum metallic blue, and a large transverse spot of the same colour on corium on each side of apex of scutellum, the spot extending for little more than half across the corium. It may be correct to regard *D. Rutherfordi* as a colour-variety of *D. pavoninus*, for M. Schouteden has had a large amount of material through his hands, but it is incorrect to refer it to the form he has figured.

Subfam. *Tessaratominæ*.

Kahlamba, gen. nov.

Body subovate, flattened above, beneath slightly convex; head elongately subtriangular, about as long as width at base including eyes, lateral lobes much longer than central lobe and meeting beyond it; antenniferous tubercles prominent and placed just in front of the eyes; ocelli placed nearer to eyes than to each other and close to base of head; rostrum just reaching the intermediate coxæ, second joint long but shorter than the remaining joints together; antennæ of five joints, first joint shortest, not reaching more than halfway between basal tubercle and apex of head, second and third joints subequal, shorter than fourth or fifth, the latter longest; pronotum broader at base than at apex, frontal margin straightly truncate except behind eyes, where it is a little convexly upcurved, lateral margins obliquely straight, truncate before scutellum; mesosternum distinctly centrally

carinate; legs unarmed, tarsi with three joints; scutellum much longer than broad, half as long again as broad at base, a little shorter than head and pronotum together; apical angle of corium subacute, not rounded; membrane with a central discal areole and with two of the veins forked near posterior margin; abdomen a little broader than hemelytra from a little beyond base, scarcely wider than base of pronotum.

Allied to *Malgassus*, Horv.

Kahlamba typica, sp. n.

Ochraceous, above coarsely darkly punctate; head with the apex acutely rounded, coarsely darkly punctate, the margins of the central lobe fuscous; pronotum punctate, transversely rugulose, the dark punctures forming some indistinct longitudinal striæ; scutellum darkly punctate, with a central pale, longitudinal, levigate line; corium darkly punctate, the venation pale, prominent, levigate; membrane dark grey; body beneath very finely punctate, the punctures darker and more confluent on head beneath and at lateral margins of sternum; legs somewhat thickly blackly punctate, abdominal spiracles black; apex of rostrum piceous; structural characters as detailed in generic diagnosis.

Long. 13–15 mm.

Hab. Natal; Newcastle (S. Afr. Mus. and Coll. Dist.).

Mr. Péringuey sent me two examples of this species representing a genus belonging to the division Sepinaria, Horv., hitherto represented only in Madagascar.

Fam. **Coreidæ.**

Subfam. *Phyllomorphinæ.*

Pephricus Fryi, sp. n.

Varying in colour from pale creamy white to ochraceous; head above behind eyes (excluding a central longitudinal fascia) black; pronotum centrally opaque, pale ochraceous, the expanded lateral areas creamy white, centrally blackly punctate, the punctures arranged somewhat transversely; abdomen above with scattered black punctures which form a prominent transverse black fascia beyond middle, extending on each side through the principal abdominal lobe, apical abdominal lobes streaked with black at apices, anal prolongations with a central black line; body beneath much punctured with black. In structure the species is allied to *P. fragilis*,

Dist., from which it differs by the non-truncate long concave apices to the two longest abdominal lobes; basal joint of antennæ stoutest and very longly spined, a little longer than second, which is about half as short again as third, fourth joint shortest, incrassate, brownish ochraceous.

Long. 10 mm.

Hab. Transvaal; Pretoria, Aapies River.

A specimen was kindly sent to me by Mr. H. Fry, of Johannesburg, after whom I have named the species.

Fam. Lygæidæ.

Subfam. *Heterogastrinæ*.

Masoas, gen. nov.

Subelongate; head a little longer than broad, strongly sinuately narrowed in front of eyes, the anterior lateral margins straight and ridged; antennæ four-jointed, first joint scarcely reaching apex of head and almost as long as second, third and fourth thickened, pilose, third longest; rostrum reaching the anterior coxæ, first joint not reaching base of head; eyes projecting a little beyond anterior margin of pronotum, which is about as long as broad at base, a little narrowed anteriorly, centrally transversely impressed; scutellum subtriangular; membrane with several basal cells; anterior femora somewhat strongly thickened, beneath near apex with a distinct spine, followed by a few very small spines, anterior tibiæ a little shorter than the femora.

The incrassated and spined anterior femora, together with the short rostrum, give this genus a resemblance to the Pachygronthinæ; but the basal cells to the membrane prompt its insertion in the Heterogastrinæ.

Masoas transvaaliensis, sp. n.

Head black, coarsely punctate, anterior lateral ridges brownish; antennæ ochraceous, first joint and base of third joint black, fourth joint piceous brown; pronotum black, somewhat sparingly but very coarsely punctate, the anterior margin narrowly ochraceous, four obscure spots on transverse impression, a central longitudinal line behind it, and two spots on basal margin ochraceous; scutellum black, very coarsely punctate, two central spots and the apex ochraceous; corium somewhat coarsely, and on basal two thirds longitudinally, punctate, ochraceous, with two small discal spots and about apical third black, the latter with an apical ochraceous

spot; membrane greyish white; connexivum black, spotted with ochraceous; body beneath black; coxæ and posterior margins of pro- and metasterna ochraceous; legs ochraceous, femora (excluding apices) and bases and apices of tibiæ black; rostrum brownish ochraceous, apex of first joint black, apices of remaining joints pale ochraceous; abdomen with a lateral margin of ochraceous spots.

Long. 3½ mm.

Hab. Transvaal; Pretoria (*C. I. Swierstra*, Pret. Mus. and Coll. Dist.).

TAMASANKA, gen. nov.

Broadly subelongate; head broad, subtriangular, longer than broad, narrowed in front of eyes; ocelli placed near eyes; antennæ four-jointed, first joint robust and reaching apex of head, second and third joints subequal in length, each a little shorter than fourth; rostrum mutilated in type, eyes projecting a little beyond anterior margins of pronotum, which is not longer than broad at base, deflected and narrowed anteriorly, its posterior margin a little sinuate; scutellum broad, subtriangular, about as broad at base as long; corium very slightly laterally ampliate; membrane a little longer than abdomen and with several basal cells; anterior femora incrassate, slightly longer than the anterior tibiæ.

Tamasanka limbata, sp. n.

Head above dark ochraceous, punctate, shaded with piceous at basal margin, ocelli red, eyes black; antennæ ochraceous, extreme bases of first and second joints black, fourth joint brownish; pronotum ochraceous, coarsely punctate, two transverse spots on anterior disk and six spots on posterior margin black; scutellum ochraceous, sparingly coarsely punctate, with nearly basal half black and palely pilose; corium ochraceous, finely punctate and pilose, the lateral margins stramineous and impunctate, and with a narrow transverse black line on apical margin; tegmina dark greyish, paler on lateral margins; body beneath black, somewhat thickly ochraceously pilose, posterior margins of the sternal segments ochraceous; legs ochraceous, femora (excluding bases and apices) and bases and apices of tibiæ dark castaneous.

Long. 4 mm.

Hab. Transvaal; Pretoria (*C. I. Swierstra*, Pret. Mus. and Coll. Dist.).

Fam. **Tingididæ.**

Piesma bicolorata, sp. n.

Head and antennæ ochraceous, eyes black; pronotum purplish brown, the anterior margin, two anterior central ridges, and anterior lateral areas stramineous, the latter with two small marginal dark spots; hemelytra pale ochraceous, much spotted with purplish brown except at basal and sutural areas; body beneath (imperfectly seen in carded specimen) stramineous, lateral sternal areas purplish brown, a lateral abdominal segmental series of purplish-brown spots, the legs ochraceous; basal joint of antennæ strongly incrassate, much longer than second, which is short and moderately thickened, third joint longest, fourth longer than second, thickened, pyriform; pronotum thickly and coarsely punctate except on anterior marginal and anterior lateral areas, two lateral central longitudinal carinations not extending behind middle, and on each side of these anteriorly an obliquely transverse foveation; apex of claval area fuscous; veins to sutural area purplish brown.

Long. $2\frac{1}{2}$ mm.

Hab. Transvaal; Pretoria (Pret. Mus. and Coll. Dist.).

This species is allied to *P. diluta*, Stål, which I have elsewhere figured *. Mr. Swierstra has sent me a specimen which was taken at Pretoria.

Fam. **Reduviidæ.**

Cerilocus waterbergensis, sp. n.

Body above black, beneath piceous; head, anterior lobe of pronotum, scutellum, rostrum, prosternum, coxæ, and legs sanguineous; antennæ, disks of sternum and abdomen dull ochraceous; connexivum piceous brown; eyes, area of ocelli, and anterior margin of pronotum black; antennæ finely pilose, second and third joints subequal in length; area of the ocelli a little gibbous; pronotum with the anterior angles obtusely prominent, anterior lobe moderately gibbous, posterior lobe with the lateral angles subacute, both lobes centrally longitudinally impressed, the impression reaching neither the anterior nor posterior margin; scutellum prominently foveate at base, the lateral margins broadly ridged, the apex terminating in an upwardly directed spine; corium and tegmina

* Ann. S. Afr. Mus. ii. t. xv. fig. 1.

dull opaque; anterior tibiæ and femora (excluding trochanters) of equal length.

Long. 19 mm.

Hab. Transvaal; Waterberg (*Zutrzenka*, Pret. Mus. and Coll. Dist.).

Fam. Saldidæ.

Genus Vallerolia.

Vallerolia, Dist. Faun. B. I., Rhynch. ii. p. 405 (1904).
Leptopus, Bergr. (nec Latr.) Wien. entom. Zeit. xxv. p. 8 (1906); Reut. Die Klassif. der Capsiden, p. 3 (1905).

The genus *Vallerolia* was founded and placed in the Saldinæ, to which it belongs by possessing only two ocelli, the Leptopinæ possessing three. Bergroth, in some miscellaneous assertions (*suprà*), has strongly declared it to be congeneric with *Leptopus*, Latr., and Reuter (*suprà*) supports this contention in a footnote to a paper defending and advocating his classificatory views on the Capsidæ. As the question has a remote Ethiopian interest it may be referred to here.

In 1878 Costa described a species as *Leptopus assuanensis*, which Reuter redescribed as *L. niloticus* in 1881, and Bergroth once more described as *L. strigipes* in 1891. Both the two latter writers in correcting themselves have sought to add my *Vallerolia Greeni* from Ceylon to the list of synonyms. In describing *Vallerolia* I gave the ocelli as only two in number, and fearing (after perusing the indictments of Bergroth and Reuter) that I might have overlooked a third, I placed the type of the genus under a microscope, and, with these conditions, sought the opinion of Mr. E. E. Austen, the well-known dipterist, and of Mr. E. Waterhouse, an experienced British coleopterist, who were also both satisfied that the number of the ocelli was *two*.

It therefore follows that if *V. Greeni* is really the same species as the synonyms of *Leptopus assuanensis* created by Reuter and Bergroth, it is they who have failed to recognize the proper genus and have placed their synonyms in the wrong subfamily, for *Leptopus* is known as possessing three ocelli, though neither of my critics has alluded to the number of ocelli in his synonymical descriptions.

XL.—*On some African Bats and Rodents.*

By Oldfield Thomas.

Kerivoula muscilla, sp. n.

Size very small. Ears short, laid forward in the spirit-specimen they barely reach to the tip of the muzzle; their breadth equal to their length; inner margin strongly convex, outer with a well-marked emargination above, convex below. Tragus as in Dobson's second group, a small basal lobule present, very much as in *K. Smithii*; inner margin evenly convex, outer slightly concave. Limbs short, less strikingly delicate than usual; upper surface of forearms and proximal part of the digits and of hind limbs and feet clothed with fine golden-brown hairs. Wings to the base of the toes. Posterior edge of interfemoral with a fringe of short curved hairs growing from its under surface. Prepuce tufted with long hairs.

Fur long, brownish grey above and below, so far as can be made out on a spirit-specimen.

Inner upper incisors slender, practically unicuspid, a rudiment of a secondary cusp present about halfway up the hinder aspect; outer incisors long, nearly as long as the inner ones, each with a minute external basal secondary cusp. Two small upper and three lower premolars subequal *inter se*.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 27 mm.

Head and body 37; tail 33; head 14; ear 10; tragus on inner edge 6; third finger, metacarpus 26·5, first phalanx 13·5, second phalanx 15; lower leg and hind foot (c. u.) 17 5; calcar 16.

Hab. Ja River, Southern Cameroons.

Type. Adult male. Collected 22nd December, 1905, by Mr. G. L. Bates. One specimen.

This little *Kerivoula* is readily distinguishable from any African species hitherto described by its small size, the presence of an interfemoral fringe, and its long outer incisors. Dobson's *K. africana* agrees with it in some respects, but is said to have a tragus as in *K. Hardwickei* and ears "longer than the head"*.

* By this expression Dobson appears always to have meant that the ears when laid forward extended beyond the tip of the muzzle.

The Giant Squirrels of Western Africa.

The following is a rough key to the different forms of African giant squirrel:—

A. Fore limbs red above, as well as hind. Skull with very long muzzle, narrow slit-like anteorbital foramina, and small bullæ.
  a. Crown red. (Gold Coast.) ..... *Funisciurus Ebii*, Temm.
  b. Crown grey, like fore-back. (Gaboon and French Congo.) ..... *F. Wilsoni*, Du Ch.
B. Fore limbs not red above. Skull with short muzzle, large rounded anteorbital foramina, and large bullæ.
  a. General colour above yellow or straw-colour; hind feet yellow.
    a^2. Crown hoary grey. (Fernando Po and Gaboon.) ..... *Sciurus Stangeri*, Waterh. (Syn. *S. Nordhoffi*, Du Ch.)
    b^2. Crown yellow, like back. (N. Angola.). *S. S. loandæ*, subsp. n.
  b. General colour usually blackish, speckled with yellow or fulvous; hind feet red.
    a^2. Sides of neck below ears white; a white line edging the belly.
      a^3. Ticking of dorsal hairs fulvous. Inner side of forearms whitish. (Gold Coast.) ..... *S. S. Temminckii*, And.
      b^3. Ticking of dorsal hairs yellowish. Inner side of forearms rufous. (Lower Niger.) ..... *S. S. nigeriæ*, subsp. n.
    b^2. Sides of neck below ears greyish brown; line along sides of belly hoary grey.
      a^3. Size larger; yellowish suffusion of back not extending on to crown. (Cameroons, Gaboon, and French Congo.)..... *S. S. eborivorus*, Du Ch. (Syn. *S. calliurus*, Pet.)
      b^3. Size smaller; yellowish suffusion of back extending on to crown. (Uganda.) ..... *S. S. centricola*, subsp. n.

I can find no reason to distinguish Du Chaillu's *S. Nordhoffi* (type B.M. no. 67. 9. 5. 1) from the insular *S. Stangeri*, though the form occurring further south in Angola seems separable. But with regard to Peters's *S. calliurus*, it is to be noted that two specimens from the Como River differ from the series from the Benito by the larger size of their anteorbital foramina, which may indicate that the more northern of the two should be separated from the southern; Peters's name would then apparently apply to the former.

With regard to the placing of all these six true *Sciuri* as geographical forms or subspecies of one species, the links

between one and another seem to be so complete that I have failed to recognize any division of more than subspecific rank. At first it appeared that at least the dark forms with red feet (*eborivorus*) might be separated specifically from the straw-coloured ones with yellow feet (*Stangeri*), but the animal I have named *nigeriæ* is really practically as yellow as *Stangeri*, while it has the red feet of *eborivorus* and the white neck-patches of *Temminckii*. Again, an Eastern Congo specimen has a yellow *Stangeri* back with red *eborivorus* feet, but is without white neck-patches. As to distribution, there is as yet no evidence that both *Stangeri* and *eborivorus* forms occur in any one district, though the ranges of the two types largely overlap.

The recognition of *Wilsoni* as a *Funisciurus* and of *Stangeri* as a true *Sciurus* is due to Mr. de Winton, who wrote some notes on the group in 1898 *.

The following are descriptions of the new subspecies :—

Sciurus Stangeri loandæ.

Size and general characters quite as in true *Stangeri*, though the yellow of the hinder back is rather more vivid. Head, instead of turning hoary grey on the crown, simply becoming paler and more whitish yellow than the back ; a dull yellowish patch behind each ear, and the ears themselves yellow rather than brown. Cheeks whitish or greyish white. Line edging body-hairs along sides of belly well-marked, white. Feet, especially the anterior, more strongly suffused with yellow above. Other characters as in true *Stangeri*.

Dimensions of the type (measured in the flesh) :—

Head and body 285 mm. ; tail 380 ; hind foot 66 ; ear 21.

Skull : greatest length 68 ; condylo-basilar length 57 ; length of upper tooth-series 11·5.

Hab. Northern Angola. Type from Canhoca.

Type. Adult male. B.M. no. 4. 4. 9. 42. Original number 199. Collected 12th December, 1903, by Dr. W. J. Ansorge.

This is the only form of the whole series which has not got the characteristic contrasted grey head which caused Temminck to give the preoccupied name of *caniceps* to the Gold-Coast animal.

Sciurus Stangeri nigeriæ.

Similar to the Gold-Coast form of this group, *S. S. Temminckii*, Anderson †, in the extension of the white throat-patch

* Ann. & Mag. Nat. Hist. (7) ii. p. 11.

† *S. caniceps*, Temm., nec Gray.

on the sides of the neck nearly up to the lower edge of the ear and in the presence of a distinctly white line along the edges of the body-fur at the sides of the belly, but distinguished by the light speckling of the back being yellowish or, at most, fulvous instead of strong rufous and by the inner surface of the forearms being orange-rufous instead of whitish. Patch behind ear dull orange-rufous. Crown dark hoary grey. Upper surface of hands blackish, finely ticked with orange, of feet orange-rufous, becoming rich rufous terminally.

Dimensions of the type (measured in skin) :—

Head and body 310 mm.; tail (doubtfully perfect) 300; hind foot 64.

Skull: greatest length 68; condylo-basilar length 56·5; length of tooth-row 10·3.

Hab. Abutschi, Lower Niger.

Type. Adult male. B.M. no. 2. 11. 10. 10. Collected by Mr. Alexander Braham.

In its yellowish general colour this animal corresponds with true *Stangeri*, while resembling members of the *eborivorus* group in its neck-patches and reddish feet.

Sciurus Stangeri centricola.

Size, as judged by skull, rather less than in true western *eborivorus*. Colours rich and bright throughout, the fulvous suffusion of the back, often confined in true *eborivorus* to the rump and never extending beyond the nape, more rufous in tone and carried forward on the head to between the eyes. Line along edge of belly not conspicuous, hoary grey. Yellowish or rufous of limbs at a maximum everywhere, the hind feet especially rich rufous.

Skull similar to that of *S. eborivorus*, but rather smaller.

Dimensions of the type (taken on the skin) :—

Head and body (overstretched) 310 mm.; tail 330; hind foot 61.

Skull: greatest length 66·5; condylo-basilar length 55; length of tooth-row 11·2.

Hab. Entebbe, Uganda.

Type. Old female. B.M. no. 6. 3. 8. 24. Original number 74. Collected 7th October, 1905, by E. Degen. Six specimens, of which the first were obtained by Mr. F. J. Jackson in 1905.

Funisciurus palliatus Lastii, subsp. n.

Distinguished from other forms of *F. palliatus* by having black hands and feet.

Size and general colour as in the darker forms of *F. palliatus*, the dorsal colour closely matching that of *F. p. ornatus*, while the belly is a little darker and richer than in any of them, nearly matching the maroon-red of the tail of *F. p. ornatus*. Muzzle, forearms, inner sides of hind limbs, and end of tail-hairs all of the same rich maroon-red; but the upper surface of the hands and feet, instead of being also red, are deep glossy black without trace of red, the change at the wrists and ankles being apparently abrupt, though there are microscopic red tips to some of the hairs on the metapodials.

Skull and dentition as usual, except that the top of the muzzle is flatter, less bowed downwards, and the molars appear to be rather narrower than in the mainland subspecies.

Dimensions of the type:—

Hind foot, s. u., (c.) 49 mm.

Skull: greatest length 51; length of molar series exclusive of p^3 8·8.

Hab. Zanzibar Island.

Type. Adult male. B.M. no. 6. 6. 5. 21. Collected and presented by J. T. Last, Esq.

This squirrel is so abruptly different from any of the forms of *F. palliatus* by its black instead of red hands and feet that many naturalists would think a binomial should be used for it; but it is so essentially a member of the *palliatus* group that I prefer to regard it as a subspecies, especially as faint indications of red may be found on its feet and also slight traces of black on those of *F. p. suahelicus*, its nearest relative.

In Mr. Oscar Neumann's account * of the subspecies of *F. palliatus* he records *F. p. suahelicus* from Zanzibar; but if his specimens were really obtained in the island he must have overlooked the very material difference in the coloration of the feet.

Mus Brockmani, sp. n.

A medium-sized pale grey species, with a very long pencilled tail.

Size and general proportions very much as in *M. Verreauxi* of the Cape. Fur of medium length; the ordinary hairs of the back about 9 mm. in length, the isolated longer hairs 12 mm. General colour above pale buffy grey, paler than Ridgway's "drab-grey," the light rings to the hairs

* SB. Ges. nat. Fr. Berl. 1902, p. 178.

cream-buff. Sides lighter. Belly white, with a slight creamy tinge, the hairs along its sides slaty at base, those on the throat, chest, and middle area of belly white to the roots. Ears almost naked, their substance greyish brown. Upper surface of hands and feet pure white; fifth hind toe without claw reaching to the end of the basal phalanx of the fourth. Tail very long, finely scaled (15–16 rings to the cm.), thinly haired basally, the hairs lengthening on the terminal half of the tail to form a distinct pencil, of which the individual hairs are about 2½ mm. long; in colour the tail is sharply bicolor, brown above and white beneath for its whole length.

Skull, as compared with other African medium-sized species, characterized by a rather flatter brain-case than usual, the parietals being less markedly convex; supra-orbital edges rounded anteriorly, square, not ridged, posteriorly. Palatal foramina widely open, their posterior end not narrowed. Mastoid portion of bulla, as usual in this group, well defined from the sides of the supraoccipital, with a fair-sized vacuity at its upper end.

Teeth as in the allied species, the antero-internal cusp of m^2 large and well defined, the antero-external minute. M^3 with the usual tricuspid interior edge.

Dimensions in the flesh :—

Head and body 108 mm.; tail 161; hind foot 22; ear 18.

Skull: greatest length 29·5; basilar length 23; zygomatic breadth 14; interorbital breadth 4·2; height of brain-case from basilar suture 7·6; palatilar length 12·6; diastema 7·6; palatal foramina 6·2 × 2·2; length of upper molar series 4·5.

Hab. Upper Sheikh, British Somaliland. Alt. 4500′.

Type. Adult male. B.M. no. 6.3.4.8. Collected 23rd November, 1905. Presented by Dr. R. E. Drake-Brockman.

This mouse is readily distinguishable from all other members of the genus by its pale colour above, whiter belly, and long feathered bicolor tail.

Of other hairy tailed species which may have a relationship to it, *M. Verreauxi* and *M. albipes* have grey bellies, besides being darker above, while *M. auricomis*, which has a white belly, has its general body-colour fulvous.

Dr. Drake-Brockman has contributed a considerable number of interesting Somali animals to the National Collection, and I have much pleasure in connecting his name with this very pretty little species.

XLI.—*New Mammals collected in North-east Africa by Mr. Zaphiro, and presented to the British Museum by W. N. M^c^Millan, Esq.* By Oldfield Thomas, F.R.S.

Besides the remarkable bat, *Platymops Macmillani*, already described *, Mr. Ph. C. Zaphiro obtained during his trip from Adis Abbaba to Lake Rudolf the following new species of Mammalia. The type specimens of all of them have been presented to the British Museum by Mr. W. N. M^c^Millan, by whose generosity Mr. Zaphiro was enabled to make this important exploration.

Helogale Macmillani, sp. n.

A very finely speckled form allied to *H. undulata* and *Atkinsoni*.

Size as in the two related species. Fur rather short, the longest hairs of the back barely attaining 13 mm. in length and the shorter ones about 8 mm. General colour above between broccoli-brown and Mars brown, warmer than the former, greyer than the latter; finely ticked with minute buffy specks, terminal or subterminal on the dorsal hairs, the specks far finer than in the allied species and each measuring less than 1 millimetre in length. Under surface near Prout's brown, with scarcely any speckling, a faintly warmer tinge (Mars brown) on the tips of the hairs. Crown finely ticked Prout's brown, becoming Mars brown or verging towards russet on the sides of the face, lips, chin, ears, and on areas round and behind the last-named parts. Limbs to wrists and ankles like the body; upper surface of hands and feet russet, without speckling. Tail speckled bistre, a russet line on the under surface proximally, and a few russet hairs mixed with the pencil at the tip.

Skull and dentition as in the above-named species.

Dimensions of the type (measured in the flesh) :—

Head and body "182" † mm.; tail 159; hind foot 41; ear 20.

Skull: length of nasals 6; interorbital breadth 9; front of canine to back of m^2 15·6.

Hab. Delbena R., Konso. Alt. 3200′.

Type. Subadult male. Original number 141. Collected 26th August, 1905.

This species is intermediate in colour, as in geographical

* Ann. & Mag. Nat. Hist. (7) xvii. p. 500 (1906).

† Evidently undermeasured; must be at least 200 or 215 mm.

position, between the grey *H. Atkinsoni* of Somaliland and the more rufous *H. undulata* of British and German East Africa; but the unusually fine speckling of the body-colour is peculiar to it. In dentition it corresponds closely with *H. Atkinsoni*, and differs equally from the broad-toothed *H. hirtula*.

Ictonyx capensis shoæ, subsp. n.

Size large, slightly exceeding that of true *capensis*, therefore markedly different from the small *erythreæ*, de Wint., of Suakin. General marking normal, the black lines clearly defined, little softened by isolated white hairs or by the tips of the hairs of the white areas overhanging them. Frontal spot of medium size, larger than in true *capensis*, about an inch long by half an inch broad, running back in a point towards the crown, separated on each side from the post-orbital white mark by about half an inch of pure sharply-defined black. In *erythreæ* the median white spot more nearly approaches the lateral ones. Outer white stripes of nape markedly broader than the inner. Tail rather less white than in other subspecies.

Skull apparently rather more elongate in general outline than in some of the allied forms.

Dimensions of the type (measured in flesh) :—

Head and body 395 mm.; tail 298; hind foot 64; ear 30.

Skull: condylo-basal length 69; basal length 63; greatest breadth 45; interorbital breadth 18; mastoid breadth 36·3; palatal length 32·3; length of upper p^4 on outer edge 7·7.

A younger male skull, with nasal sutures still open, measures 66·5 mm. in condylo-basal length, and a female of about equal immaturity 62·5.

Hab. Adis Abbaba. Alt. 8500′.

Type. Old male. Original number 6. Collected 15th September, 1904.

"Trapped in a Galla house near the legation."

This form of *Ictonyx* differs by its larger size from the Red-Sea *erythreæ*, while by the well-marked black band separating the frontal from the lateral white face-markings it is distinguishable from the *intermedia* of Uganda and British East Africa, in which these white areas are scarcely separated from each other or even form an uninterrupted band across the face.

Xerus rutilus stephanicus, subsp. n.

General characters as in true *rutilus*, but the grizzled

yellowish grey—restricted in that form to the centre of the back—is spread over the whole of the upper surface, so that the pink area along the sides is reduced to a narrow strip, or even occasionally absent, the rufous of the forearms and hips being in such cases isolated from each other. Base of tail coloured like back. Hands slightly suffused with rufous; feet yellowish white.

Dimensions of the type (measured in skin) :—

Head and body 215 mm.; tail 180; hind foot 53.

Skull: greatest length 53; length of upper tooth-series 9·7.

Hab. Between N. end of L. Rudolf and L. Stephanie. Type from the latter. Alt. 2000′.

Type. Adult male. Original number 132. Collected 18th August, 1905.

These ground-squirrels are by no means easy to sort into geographical races, owing partly to their variability and partly to their liability to bleaching, the black parts of the fur bleaching through rufous and fawn to pale sandy, so as to give a wholly different appearance to specimens killed before or after the moult. But by a careful comparison of specimens all in fresh fur I find that the series from the Stephanie area differ sufficiently on the average from those representing true *rutilus* to make a local name advisable, though some examples show evidence of intergradation. The other named forms in this group—*brachyotus*, *dabagalla*, *intensus*, and *saturatus*—are all further off, both geographically and zoologically, than the true *rutilus* of Eastern Abyssinia.

Otomys typus fortior, subsp. n.

By the kindness of Dr. Lampert, of the Stuttgart Museum, I have been entrusted with the loan of the typical skull of Heuglin's *Oreomys typus*, and I regret to find that it is after all of the same group as my *Otomys Degeni*, Heuglin's description of its incisive grooves proving to be grossly inaccurate. Their true number and positions are as described in *O. Degeni*, and this latter must, I fear, be regarded as a synonym of *O. typus*.

But the Kaffa form obtained by Mr. Zaphiro, though similar to *typus* and *Degeni* in all essential respects, is sufficiently larger to make me think it should have a special subspecific name. The skull, as a whole, is markedly larger than that of *Degeni*, which agrees with what remains of the specimen of *typus*. The worn surface of the upper molars is 8·5 mm. in length, as compared with 7·7 in the other two. The breadth of the two upper incisors, taken together, is 4·7 mm. in *fortior*, 4·1 in *Degeni*, and 3·7 in *typus*.

There is no evidence of any marked difference of age between the three skulls, but, if anything, the type of *typus* is the oldest of all.

In colour the type of *fortior* is rather browner than that of *Degeni*, the feet are darker, and the yellowish markings over the eyes and on and behind the ears are practically absent.

The following are the general measurements of the type:—

Head and body 182 mm.; tail 97; hind foot 30; ear 26.

Skull: greatest length 39; basilar length 32·2; greatest breadth 19·8; palatilar length 18·5; palatal foramina 7·7; length of upper molars (crowns) 9·5.

Hab. Charada, Kaffa. Alt. 6000′.

Type. Adult female. Original number 102. Collected 4th June, 1905.

Tatera Harringtoni, sp. n.

Allied to *T. Emini*, Thos., but much smaller.

Size very small for a *Tatera*. General colour along the dorsal area clay-colour, darkened by the minute blackish tips to the hairs. Sides clearer, more nearly "pinkish buff," the hairs with whitish subterminal bands. Lower part of muzzle pure white, the same region in *Emini* being more or less buffy. A patch above and behind each eye dull whitish. A white patch behind each ear. Hands and feet white as usual. Soles naked posteriorly, but with a band of short hairs crossing them near the base of the hallux, as in *Emini* alone of other gerbilles. Tail unusually well tufted, with long brownish-black hairs, which attain a length at the tip of about 14 mm.; shorter hairs of tail dull buffy whitish.

Skull closely similar to that of *T. Emini*, but conspicuously smaller throughout.

The posterior palatal vacuities, between the molars, are, however, much narrower than the anterior palatal foramina, while in *T. Emini* they are nearly or quite as broad as the latter.

Dimensions of the type (measured in the flesh):—

Head and body 96 mm.; tail 132; hind foot 28; ear 19.

Skull: greatest length 30·7; basilar length 22·3; interorbital breadth 6; breadth of brain-case 14·2; diastema 8·2; palatal foramina 5·2 × 2; length of bulla 9; length of upper molar series 4·3.

Hab. Mutti Galeb, E. of Lake Rudolf. Alt. 2300′.

Type. Adult female. Original number 122. Collected 26th July, 1905.

"Caught in dry river-bed."

This pretty gerbille is allied only to *T. Emini*, with which

it shares the peculiar and hitherto unique character of the hairy band passing across the sole and dividing from each other the smooth posterior part and the distal part at the base of the toes, where the tubercles are situated. From that species, which was discovered at Walelai by Emin Pasha, it is at once distinguishable by its much smaller size.

Named in honour of Col. Sir John Harrington, British Resident in Abyssinia, without whose active assistance Mr. Zaphiro would hardly have been able to carry out his successful collecting-trip.

Arvicanthis rex, sp. n.

A very large species without dorsal stripe.

Size larger than in any other species. General colour of fore-back between hair-brown and smoke-grey, resulting from a coarse mixture of blackish brown and creamy white; posteriorly the light colour becomes more and more buffy, so that round the base of the tail and on the lower leg it approaches tawny ochraceous. Sides lined cream-buff. Under surface and inner side of limbs white. Forearms dull buffy; hands pale brown; upper side of feet whitish laterally, pale tawny along the middle line. Tail blackish above, dull white on sides and below.

Dimensions of the type (measured in the flesh):—

Head and body 212 mm.; tail 175; hind foot 36; ear 22.

Hab. Charada Forest, Kaffa. Alt. 6000′.

Type. Adult male. Original number 101. Collected 30th May, 1905.

This is a remarkably fine species, very different from anything hitherto described. Its colour has almost a suggestion of silvery blue-grey in it not easy to describe, but very characteristic, while at the same time its unusual size and the entire absence of any trace of a darker dorsal band will distinguish it from the other members of the group. Unfortunately the skull is missing, but the species is so distinct as to be readily recognizable by its external characters.

Lophuromys Zaphiri, sp. n.

General colour above greyish, without the warmer tones of the other forms, most nearly matching "hair-brown" of Ridgway; very finely speckled with buffy. The bases of the hairs deep rufous. Under surface fawn, more or less suffused with buffy. Upper surface of hands and feet dull whitish. Tail short, strongly tapering, well haired, markedly bicolor, black above, whitish below, sharply defined laterally.

Skull with very widely open palatal foramina. Molars apparently rather broader than usual.

Dimensions of the type (measured in the flesh) :—

Head and body 139 mm.; tail 66; hind foot 20; ear 19.

Skull: greatest length 30; basilar length 25·2; nasals 12 2; interorbital breadth 6; length of palatal foramina 6·6; length of upper molar series 5·6.

Hab. District east of the Upper Omo. Type from Bodeli, Walamo. Alt. 6200′.

Type. Subadult male. Original number 145. Collected 15th September, 1905.

This animal may be distinguished from its allies by its markedly greyer colour and finer speckling. It has the short tail of *L. flavopunctatus.*

The genus *Lophuromys* falls readily into two groups of species—the one from Eastern Africa (Abyssinia to Nyasa), with speckled fur, and the other Western (Uganda to the Gold Coast), with unspeckled fur. Whether the forms within each of the groups will be found to intergrade remains to be seen, but for the present I have thought it best to use a binomial term for the Eastern Omo animal.

I have named this species in honour of Mr. Ph. C. Zaphiro, the collector, who deserves the greatest credit for his remarkable exploring-trip, of which the series of mammals only forms a small part of the outcome.

Lophuromys aquilus brunneus, subsp. n.

General colour pale brownish, without the yellowish tone of *L. flavopunctatus*, the light rings of the hairs "clay-colour." Under surface variable as usual, ranging from pale brown to clay-colour. Hands and feet pale brownish, with or without a central dark metatarsal streak. Tail long as compared with that of *L. flavopunctatus*, apparently more as in the East-African *aquilus*, its colour not so conspicuously bicolor as in *flavopunctatus*, the under surface only slightly lighter than the upper.

Dimensions of the type (measured in the flesh) :—

Head and body 125 mm.; tail 80; hind foot 23; ear 20.

Skull: length of nasals 11 7; interorbital breadth 6·5; diastema 8·5; palatal foramina 6·8 × 2·7; length of upper molar series 5·3.

Hab. District west of the Upper Omo. Type from Manno, Jimma. Alt. 4200′.

Type. Male. Original number 90. Collected 13th May, 1905.

This *Lophuromys* would seem to be a paler form of the strong-coloured East-African *L. aquilus*. Possibly it may in turn prove to grade northwards into *L. flavopunctatus*, but all the specimens as yet available have longer tails than that animal.

XLII.—*Natural History Notes from the R.I.M.S. Ship 'Investigator,' Capt. T. H. Heming, R.N. (retired), commanding.*—Series III., No. 14. *Notes on the Skull of the Genus* Aulastomatomorpha, *with Descriptions of some new Deep-sea Fish.* By R. E. Lloyd, M.B., B.Sc., Capt. I.M.S., Surgeon-Naturalist, Marine Survey of India.

The genus *Aulastomatomorpha*, first described by Alcock from a single specimen (Ann. & Mag. Nat. Hist., Oct. 1890), is unique among the Alepocephalidæ in possessing a tubular snout with a small terminal mouth.

A second specimen of the same species was obtained by the 'Investigator' in 1904 from 1100 fathoms off the Arakan coast, and in the following year a new species of this genus was obtained from 1005 fathoms in the Gulf of Oman.

Material has been thus obtained for a partial description of the skull of this genus and for a more particular description of the jaw suspensory apparatus, which can be fully elucidated without complete disarticulation and destruction of the specimen.

A notable feature in the structure of this skull is the forward position of the quadrate and the consequent prolongation of the symplectic and præopercle which articulate with it.

The quadrate is a thin fan-shaped bone situated almost entirely in front of the orbit, articulating with the pterygoid and articular in front, and with the symplectic and the præopercle behind. The large pterygoid is partially overlapped in front by the small toothless palatine.

The mesopterygoid, also a large bone, forms most of the lower floor of the orbit; in front it lies to the inner side of and above the quadrate and pterygoid.

The metapterygoid, a small bone, lies on and partially hides the symplectic.

The symplectic is of unusual length.

The maxilla, which is very loosely connected with the snout, consists of two separate crescentic particles, movable on one another.

The hyomandibular has the usual articulations.

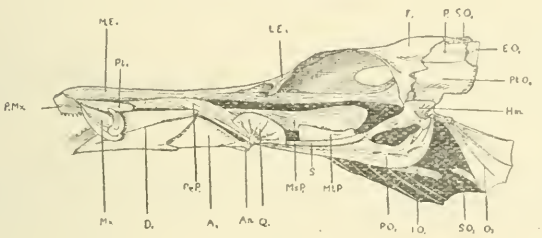
The opercular apparatus consists of the usual four bones. The præopercle is much prolonged forward to articulate with the quadrate. The sub- and interopercles are small and linear. The opercle, a very thin triangular bone, bears at its upper end a projecting knob, which is seen externally as a well-marked prominence halfway between the eye and the upper end of the branchial opening.

The lower jaw contains articular angular and dentary bones.

The upper part of the snout is formed by one long fibrous piece of bone intimately united with the vomer in front and dividing at the base of the snout into two limbs, between which the fore parts of the frontals fit. This long bone represents an ethmoid and two lateral ethmoids; a suture separating these elements could not be found.

In the cranium proper the supraoccipital articulates with the frontals and lies between the small parietals, separating them from each other.

The frontals are not fused in the middle line.



Skull of *Aulastomatomorpha phosphorops*.

Reference letters.

Q. = Quadrate.
A. = Articular.
An. = Angular.
D. = Dentary.
Pr.P. = Pterygoid.
Ms.P. = Mesopterygoid.
Mt.P. = Metapterygoid.
S. = Symplectic.
P.O. = Præopercle.
I.O. = Interopercle.
S.O. = Subopercle.
O. = Opercle.

Hm. = Hyomandibular.
Pt.O. = Pterotic.
E.O. = Epiotic.
P. = Parietal.
F. = Frontal.
S.O. = Supraoccipital.
L.E. = Lateral ethmoid.
M.E. = Mesethmoid.
Pl. = Palatine.
Mx. = Maxilla.
P.Mx. = Premaxilla.

Aulastomatomorpha cæruleiceps, sp. n.

B.	D.	A.	P.	V.
5	18	40	7	6

Closely resembles *A. phosphorops*, from which it differs in the following particulars:—

1. The premaxillary teeth are fewer in number and are relatively larger; they are arranged in two sets, an anterior closely set group of eight or nine, and a posterior group of three with wide intervals between.

2. The interorbital space is wider than half the diameter of the eye.

3. The head is covered with a firm smooth skin just as in *A. phosphorops*, but in the new species the colour of this skin is a dark slaty blue. The colour of the rest of the body is brownish black. The bases of the fins have a blue tinge. The blue colour is partially preserved in spirit.

4. The total height is only $\frac{1}{5}$ of the total length excluding the caudal fin, but as this specimen is smaller and younger than the type of *A. phosphorops*, this character does not, perhaps, constitute a specific difference.

One damaged specimen, 18 cm. long, from 1005 fathoms in the Gulf of Oman.

The wide distribution of the three specimens and the close similarity in the depths from which they were obtained are points worth noting.

Species.	Depth.	Locality.
A. phosphorops (1st specimen).	1000	Arabian Sea, off the Laccadives.
A. phosphorops (2nd specimen).	1100	Bay of Bengal, off Arakan.
A. cæruleiceps	1005	Gulf of Oman, off Muscat.

Narcetes affinis, sp. n.

B.	A.	D.	V.	P.	L. l.	L. tr.
7	14	17	10	13	73	9+1+13

Resembles *N. pluriserialis* (Gorman), and differs from *N. erimelas* (Alcock) in the following particulars:—

1. There are seven branchiostegal rays.

2. The first ray of the anal fin is vertically below the eighth ray of the dorsal.

3. There is one enlarged tooth on either side of the vomer.

In all its proportions this species resembles *N. pluriserialis* very closely.

It differs from *N. pluriserialis* in the following respects:—

1. The teeth in the maxillæ are in two series, an outer series of small teeth and an inner series of larger ones.

2. There are only seventy-three scales in the lateral line.

3. The anterior of the two nostrils is relatively larger.

The scales of the lateral line are large, measuring as much as $\frac{1}{4}$ inch in length.

The total length of the single specimen is 14 inches.

In the middle and hinder parts of the fish, one inch of the lateral line contains six scales, but in the front these scales overlap one another to a much further extent, so that one inch contains eight or nine scales.

In the anterior half of each scale of the lateral line is the wide opening of its tube; the margin of this opening is completed in front by a semicircular notch in the hinder edge of the scale which lies next in front.

Colour almost black; head and lining of gill jet-black.

One specimen, 14 inches long, from 1005 fathoms in the Gulf of Oman.

It is notable that *N. pluriserialis* (Gorm.), which this species resembles in many ways, came from 1010 fathoms in the Gulf of Panama.

Raia Philipi, sp. n.

The greatest breadth of the disk is equal to the greatest length, including the ventral fins.

The ends of the snout and tail are equidistant from the cloacal orifice. The snout is slender and prominent. The interorbital space is $3\frac{2}{3}$ in the length of the snout, measured from an eye or the middle of the mouth.

The anterior borders of the pectoral fins, which are somewhat sinuous, together form an angle of about 85°.

The lateral angles are rounded. The spiracle is large, its greatest diameter equals that of the eye.

Numerous small spinules occur on the upper surface of the tip of the snout and close to the antero-lateral margin in its posterior half only.

The superciliary ridge bears four spines in front and three behind.

There are five mid-dorsal spines in the branchial region.

Between the ocellus and the margin of the pectoral fin is a group of lanceolate denticles pointing inwards (probably characteristic of the male).

The whole lower surface of the snout is covered with fine denticles.

On the dorsum of the tail are three somewhat irregular rows of spines. The tail is naked below, the sides of the tail are spiny.

The mouth is widely but distinctly V-shaped; in width it is $1\frac{7}{8}$ in the length of the snout.

There are eighty rows of teeth in the upper jaw and sixty in the lower. Teeth low and triangular, on a rhomboidal base.

The edges of the nasal valves are deeply fimbriated and are united across the middle line by a distinct fold of skin, which is separated from the upper jaw by a deep curved groove.

The dorsal fins are equal in length; the distance between them is greater than the length of either. Caudal fin small.

Colour uniform brown above, with a dark ocellus at the base of each pectoral fin, surrounded by a paler ring.

Uniform white below; the tail shows dark mottling on its lower surface.

One small male specimen, measuring 36 cm. in its greatest length and 23 cm. in its greatest breadth, was taken from 130 fathoms in the Gulf of Aden.

Raia reversa, sp. n.

The greatest breadth of the disk is equal to the length from the snout to the root of the tail.

The cloaca is slightly nearer the end of the snout than the end of the tail.

The interorbital space is $\frac{1}{4}$ the length of the snout measured from an eye or the middle of the mouth.

The anterior borders of the pectoral fins are sinuous and together form an angle of about 80°.

The snout is prominent.

The lateral angle of the pectoral fins is rounded.

The spiracle is large; its greatest diameter equals that of the eye.

The skin over the skull, but not over the snout, is covered with fine denticles.

The anterior half or more of the pectoral fins is covered with small denticles.

There are two series of larger spines on the pectoral fins, one series of about twenty opposite the shoulder-girdle (male characteristic probably) and another of about fifteen opposite the eye.

There is one large white stellate spine in front of the eye and two or three smaller ones behind.

There are four or five similar spines in the mid-dorsal line.

On the dorsum of the tail are three regular rows of large spines, those of the middle row being about half as numerous as those of the lateral rows.

The sides of the tail are spiny.

The lower surface of both disk and tail is smooth and devoid of spines.

The two dorsal fins are equal in length and are in contact at their bases; the caudal fin is a minute fold.

The mouth is transverse in its outer part and curved in the middle; its breadth is exactly half the length of the snout.

There are forty-two rows of teeth across both upper and lower jaw.

The teeth in the middle of the series are long and curved; their bases are heart-shaped.

Colours in the fresh state:—The upper surface of the disk is pure white, passing into dark grey at the margin of the pectoral fins. The upper surface of the pelvic fins and claspers is grey. The iris is black, but the pupil has a white milky appearance: the anatomical cause of this was unfortunately not made out in the fresh state. The entire lower surface is purplish black. In consistency the whole body is soft and flabby; when taken from the trawl it was rolled up in a cylindrical posture.

The single specimen (a male), measuring 60 cm. in its greatest length and 33 cm. in its greatest breadth, was taken from 820 fathoms in the Arabian Sea off the Baluchistan coast.

In the same trawl was obtained a black pillow-shaped egg with four hollow horns at the corners; this measures $2\frac{1}{2}$ by $1\frac{1}{2}$ inches. The horns are not equal in length: those of one pair are $2\frac{1}{2}$ inches long and are separated by a straight border; those of the other pair are $1\frac{1}{2}$ inch long and are separated by a tongue-shaped projection of the border, which constitutes a smaller fifth horn.

The most characteristic features of this species are the soft flabby consistency in the fresh state and the remarkable coloration, which suggested the name *R. reversa*.

In concluding these notes I must acknowledge my indebtedness to Lt.-Col. A. Alcock, I.M.S., F.R.S., who has kindly given me much help and advice in their production.

Figures of these four species will be subsequently published in the "'Investigator' Illustrations."

XLIII.—*The Relations of Palæontology to Biology* *.

By A. Smith Woodward, LL.D., F.R.S.

It is clear that the scientific value of a fossil depends upon the exactness with which the circumstances of its discovery are determined by a geologist. The briefest experience is also enough to demonstrate that the well-mineralized remains of an organism can only be satisfactorily interpreted by an observer who is familiar with the structure of rocks and their common constituents. The student of fossils needs as much elementary training in the geological succession of the rocks and the varied nature of mineralization as the student of histology and embryology requires to locate his sections with exactitude and to understand the action of the different stains and media he employs. In the one case nature makes the preparation, in the other case the processes of laboratory technique are responsible for the difficulties. In both cases there is scope for numerous fantastic conclusions if the properties of the preservative medium are misunderstood.

Palæontology, however, is essentially a department of Biology, and it can only be prosecuted with success by a skilled biologist who has had the elementary geological and mineralogical experience just mentioned. It bears, indeed, the same relation to the whole world of life that embryology bears to the structure of an individual organism. The one deals with the rise and growth of races and their varying relationships, the other describes and interprets the evolution of an individual and the processes by which the different parts of its mechanism are finally adjusted. Both, unfortunately, depend on extremely imperfect material; for fossils are nearly always mere badly preserved skeletons, and they represent only an infinitesimal fraction of the life that has passed away, while embryos are so much adapted to the peculiar circumstances of their environment that many of the essential stages in their growth and development are obscured and modified by temporary expedients.

The past history of the world of life, as revealed by fossils, has long been familiar in its general outlines. At least a century has elapsed since it was made clear that the various organisms come into existence at different times and in a definite order, according to their grade in the scale of being, the lowest first, the highest latest. Several decades have

* Extract from an Address delivered before the International Congress of Arts and Science, St. Louis, U.S.A., Sept. 22nd, 1904; published in the Congress Report, vol. iv., June 1906.

also passed away since it was recognized that within each group the lowest or most generalized members appeared earliest, the highest, most specialized, or most degenerate towards the end of the race. Modern research is concerned only with the details of this succession and with the laws which can now be deduced from the rapidly multiplying available facts.

Our present knowledge of the geological succession of the fishes may be briefly summarized to show how Palæontology contributes to the solution of the fundamental problems of Biology. The earliest recognizable fish-like organisms, which occur in Upper Silurian formations, seem to have been mere grovellers in the mud of shallow seas, nearly all with incompletely formed jaws and no paired fins, devoting most of their growth-energy to the production of an effective armour by the fusion of dermal tubercles into plates (*Ostracodermi*). With them were a few true fishes which had completed jaws, but which possessed a pair of lateral fin-folds, variously subdivided, instead of the ordinary two pairs of fins (*Diplacanth Acanthodii*). The main features of Silurian fish-life were, therefore, the acquisition of dermal armour, definite jaws, and the beginning of paired fins. Some of the lowly types thus equipped survived and further evolved in the Devonian period; but the multitude of new-comers which then formed the majority were much higher in the scale of being (*Crossopterygii*). They were still adapted for the most part to live on the bottom of shallow water or in marshes, but they were typical well-formed fishes in respect to their jaws, branchial apparatus, and two pairs of fins. Nearly all their bones were external, very little of their internal skeleton being ossified, and the only changes they seem to have been undergoing related to the fusion of some of the head-bones and the more exact adaptation of their fins and tail to their environment. Fishes more fitted for sustained swimming were also beginning to appear, and these (*Palæoniscidæ*) formed the large majority in the succeeding Carboniferous and Permian periods. They were about equivalent in grade to the modern sturgeons, and the tendency towards change in their structure was in the direction of effective swimming, by the more intimate correlation between the fin-rays and their supports and by the shortening of the upper lobe of the tail. They still exhibited scarcely any ossification of the internal skeleton. As soon as the best type of balancing fin and the most effective type of propelling tail-fin had become universal among the highest fish-life of the Triassic period the internal skeleton began to ossify and vertebral centra arose. In fact,

the whole of the succeeding Jurassic period was spent by the highest fishes in improving and finishing their internal skeleton, while their external bony armour began almost universally to degenerate. Thus, by the early part of the Cretaceous period the most advanced members of the class had already become true bony fishes or *Teleosteans*. Having attained that stage of complexity, they admitted of much more variation than formerly, and then arose the immense host of fishes which characterize the Tertiary period and the present day. For the first time in fish-history there were fundamental changes in the head. First, in some genera the maxilla began to slip behind and above the premaxilla, so that it was excluded from the gape. Next, in these and most other fishes, the ear-capsules began to enlarge to such an extent that the original roof of the brain-case eventually formed only an insignificant part of the top of the skull. At the same time the lateral muscles of the trunk extended forward over the cranial roof, and various crests arose between them. Finally, it was quite common for the pelvic fins to be displaced forward beneath the pectoral fins, while the vertebræ, as well as some of the fin-rays, were usually reduced to a definite and fixed number for each family or genus. Simultaneously many of the fin-rays were modified into spines, and there was a constant tendency for the external bones and scales to become spinose. At all stages of this progress there were, of course, stragglers left by the way; and the modern fish-fauna is therefore a mixture of slightly modified survivors of many periods in the earth's history.

To state this brief summary in more general terms, fossils prove that the earliest known fish-like organisms strengthened their external armour so long as they remained comparatively sedentary; that next the most progressive members of the class began to acquire better powers of locomotion, and concentrated all their growth-energy on the elaboration of fins; that, after the perfection of these organs, the internal bony skeleton was completed at the sacrifice of outer plates, because rapid movement necessitated a flexible body and rendered external armour less useful; that, finally, in the highest types the vertebræ and some of the fin-rays were reduced to a fixed and practically invariable number for each family or genus, while there was a remarkable development of spines. As survivors of most of these stages still exist, the changes in the soft parts which accompanied the successive advances in the skeleton can be inferred. Hence Palæontology furnishes a sure basis for a natural classification in complete accord with the development of the group.

Now fishes are aquatic animals, and nearly all the fossiliferous rocks were deposited in water. The past history of this chain of life ought therefore to be almost completely revealed by the geological records. Making due allowance for the imperfection of collections and the accidental nature of the discovery of fossils, the general outlines of this history may indeed be considered as tolerably well ascertained. Thus the facts of Palæontology not only aid the biologist in discovering the true relationships of the fishes; at the same time they afford a definite means of determining with certainty some of the fundamental principles of organic evolution illustrated by them. As identical principles may be deduced from other departments of Palæontology, most of them are not likely to be altered in any essential respects by future discoveries.

It must suffice here to allude only to a few of these general results which seem to be of far-reaching importance, omitting details which may be obtained from special treatises. Foremost among them is the demonstration that the evolution of the animal world has not proceeded uniformly, but in a rhythmic manner. As soon as fishes had acquired the paddle-shaped paired fins, they suddenly became the special feature of the Devonian period in all parts of the globe that have hitherto been geologically examined, and they attained their maximum development, being more numerous and more diverse in form than at any subsequent time. None of these paddle-finned fishes (*Crossopterygii*) in the course of their varied development made much approach towards passing into the next grade of fish-life with short-based paired fins and a heterocercal tail (*Chondrostei*); but among their earliest representatives there was at least one member of the higher group, which suggests that the latter arose when the previous group was just becoming vigorous. At the beginning of the Carboniferous period the higher grade of fish-life just mentioned suddenly became the dominant feature, and during the Carboniferous and Permian it attained its maximum development. Towards the close of the Permian period the next higher group was heralded by only one representative, but as soon as it arose in the Trias it resembled its predecessors in becoming immediately dominant, surpassing all contemporary races of fishes both in the number of individuals and in the variety of genera and species. In the Cretaceous period the highest bony fishes appeared, and at the end of that period, with the dawn of the Tertiary, they suddenly diverged into nearly all the subdivisions which characterize the existing fish-fauna, accomplishing much more

evolution in a brief interval than has taken place during the whole of the succeeding Tertiary time. In short, the fundamental advances in the grade of fish-life have always been sudden and begun with excessive vigour at the end of a long period of apparent stagnation, while each advance has been marked by the fixed and definite acquisition of some new character—an "expression point," as Cope termed it—which seems to have rendered possible, or, at least, been an essential accompaniment of, a fresh outburst of developmental energy. As we have seen, the successive "expression points" among fishes were the acquisition of (1) paddle-like paired fins, (2) shortened fin-bases but persistent heterocercal tail, (3) completed balancing fins and homocercal tail, and (4) completed internal skeleton.

When fossils are examined more closely, it is interesting to observe that the geological record is most incomplete exactly at these critical points in the history of each race. There are abundant remains of the families and genera which are definitely referable to one or other order or suborder; but with them there are scarcely any of the links between these major divisions which might have been expected to occur. It must also be confessed that repeated discoveries have now left faint hope that exact and gradual links will ever be forthcoming between most of the families and genera. The "imperfection of the record," of course, may still render some of the negative evidence untrustworthy; but even approximate links would be much commoner in collections than they actually are if the doctrine of gradual evolution were correct. Palæontology, indeed, is clearly in favour of the theory of discontinuous mutation, or advance by sudden changes, which has lately received so much support from the botanical experiments of H. de Vries.

Further results obtained from the study of fossils have a bearing even on the deepest problems of Biology, namely, those connected with the nature of life itself. For instance, it is allowable to infer, from the statements already made, that the main factor in the evolution of organisms is some inherent impulse—the "bathmic force" of Cope—which acts with unerring certainty whatever be the conditions of the moment. So far as human judgment can decide, the varied assemblage of fishes at each stage of the earth's history was always in perfect accord with its environment and displayed very few signs of waning, even at the time when a new race suddenly took its place and provided every kind of fish once more on a higher plane or, so to speak, in a later fashion. The change was inevitable and according to some fundamental law of

life whose influence is independent of temporary equilibrium. Equally inevitable and irreversible are the essential changes which may be observed during the evolution of each family of organisms. As the late Professor Beecher pointed out *, all animals with skeletons tend to produce a superfluity of dead matter, which accumulates in the form of spines as soon as the race to which they belong has passed its prime and begins to be on the downgrade; all vertebrates tend to lose their teeth when they reach the culmination of their life-history; nearly all groups of fishes end their career with eel-shaped representatives; and when a structural character has been definitely lost in the course of evolution it never reappears, but, if actually wanted again, is reproduced in a secondary makeshift. Finally, and perhaps most important of all, there is in the course of evolution of all groups of animals to their prime a tendency towards fixity in the number and regularity (or symmetry) in arrangement of their multiple parts. The assumption of a fixed number of vertebræ and fin-rays in the latest and highest families and genera of bony fishes has already been mentioned. An irregular cluster of grinding-teeth characterized the Pycnodont fishes of the Lower Lias, while these teeth began to be disposed in definite regular rows in some of the Bathonian forms, and such a symmetrical arrangement henceforth pervaded the highest members of the family. Many of the lower vertebrates, both living and extinct, have teeth with multiplied cusps, and in some genera the number of teeth seems to be constant; but in the history of the vertebrates the tooth-cusps never became fixed individual entities, strictly homologous in whole races, until the highest or mammalian grade had been attained. Moreover, it is only in the same latest phase that the teeth themselves can be treated as definite units, always the same in number (44), except where modified by degeneration or special adaptation. The number of vertebræ in the neck of the lower vertebrates depends on the extent of this part, whereas in the mammal it is almost invariably seven whatever the total length may be. Equally constant in the artiodactyl ungulate mammalia is the number of nineteen vertebræ between the neck and the sacrum.

In short, the biologist equipped with an adequate knowledge of Palæontology cannot fail to perceive that throughout the evolution of the organic world there has been a periodical succession of impulses, each introducing not only a higher grade of life, but also fixing some essential characters that

* C. E. Beecher, "The Origin and Significance of Spines," Amer. Journ. Science, [4] vol. vi. (1898), July to October.

had been variable in the grade immediately below. He must also realize that in the interval between these impulses some minor characters in the families similarly acquired fixity in their prime, until old age and extinction approached. The general conclusion is, that if the unknown influence which Cope has termed "bathmic force" were able to act without a succession of checks from the environment and Natural Selection, animals would form much more symmetrical groups than we actually find, and their ultimate grades would display still more instances of numerical fixity in multiple parts than can be observed under existing circumstances.

This result almost tempts a palæontologist to risk the pitfalls of reasoning from analogy and to compare organic evolution with some purely physical processes. It has already been pointed out more than once that the initial stages of animal races resemble the nascent states of chemical elements in their particular intensity of vigour and unwonted susceptibility to influence; while Cope himself has hinted that the "expression points" in the evolution of races may, perhaps, be compared with the phenomena of latent heat in the inorganic world. It now seems reasonable to add that each "phylum," or separate chain of life, bears a striking resemblance to a crystal of some inorganic substance which has been disturbed by impurities during its growth, and has thus been fashioned with unequal faces, or even turned partly into a mere concretion. In the case of a crystal the inherent forces act solely upon molecules of the crystalline substance itself, collecting them and striving, even in a disturbing environment, to arrange them in a fixed geometrical shape. In the case of an organic phylum, the inherent forces of the colloid germ-plasm act upon a consecutive series of temporary outgrowths or excrescences of colloid substance (the successive individual bodies or "somata"), struggling not for geometrically arranged boundaries, but towards various other symmetries and a fixity in number of multiple parts. Palæontology thus contributes to Biology by placing the oft-repeated comparison of life with crystallization in an entirely new light.

BIBLIOGRAPHICAL NOTICES.

A Descriptive Catalogue of the Tertiary Vertebrata of the Fayum, Egypt. By Charles William Andrews, D.Sc. Pp. xxxvii + 324, pls. 26, and text-figures. London: Printed by Order of the Trustees of the British Museum. 1906. Price 35*s*.

Dr. Andrews is a zoologist in the widest sense of the term, and hence it is that this bulky volume is something more than a mere

catalogue of dry bones; though even had it been no more than this, from the extraordinary character of these bones the book he has just finished would have been one of exceptional importance: and this because, for the most part, the remains which he describes are missing links for which palæontologists and students of phylogeny have long been seeking, desiring without hope.

Though Dr. Andrews had not, in many cases, the good fortune to unearth the first specimens of these remains to be discovered, it is to him that we owe their determination: to him that the credit belongs of interpreting the true nature of the puzzles they presented. But he has himself done much work in the burning deserts of Egypt, and many of the most important remains described here are due to the masterly intuition he displayed in the arduous work of fossil-hunting; many of the biggest prizes were obtained from ground that others on the same quest had already surveyed and pronounced barren!

The greater part of this volume is concerned with that most important group, the Ungulates; and, undoubtedly, the most striking of these is the bizarre creature which has been named *Arsinoitherium*. A considerable number of bones, including skulls, of this animal have been obtained, representing different ages, so that, as Dr. Andrews remarks, "this extraordinary mammal is now almost completely known, so far as this is possible from the bones alone."

In general appearance somewhat resembling a large and heavily built rhinoceros, it differed therefrom in having an enormous pair of horns placed side by side above the nose and a smaller pair above the eyes. From the corrugations on the surfaces of these cores it would seem certain that they were ensheathed in horn; and in this, of course, *Arsinoitherium* differed fundamentally from the Rhinoceros; while, from their dentition and other cranial characters, it would appear that these ponderous animals are descended from the same ancestral stock as the Hyracoidea.

The great feature of this Catalogue, and of Dr. Andrews's work, is, however, the section devoted to the Proboscidea. Hitherto the origin and evolution of this group has been shrouded in mystery: to-day the veil is lifted. It is no small thing to have done this; and those who will turn to the pages of this work will find that Dr. Andrews has brought to bear upon his task a subtilty of analysis and a grasp of complicated facts that most of us can but envy.

Till now one of the strongest and most telling object-lessons in the Evolution Theory has been furnished by the Horse; but Dr. Andrews has now provided an even more striking piece of evidence. To attempt, even in outline, to describe the nature of this evidence would be impossible in the space at our disposal; for the author's discoveries do not end here, and of these other achievements we must also speak. The most important of these concerns his contentions with regard to the origin and evolution of the Sirenia, which he holds are to be regarded, as De Blainville suggested years ago, as intimately related to the Proboscidea. But

while De Blainville advanced this view rather as a pious opinion, Dr. Andrews has brought forward a mass of skilfully marshalled facts which leave but little room for doubt on the question.

With regard to the question of the descent of the Cetacea, he shows, conclusively, that these most remarkable mammals are derivatives of that primitive group of Carnivora known as the Creodonts.

The bird-remains found by Dr. Andrews in the beds (Lower Tertiary) which furnished the materials for this Catalogue were scanty, though in their way important, inasmuch as among them he found remains apparently of a Ratite (*Eremopezus*) which lived in this district during the Upper Eocene period. But since neither skull, pelvis, nor sternum has so far come to light, there is no evidence to show whether this was really a "Ratite" (Palæognathine) form; nor can much that is profitable be said as to whether it was more nearly allied to the Struthiones or Æpyornithes.

With regard to the Reptilia, little of phylogenetic importance has come to light; but from a distributional point of view some very significant facts will be found recorded. Thus, giant Land-Tortoises near akin to the recent Mascarene forms were found, as well as remains of pleurodiran species; and since these last are now confined to the Southern Hemisphere this discovery is of very great significance—tending as it does, Dr. Andrews believes, to support the view that during Jurassic times Africa and S. America formed a continuous land-mass.

But, surely, enough has now been said to show that this "Catalogue" may be said, without exaggeration, to mark an epoch in the history of Vertebrate Zoology. W. P. Pycraft.

Die Tierischen Gifte. Von Edwin Stanton Faust. Braunschweig, 1906. Pp. xiv, 248.

This is a comprehensive treatise on animal poisons, dealing both with those animals which bite or sting, those the flesh of which is poisonous, and those from which poisonous drugs or arrow-poisons are obtained. The structure of the poison-glands is described and the various symptoms produced by the poisons, and their chemical characters are also discussed. The greater portion of the volume is devoted to Ophidia, Amphibia, Pisces, Arthropoda, Vermes, &c., and certain portions of the subject seem to have been purposely excluded. Thus, *Platypus* is the only poisonous mammal included, and we do not notice anything about hydrophobia or glanders, on the one hand, or the carriage of infection by rats &c., on the other. The carriage of infection by mosquitoes and the tsetze-flies is only briefly alluded to, nor are parasitic insects noticed. Within the limits which the author seems to have imposed upon himself, his book will be found very useful to those interested in animal poisons from a medical and chemical point of view. W. F. K.

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XLIV.—*Brachiopod Nomenclature.*

By S. S. Buckman, F.G.S.

The following remarks are presented in the hope that they may be of assistance in clearing up various difficulties connected with the names of some Brachiopod genera.

Epithyris, Hypothyris, Cleiothyris, Phillips, 1841.

According to Dall * these genera are indeterminable from what Phillips has said about them, and so he establishes two of them on King's authority. Schuchert † does the same, definitely stating that King's genera are not Phillips's. But this arrangement can only be accepted as a temporary expedient. The generic names must stand or fall by what Phillips has done, and if they fall they cannot be revived in another sense. "Once used, always used."

However, I do not accept the dictum that Phillips's genera are indeterminable, or that Phillips did not sufficiently indicate his types, so that a subsequent author was free to select—though this would make them still Phillips's genera, not King's. Phillips, to my reading, indicated the types which he had in mind—not so definitely as he might have done, perhaps; but still he did indicate them. He says of the first

* Index Brach., Bull. U.S. Nat. Mus. 1877.

† Syn. Am. Brach., Bull. U.S. Geol. Survey, 1897.

two :—" Whoever will carefully examine the '*Terebratulæ*' of the strata below the Lias will find but few which can be supposed to exhibit a distinct oval or circular opening below the beak (such as belongs to *T. concinna*, for example), and perhaps none which show a truncate perforate beak (as, for example, in *T. maxillata*)" *.

Then he further says (p. 55) : "*Epithyris* . . . beak truncate, perforate." "*Hypothyris* . . . beak acute, perforation below it." Putting these statements with those on the preceding page, it seems to be obvious that Phillips regarded as typical of his genera *Hypothyris* and *Epithyris* *T. concinna* and *T. maxillata* respectively.

Therefore one can say

Genus Epithyris, Phillips, 1841.

Type *Terebratula maxillata*, Sowerby.
Non *Epithyris*, King, nec Deslongchamps.

This may stand as the generic name for a small but very distinct series of Jurassic Terebratulids. It includes *T. submaxillata*, Morris, *T. marmorea*, Oppel, *T. lentiformis*, Upton, *T. permaxillata*, S. Buckman, and another form which requires a new name. This may be called

Epithyris bathonica, nom. nov.

As type may be taken the specimen figured as *Terebratula maxillata*, Davidson, Brit. Ool. Brach. (Pal. Soc.) 1851, pl. ix. fig. 3 only. It is a larger and more massive shell than *T. maxillata*, Sowerby, properly represented in Davidson (pl. ix. fig. 1), and it grows to a much larger size before it begins to show plications. It is characteristic and fairly abundant in the Great Oolite, whereas *E. maxillata* characterizes the Bradford Clay below and *E. marmorea* the Forest Marble beds above; so that the distinction is of stratigraphical value.

Genus Hypothyris, Phillips, 1841.

Type *Terebratula concinna*, Sowerby.

The name *Hypothyris* cannot be used, as, according to Scudder, it is preoccupied—for a genus of Lepidoptera by Hübner in 1822.

The terms epithyrid and hypothyrid will be found extremely useful for describing the beak-characters which Phillips

* Pal. Foss. Corn. Devon, p. 54 (Mem. Geol. Surv. 1841).

noted. Most Terebratulids are epithyrid, but *Stringocephalus* is hypothyrid; most Rhynchonellids are hypothyrid, but *Terebratuloidea* is epithyrid—in other words, it is a Rhynchonellid with a truncate perforate beak.

The case regarding *Cleiothyris* is hardly so satisfactory as the others. Phillips's two statements are:—

"Cardinal area obsolete; beak incurved over a minute perforation, which is often obtect or merely serves to receive the beak of the smaller valve—*Cleiothyris*.

"Under the head of *Terebratula* I shall include many of the *Atrypæ* of Dalman and Sowerby, giving this term and *Cleiothyris* as synonyms of a part of that great group. *Strigocephalus*, *Orthis*, and *Spirifera* will be separated. In this latter genus I include the analogues of *Spirifera lineata*, and which seem to conduct naturally to the smooth terebratuliform species now ranked as *Atrypa* by Mr. Sowerby" (p. 55).

"The effect of introducing the classification of Brachiopoda presented on pp. 54, 55, would be a modification of *Spirifera* and *Terebratula* by transferring a part of the species here included in these groups to *Cleiothyris* and *Hypothyris*. Until, however, the foramen of the larger valve is more carefully examined, in the plaited species analogous to *Terebratula pleurodon*, *T. pugnus*, &c., in the smooth species allied to *Terebratula concentrica* (von Buch) and *Spirifera imbricata* (Sowerby), and in those which rank with *Tereb. prisca*, it seems not desirable to disturb too much the existing methods of classification" (p. 92).

The first of these two statements signifies that *Cleiothyris* is not to replace *Atrypa*, but is to be used by the side of it, for "the smooth terebratuliform species now ranked as *Atrypa* by Mr. Sowerby." In the next statement there are three divisions made:—(1) "plaited species"; (2) "smooth species"; (3) "[species] which rank with *Tereb. prisca*." Obviously, then, *Cleiothyris* is the term for division 2, and in this are mentioned *Terebratula concentrica* (von Buch) and *Spirifera imbricata* (Sowerby). It may be argued that by saying *Spirifera imbricata* Phillips expressed his opinion as to its probable position, and so he left *Terebratula concentrica* to be the type of his genus.

There is further evidence for this in the footnote, p. 55. Phillips says "*Cleiothyris* . . . . with the terms *Epithyris* and *Hypothyris* might console us for the loss of *Terebratula*, which in von Buch's view includes the three groups." Evidently, then, *Cleiothyris* included a species called by von Buch a *Terebratula*.

The conclusion arrived at is that *Cleiothyris* cannot be used on King's authority at all, and if it be used on Phillips's foundation it takes priority of *Athyris*. M'Coy, indeed, admits as much when he says of *Athyris* (p. 146) :—"Prof. Phillips is the only author who has recognized the group; he forms of it his last division of the genus *Spirifera*." Phillips's last division of the "Delthyridæ or Spirifers"—M'Coy uses this phrase—is *Cleiothyris* (Pal. Foss. p. 55).

As *Hypothyris* cannot be used for the *Atrypa* (*Rhynchonella*) *cuboides* series—first because it does not belong there, and second because it has been preoccupied,—it becomes necessary to name afresh. It is desirable to make as little change as possible, so there may be suggested

Genus Hypothyridina, nom. nov.

Genotype *Atrypa cuboides*, Sowerby, = *Hypothyris*, King, Hall & Clarke, Schuchert et al. (non Phillips).

As *Cleiothyris* is not available on King's authority, and as it seems to be generally agreed that the *A. Roysii* series requires a separate name from *A. concentrica*, then a new term must be used:

Genus Cleiothyridina, nom. nov.

Genotype *Athyris Roysii*, Davidson, Mon. Carb. Brach. pl. xviii. fig. 8. Syn. *Cleiothyris*, King et auctt. (non Phillips).

Composita, Seminula.

The first of these generic designations has been entirely overlooked, yet it must be confessed that its author, Capt. Thomas Brown, has done his work much more accurately than his professorial contemporaries; he, at any rate, has definitely fixed and described his type thus:—"Genus *Composita*, Brown. Shell somewhat pentangular; hinge-line very short; beak of the larger valve produced, with a small circular perforation; inside furnished with spiral appendages.

"This genus is founded upon the *Spirifer ambiguus* of Sowerby and is intermediate between that genus and *Terebratula*. The perforated beak removes it from *Spirifer*, and the internal spiral appendages never exist in the genus *Terebratula*, but are peculiar to the genus *Spirifer*. 1. *Composita ambigua*, *Spirifer ambiguus*, Sowerby" *.

The date is given by Mr. C. Davies Sherborn in a pamphlet, "Conch. Writings of Capt. Thomas Brown," Proc.

* Brown Illust. Foss. Conch. Gt. Britain and Ireland, p. 131 (1845).

Malacol. Soc. vi. p. 358 (1905), and he it was who directed my attention to this work of Brown's.

Davidson remarks (Carb. Brach., Pal. Soc. 1857, p. 78 n.) "that *Spirifer ambiguus* has received no less than six different generic appellations." He overlooked Brown's term, which makes seven; and it had not then been given the name (the eighth) it now passes by—*Seminula*—for M'Coy did not mention it as one of his types.

It is, then, necessary to consider what is the type of M'Coy's genus *Seminula*. Dall merely cites the three species mentioned by M'Coy. Hall and Clarke say "Type *Seminula ambigua*, Sowerby, sp.," which M'Coy did not mention. Schuchert says "Genotype *Terebratula pentædra*, Phillips, = *Athyris ambigua* (Phillips)," which may be a lapse for (Sowerby). Now M'Coy has definitely indicated his own genotype by giving a figure (p. 150, fig. 31), and this figure is certainly *T. pentaëdra*, Phillips. But Davidson, who was more ready to combine than to separate, only united *T. pentaëdra* to *T. ambigua* with a query. One may reasonably feel much doubt about the association when it is remembered that Phillips kept the two species distinct and that M'Coy classed with *T. pentaëdra* as belonging to his *Seminula* two species which are recognized now as *Camarophoria*. Further, M'Coy says in regard to *Seminula* (p. 150) "perforation minute." This is not a description that could be applied to *T. ambigua*.

A glance at Phillips's original figure shows that *T. pentaëdra* is rightly described by M'Coy, and that it is quite different from *T. ambigua*. *T. pentaëdra* has a rhynchonelliform beak—it is evidently hypothyrid; but *T. ambigua* has a terebratuliform beak—it is epithyrid. Phillips's descriptions fully bear this out. Of *T. pentaëdra* he says "Perforation of the beak minute"; he applies the same description to *T. rhomboidea* and to *T. seminula*, but of *T. ambigua* he says "beak with a large round aperture"—in comparison with *T. pentaëdra* it is "large."

Therefore the type of *Seminula* is really a hypothyrid rhynchonelloid, congeneric with *T. seminula* and *T. rhomboidea*, which at present are called *Camarophoria*, and it has nothing to do with *T. ambigua*.

Therefore it must be said:—

Genus SEMINULA, M'Coy, 1844.

Genotype, species figured by M'Coy, fig. 31, p. 150, = *T. pentaëdra*, Phillips.

Non *Seminula*, Hall & Clarke, Schuchert et al.

Syn. *Camarophoria* (pars), Davidson et auctt.

Shells rhynchonelliform, hypothyrid, with the surface sinuate or feebly semiplicate.

The genus is nearest to *Camarophoria*; it is not one of the Athyridæ, but belongs to the family Pentameridæ. The later-named *Camarophoria* may probably be distinguished from it, as containing shells more transverse, more fully and more numerously plicate.

The species placed in it by M'Coy are rightly classed. Their distinction as three species of *Seminula* seems to be justifiable; but three names will be *S. pentaëdra* (Phill.), *S. seminula* (Phill.), *S. rhomboidea* (Phill.). The last is probably quite distinct enough from the Permian *T. globulina*, which is also a *Seminula*.

What has hitherto been called *Seminula* must be altered, thus:—

Genus Composita, Brown, 1845.

Type *Spirifer ambiguus*, Sowerby.
Syn. *Seminula*, Hall & Clarke, Schuchert et al.; non *Seminula*, M'Coy.

Leptodus, Lyttonia.

In systematic works the generic name *Leptodus*, Kayser, is placed as a synonym of *Lyttonia*, Waagen; but this is not justifiable. Waagen had no right to give a new name because Kayser happened to place his genus among the fishes. So we must record thus:—

Genus Leptodus, Kayser, 1883.

Genoholotype *L. Richthofeni*, Kayser.
Syn. *Lyttonia*, Waagen.

Genus Cyclothyris, M'Coy, 1844.

Type, the species figured by M'Coy, Carb. Foss. p. 150, fig. 29,= *Terebr. latissima*, Sowerby.

Dall says that M'Coy's figure is indeterminable; but this is not justified. It is obviously a multiplicate *Rhynchonella*, and Davidson is quite correct in mentioning *Rh. latissima* as type. Thus it will be more correct at present to turn over to *Cyclothyris* the bulk of the present Mesozoic *Rhynchonellæ*—all those which are multiplicate and hypothyrid; leaving in true *Rhynchonella* only the species which are pauciplicate and hypothyrid, congruous with *R. loxia*—such series as the *R. acuta* group.

However, further division of the Mesozoic Rhynchonellids is imperative, if only for the sake of classificatory convenience; for the present genus is quite unwieldy, and therefore very troublesome for any systematic arrangement.

Summary.

[New names in heavy type.]

Cleiothyridina,	= *Cleiothyris,* auctt.
Cleiothyris, 1841,	= *T. concentrica* series.
Composita, 1845,	= *Seminula,* auctt.
Cyclothyris, 1844,	= *T. latissima* series.
Epithyris, 1841,	= *T. maxillata* series.
Epithyris **bathonica,**	= *T. maxillata* (pars).
Hypothyridina,	= *Hypothyris,* auctt.
Hypothyris, 1841, preoccupied.	
Leptodus, 1883, precedes *Lyttonia.*	
Lyttonia, 1883, syn. of *Leptodus.*	
Seminula, 1844,	= *Camarophoria* (pars).

XLV.—*The Flying-fish Problem.*

By Lieut.-Colonel C. D. Durnford.

In a paper published in these 'Annals' for January 1906 the impossibility, from a mechanical point of view, of a flying-fish accomplishing sailing flight was shown. The argument was based upon the fact that as a flying animal the flying-fish is equipped with wings of a fractional sailing value compared with those of a sailing bird. Also that if the wings were many times larger, so as to bring the fish on an equality with the bird in this respect, it could only sail with the bird's limitations as regards direction of the wind, and with the bird's frequent assistance from rowing flight. Also that if the figures (which can be easily verified or, if wrong, refuted) are correctly given in the article, the accepted aeroplane flight is miraculous, unless a new law of Nature be discovered.

It is, then, perhaps advisable, if the present curious condition of the question is to be understood, to examine how it has come about.

The flying-fish problem is a very odd one in many ways, of which the most striking is the unexplained power therein of the negative to quench the positive. Throughout we find the aeroplanist's "I cannot see the wing-movement" smothering a fairly equal bulk of "I can, and have, and do see it."

Let us create a parallel instance, for a real parallel does

not perhaps exist:—Many people can see bullets in their flight. Many others with equally good, or even better, sight cannot pick up the flying bullets. Now if those who fail to see them said, and if all books and papers on shooting supported them in so saying, "I cannot see the bullets, therefore you, and all those who do see them, do not see them," we should have a parallel to the current odd mode of conducting the flying-fish problem.

It is in consequence of this supremacy of the negative that the flying-fish problem has earned for itself the name of "eternal," for as soon as one new witness can see the flight, either another new one fails to do so, or a reference is made to some observer who has formerly so failed; and this is equally satisfactory, for, in the problem, even an old "I did not" is better than a new "I do."

It might naturally be supposed that there must be an overwhelming backing of probability, both mechanical and natural, to the negative evidence in order to justify such dogged denial to the affirmative of its common value. So far, however, from this being the case, it is a second odd fact that but one seemingly practical effort at proof has been made, and with this one exception aeroplane flight rests wholly upon the flat negative.

Let us examine this solitary attempt at proof.

I requote from an article, which may be taken as typical of the system, in the 'Annual Report of the Smithsonian Institution,' 1904, p. 498, by Dr. Theodore Gill, an emphatic aeroplanist:—"Möbius (1878, 1885) contended that 'Flying-fish *are incapable of flying* [the italics are his], for the simple reason that the muscles of the pectoral fins are not large enough to bear the weight of their body aloft in the air.'" If undisputed that is, without doubt, a most powerful argument—decisive, in fact. But mark! almost immediately Prof. Whitman, a high authority, denies its accuracy. In the same article we find that this statement is "vigorously objected to by C. O. Whitman (1880), who urged, 'Admitting that in form, size, length, and structure the pectoral fins of *Exocœtus* are less well adapted to flight than the wings of most birds, there is still ample room to believe, on anatomical and physiological grounds alone, that they are capable of executing true flight.'" This is a plain statement moderately worded by a distinguished physiologist and naturalist, and it is interesting to note that it is answered, as though by convincing argument, by the old irritating *impasse*—the reference to views of distinguished naturalists as to whether

flying-fish fly or do not fly, and entirely ignoring the new muscle aspect opened by Whitman.

Among the distinguished naturalists thus referred to in support of Möbius's theory, Prof. Moseley, as being of the 'Challenger' Expedition, and Mr. Boulenger are prominently mentioned. But Moseley, who cannot see the *Exocœtus* flapping, can see the Dactylopterids doing so (p. 312) : the possibility of which act is denied by Möbius from personal observation as strongly as in the case of *Exocœtus*! Whilst Boulenger merely quoted the verdict of others, he himself retained, then as now, as he informs me, an open mind upon the question.

It is surprising how largely this "general verdict" is influenced by the researches of Möbius, the very Professor whose solitary so-called proof is questioned by Whitman; so we will examine more closely what he says about the muscles. The quotation is continued from "'aloft in the air,'" above.

"'The pectoral muscles of birds depressing their wings weigh, on an average, one sixth of the total weight of the body, the pectoral muscles of bats one thirteenth, the muscles of the pectoral fins of flying-fish only one thirty-second.'"

If this proves anything—which to the purpose it does not—it may prove that, as flying-fish have somewhat less than half the comparative muscle of bats, and (according to aeroplanists) cannot, for this reason, fly, therefore bats, which have somewhat less than half the comparative muscle of birds, cannot fly.

Or, the other way about :—Birds can fly. Bats, having rather less than half the comparative muscle of birds, can fly; therefore flying-fish, having rather less than half the comparative muscle of bats, may fly.

Those are reasonable deductions, but "therefore flying-fish cannot fly" is an unreasonable one.

It is quite clearly a question of degree, and the true deduction is that bats, if they can fly, cannot be expected to fly like birds, and flying-fish, if they can fly, cannot be expected to fly like either bats or birds; and, I may add, no one thinks or claims that they do so fly.

But an even greater claim is made by aeroplanists. It is recognized that there are two kinds of bird-flight, "sailing" and "rowing," the sailing being greatly the superior form. Sailers can always row, but rowers cannot properly sail on account of their low wing to weight ratio*. Now flying-fish

* Hartings' formula $\frac{\sqrt{\text{wing-surface in sq. cm.}}}{\sqrt[3]{\text{weight in grammes.}}}$, which governs this

have a ratio of the lowest class in comparison with birds (see 'Annals,' Jan. 1906, p. 162); yet they are credited by aeroplanists with sailing of a higher form than that of the best-equipped sailing-birds—sailing, without even occasional rowing assistance, at a slow speed, regardless of the direction of the wind! Such a feat—one utterly impossible for an albatross *, an eagle, a vulture, kings of flight—is given to this last poor dabbler in the art upon persistently contradicted negative evidence, two impossible parallels, and the one discredited proof.

I have endeavoured in the foregoing to show how observers have been weighted and clogged by the unique system of handling an admittedly difficult question—how a very able man, Prof. Möbius, years ago undertook a research which required a very special knack of eyesight in the observer. Probably the majority of men are without this knack, and do not know it. Firmly believing what I have endeavoured to show must have been the false view presented to his retina, to be a true view, he wrote, with the cleverness that belonged to him and the dogmatism of the believer, the text of the faith which has guided and misguided scientists for over a quarter of a century. His reputation was, and is, deservedly great—so great that his word was practically law, and it came about that if other scientists possessed the knack of sight and differed from him so much the worse for them; they must be either ignored, or explained away, any or no explanation being sufficient for such a proper purpose. This is not a hard judgment. Anyone, who is free from the superstition, on reading an ordinary aeroplane article will recognise its justice.

Take a quite typical example of the common aeroplane blindfold acceptance from writer to writer of palpable impossibilities as guiding facts. In the article that we have been quoting from we may note the following (p. 500): "The best estimate has been that an ordinary flight may

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ratio in birds, is impugned by R. von Lendenfeld in the volume that we have been quoting from (Ann. Rep. Smith. Inst. 1904, p. 129). The figures of his example in proof will not, however, bear examination. Correctly calculated they strongly support Hartings $\left(\frac{\sqrt[2]{336}}{\sqrt[3]{320}}=2{\cdot}68\right.$, and *not* 4·03 as given by Von Lendenfeld as the ratio of the partridge$\left.\right)$.

* Some notes by Prof. Moseley ("Notes by a Naturalist on the 'Challenger,'" p. 571, 1874) upon the small amount of true soaring performed even by the albatross are instructive. Our eyesight misleads us again in this matter.

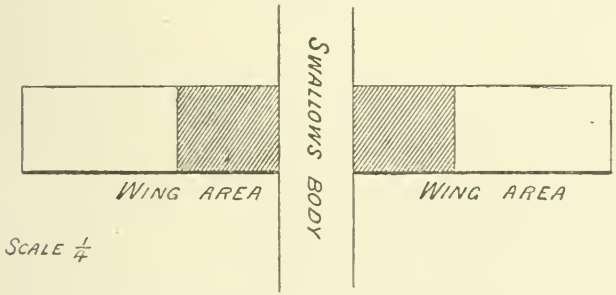
extend from 30 to 50 yards in less than twenty seconds." In order to get working figures we may call "30 to 50 yards" 40 yards, and "less than twenty seconds" 15 seconds. This gives a rate of $5\frac{1}{2}$ miles an hour!

Note this, you who watch the fish fleeing before a 14-knot steamer.

Such statements are the habit of the problem. Just in the same way is it its recognized habit to quote, unquestioned, as "sailing" parallels to the heavy small-winged fish, the $\frac{3}{4}$-oz. large-winged swallow, and the parachute whose work is falling only; or, again, to faithfully reproduce over and over again pictures of impossible air-currents performing feats also impossible; or to continue to ascribe the frantic efforts at flight of a fish fallen on deck to natural spasms, although it is not credited with active use of its wings either in air or sea; and so on. It is the way of the problem, and no one is to blame.

Perhaps the odd unsuitability of the swallow comparison may be brought more fully home by a sketch.

The ratio (Hartings' formula) of a swallow (house-martin) is 4·2, and its wing-area 120 sq. cm. The flying-fish ratio is 2·6. If we reduce the swallow to a 2·6 ratio, its wing-area becomes about 47 sq. cm.



This reduction to flying-fish ratio is shown by the shaded parts of the sketch.

Could anyone contend that a swallow could sail even in its present poor and much-assisted way (for it is far from being a first-class sailer) if the unshaded parts of the wing-areas were removed?

Opinion is, however, undoubtedly changing. Many of the old shibboleths are fast becoming discredited. The great distances that the fish, under favouring conditions, fly clear

of the water*—the fact that they fly in calms as in winds—that they come on board ships from lee and weather sides indifferently—that they can and do turn in air†—that they often lose and often gain speed, both from simple causes, on meeting a wave or on tail-dipping—that they can and do at times gain speed whilst still in air—that they make for lights deliberately—that they rise and fall of set purpose while in the air: all these and much more that has been under the ban are being witnessed and certified to so incessantly that soon only the high-priests of aeroplane will be left contradicting them.

F. G. Aflalo ('Natural Hist. of Australia': Macmillan & Co., 1896) writes: "I have watched these beautiful creatures by the hour and in all weathers, ... but after having closely watched thousands of them through strong glasses, I cannot give as emphatic an opinion as I should like on the oft-discussed question of whether the wings vibrate like those of birds. . . . . If the pectoral fins are so constituted as to be capable of vibration, then I would say as the result of my own observations that to some slight extent they do flap, not like those of birds, perhaps, certainly not like those of the bat."

I have quoted the above as it expresses markedly two common difficulties: (1) the real difficulty in discerning the movements; (2) the pre-acquired idea that the wings are

* It is difficult to judge distance at sea. The tendency is to underestimate it. Many observers testify to having seen flights of more than a quarter of a mile. Frank Bullen, in his article upon flying-fish in 'Creatures of the Sea,' insists that he has seen flights of over a mile. He has had exceptional opportunities for observing them, and I see no reason for thinking that he is mistaken.

† With reference to their turning powers. I mentioned in the former paper a fish which I had seen to turn back in air. I then restricted myself to the bare facts required for the argument. It had interested me, however, much at the time, not only because it was, to me, a rare occurrence, but also because the controlling cause of the fish's remaining and turning in air was quite evident. The sea was rather calm and the ship was throwing out, with each gentle roll and dip, those broad hissing tables of white foam which spread away for many feet from her sides, and die in a mass of struggling bubbles, to reappear as the white broad rushing table of the next dip. The fish had risen independently of the ship, and was flying towards us at full speed, when a sudden slow down marked its perception of the advancing monster. There was no time, however, for it to decide whether water or air was the less perilous before it was over an unusually broad table of boiling foam. The hidden and fearful possibilities of this evidently decided it, and then ensued its slow but successful struggle to turn and get clear of the concealed horrors. This it did with what must have been a terrific effort, but it got quite round and well away out into the blue water before it dived.

not fitted for flapping, an idea which naturally greatly increases difficulty (1). Had Mr. Aflalo been certain of the two facts that the wings were fitted for flapping and that "sailing" was for the fish ordinarily impossible, it cannot be doubted that his views would have been stronger and expressed very differently.

Among quite recent papers upon this question, two should be especially noted. Lionel E. Adams, B.A., writes in the 'Zoologist' (April 4th, 1906) an article interesting throughout. I quote from p. 146: ". . . . I was often able to see them against the sky. . . . . I could see quite distinctly that their tails were vibrating very rapidly from side to side during the whole flight, and that the wings would vibrate with an intensely rapid shivering motion for a second, then remain outspread motionless for one or two seconds, and then vibrate again. This vibration of the wings is not up and down as in the case when birds fly, but in an almost horizontal direction."

That is a quite possible explanation of the mode of flight, provided that a sufficient speed be acquired in the intermediate flappings, but this the known speed of the fish shows to be not commonly the case.

Again, on p. 148: "I am perfectly well aware that a casual glance at flying-fish from the lofty deck of a liner gives the impression that they soar like birds with motionless wings, but watch them at close quarters from the deck of a low-waisted tramp and the vibratory motion of the tail and fins will be quite plain."

Interesting as is Mr. Adams's paper, I cannot but think that he is partly mistaken in his views, and that the wing-vibration which he discerned was really less rapid than the movement in the period following which he believed to be one of stillness, just as the liner-passengers mistook his vibrations for stillness. I do not say that the fish could never arrive at a speed by which a very short aeroplane flight could be attained even with their low ratio; but I do say that such is not their common speed, and that in any case their disregard of wind-direction disproves such flight.

Therefore another way must be looked for, and we are driven back, perforce, to continuous wing-action, the manner of which may be here examined as carefully as our information allows.

Premising that the flight varies greatly on different days and under different conditions, the following is probably a fair description of their methods in an ordinary flight:—

1. The tail-impelled, visibly (to many) wing-assisted jump

from the water to a height where the wings can work freely.

2. The flight continued by an intensely rapid and laboured wing-movement—one easily mistaken for stillness, and usually seen, if at all, as blurr.

3. Short periods of slowing down of wing-speed, during which the wing-movement becomes again visible. (These are the "vibration" periods, representing to aeroplanists loose wing-trailing, or dragging like a flapping flag—an impossibility; and, to Mr. Adams, periods of wing-assistance—with limitations a possibility.) These periods often precede a special spurt such as is required to lift the fish over an oncoming wave.

4. Either sudden cessation of wing-movement and consequent immediate drop into the sea or a short slow down into visibility (No. 3) previous to such drop.

It is to be noted that this vibration so often seen before the fish enters the water is one of the many pointers to continuous wing-movement, for such a time is a proper one for slowing down, but an absurd one for renewal of wing-effort.

To return to Mr. Adams's paper. He notes, as have others, the vibration of the wings as being in "an almost horizontal direction." This horizontal movement, if it exists, as is probable, may afford, as I hope to show, a looked for key to the fish's action.

According to Pettigrew, it is a necessity of flight, where wing-beats are in a more or less vertical direction, that the up-beat should meet with little and the down-beat with much resistance from the air. This is arranged for in the case of bats, birds, and certain insects by means of special muscles and ligaments which automatically flex the wing for or during the up-stroke and extend it for or during the down. (Pettigrew, 'Animal Locomotion,' Int. Science Series, vol. vii. pp. 122, 182, 194, &c.: 1891.)

Marey ('Animal Mechanism,' p. 263 &c.: Int. Science Series, 1893) equally recognizes the necessity for a diminished wing-area in the up-stroke, but believes it to be obtained in birds through the natural elasticity of the feathers, which enables them to return to their ordinary position when the resistance of the air in the down-stroke ceases to raise them.

The flying-fish's wing, as is known, is formed on quite a different principle from that of a bird or bat. It opens and closes somewhat like a fan. A partial automatic closing of this fan at the foot of the downward stroke in flight and opening at the top of the rising stroke would both give the

appearance of horizontal vibration when seen either from above or below, and would turn a somewhat difficult question of the mechanics of the flight into a very simple one. Indeed we have here flying action on the same general principle as that shown by Pettigrew and Marey to be necessarily provided for in the case of bats and birds, but the working details of which are different and simpler, as becomes a simpler form of wing.

Perhaps that is the explanation. There must, of course, be some explanation, and that is not only the natural deduction from the peculiar formation of the wing, but it also fits everything in.

The known (but indistinct) visibility of the larger rays of the wings at times during flight points, perhaps, to a comparative pause with wings full open before beginning the down-stroke. Such pause would give the open position, and with it the wing-tracery prominence.

The form of these fishes' wings points to this fan-action rather than to other known horizontal wing-actions of the nature of that of certain insects—the common fly, for instance (Marey, *loc. cit.* pp. 204, 206).

The second quite recent and very important observer and writer on this subject is convinced of the flight-action. He writes also from personal observation, and is as free from proper mechanical bias as from the improper follow-my-leader habit. One of his remarks, "It is by no means impossible that flying-fish may soar, as *even* [my italics] birds do this," shows his mechanical freedom. In a paper dated Oct. 28th, 1905, Brig 'Galilee,' North Pacific Ocean, Dr. J. Hobart Egbert, Carnegie Expedition, writes ('Forest and Stream,' Jan. 27th, 1906): "Though still denied by some observers, the power of propulsion through the air by means of its fin-wings is generally accorded the flying-fish *. During months at sea in the tropics the writer has almost daily watched the flying-fishes and studied their flight through the air. . . . . The difficulties of assuring oneself that the flying-fish moves its wings during its flight through the air are well understood, and also the fact that these difficulties are generally removed when opportunity is afforded of observing the flight of certain of the larger species under favourable conditions. That flying-fishes use their wings after the manner of birds, at least upon emerging from the water, can hardly be denied, since from the fo'c's'le head of a ship plying the waters of the lower latitudes this wide bird-

* A little premature, if Natural Histories and Encyclopædias are any indication of general accord.—C. D. D.

like motion of the fin-wings may be easily observed as the large flying-fishes break water almost under the vessel's bow. This flapping motion of the fin-wings is not, however, long maintained, but as soon as the fish is well started in the air apparently passes into a vibratory motion of the appendages so rapid as to be almost beyond human visual perception."

Quite so. That is the to-be-expected flight of an exceptionally low-ratio flyer having special added natural disabilities. Before long it will be the accepted one for flying-fish.

More about the Pectoral Muscles.

Since writing the foregoing I have received a communication from Prof. C. Stewart, F.R.S., Conservator of the Museum of the Royal College of Surgeons, who kindly gives me permission to use the results of a dissection made at the Museum for the purpose of comparing the pectoral muscles of the flying-fish with those of a nearly related non-flying fish.

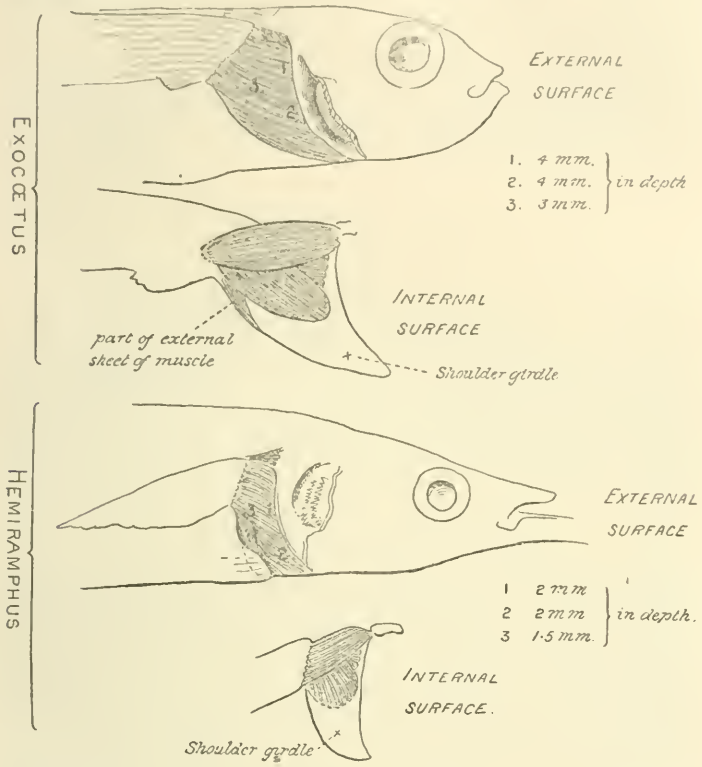
I quote from the letter of Mr. Burne, who made the dissection :—

"Royal College of Surgeons of England,
Lincoln's Inn Fields,
London, W.C., 18th June, 1906.

"Dear Sir,—. . . . . I have made a dissection of the pectoral muscles of a flying-fish (*Exocœtus* sp.) and of a nearly related fish of much the same build, but without the enlarged pectoral fins (*Hemiramphus*). Both were specimens from our store-room, and although in pretty good condition had evidently been in spirit for a considerable time. I enclose you tracings of the drawings I made. The two of the external view were drawn with a camera, and the *Hemiramphus*, which was rather less in girth than the *Exocœtus*, was so much enlarged as to have the same girth about an inch behind the pectorals. I thought that body-girth sufficiently far behind the fins not to be influenced by their degree of development was the best standard of size to take—better than length, for instance. As a matter of fact, the fish were very much the same length, the *Exocœtus* being rather the longer.

"The drawings, I think, explain themselves. The flying-fish muscles were, as you see, considerably larger, both in area and in thickness, than in *Hemiramphus*, and the same was the case with the muscles on the deep surface of the fin. In their arrangement they were much the same in both fish and the

same as in other bony fishes (the cod, for instance). The numbers on the surface of the fins are the points where I took the thickness of the muscle by plunging a needle into it and



measuring the depth to which the needle entered. You will notice the great length of the muscles in *Exocœtus*: a long muscle means a proportionate length of contraction.

"..... there is a very marked difference in the size of the muscles of these two fishes. . . . .

"Believe me, yours faithfully,

R. H. Burne

(*Assistant in Museum*)."

The above tracing seems to give, roughly, about $4\frac{4}{5}$ times greater bulk of muscle to the *Exocœtus* than to the *Hemiramphus*. With this light it will not be out of place to requote and amplify the one "proof," distinguishing the addition by italics:—"The pectoral muscles of birds

depressing their wings weigh on an average one sixth the total weight of their body, the pectoral muscles of bats one thirteenth, the muscles of the pectoral fins of flying-fish . . . . one thirty-second," *and the muscles of a nearly related non-flying fish only one hundred and fifty-fourth.*

As before, it does not prove that bats or flying-fish flap or do not flap their wings, but it gives a different and, I hope, a proper aspect to the figures which have done duty—of a kind—for so many years.

XLVI.—*On a new Race of* Sciurus lokriodes *from Burma.*

By J. Lewis Bonhote, M.A.

A small collection of mammals, recently brought home from Rangoon by Capt. A. Mears, contains four specimens of a squirrel closely allied to *S. lokriodes*, Hodgs., but so distinct as to be entitled to subspecific rank. I propose for it the name

Sciurus lokriodes Mearsi, subsp. n.

Similar in size and general characters to *S. lokriodes*, Hodgs., but much paler and greyer than examples from the typical locality. General colour above greyish green, rather darker on the back and paler on the flanks, and especially over the thighs. Tail ringed with black and grey and with no black tip. Ears covered with short fulvous hairs. Underparts dull white, purest on the chin, duller on the body; on the inner side of either thigh is a patch of pale orange, and similar patches, though of a paler tint, are situated on the inner sides of the arms and at the root of the tail, while in some specimens the yellowish tinge tends to cover the whole of the underparts between the limbs.

The *skull* shows no marked differences from that of *S. lokriodes* except in being slightly smaller, but in its general characters it closely resembles that of the typical race.

Dimensions (of type in flesh) :—

Head and body 185 mm.; tail 172; hind foot 40; ear 19.

Skull: greatest length 46·5; length of palate from henselion 20; zygomatic breadth 27·5; greatest breadth of brain-case 20; length of nasals 15; length of molar series (alveoli) 10.

Hab. L. Chindwin, Burma.

Type. B.M. G. 7. 5. 10 (♂ ad.). Collected by Capt. Mears at Chinhyit, L. Chindwin, on 16th January, 1906.

The very much greyer general coloration of this race will enable it to be easily recognized.

XLVII.—*Descriptions of African Lepidoptera.*

By George T. Bethune-Baker, F.L.S., F.Z.S.

Family **Lycænidæ**.

Pentila Catori, sp. n.

♂. Head, antennæ, and prothorax black; metathorax brownish; abdomen ochreous. Both wings straw-colour: primaries with the costa dark brown nearly to the costal vein, confluent with the very broad blackish apex and termen; a small black spot above the cell in front of vein 11, with one below it in the cell; these spots are inclined to be fugitive; a black spot at the end of the cell: secondaries with a small blackish spot above the cell near its middle; a black spot at the end of the cell; termen broadly brown from vein 6 to vein 3. Underside with the spots and markings showing through, and, in addition, the secondaries have a spot below the angle of vein 3 and a subterminal curved series of seven black spots which show through slightly on the upper surface.

♀. Like the male, but whiter. In the secondaries the subterminal series of spots are as prominent on the upperside as on the underside. Under surface as in the male, but with a postmedial series of five or six spots which show slightly through the dark area of the upper surface.

Expanse, ♂ 44, ♀ 48 mm.

Hab. Kabba Province, N. Nigeria; September.

Type in Cator's collection.

Liptena libyssa orientalis, subsp. n.

♂. Similar to *L. libyssa* on the upperside. Underside with the secondaries blackish spotted with cream-colour, instead of cream spotted with black; a large irregular creamy basal blotch, followed by another large spot in the radial area, above which is a round costal spot, and below it two spots (one at its inner and the other at its outer angle) extending nearly to the inner margin; an obscure series of postmedial dots; a largish terminal spot below the apex, below which are

three smaller terminal spots, the first being nearly linear and the third smaller than the second.

Expanse 32 mm.

Hab. Uganda; March.

Type in my collection.

This is probably the Eastern form of *L. libyssa*, Hew.; all my specimens from Uganda are similar, so that it probably forms a distinct local race.

Liptena subpunctata, sp. n.

♂. Upperside: both wings spotless white; primary broadly blackish from three quarters the costa to just below vein 3 on the termen; base of wing very slightly ochreous, with the costa dark grey to one third: secondaries with the termen having a band of fine, sparingly scattered, brownish irrorations. Underside: primaries white, with a dark line closing the cell; costa slightly dusted with fine brown irrorations; apical area creamy white, with a short, curved, internal, serrate line of pale brown to below vein 5; a short, subterminal, fine brown line to vein 4; termen cream-colour, with a distinct fine brown internal edge to vein 5; fringes dark brown to vein 3, white below: secondaries pale straw-colour, with numerous pale brown markings; a very fine and scattered basal dusting; a more plenteous dusting on the inner margin; a spot near the centre of the cell, preceded by a small fugitive dot; above and below the cell-spot is a smaller dot; cell closed by a fine line; an obscure trace of a median interrupted line; a postmedian curved line of serrations interrupted at the veins, followed by a fine scalloped line; termen creamy, with a fine dusting more or less on each side; fringes creamy white.

♀. Just like the male.

Expanse 39 mm.

Hab. Kabba Province, N. Nigeria; September.

Type in Cator's collection.

Hypolycæna aureolineata, sp. n.

♂. Antennæ brown, with white segmental divisions. Both wings brown, with a purplish-mauve lustre, in a side light the colour is much brighter; termen finely black: secondaries with three black anal spots, the lobe-spot and the second edged slightly internally with whitish, the third with an internal orange spot adjoining it. Under surface: both wings warm stone-grey, with rich golden-orange spots and fasciæ edged finely with black and white. Primaries with

the cell closed with an orange spot whose black edging is barely traceable; postmedial fascia broad, erect, increasing in width slightly from the costa to vein 2, then rapidly decreasing and becoming dusky; subterminal line much finer, the radial area between these lines whitish; termen finely orange: secondaries with a subbasal spot and one closing the cell; postmedial fascia broad, angled above vein 1*b* and ascending to beyond the middle of the inner margin; subterminal line narrow, following the whole course of the postmedial, but broken at the angle; area between these two lines whitish; a dark band of shading between the latter (subterminal line) and the termen; termen orange. Lobe-spot black, with metallic scales and a golden-orange internal spot; an orange spot with a black external dot on the termen between veins 2 and 3; both tails fine.

Expanse 28–32 mm.

Hab. Toro.

Type in my collection.

Family **Hesperiidæ.**

Sarangesa tsava, sp. n.

♂. Head, thorax, and abdomen brown; antennæ white, with a very fine interrupted line above and below, tipped with brown below. Both wings dark brown; primaries with a tawny-brown spot at the end of the cell; median area blackish and a blackish patch beyond the tawny spot, with four small hyaline spots at its costal extremity just below the costa, two small hyaline spots below the costa at the end of the cell, the lower one touching the tawny spot; in the angle of vein 3 another hyaline spot, below which is a second larger one, terminal area slightly ochreous: secondaries with a trace of a postmedian dark line, beyond which the terminal area is broadly slightly ochreous. Underside: primaries paler than above, with the tawny spot of the upperside ochreous yellow: secondaries ochreous yellow, with the base and costa greyish and a dark greyish apical patch; an obscure interrupted median line and an indefinite dark greyish postmedian line; termen with a dark line; fringes pale, with a dark central line.

Expanse 34 mm.

Hab. Tsavo River.

Type in my collection.

Sarangesa subalbicans, sp. n.

Primaries pale brownish; a small hyaline dot in the cell in front of vein 3 and one above it outside the cell; a small similar costal spot well in front of the apex; a hyaline spot near the angle of vein 3, with a large quadrangular one below it and two small spots below it; a dark indefinite subterminal band angled below the spot in front of the apex: secondaries rather darker, with a trace of a dark median band and a curved postmedian spotted band. Underside: secondaries white, with costa brownish; a small brown dash above the cell, followed by a large brown spot, with a curved spotted line from this spot to vein 1 *b*; a small spot closing the cell; two large confluent, brown, apical spots, with a trace of a subterminal brown spotted line below.

Expanse 40 mm.

Hab. Kisumu district.

Type in my collection.

This species is close to *S. thecla*, Plötz, but the hyaline spots of the primaries and the position of the markings on the under surface of the secondaries are decidedly different.

Pardaleodes kamagamba, sp. n.

Primaries blackish, with a very broad orange band across the outer half of the cell, expanding suddenly along vein 3 to vein 1; two small yellowish subapical costal dots and two subterminal small yellowish dots at vein 5: secondaries uniform blackish brown.

Expanse 38 mm.

Hab. Kamagambo.

Type in my collection.

Pardaleodes torensis, sp. n.

♂. Head, thorax, and abdomen dark brown, the latter with yellow segmental divisions except on the dorsum. Both wings darkish brown, with considerable areas of orange-yellow: primaries with the base brown, the median area to vein 1 orange, invaded with brown at the end of the cell, and rather further invaded on the costa; the end of the cell has two subovate spots of yellowish hyaline; the spaces between veins 2 and 3 and 3 and 4 occupied by yellowish hyaline for half their length, so that the latter extends further out than the former, and above it is a small orange spot; a larger orange spot is nearer the costa and nearer the cell: secondaries with area from vein 2 to 6 clear orange; the brown

ground-colour of vein 2 is also invaded with orange about a quarter near the centre to vein 1; termen narrowly brown.

Expanse 39 mm.

Hab. Toro, E. Africa.

Type in my collection.

This may possibly be the Eastern form of *P. Reichenowi*, Plötz.

Ceratrichia brunnea, sp. n.

Both wings uniform dark umber-brown without any markings. Underside: secondaries white, tinged with olive at the outer edge; costa brown to vein 8; a very large brown patch occupies the whole of the termen, with a curved inner margin, thus giving the white area a crescentic form at the apex; the brown area is broken outwards along vein 4, terminating at vein 2; in the white area is a dark spot in the middle of vein 8, with two dots obliquely placed before it and two small spots below vein 2.

Expanse 34 mm.

Hab. Nandi Country.

Type in Jackson Coll.

Oxybadistes ardea, sp. n.

Head and thorax black, mixed with orange hairs; abdomen black, orange ventrally. Primaries black, with a large wedge-shaped orange patch from the base of the costa to beyond the cell, extending to the lower margin of the cell, at the lower extremity of which it is slightly excised; a broad postmedial orange band, produced forwards and reduced above vein 4, with an internal orange spot above it close to the costa; inner margin slightly orange to the postmedial band: secondaries black, with a very broad, irregular, postmedian band extending in a fine line along the fold to the base; fringes orange slightly intersected with black. On the under surface the markings of both wings are somewhat reproduced, but there is a large apical orange suffusion of the primaries, and the secondaries are yellowish.

Expanse 24 mm.

Hab. Fak-Fak, Dutch New Guinea.

Type in Coll. Kenrick.

Family Zygænidæ.

LEVUANA, gen. nov.

Antennæ bipectinated in both sexes. Palpi minute, porrect. Mid and hind tibiæ with minute spurs. Wings moderately

broad, expanding in the primary slightly outwards. Neuration: cell very long to nearly three quarters of the wing in both wings: primaries, vein 3 given off from the angle, 4 and 5 above the angle, 6 and 7 stalked from above the middle of the cell; 8 given off from 7 close to the termen, 9 from the angle, 10 midway between 9 and 11, 11 from beyond the centre of the cell: secondaries, vein 2 from well in front of the angle strongly bent downwards, 3 from the angle, 4 absent, 5 from the centre of the cell, 7 absent, 8 connected with the cell by a short bar.

Type, *Levuana iridescens*, B.-B.

Levuana iridescens, sp. n.

♂ ♀. Head and thorax steel-blue; abdomen and legs ochreous. Primaries deep unicolorous steely blue, without any markings: secondaries iridescent steely blue, semihyaline, especially from vein 1 *c* to vein 5.

Expanse 16 mm.

Hab. Fiji Islands (Viti Levu).

Type in my collection.

The larva of this species has been doing great harm to the cocoa-nut palms in the islands, mining in the leaves and committing considerable destruction. Its life-history may prove to be of exceptional interest if the information that I have at present proves to be correct in all its details. I am hoping, however, to clear one or two doubtful matters up in a few months, when I may bring the species forward again.

Family **Lasiocampidæ**.

Taragama butiti, sp. n.

♀. Head and collar pinkish brown; patagiæ rufous edged with whitish. Primaries rufous, with a single whitish, slightly curved postmedian line from near the apex to near the middle of the inner margin: secondaries uniform pinkish rufous, somewhat diaphanous.

Expanse 62 mm.

Hab. Butiti, Toro.

Type in my collection.

The species is allied to *T. carinata*, Wllgr.

Family **Noctuidæ**.

Catephia acholi, sp. n.

Head and thorax rusty brown; abdomen dark brown, with

rusty brown dorsal tufts, whitish laterally; pectus rusty brown, thickly haired. Primaries with basal area rusty brown, with a grey basal tuft; antemedial line black, broad, twice angled below the cell, preceded by a greyish-brown triangular area; area beyond the line greyish brown, strongly irrorated with ochreous-brown rough scales, especially in the upper median area; median black line somewhat obscure, edged laterally with ochreous; postmedian line black, broad, waved, interrupted between veins 3 and 4; beyond this line the irroration ceases; subterminal line interrupted, composed of ochreous rough scales, somewhat fugitive; termen irrorated with lavender-grey at the apex and tornus; reniform represented by two black spots, edged internally with pink and followed by a pink spot nearer the postmedian line; veins somewhat outlined with rusty brown: secondaries white, with a broad black termen; fringes tessellated blackish and rusty brown. Under surface: primaries suffused with whitish except in the fold up to the radial area: secondaries with a black spot closing the cell.

Expanse 72 mm.

Hab. Patigo, North Uganda Protectorate.

Type in my collection.

Family Geometridæ.

Paramilionia, gen. nov.

♂. Palpi small: second segment curved over the face; third segment porrect. Antennæ serrate. Legs long, smoothly scaled; mid tibiæ with one pair of minute terminal spurs; hind tibiæ with two pairs of small spurs. Neuration: primaries with vein 3 from before the angle, 4 from the angle, 5 from the centre of the discocellulars, but rising as an aborted vein at the base of the cell, 6 from the angle, 7, 8, and 9 stalked, 9, 10, and 11 anastomosing with 12, forming a spurious areole over the cell and a very long narrow true areole: secondaries with vein 3 from before the angle, 4 from the angle, 5 from the middle of the discocellulars but rising from the base of the cell as an aborted vein, 6 and 7 from the upper angle.

Type, *Paramilionia rubroplagata*, B.-B.

Paramilionia rubroplagata, sp. n.

♂. Thorax and abdomen steely blue, the latter with a lateral bright red narrow stripe. Both wings blackish, with a strong deep blue metallic lustre over nearly all the wing:

primaries with a large, oblique, oblong, bright red patch at the end of the cell from the areole to near vein 2. Underside: both wings sooty brown: primaries with the red patch showing through as deep orange; secondaries with the costa broadly bright red to beyond its centre, the space between all the veins streaked with bright red and also in the cell.

Expanse 50 mm.

Hab. Sierra Leone.

Type in my collection; two specimens.

XLVIII.—*Description of a new Chameleon of the Genus* Rhampholeon *from Mashonaland.* By G. A. Boulenger, F.R.S.

Rhampholeon Marshalli.

No spine on the inner surface of the digits, but each claw with a strong secondary cusp. Head once and two thirds as long as broad, very feebly raised behind; no parietal crest; large tubercles on the occipital region; a tubercular ridge on the temple, terminating in a subconical bony knob; no prominent supraciliary ridge; a small, soft, granular rostral appendage in the female*; no gular crest; a series of enlarged tubercles on each side below the lower jaw, from the chin to the arm. Body granular, with scattered larger

Rhampholeon Marshalli, natural size.

tubercles on the sides; a series of widely spaced subconical tubercles along the spine; no ventral crest. Tail about three fifths the length of head and body. The specimen, as preserved in spirit, is brownish on the body, variegated with

* It is probably much larger in the male.

blackish, whitish on the belly and under the limbs; head blackish above and beneath.

	mm.
Total length	88
Length of head	16
Width of head	10
Body	41
Fore limb	25
Hind limb	25
Tail	31

A single specimen, a gravid female, was found in the Chirinda Forest, S.E. Mashonaland, altitude 4500 feet, by Mr. Guy H. K. Marshall, and presented by him to the British Museum.

The discovery of a species of the genus *Rhampholeon* south of the Zambesi is one of very great interest. The Chirinda Forest, Mr. Marshall informs me, has a tropical insect-fauna quite distinct from that of the surrounding districts. Its reptile and batrachian fauna, when explored, is likely to afford further startling additions to South-African herpetology.

XLIX.—*Description of a new Silurid Fish of the Genus* Doumea, *Sauvage, from Angola.* By G. A. Boulenger, F.R.S.

Doumea angolensis.

Depth of body about $\frac{3}{4}$ its width, $10\frac{1}{2}$ times in total length. Head strongly depressed, smooth above, once and $\frac{1}{3}$ as long as broad, $5\frac{1}{4}$ times in total length; snout obtusely pointed, projecting beyond the mouth, once and $\frac{1}{2}$ as long as post-orbital part of head; internarial space a little nearer the eye than the end of the snout; diameter of eye 8 times in length of head, twice in interorbital width; maxillary barbel $\frac{1}{3}$ length of head, mandibular barbels a little shorter still; lips and barbels covered with large round papillæ. Occipital process narrow, half length of snout, widely separated from interneural shield. Dorsal I 7, first ray nearly as long as head. Anal I 7. Pectoral not longer than head, widely separated from the ventral, which just reaches origin of anal. Caudal peduncle $\frac{1}{4}$ of the total length. Yellowish brown above, whitish beneath; ill-defined dark bars across the

back ; a dark streak from the end of the snout to the eye ; two dark transverse bars on the dorsal, pectoral, and ventral fins.

Total length 70 mm.

A single specimen from the interior of Benguella, at an altitude of 4000–5000 feet. Presented to the British Museum by Dr. F. C. Wellman.

Closely allied to *D. typica*, Sauv., but snout less pointed, posterior nostril nearer the eye, and dorsal, pectoral, and ventral fins and caudal peduncle shorter.

L.—*On the Presence of Two Species of* Anabas *in the White Nile and the Bahr-el-Gebel.* By G. A. Boulenger, F.R.S.

The large series of specimens collected by Mr. Loat has established the fact that two perfectly distinct species of *Anabas* occur in the White Nile and the Bahr-el-Gebel. Both were confounded by Dr. Günther in his original description of *Ctenopoma Petherici* from Gondokoro. I propose to retain the name *Petherici* for the large specimen figured in Petherick's 'Travels,' the others, the supposed young, representing a smaller species, which I have pleasure in naming after Dr. J. Muric, who accompanied the Pethericks to Gondokoro and did most of the collecting.

Anabas Muriei may be defined as closely allied to *A. Petherici*, but smaller, not exceeding a length of 80 mm., less deep in the body, the depth not exceeding the length of the head, which is 3 times, or a little less than 3 times, in the total length, dorsal spines fewer, and coloration different, the body being covered with numerous black spots, whilst a blackish ocellar spot edged with yellowish is situated at the root of, and partly upon, the caudal fin.

The fin- and scale-formula of *A. Muriei* is D. XIV–XVI 8–10 ; A. IX–XI 8–11 ; Sq. 27–28 $\frac{3}{9-10}$; lat. l. $\frac{13-16}{10-13}$: that of *A. Petherici* being D. XVII–XIX 8–10 ; A. X 10–11 ; Sq. 28–30 $\frac{3}{9-10}$; lat. l. $\frac{14-17}{10-12}$.

A. Muriei inhabits also Lake Victoria.

LI.—*Rhynchotal Notes.*—XL.

By W. L. Distant.

Fam. **Fulgoridæ** (continued from p. 208).

Subfam. *Dictyopharinæ*.

Genus Cladypha.

Cladodiptera, Spin. Ann. Soc. Ent. Fr. viii. p. 316 (1839).
Cladypha, Amy. & Serv. Hist. Hém. p. 502 (1843).
Cladopteryx, Westw. Arc. Ent. ii. p. 90 (1844).
Diacira, Walk. Ins. Saund., Hom. p. 34 (1850).

Type, *C. macrophthalma*, Spin.

Cladypha boliviana, sp. n.

Body and legs brownish olivaceous; two central longitudinal fuscous lines traversing vertex of head, pronotum, and mesonotum; two broad, longitudinal, central, fuscous fasciæ to abdomen above; anterior legs fuscous, the anterior tibiæ annulated with olivaceous at base and before apex; tegmina and wings hyaline, the venation fuscous, tegmina with an oblique, inwardly directed, fuscous, subapical streak extending from costal margin to halfway across tegmen, three minute fuscous spots on the discal veins of basal area, and the veins on apical area more pronouncedly fuscous.

Long., excl. tegm., 11–12 mm.; exp. tegm. 30–32 mm.

Hab. Bolivia (*J. Steinbach*, Brit. Mus.).

Allied to *C. obliquata*, Westw., but tegmina lacking the fuscous apical patch and the prominent basal discal fuscous spot, anterior tibiæ much less dilated, &c.

Genus Dichoptera.

Dichoptera, Spin. Ann. Soc. Ent. Fr. viii. p. 286 (1839).
Clonia, Walk. List Hom., Suppl. p. 60 (1858).

Type, *D. hyalinata*, Fabr. (*Fulgora*).

Dichoptera strigivitta.

Dichoptera strigivitta, Walk. Ins. Saund., Hom. p. 36 (1858).
Dichoptera nubila, Dist. Trans. Ent. Soc. Lond. 1892, p. 277.

I have recently been able to examine the unique type of Walker's species from the Saunders Collection, and find it to be only a faded example of my *D. nubila*. Walker's name must therefore take precedence, and the distribution of the species is now found to comprise India, Borneo, and Java.

Kasserota, gen. nov.

Allied to *Acarna*, Stål, but to be separated by the different structure of the head. Head not protuberant, vertex subquadrate, longer than broad, produced in front of eyes; anterior margin a little convex, anterior and lateral margins ridged and sometimes distinctly centrally ridged; face angularly ampliated behind eyes, tricarinate, the lateral carinations a little convex and convexly united at base.

Type, *K. notaticollis*, Stål (*Acarna*).

Kasserota notaticollis.

Acarna notaticollis, Stål, Trans. Ent. Soc. Lond. (3) i. p. 584 (1863).
Acarna subapicalis, Walk. Journ. Linn. Soc., Zool. x. p. 101 (1870).

Kasserota doreyensis, sp. n.

Body and legs brownish ochraceous; abdomen above with the posterior segmental margins fuscous; vertex of head, face, clypeus, femora, and apex of mesonotum paler or more ochraceous; tegmina pale ochraceous, with the venation brown, posterior basal half and apical third umber-brown, the latter with two greyish-white spots at costal margin and a similar spot near apex of inner margin, and before apex a black spot with a white eye and an ochraceous margin; wings very pale fuliginous, the venation and apical area fuscous; face with the lateral carinæ very convex, broadly rounded and united anteriorly, angles behind eyes strongly acutely produced; pronotum distinctly tricarinate; mesonotum with a central double carination, not extending beyond anterior half, the lateral carinations united anteriorly.

Long., excl. tegm., 13½ mm.; exp. tegm. 36 mm.

Hab. Dorey (*Wallace*, Brit. Mus.).

Allied to *K. pupillata*, Stål.

Genus Dictyophara.

Dictyophara, Germ. in Silb. Rev. Ent. i. p. 175 (1833).
Dictiophora, Spin. Ann. Soc. Ent. Fr. viii. p. 290 (1839).
Pseudophana, Burm. Handb. Ent. 2, i. p. 159 (1835).
Chanithus, Amy. Ann. Soc. Ent. Fr. 1847. p. 160.
Nersia, Stål, Rio Jan. Hem. ii. p. 62 (1861).

Type, *D. europæa*, Linn. (*Fulgora*).

Dictyophara Rocheti.

Fulgora (*Dictyophara*) *Rochetii*, Guér. in Lef. Voy. Abyss., Ins. p. 342, t. vi. fig. 8 (1849).
Dictyophora semireticulata, Walk. Journ. Ent. i. p. 307 (1862).

Dictyophara atbaræ, sp. n.

Body and legs ochraceous brown, thoracic carinations paler and virescent; tegmina and wings pale hyaline, the first somewhat tale-like and with two very pale brownish longitudinal streaks on apical area—one near costal, the other near inner margin; cephalic protuberance long, robust, from in front of eyes a little longer than pronotum and mesonotum together; face with a central longitudinal carination; clypeus centrally carinate and much more obscurely obliquely carinate on each lateral area; spines to posterior tibiæ concolorous.

Long., excl. tegm., 9 mm.; exp. tegm. 18 mm.

Hab. Abyssinia; Atbara (Brit. Mus.).

Dictyophara speicarina.

Dictyophora speicarina, Walk. Journ. Linn. Soc., Zool. i. p. 144 (1857).
Dictyophara sanguinolenta, Léth. Ann. Mus. Civ. Gen. (2) vi. p. 467 (1888).

Dictyophara ferrifera.

Dictyophora ferrifera, Walk. List Hom. ii. p. 313 (1851).
Dictyophora melanogona, Walk. List Hom., Suppl. p. 63 (1858).

Dictyophara Dixoni, sp. n.

Body and legs virescent or ochraceous; tegmina and wings pale hyaline, the venation very pale ochraceous; head curved upwardly, narrowing to apex, in front of eyes about as long as mesonotum, above with the lateral margins strongly ridged, and with a very short central ridge near middle; face tricarinate, the lateral carinations moderately converging before clypeus, which is strongly centrally carinate, and obliquely striate on each lateral area; pronotum centrally carinate; mesonotum tricarinate, the lateral carinations almost straight, not convexly converging anteriorly; posterior tibiæ with five spines, their apices black, first spine near extreme base; rostrum considerably passing posterior coxæ; femora and tibiæ strongly longitudinally sulcate.

Long., excl. tegm., 11 mm.; exp. tegm. 26 mm.

Hab. Bombay (*R. M. Dixon*).

Dictyophara Cummingi, sp. n.

Body and legs virescent or ochraceous; eyes black; tegmina and wings hyaline, with the venation very pale ochraceous; head prolonged, robust, porrect, slightly ascending at

tip, strongly excavate above, the ridges very pronounced, its length from in front of eyes about equal to that of pronotum and mesonotum together; face tricarinate, the lateral carinations converging anteriorly and not extending posteriorly beyond the eyes; clypeus centrally carinate; pronotum tricarinate, the lateral carinations obscure, oblique and tuberculous; mesonotum tricarinate; posterior tibiæ with four spines, one at base and apex, the other two central; tegmina a little more opaque than wings, the stigma concolorous.

Long., excl. tegm., 9½ mm.; exp. tegm. 20 mm.

Hab. Karachi (*Cumming*).

Allied to *D. Walkeri*, Atkins., but face extending much more behind eyes than in that species; stigma to tegmina concolorous, &c.

Dictyophara concolor.

Dictyophora concolor, Walk. List Hom. ii. p. 322 (1851).

Virescent or ochraceous, apparently the first in fresh and not discoloured specimens; tegmina and wings hyaline, the first very slightly ochraceously infuscate on apical area, the stigma more pronouncedly ochraceous; head with a long, porrect, robust prolongation, from in front of eyes about as long as abdomen, its margin strongly ridged, and with a short central carination at base, beneath with two central longitudinal carinations strongly converging before clypeus, and a fainter central carination more pronounced posteriorly; pronotum and mesonotum tricarinate, the carinations somewhat faintly and convexly united anteriorly; posterior tibiæ with four spines, the apices of which are black, the basal spine shortest; rostrum about reaching posterior coxæ, its apex black.

Long., excl. tegm., 12–13½ mm.; exp. tegm. 19–22 mm.

Hab. North Australia (*J. R. Elsey*, Brit. Mus.); Moreton Bay and Adelaide (Brit. Mus.); Queensland, Peak Downs.

Walker described this species from a single unlocalized specimen, and I am now able to give its proper habitat.

Dictyophara prognatha, sp. n.

Body and legs virescent or ochraceous; tegmina faintly virescent, the venation more darkly virescent, stigma obscure virescent; wings pale hyaline; head curved upward, the prolongation narrowing to apex, in front of eyes very little longer than mesonotum, laterally and centrally carinate above, the central carination not extending for more than half the length from base; face distinctly narrowed anteriorly from

in front of eyes, tricarinate, the lateral carinations converging anteriorly and posteriorly; clypeus centrally carinate; pro- and mesonota tricarinate, in each case the lateral carinations convexly converging anteriorly; posterior tibiæ with five spines, their apices black; rostrum passing the intermediate coxæ.

Long., excl. tegm., 11½ mm.; exp. tegm. 25 mm.

Hab. Queensland (*Gilbert Turner*, Brit. Mus.).

Dictyophara? inscia.

Dictyophora inscia, Walk. Ins. Saund., Hom. p. 38 (1858).

This species was described from an unlocalized specimen which constitutes the unique type. It is in a mutilated condition, the head being entirely missing. It probably represents a Neotropical species.

Rotunosa, gen. nov.

Head broad, but longly produced in front of eyes, a little narrowed at apex, moderately flat above, strongly centrally and laterally carinate, the central carination forked at base; face moderately broadened from base to clypeus, strongly centrally carinate, with a curved lateral carination on each side not reaching base and meeting before clypeus, which is centrally ridged; pronotum scarcely longer than eyes, strongly emarginate at base, centrally carinate; mesonotum more than twice as long as pronotum, tricarinate; tegmina narrow, sub-opaque, about three times as long as broad, veins longitudinal, but much closer together and obscurely reticulate on apical area, which is defined by a straight series of transverse impressed veins; wings hyaline, with a transverse, discal, subapical vein; posterior tibiæ with three spines.

Type, *R. indicanda*, Walk.

Rotunosa indicanda.

Dictyophora indicanda, Walk. List Hom., Suppl. p. 318 (1858).

Hab. Amazons.

Genus Putala.

Putala, Melich. Hom. Faun. Ceylon, p. 26 (1903).

Type, *P. rostrata*, Melich.

Putala brachycephala, sp. n.

Head, thorax, body beneath, and legs brownish ochraceous; carinations to pro- and mesonota much paler in hue; abdomen above piceous, with ochraceous macular markings; apex of clypeus, linear markings to femora, apices of tibiæ and tarsi, and apex of rostrum fuscous; tegmina and wings hyaline, the venation fuscous; tegmina with the stigma and a central longitudinal apical patch fuscous; head short, only about as long in front of eyes as between them; face narrowed at base, widened towards clypeus, tricarinate; clypeus centrally carinate and on each lateral area obliquely striate; posterior tibiæ with five spines; mesonotum tricarinate.

Long., excl. tegm., 7–7½ mm.; exp. tegm. 19½–20 mm.

Hab. Singapore (*H. N. Ridley*, Brit. Mus.); Bombay (Coll. Dist.).

To be recognized among the Oriental species by the broad and short cephalic process.

Putala Lewisi, sp. n.

Head ochraceous, lateral margins of the cephalic process very broadly castaneous; pro- and mesonota brownish ochraceous, the first with a central carination and the produced anterior margin pale ochraceous; mesonotum with a pale central ochraceous line not reaching basal margin; abdomen above and beneath ochraceous, much mottled with dark castaneous; femora castaneous brown minutely spotted with ochraceous, and more or less annulated with the same colour near apex; tibiæ ochraceous, anterior and intermediate tibiæ broadly annulated with castaneous at base, middle, and apex, posterior tibiæ with the base, spines, and a longitudinal line castaneous; face, clypeus, and broad lateral sternal margins very pale ochraceous; tegmina and wings hyaline, the venation fuscous brown, tegmina with the stigma piceous; cephalic process a little upcurved and apically narrowed, from in front of eyes as long as from eyes to apex of mesonotum; face very finely wrinkled, tricarinate, the lateral carinations inclined inwardly from eyes but not reaching clypeus; rostrum castaneous, ochraceous towards apex and about reaching posterior coxæ; mesonotum tricarinate, the lateral carinations very prominent and curved; posterior tibiæ with five spines.

Long., excl. tegm., 13 mm.; exp. tegm. 25 mm.

Hab. Japan (*G. Lewis*).

Genus Rhaphiophora.

Nematophora, Schaum, in Ersch und Grub. Enc. p. 67 (1850), nom. præocc.
Rhaphiophora, Schaum, Arch. f. Naturg. xxvii. (2) p. 268 (1851), n. nom.
Simotettix, Stål, Öfv. Vet.-Ak. Förh. 1853, p. 264.

Type, *R. vitrea*, Schaum (*Nematophora*).

Taosa, gen. nov.

Head not produced in front, rotundately truncate a little in front of eyes, front slightly broader at apex than at base, lateral margins subparallel ; face moderately broad, ampliated on each side before clypeus, obscurely tricarinate, the central carination distinct ; clypeus strongly centrally carinate ; pronotum only about half the length of front of head, centrally carinate ; mesonotum more than three times longer than pronotum, tricarinate ; tegmina three times as long as broad, slightly ampliated towards apex, apical third with three series of transverse veins defining more or less clearly three series of cellular areas ; wings broader than tegmina, with some apical marginal transverse and forked veins ; posterior tibiæ with four spines, one being at extreme base.

Type, *T. suturalis*, Germ. (*Flata*).

Taosa suturalis.

Flata suturalis, Germ. in Thon, Ent. Arch. ii. 2, p. 48 (1830).
Nersia suturalis, Stål, Rio Jan. Hem. ii. p. 65 (1858).
Dictyophara suturalis, Berg, An. Soc. Cient. Argent. xvii. p. 114 (1884).
Cladodiptera muliebris, Walk. List Hom., Suppl. p. 76 (1858).

Hab Brazil.

Remosa, gen. nov.

Head longly produced in front of eyes, cephalic process at base, gradually but much narrowed on apical half, strongly centrally carinate, the lateral areas oblique, the lateral margins carinate ; face long, narrowed in front of eyes, margins subparallel from anterior margins of eyes to a little before clypeus, where they are inwardly oblique, strongly centrally carinate ; clypeus centrally carinate ; pronotum about as long as eyes, tricarinate ; mesonotum about twice as long as pronotum, tricarinate ; tegmina about two and a half times as long as broad, subopaque, minutely tuberculate, costal area broad, apical area finely and closely reticulate and inwardly defined by an almost straight series of transverse veins ; wings

hyaline, with a discal subapical transverse vein; posterior tibiæ with three spines.

Type, *R. cultellator*, Walk.

Remosa cultellator.

Dictyophora cultellator, Walk. List Hom., Suppl. p. 62 (1858).

Hab. St. Domingo.

Mr. Otto H. Sweezey, in his recently published 'A Preliminary Catalogue of the described Species of the Family Fulgoridæ of North America, north of Mexico,' has included the genus *Nonopsis*, Spin., in the Dictyopharinæ. Stål, however, to whom he gives a reference, placed it in the Tropiduchinæ, and Uhler also places it in the same subfamily. I have no personal knowledge of the genus.

LII.—*The Primary Septal Plan of the Rugosa.*

By R. G. Carruthers *.

[Plate IX.]

There has been of late years a revival of the long-dormant discussion as to the presence of four or six primary septa in the Rugosa. It would be, perhaps, as well to indicate briefly the reasons for the investigation of a point which may possibly seem of subordinate importance.

While most members of the Zoantharia have a hexamerous or dodecamerous primary plan, certain others, such as *Edwardsia*, have an eight-rayed arrangement. By common consent the latter is regarded as the more primitive type, and most zooids, whether hexamerous or not, are said to pass through an *Edwardsia* stage; in all cases, so far as it is known, the fundamental plan, when not of simultaneous formation, is arrived at by an insertion of bilateral pairs proceeding in a common order. It is a question whether this octamerous plan is genetically connected with that of the Rugosa, an extinct group of Palæozoic corals, commonly supposed to be primarily tetramerous, but whose other characters link them with the hexamerous Madreporaria; but the very slight amount of actual investigation of the early stages in these ancient corals has been a bar to their phylogenetic classification, and their relations to other Anthozoa have remained doubtful.

* Communicated by permission of the Director of H.M. Geological Survey.

When Kunth, in 1869 *, first clearly demonstrated the remarkable pinnate mode of septal development so characteristic of the Rugosa, in which new septa are added at four distinct points in the circumference of the corallum, he naturally inferred, in the absence of direct evidence, that these corals had four primary septa. But whenever actual investigation of the point has occurred, not four but six septa have been found. Thus Pourtales, in 1871 †, in the youngest stage he examined in *Lophophyllum proliferum* found six septa only, so symmetrically arranged that he regarded them as primary. It was not till 1902 that the matter was again taken up. In that year Duerden published an important paper ‡ in which Pourtales's conclusions with regard to *L. proliferum* were fully supported and in which an interesting relationship of the living Zoantheæ to the Rugosa is suggested; this paper also contains an excellent survey of the literature of the subject. In a later paper § the same author incidentally figures another instance where he has found six septa symmetrically arranged in the youngest stage examined in *Streptelasma rectum*, and which he regards as primary; and while preparing this manuscript for publication I have seen, through the kindness of Dr. Ashworth, an advance proof of a further note by Duerden ‖, in which he gives a list of five additional species in which six septa, presumably primary, have been observed.

On the other hand, it may fairly be said that no evidence has yet been brought forward conclusively demonstrating the presence of a primary four-rayed condition in these corals, though quite recently Gordon ¶, from examination of an Ordovician *Streptelasma*, has concluded that in that form there were four primary septa, and that of the six observed by Duerden in the Carboniferous *Lophophyllum* four were the true primary ones and the remaining two "accelerated secondary septa." It is hoped that in the course of the present paper it will be shown that Gordon's careful observations are in no way inconsistent with the presence of a

* Kunth, A., "Beit. zur Kennt. foss. Korallen," Zeit. d. Deut. Geol. Ges. xxi.

† Pourtales, L. F. de, "Deep-sea Corals," Illus. Cat. Mus. Comp. Zool. Harvard Coll. iv.

‡ Duerden, J., "Relationships of the Rugosa to the living Zoantheæ," Ann. & Mag. Nat. Hist. (7) ix.

§ Duerden, J., "The Fossula in Rugose Corals," Biol. Bull. vol. ix. no. 1 (1905).

‖ Duerden, J. E., "The Primary Septa in Rugose Corals," 'Science,' Aug. 24, 1906, p. 246.

¶ Gordon, C. E., "Early Stages in Palæozoic Corals," Amer. Journ. Sci. (4) xxi. (1906).

primary hexamerous plan in the Rugosa, but, on the contrary, support that view.

There seems to be no doubt that the unsatisfactory state of our knowledge of these primary stages is due to lack of sufficiently good material. There is, however, in the calcareous shales found in the Carboniferous Limestone Series of Scotland an abundance of small corals, chiefly Zaphrentids, and often beautifully preserved. Large numbers of these are in the collections of the Geological Survey, and in dealing with them during a revision of the corals for some forthcoming Sheet Explanations, so many were found to show the earliest stages of their septal development that opportunity was taken to investigate the matter further. The majority were so preserved that on carefully grinding down the tips, the septal arrangement could easily be seen with the aid of a hand-lens. This fact to some extent obviated recourse to microscopic sections, but of the latter about one hundred in all were made in order to permit of more detailed examination of the various stages. From the Museum of Practical Geology in London one or two additional Carboniferous corals and also several Silurian ones were obtained; while, owing to the kindness of Mrs. Gray, I have been able to examine from her unique collection of the Lower Palæozoic fauna of Girvan some small specimens of *Streptelasma* showing these early stages. They are from the Silurian (Llandovery) rocks of Woodhall Point and from the Ordovician (Llandeilo) beds of Craighead.

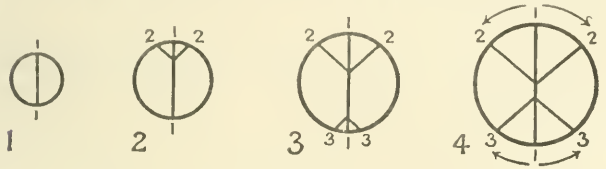
Sequence of Septa.

In all the corals examined the septa were found to appear in the same order and manner in both early and late Palæozoic forms. As an example, one of the small Carboniferous Zaphrentids will be chosen for description. The growth of the first six septa may conveniently be divided into three stages, but it is to be understood that these stages merge gradually into one another; it is not till all six septa have appeared that any pause in the development is met with. On carefully grinding down the tip of the coral the septal sequence is seen to be as depicted in Diagram A.

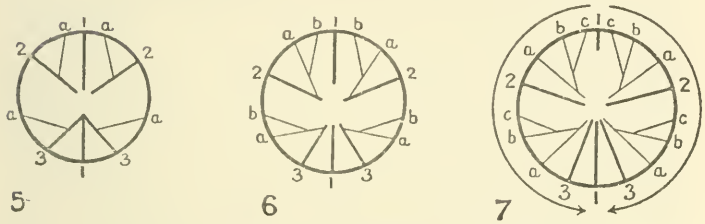
Stage I.—A single septum is seen to stretch across the calicle from wall to wall (diag. A. 1). This may conveniently be referred to as the "axial septum." In later stages this "axial septum" breaks up to form the main and counter septa of the mature coral. Microscopic sections show that the median dark line seen in most septa occurs here also in a continuous dark band passing down the centre (fig. 1, Pl. IX.).

Stage II.—Two new septa are next seen to arise, one on each side of the "main" end of the axial septum. Though remaining attached to the wall of the calicle and to the axial septum, they gradually spread outwards, and eventually form the "alar" primary septa of Kunth (diag. A. 2).

Diagram A.—Formation of Septa in a Simple Rugose Coral.



1–4. Development of the Primary or Protosepta.



5–7. Development of the Secondary or Metasepta.

Stage III.—Shortly after the alar primaries have developed another pair appears, in the same manner as before, but at the opposite or "counter" end of the axial septum (diag. A. 3). These also spread outwards, though very rarely to the same extent as the alar septa. There is now a distinct pause in the formation of new septa, and no more appear for some time. Any irregularity that there may have been previously in the growth of the septa is corrected at this stage, and the two lateral pairs dispose themselves symmetrically on each side of the axial line * (diag. A. 4). Later septa are added on a slightly different plan. As before, they appear at the junction of the last-formed septum with the wall and in pairs, but instead of moving towards each other as the two lateral primary pairs did, they all eventually move towards the counter septum, and all arise on the fossular faces of the last-formed septa (diag. A. 5, 6, & 7). No further description of the development of these later septa need be given here, as this part of the subject has been fully

* The six protosepta are rapidly developed. An opaque microscopic section (C. 55) shows very clearly the beginning of Stage II. on one side and the close of Stage III. on the other, although the section is less than ·5 mm. thick.

treated by previous observers, among whom Duerden should be specially mentioned.

The movements above referred to are in part shown by the varying angles of inclination of the septa to the axial line. These serve to express the fact that the first six or protosepta are developed differently from the later or "metasepta." The change is marked by the only developmental pause observed. In other words, the primary septal plan of these Rugose corals is hexamerous and is arrived at by an insertion of bilateral pairs analogous to that occurring in the soft parts of the rest of the Madreporaria and, indeed, in most Anthozoa.

There is commonly some irregularity in the growth of the two lateral protoseptal pairs, and in some cases an indication of a spiral, or, at any rate, an alternating arrangement. The direction of the spiral, however, was found to vary in different specimens of the same species, and may quite well be an irregularity of no special significance, such as commonly occurs in living corals. The important point is that this irregularity, when it occurs, is never so strongly marked as to interfere with the sequence above given—*i. e.*, the axial septum appears first, followed by the alar primary pair, and this by the counter lateral pair. Further consideration of this point may therefore be left to future investigation.

The septal sequence given above was originally observed in some varieties of *Zaphrentis Phillipsi*, Ed. & H., and has since been found in several other species enumerated below, together with the various stages found in each :—

Carboniferous	1. *Zaph. Phillipsi*, Ed. & H., and variants.	Stages I. to III.
	2. *Zaph.* sp.[1]	Stage III.
	3. *Lophophyllum eruca*, M'Coy.	Stages I. to III.
	4. *Cyathaxonia* sp.[2]	„ I. to III.
	5. *Dibunophyllum* sp.	Stage III.
	6. *Cyclophyllum fungites*, Flem.	„ III.
Silurian	7. (?) *Cyathophyllum*, sp.[3] (a Wenlock form).	Stages II. & III.
	8. *Streptelasma* sp. (a Llandovery form).	Stage III.
Ordovician ..	9. *Streptelasma* sp. (a Llandeilo form).	Stages I. to III.

[1] A small, long and narrow, tuberculated form, which I have been unable to specifically identify. It is labelled "*Pyrgia*" in the Jermyn Street collection—an obvious mistake. Reg. no. 16186 Mus. Pract. Geol. London.

[2] This is the form referred to *C. cornua*, de Kon., by James Thomson, and figured and described by him as such in Proc. Phil. Soc. Glasgow, vol. xiv. (1882–83) p. 428 and fig. 29, pl. x.

[3] Provisionally referred to this genus. It is certainly specifically distinct from the two species of "*Streptelasma*" examined from Mrs. Gray's collection. Reg. no. 16179 Mus. Pract. Geol. London.

The lower Palæozoic corals in the above list all had to be sectioned for the microscope before the early septa were visible. Consequently fewer specimens were examined than in the Carboniferous corals, of which nearly two hundred were obtained, showing Stages I. to III. But enough were obtained to show that these early Palæozoic forms agreed exactly in their initial stages with the Carboniferous ones, a conclusion of interest in view of Gordon's suggestion that there were four primary septa in the early Rugosa. But, using the length of the septa as a guide to their age, an examination of Gordon's own figure* of an Ordovician *Streptelasma* shows that it is in perfect accordance, from Stage I. onwards, with the septal sequence above described; the tendency to a spiral growth of the primaries is perhaps slightly more marked than usual, though this may well be an accident of preservation.

Except for *Dibunophyllum* and *Cyclophyllum*, all the corals examined were small forms. This is, of course, simply due to the fact that in large, heavy forms the delicate tip is more easily destroyed by rolling or movement of any kind.

In no instance have I found any essential divergence in the arrangement of the primary septa in the genera examined; and from the uniformity displayed in this respect, even in corals far removed in point of time, it seems reasonable to suppose that the sequence will be found to extend to the Rugosa as a whole, and that Duerden and Pourtales were right in considering these corals to be primarily hexamerous. Similar instances of the formation of the early septa in bilateral pairs have been observed in certain Mesozoic Hexacorallids†, but, indeed, the great majority of the Zoantharia seem to have a primary hexamerous plan, attained in most cases by the insertion of bilateral pairs. It is in the later stages that, as Duerden remarks, "divergences are introduced which are to be regarded as of the most fundamental importance in coral and actinian morphology."

While these results bring the Rugosa into closer association with modern corals and dismiss the idea that they are primarily tetramerous, and as such built on a more primitive basis than other Madreporaria, yet there are reasons to suppose that septal formation in these ancient corals took place

* *Loc. cit.* fig. 16, p. 120.

† See especially M. M. Ogilvie, "Microscopic and Systematic Study of Madreporarian Types of Corals," Phil Trans. clxxxvii. p. 291, diag. F & G (1896); and also pp. 97 & 105 of 'Die Korallen d. Stramberger Schichten,' Stuttgart, 1897 (by the same authoress).

in a more primitive way than that now existing; these considerations, however, I must defer to a future occasion.

The last point I wish to deal with concerns the orientation adopted for the figures in this paper. While in living corals the first six or twelve septa appear simultaneously, the entoceles in which they are formed arise in bilateral pairs, of which the first lateral pair appears on the dorsal surface. Similarly the dorso-lateral pair of exoceles arises before the ventro-lateral one. And again, the first six tentacles of most corals arise over the septa, and the dorso-lateral pair appears first. It would seem to be a general rule in the Zoantharia, indeed, that in the insertion of bilateral pairs of this nature the first appears on the dorsal surface. The natural conclusion is that in the Rugosa the first lateral pair of septa to appear, *i. e.* the alar septa (2 . 2), arose on the dorsal side of the corallum, and this whether the septa were exclusively entocelic or not.

It is only fair to Duerden to remark that the reverse orientation seen in his figures was adopted before the order was known in which the six primary septa of the Rugosa appeared.

Before concluding this paper I must express my hearty thanks to Dr. Ashworth, of the University of Edinburgh, for much valuable help, especially for the loan of papers not otherwise obtainable, and to Dr. Flett and Mr. T. C. Hall, of the Geological Survey, for the micro-photographs on Pl. IX.

EXPLANATION OF PLATE IX.

Horizontal sections illustrating the formation of early septa in Rugose corals. All figures have the "main," "cardinal," or "fossular" septum on the upperside, and with the exception of figs. 6*a* and 6*b* are from different specimens.

Figs. 1–6*b* from variants of *Zaph. Phillipsi*, Ed. & H.

Fig. 1. (C. 58.) Single septum of Stage I. × 40.

Fig. 2. (C. 67.) Appearance of the alar septa 2 . 2 in Stage II. The dark mark on the upperside is caused by earthy matter filling up the vacant space left by a "*Productus*" spine to which the young coral was attached—a very common phenomenon in these corals. × 35.

Fig. 3. (C. 90.) Early part of Stage III. The counter-lateral protosepta 3 . 3 just appearing. Irregular growth of septa. × 35.

Fig. 4. (C. 76.) End of Stage III. The six protosepta symmetrically arranged about the axial line. × 35.

Fig. 5. (C. 44.) Appearance of the first two metasceptal pairs (*a a*). The axial septum has broken up into "main" and "counter" septa (M and C). × 35.

Figs. 6*a* & 6*b*. Both from the same specimen. 6*a* (C. 68) shows

appearance of the two alar septa 2 . 2. *6 b* (C. 69) is a later section and shows a pseudo-tetramerism caused by a late appearance of the two counter-lateral septa 3 . 3, and a divergence of the alar septa 2 . 2, most unusual at this stage. In the same specimen the main septum became detached before the addition of any metasepta. × 40.

Fig. 7. (C. 78.) *Cyathophyllum* (?). A Silurian specimen (Wenlock), to show the identity of the protoseptal arrangement of a Lower Palæozoic coral with that existing in a Carboniferous one. × 35.

The numbers in brackets refer to slides in the possession of the Geological Survey of Scotland.

LIII.—*Oriental* Reduviidæ. By W. L. Distant.

With the exception of one Bornean genus, the Reduviids described in this paper have reached my hands since the publication of the second volume of Indian Rhynchota ('Fauna of British India'). They will be included in the appendix to Vol. IV., now in preparation, and figures of the new genera will then be added.

Fam. **Reduviidæ**.

Subfam. *Emesinæ*.

Div. Stenolæmaria.

Ploiariola pygmæa, sp. n.

Head fuscous brown, the eyes black; antennæ creamy white with numerous fuscous spots or annulations; pronotum with the anterior lobe piceous, the posterior lobe fuscous, the former much irrorated with linear white markings and with its lateral margins ochraceous, the latter with its lateral margins and three central carinate lines (of which the central is incomplete and the two lateral meet anteriorly) creamy white, its posterior margin ochraceous; abdomen above fuscous, beneath greyish with fuscous spots; legs creamy white with fuscous spots or annulations; hemelytra creamy white with darker mottlings, on basal area the mottlings are fuscous and on costal margin there are fuscous spots; first joint of antennæ about as long as intermediate femora, second very little shorter than first; posterior femora about as long as whole body; anterior lobe of pronotum a little shorter than the posterior lobe, pronotal margins slightly sinuate.

Long. 3½ mm.

Hab. Ceylon; Peradeniya (*E. E. Green*).

Div. Leistarcharia.

Bagauda splendens, sp. n.

Ochraceous; head and anterior margin of pronotum piceous; eyes, posterior lobe of pronotum, scutellum, membrane, anterior femora (excluding base), anterior tibiæ, and apical area of abdomen beneath, black; scutellum with two discal ochraceous lines; corium longitudinally castaneous brown between the veins and with a pale creamy patch before the membrane, the latter with a central pale vein; pronotum more than twice as long as head, the anterior lobe constricted and longer than posterior lobe, which is gibbous, with a central longitudinal narrow ridge, and with a nodule near each posterior angle, its basal margin sinuate; first joint of antennæ about as long as the intermediate femora and much longer than second joint; corium transversely striate in each lateral area; posterior femora about as long as entire body, intermediate and posterior femora annulated with creamy white at apices.

Long. 12 mm.

Hab. Ceylon; Peradeniya (*E. E. Green*).

Guithera, gen. nov.

Head suboval, above and beneath convex, subequal in width to apex of pronotum, narrower in front of eyes than behind; rostrum with the second joint slightly longer than first, shorter than third; first joint of antennæ about twice as long as pronotum; pronotum less than twice the length of head, above mesonotum outwardly produced, base only slightly wider than apex, medially constricted, basal margin not sinuate; scutellum subtriangular; hemelytra reaching or just passing abdominal apex; anterior femora moderately incrassated, beneath finely spinose, basal spines most prominent, anterior tibiæ and tarsi united shorter than femora, the tarsus single-jointed; anterior coxæ a little more than half the length of anterior femora, posterior femora a little longer than the abdomen.

Type *G. jeana*, Dist. (*Luteva*).

Allied to *Bagauda*, Bergr.

Guithera hortensia, sp. n.

Ochraceous; head, basal half of posterior lobe of pronotum, scutellum, extreme base of corium, and membrane piceous; antennæ castaneous brown; head scarcely longer than

anterior lobe of pronotum ; first joint of antennæ about as long as hemelytra and much longer than second joint ; anterior lobe of pronotum longer than posterior lobe, the first semiglobose with a central longitudinal incised line, the latter with a nodule on each side of its anterior margin, the posterior angles subacute and subprominent, a little directed backward ; corium transversely striate on each lateral area between the veins ; membrane reaching abdominal apex ; anterior coxæ a little more than half the length of anterior femora ; posterior femora a little longer than the abdomen.

Long. 8 mm.

Hab. Ceylon ; Peradeniya (*E. E. Green*).

Guithera nubifera, sp. n.

Ochraceous ; eyes black ; corium and apical area of abdomen beneath fuscous brown ; membrane pale brown with greenish iridescence ; first joint of antennæ considerably longer than hemelytra, more than twice as long as second joint ; pronotum strongly centrally channelled, posterior lobe with a nodule near each posterior angle ; corium slightly piceous at extreme base ; anterior coxæ considerably shorter than anterior femora ; posterior femora as long as the whole body ; antennæ very palely fuscous.

Long. 8 mm.

Hab. Ceylon ; Peradeniya (*E. E. Green*).

Subfam. *Tribelocephalinæ.*

Pangeranga, gen. nov.

Head long, slightly longer than pronotum ; in front of eyes longly, porrectly, narrowly produced, behind eyes attenuated to base ; eyes transverse, almost meeting on vertex ; ocelli absent ; first joint of rostrum slightly passing eyes, subequal in length to second joint ; antenniferous tubercles prominent ; antennæ longly pilose, first joint slightly thickened, about as long as head and pronotum together, second joint curved, a little longer than first ; pronotum moderately convex, the anterior lobe a little less than half the length of posterior lobe ; hemelytra passing abdominal apex, corium short and narrow ; membrane very large and containing two large cells, the uppermost transverse, the lowermost longitudinally subovate ; intermediate and posterior coxæ about equally wide apart, the anterior coxæ placed close together ; legs moderately slender ; prosternum centrally sulcate ; abdomen moderately centrally ridged.

Type, *C. cinnamomea*, Dist.

Pangeranga cinnamomea, sp. n.

Pale uniform cinnamon-brown; body and legs moderately pilose, lateral margins of head behind eyes, pronotum, corium, and abdomen more longly pilose, antennæ very longly pilose; pronotum with a large obtuse tubercle on each side of transverse incision separating the anterior and posterior lobes; veins to corium coarse and somewhat rugose; sternum and abdomen beneath densely pilose, the latter centrally moderately ridged where there is a central longitudinal narrow levigate slightly incised line.

Long. 12½ mm.

Hab. Borneo; Buri.

Subfam. *Acanthaspidinæ*.

Div. Reduviaria.

Stesichorus, gen. nov.

Body subovate; head strongly transversely impressed between eyes, which extend transversely across the lateral areas of the head, anteocular portion of head slightly depressed, a little longer than postocular portion; antennæ pilose, first joint shorter than head, second joint more than twice as long as first; pronotum with the lobes subequal in length, anterior lobe much narrower than posterior, tuberculate at anterior angles, subconvex, and centrally longitudinally sulcate, lateral margins of posterior lobe oblique; scutellum terminating in a semiporrect spine; membrane extending a little beyond abdomen, which beneath has a slight longitudinal central ridge, the lateral areas being oblique; legs pilose and body beneath pilose; anterior femora unarmed.

Type, *S. pilosus*, Dist.

Allied to *Crocicus*, Bredd.

Stesichorus pilosus, sp. n.

Head, pronotum, scutellum, and sternum black; corium ochraceous, with the basal angle, basal half of claval area, and apical angle black; membrane black, with a pale apical spot; antennæ, rostrum, legs, and abdomen beneath ochraceous, the latter with the apical and lateral areas piceous; antennæ, rostrum, legs, and abdomen beneath strongly pilose.

Long. 11 mm.

Hab. Ceylon; Eppawela (*E. E. Green*).

Subfam. *Ectrichodiinæ*.

Antiopula typicalis, sp. n.

Sanguineous; antennæ, hemelytra, a broad transverse fascia to the last two dorsal abdominal segments, a large spot on each lateral area of the same segment beneath, and a spot on apical segment, black; base of first joint of antennæ sanguineous, fifth and sixth joints pale stramineous, apex of sixth joint fuscous; basal halves of lateral margins to hemelytra sanguineous, becoming broader at area of membrane; antennæ with six joints, first nearly as long as head, second longest, third, fourth, fifth, and sixth small, the last three subequal in length; head convexly globose; eyes convex, black; pronotum centrally longitudinally sulcate, posterior lobe also longitudinally impressed near lateral angles; anterior femora a little thickened but unarmed.

Long. 7½ mm.

Hab. Ceylon; Peradeniya (*E. E. Green*).

Stål's type of the genus has the antennæ imperfect; the above description therefore locates the genus *Antiopula* in the section of the subfamily Ectrichodiinæ distinguished by the possession of six joints to the antennæ.

Libavius tricolor, sp. n.

Sanguineous; corium dull ochraceous, the veins, lateral margins, and apical angles sanguineous; membrane black; antennæ longly pilose, first and second joints dull sanguineous, remaining joints fuscous; anterior lobe of pronotum centrally sulcate and with two prominent acute tubercles, posterior lobe with three deep longitudinal impressions, the central one not reaching basal margin; head with two short spines at its anterior margin; connexivum moderately broadly and upwardly produced, the segmental angles slightly tuberculous; rostrum reaching the anterior coxæ.

Long. 12 mm.

Hab. Ceylon; Wellawaya (*E. E. Green*).

Subfam. *Harpactorinæ*.

Div. Rhaphidosomaria.

Rhaphidosoma Greeni, sp. n.

Piceous black; rostrum and legs castaneous, intermediate and posterior tibiæ dull ochraceous, tarsal claws piceous; head elongate, ante- and postocular portions almost subequal

in length, the postocular portion finely granulate and somewhat castaneous; antennæ pale castaneous brown, first joint as long as intermediate femora; second and third joints subequal in length and each considerably shorter than first; anterior and intermediate femora subequal in length, posterior femora a little shorter and posterior tibiæ a little longer than abdomen; abdomen above pale piceous brown, a central longitudinal fascia and the lateral margins black; rostrum reaching the anterior coxæ.

Long. 25 mm.

Hab. Ceylon; Wellawaya (*E. E. Green*).

Div. Sycanaria.

Sycanus galbanus, sp. n.

Black; corium stramineous, the clavus black; head and rostrum smooth, shining black, second and third joints of the latter piceous brown; antennæ with the first and second joints black, remainder greyish brown, first joint a little longer than head; pronotum with the anterior lobe shining black but greyishly pilose, posterior lobe granulose; scutellum with a moderately long erect spine, its apex subacute, not bifid; corium finely rugosely punctate between the veins, which are strongly prominent; membrane shining, slightly bronzy black, extreme basal margin stramineous; abdomen beneath shining black, with a longitudinal series of white segmental spots near each lateral margin; sternum with some obscure testaceous-brown spots; femora longly pilose, slightly nodulose near apex; abdomen moderately ampliated and raised on each side, its margins obtusely angularly sinuate.

Long. 20 mm.

Hab. Ceylon; Ritangalla (*E. E. Green*).

In colour *S. galbanus* is allied to that section of the genus represented by *S. collaris*, Fabr., but in structure is widely divergent, and belongs to the specific section characterized by the subacute and not bifid scutellar spine.

Div. Euagorasaria.

Serendiba, gen. nov.

Body elongate; head shorter than pronotum, and with a short but prominent spine behind the base of each antenna, postocular area about half as long again as anteocular area, transversely impressed between eyes and attenuated to base;

ocelli situate just behind eyes; rostrum with the first joint a little longer than second and subequal to the remaining two joints together; antennæ slender, the first joint about as long as the posterior femora; pronotum with the posterior lobe about half as long again as the anterior lobe, which is sculptured and broadly, medially, posteriorly impressed, the posterior angles longly porrectly spinous; scutellum short, robust, medially impressed at base, its apex not acuminate; anterior tibiæ straight, as long as anterior femora, shorter than posterior femora; posterior tibiæ longer than the femora.

Allied to *Villanovanus*, Dist.

Type, *S. pundaluoyæ*, Dist.

Serendiba pundaluoyæ, sp. n.

Head ochraceous or brownish ochraceous; antennæ reddish ochraceous; pronotum with the anterior lobe dull opaque greyish, the posterior lobe and hemelytra more brilliant greyish; pronotal lateral spines with their basal area pale testaceous; membrane with more than basal half iridescent; legs ochraceous, somewhat stramineous near base; abdomen beneath with piceous suffusions; pronotum with the anterior lobe sculptured, levigate, the posterior lobe finely granulose, the posterior lateral spines slightly directed backward; legs finely pilose; antennæ with the first joint as long as posterior femora and more than three times longer than second joint.

Long. 12 mm.

Hab. Ceylon; Pundaluoya (*E. E. Green*).

Lanca, gen. nov.

Body narrow, elongate; head about as long as pronotum, postocular portion much longer than anteocular, profoundly transversely incised between eyes, attenuated towards base, a short tubercle or spine behind the antenniferous tubercles; ocelli placed just behind eyes; rostrum with the first joint slightly longer than second; antennæ slender, first joint about as long as posterior femora, second joint about one third the length of first; pronotum with the anterior lobe much shorter than the posterior lobe, the latter with two moderately long, erect, discal spines, and with a long, slender, porrect spine at each lateral angle, its basal margin strongly emarginate, the anterior lobe convex, faintly medially incised, and with its anterior angles tuberculously subprominent; scutellum apically somewhat tuberculous, not spined; hemelytra not quite reaching the apex of abdomen, membrane

longer than corium ; abdomen not projecting beyond the lateral margins of the hemelytra, the sixth abdominal segment with the connexivum subangularly dilated on each side ; anterior femora slightly thickened and a little longer than the tibiæ, posterior femora and tibiæ longest and subequal in length.

Type, *L. kandyensis*, Dist.

To be placed near *Platerus*, Dist.

Lanca kandyensis, sp. n.

Pale fuscous brown ; pronotum much mottled with ochraceous pile, more thickly so on posterior lobe ; antennæ pale fuscous brown, first joint ochraceous, with its apex infuscate ; antenniferous tubercles castaneous ; eyes black ; rostrum ochraceous ; anterior femora with an obscure, subapical, greyish annulation and anterior tibiæ with a similar subbasal annulation, intermediate and posterior femora annulated and basally suffused with ochraceous, the tibiæ with a similarly coloured subbasal annulation ; body and legs shortly pilose, the abdomen beneath piceous and ochraceously pilose.

Long. 18 mm.

Hab. Ceylon (*G. Lewis*) ; Kandy (*E. E. Green*).

Div. Polididusaria.

Gallobelgicus, gen. nov.

Head moderately long, anteriorly spinously produced between the antenniferous tubercles, deeply transversely incised behind eyes, postocular portion moderately globose and with two fine moderately long spinules on each lateral margin behind eyes ; rostrum with the first joint robust and passing eyes, second joint slightly shorter and dilated at base ; antennæ slender, first joint about as long as head, thorax, and scutellum together, second joint short, shorter than third ; pronotum with the anterior lobe longer than the posterior, the first with two tubercles on each lateral margin, posterior lobe with a long, slender, slightly curved spine at each lateral angle ; scutellum with two long spines, one erect near base, the other longest and obliquely ascendant at apex ; hemelytra reaching apex of abdomen ; anterior coxæ about one third the length of anterior femora ; legs slender, anterior femora and tibiæ longly acutely spinous, the first slightly thickened ; intermediate and posterior legs unarmed, posterior femora as long as hemelytra and a little shorter than posterior tibiæ.

Type, *G. typicus*, Dist.

Gallobelgicus typicus, sp. n.

Ochraceous; hemelytra pale fuscous brown, with the veins ochraceous; second joint of antennæ narrowly creamy white at base and apex; eyes black; femora obscurely fuscously annulate near apices, structural characters as in generic diagnosis.

Long. 5 mm.

Hab. Ceylon; Peradeniya (*E. E. Green*).

LIV.—*Note on the Type Specimen of the Bat* Micronycteris microtis, *Miller*. By Marcus W. Lyon, Jun.

Micronycteris microtis was described by Mr. Gerrit S. Miller, Jun.*, in 1898 from a single specimen, which is still the only one known, in the collection of the United States National Museum. Dr. Knud Andersen † has recently raised the question as to whether the ears of the type are damaged. The following history of the type, part of which was probably not known to Mr. Miller, and remarks on the ears may prove of interest.

The specimen, an adult male, now a skin and skull, U.S. National Museum number $\frac{16366}{23364}$, was collected at Greytown, Nicaragua, by Dr. L. F. H. Birt; date of collecting not known. It was entered in the National Museum Catalogue on February 2, 1889, as an alcoholic, and the skull was catalogued on April 16, 1889. There is no record showing at what time the alcoholic was made into a skin. The wing-membranes are considerably torn and some hair has slipped from the lower back and abdomen, but otherwise the skin is in good condition. The skull is perfect. The colour-value of the skin is much lessened by the fact that it was immersed for an unknown time in alcohol or other preserving fluid. The basal portions of the hairs of *Micronycteris megalotis* are pure white. They were probably so in *M. microtis*, but the preserving fluid has apparently darkened them to a dirty white. The ears of the type of *M. microtis* measure, from meatus to apex, 12 mm., and the greatest breadth is 8 mm. The corresponding measurements in the skin of an adult male, U.S. National Museum Catalogue number 102913, from La Guaira, Venezuela, are 20 mm. and 12 mm. respec-

* Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 328 (July 12, 1898).

† Ann. & Mag. Nat. Hist. ser. 7, vol. xviii. (July 1906) p. 55, footnote.

tively. I have examined the ears of the single specimen of *M. microtis* very carefully, and can find no evidences of singeing or other apparent injury that might have caused them to shrink from 20 mm. to 12 mm. In places about $\frac{1}{2}$ mm. of the ear has been rolled or folded on itself, giving the margin of the ear a heavier appearance than in that of *M. megalotis*. The outer surface of the ear of *M. microtis* is furred about one-half the distance from the base to the tip, and in *M. megalotis* the furring extends about one-third that distance. I can detect no essential differences between the skulls of the two species. The forearm of *M. microtis*, as already noted by Miller and Andersen, is considerably shorter than that of the Mexican form of *M. megalotis* and a little smaller than in Venezuelan examples of the typical race. The same is true of the tibia and foot.

[I am glad that my note on *Micronycteris microtis*, Miller, in the July number of the 'Annals' has induced Dr. Lyon to give the above interesting details on the type specimen. But I must admit that I still do not feel satisfied that the extraordinarily small ears of this example are in their natural condition. I am all the more inclined to doubt on this point as (in addition to the case referred to in my paper, p. 55, footnote) I have recently seen another very striking instance of shrinkage of the ears in a bat: in a series of *Pipistrellus pipistrellus* from Ireland, kindly shown me a few months ago by Major Barrett Hamilton, the ear-conches of *all* examples, without exception, had shrunk to little more than half their natural size; the specimens were *preserved in alcohol* and in other respects undamaged. With their small ears they looked very strange indeed, and I cannot help thinking that if this series of bats had not been the well-known *P. pipistrellus*, but, say, a *Micronycteris*; if they had not come from Ireland, but, say, from Central America, from which material for comparison is considerably scarcer; they might easily have been described as a readily distinguishable new species, and —in view both of the very great difference in the size of the ears of these specimens as compared with individuals in a normal state of preservation, and of the fact that in this case not a single specimen only was available, but a series of individuals all exhibiting the same peculiarity—the mistake would have been very excusable. One statement in Miller's description of *M. microtis*—confirmed by Lyon—seems to me worth emphasizing, viz. that *the skull does not differ appreciably from that of M. megalotis*; it is, of course, not decisive evidence that *microtis* is not specifically distinct from *mega-*

lotis, but—taken together with the fact that also externally, apart from the size of the ears, there is no difference worth mentioning between *microtis* and *megalotis* (for even the colour of the single skin of *microtis*, on which Miller laid some stress in his description, is, according to Lyon, unreliable)—it certainly looks rather suspicious.

My argument is, briefly summed up, this:—As in two British Museum specimens of *Micronycteris hirsuta* (98. 10. 9. 13–14), preserved in alcohol, the ears, for some reason or other, have shrunk far below their natural size (my paper, *l. s. c.*); as in a series of Irish *Pipistrellus pipistrellus*, preserved in alcohol, recently shown to me, the ears, for some reason or other, have shrunk to little more than half their natural size; so, the only specimen known of *Micronycteris microtis*, which differs from *M. megalotis* in no essential external character but its curiously small ears, and the skull and dentition of which are indistinguishable from those of *M. megalotis*, may, very likely, be an example of this latter species with much shrunk ears. Whether my assumption is right or wrong cannot, I believe, be definitely proved, until further material is forthcoming from the type locality of *M. microtis*. If it is wrong, the case will stand as follows: the genus *Micronycteris*, as restricted by me, numbers four species; three of these (*M. megalotis*, *minuta*, *hirsuta*) have the ears proportionately quite of the same size, but differ in many important cranial, dental, and external characters; the fourth species (*M. microtis*) has extraordinarily small ears, *but is otherwise practically indistinguishable, cranially, dentally, and externally, from M. megalotis*! All is possible, but strange as the characters of this latter "species" look to me, I still think it safer, for the present, to leave the question as to its validity open to doubt.—Knud Andersen.]

LV. — *Descriptions of new* Pyralidæ *of the Subfamilies* Hydrocampinæ *and* Scoparianæ. By Sir George F. Hampson, Bart., B.A., F.Z.S., &c.

The following paper is supplementary to my classification of these two subfamilies in the Trans. Ent. Soc. Lond. 1897, pp. 127–240, and the numbers prefixed to the species indicate their position in the genera there dealt with.

Hydrocampinæ.

For *Mixophila*, Meyr., insert Gargela, Wlk., xxix. 815 (1864), which has precedence.

(1.) Gargela renatusalis, insert (syn.) *Gargela subpurella*, Wlk. xxix. 815 (1864).

(2 *a*.) *Gargela cuprealis*, sp. n.

♂. Head and thorax cupreous yellow mixed with some white; palpi white, the second and third joints with black bands; legs white, the fore tibiæ and the tarsi banded with black; abdomen yellowish, dorsally suffused with fuscous, the ventral surface white with black segmental lines and extremity. Fore wing cupreous yellow, the costal and terminal areas more or less suffused with fuscous; a dark antemedial line oblique from costa to submedian fold, then slightly incurved; a black discoidal point; an indistinct postmedial line excurved from costa to vein 4, then incurved; a dark terminal line; cilia cupreous, with dark line through them and whitish tips. Hind wing fuscous brown with a cupreous gloss; cilia cupreous, with a dark line through them and whitish tips; the underside white slightly tinged with brown, a black point at upper angle of cell, a more or less distinct dark postmedial line oblique from costa to vein 4, then curved inwards and sinuous to inner margin, a more or less diffused blackish terminal line; cilia white, with a dark line through them.

Hab. S.E. Borneo (*Doherty*), 1 ♂; Pulo Laut (*Doherty*), 1 ♂ type. *Exp.* 14 mm.

(5.) *Gargela arcualis*, sp. n.

Mid tibiæ of male dilated, with fringe of long hair.

♂. Head and thorax silvery white; palpi above and antennæ tinged with orange-brown; tarsi banded with orange-brown; abdomen white, slightly tinged with brown on dorsum, the anal tuft with some fuscous hair. Fore wing silvery white; an oblique orange line from middle of costa to lower angle of cell, and two oblique lines from costa beyond middle to vein 5 near termen; a curved black-brown fascia from middle of inner margin to just before termen at vein 2, broken up into two spots above inner margin and one before termen, where there is some orange beyond it; a fine black terminal line from apex to vein 6; cilia dark

brown, with a golden gloss at middle and at tips towards apex. Hind wing white.

Hab. New Guinea, Milne Bay (*Meek*), 2 ♂ type. *Exp.* 18 mm.

Genus Argyractis.

As many species hitherto placed in *Cataclysta* belong to this genus, the following revision becomes necessary.

Sect. I.—Fore wing with veins 3, 4 stalked.

(1.) *Argyractis malayalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with fulvous brown; abdomen with slight brown segmental bands; pectus and ventral surface of abdomen white. Fore wing whitish suffused with fulvous yellow and thickly irrorated with black-brown scales except terminal area; a slight diffused dark subbasal band; an oblique dark antemedial line, defined by whitish on inner side and slightly angled outwards below costa and at median nervure; an oblique yellow discoidal lunule; a dark postmedial line forming a wedge-shaped mark on costa, oblique to vein 3, then retracted to discoidal lunule and again oblique, the area beyond it yellow suffused with brown on costal half before the wedge-shaped white subterminal band from costa, defined by black on outer side extending to vein 4, and followed by a diffused dark line angled inwards in submedian fold, below which there is a whitish mark on it; a blackish spot at apex and terminal series of minute dentate marks; cilia dark brown, with slight whitish line at base. Hind wing fulvous yellow, with oblique diffused blackish band from costa near base to tornus; two fine oblique black medial lines filled in with white from costa to submedian fold, the area beyond them whitish thickly irrorated with black-brown; two fine black lines from costa beyond middle, very oblique to below apex, then sinuous and ending on termen at submedian fold; four black spots on medial part of termen, with black lunules before them, with white points on them between the spots; cilia black at base, with a bluish silvery gloss, yellowish at tips, with blackish patch at middle.

Hab. Selangor, Kuala Lumpur (*Durham*), 1 ♀ type. *Exp.* 22 mm.

Sect. II.—Hind wing with veins 3, 5 stalked.

(2.) *Argyractis bifascialis*, Rob. Ann. Lyc. N. Y. ix. p. 153, pl. iv. fig. 3.

Texas.

Sect. III.—Hind wing with veins 3, 5 from cell.

A. Abdomen of male with lateral fans of large scales at base covering tufts of long hair.

(3.) *Argyractis lophosomalis*, sp. n.

Head and thorax white mixed with some golden brown; abdomen white, with brown band on second segment, incomplete dorsally, and some brown on medial segments, the tufts of hair fuscous. Fore wing white; the base of costa golden brown, expanding into a small subbasal spot and patch before the antemedial line; a small subbasal spot below the cell and patch on inner area before the antemedial line, which is slightly excurved below costa and submedian fold; the medial costal area brown, with a blackish patch below it almost filling end of cell; postmedial line incurved from costa to vein 4, then retracted to below end of cell and outwardly oblique to inner margin near tornus, a large, oblique, oval, brown patch beyond it between vein 4 and tornus; a wedge-shaped brown subterminal band from costa to the oval patch; a fine black terminal line; cilia golden yellow, with fine black line at tips. Hind wing white, with waved antemedial brown band from discal fold to inner margin, followed by a fine medial black line angled outwards in submedian fold and on vein 1, some black irroration beyond it below costa, bounded below by a slight, oblique, waved line; terminal area golden yellow-brown from below apex to submedian fold, with slight brown line on its inner edge from discal fold to submedian fold and some silver scales on termen and in submedian interspace; a subterminal series of black points from vein 7 to 2 and four small spots on middle of termen; the underside white, with subterminal series of five black points on the veins.

Hab. S. Brazil, Organ Mts., Tijuca (*Wagner*), 4 ♂ type. *Exp.* 20 mm.

(4.) *Argyractis danœalis*, sp. n.

Cataclysta opulentalis, Druce, Biol. Centr.-Am., Het. ii. p. 272 (part.), nec Led.

♂. Head, thorax, and abdomen orange-yellow; pectus,

legs, and ventral surface of abdomen whitish, the fore femora and tarsal joints with dark rings. Fore wing orange, the costal area suffused with fulvous; a diffused fulvous subbasal band; a nearly straight, erect, antemedial white line defined on each side by diffused fuscous; an oblique white postmedial band from costa to vein 3, where it nearly meets a subterminal white band from costa, the space between them filled in with rufous; a diffused rufous and whitish patch in extremity of submedian fold; cilia dark. Hind wing orange, with subbasal silvery marks below the cell and on inner margin and medial marks at end of cell and on inner margin; a faint rufous medial band; a terminal series of three deep chocolate-red conjoined, irregular, ocellate spots with silvery markings on and between them and slight white patch above the two upper spots; cilia fuscous, whitish at tips; the underside with the chocolate-red spots more broken up.

Hab. Mexico, Tabasco, Teapa (*H. H. Smith*), 4 ♂ type, Godman-Salvin Coll. *Exp.* 12 mm.

B. Abdomen of male normal.

(5.) *Argyractis pervenustalis,* Hmpsn. Trans. Ent. Soc. 1897, p. 152.

W. Africa.

(6.) *Argyractis triopalis,* sp. n.

Head, thorax, and abdomen white slightly tinged with pale brown. Fore wing orange-yellow, the basal area and costal area to middle silvery whitish; a black subbasal point on inner margin; an oblique silvery-white wedge-shaped mark defined by a slight brown line from costa beyond middle to vein 3, its inner edge with black point at costa and curved downwards in upper end of cell; a subterminal silvery-white wedge shaped band from costa to vein 3, defined by diffused brown on inner side and by a slight brown line on outer; a terminal series of slight black striæ; cilia silvery white tinged with brown. Hind wing white; a broad orange-yellow band before the obliquely incurved brown medial line; two black subterminal lines, slightly excurved below costa, then incurved and ending at submedian fold; three large black ocelli on termen, with silvery-blue scales on and between them, connected by short oblique black lines and with black line from costa to subapical ocellus; cilia

white, fuscous at base beyond the ocelli and with fuscous tips.

Hab. Sierra Leone (*Clements*), 2 ♂, 2 ♀ type; Nigeria, Old Calabar (*Crompton*), 3 ♀, Warri (*Roth*), 1 ♀. *Exp.* 14 mm.

(7.) *Argyractis pentopalis*, sp. n.

♀. Head, thorax, and abdomen whitish tinged with yellow-brown; pectus and ventral surface of abdomen white. Fore wing white suffused in parts with yellow-brown and with pale yellow from upper angle of cell to middle of termen; a small subbasal brown mark on inner margin; a very indistinct diffused brown antemedial line; an indistinct oblique diffused brown medial line, slightly excurved at middle; postmedial line indistinct, very oblique from costa to vein 4, then retracted to upper angle of cell, oblique to submedian fold, where it is angled outwards, then retracted to inner margin; a white subterminal band defined on each side by brown from costa to vein 4, and an indistinct white spot defined by brown above tornus; a fine dark terminal line; cilia yellowish white. Hind wing white; an orange-yellow fascia from origin of vein 2 to tornus, with slight brownish mark below it on middle of inner margin and dark line beyond it from below costa to submedian fold; two black subterminal lines, excurved below costa and ending at submedian fold; five black ocelli on termen with silvery-blue centres, the upper and lower pairs conjoined and the lowest ocellus small; an oblique black line from outer subterminal line at costa to subapical ocellus; cilia brownish at base, silvery white at tips.

Hab. Sierra Leone (*Clements*), 2 ♀ type. *Exp.* 12–14 mm.

(8.) *Argyractis chrysopalis*, sp. n.

Cataclysta opulentalis, Druce, Biol. Centr.-Am., Het. ii. p. 272 (part.), nec Led.

Head, thorax, and abdomen golden yellow tinged with fulvous; pectus, legs, and ventral surface of abdomen whitish. Fore wing orange-yellow, the costal area tinged with fulvous; an oblique, ill defined, silvery-white antemedial band; a whitish fascia in and beyond end of cell, interrupted by an oblique orange discoidal bar, defined on each side by brown; a white patch in submedian fold below end of cell, irrorated by some dark scales; an oblique wedge-shaped whitish band from costa to vein 4, with blackish spot

on its inner edge at costa, almost meeting a wedge-shaped white subterminal band, defined on each side by fuscous lines and ending at vein 4; a short silvery-white streak in terminal part of submedian fold; a dark terminal line; cilia whitish. Hind wing orange-yellow; an oblique silvery-white bar across end of cell; a series of four irregular ocellate black spots on termen, with golden metallic marks between them, the three upper spots defined above by a waved white band with two slight black striæ on it below costa; cilia whitish.

Hab. Mexico, Tabasco, Teapa (*H. H. Smith*), 2 ♂ type, Godman-Salvin Coll. *Exp.* 10 mm.

(9.) *Argyractis opulentalis*, Led. Wien. ent. Mon. 1863, p. 453, pl. xviii. fig. 17.

Cataclysta divisalis, Wlk. xxxiv. 1336.

Grenada, Colombia, Br. Guiana, Brazil.

(10.) *Argyractis æglesalis*, Wlk. xix. 952.

Brazil.

(11.) *Argyractis hamiferalis*, sp. n.

Cataclysta æalis, Druce, Biol. Centr.-Am., Het. ii. p. 272 (part.), nec Wlk.

Head, thorax, and abdomen white irrorated with red-brown; palpi blackish; fore legs blackish in front; abdomen with brown dorsal spots on first three segments and slight segmental rings, the extremity yellow. Fore wing with the costal area rufous; the basal inner area whitish irrorated with rufous; a slight antemedial white line from costa to submedian fold defined on each side by brown, the area beyond it yellow on inner half; the end of cell whitish; two oblique brown discoidal striæ, the outer continued as an oblique line to vein 3 near termen, where it is met by a brown line from costa near apex defined by white on outer side, thus forming a V-shaped mark, its apex filled in with white; a wedge-shaped white band defined on each side by brown lines from costa before apex to submedian fold, where it emits a short silvery streak inwards; termen golden yellow; cilia brown. Hind wing yellow, the inner area white, with some brown on vein 1 towards tornus and some brown irroration in end of cell; an oblique silver band across end of cell from below costa to submedian fold and another band beyond the cell; four conjoined black ocelli

on termen with metallic spots on them, defined above by a waved black line, before which is a white patch with fine, slightly irregular, oblique black line on it from below apex to vein 3; cilia white, brown towards apex.

Hab. Mexico, Tabasco, Teapa (*H. H. Smith*), 1 ♂, 3 ♀: Vera Cruz, Atoyac (*H. H. Smith*), 2 ♂ type, Godman-Salvin Coll. *Exp.* 14 mm.

(12.) *Argyractis inaurata*, Cram. Pap. Exot. iv. p. 135, pl. ccclix. G.

Surinam.

(13.) *Argyractis æalis*, Wlk. xix. 953.

Cataclysta gemmiferalis, Led. Wien. ent. Mon. 1863, p. 454, pl. xviii. fig. 8.

Centr. America, W. Indies, Venezuela, Brazil.

(14.) *Argyractis pavonialis*, Hmpsn. Trans. Ent. Soc. 1897, p. 150.

Guadalupe, Brazil, Peru.

(15.) *Argyractis fulvicinctalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 150.

Jamaica.

(16.) *Argyractis axis*, Hmpsn. Trans. Ent. Soc. 1897, p. 149.

W. Indies, Peru.

(17.) *Argyractis constellalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 151.

Brazil.

(18.) *Argyractis niphoplagalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 136.

Panama, Dominica.

(19.) *Argyractis catenalis*, Guen. Delt. & Pyr. p. 267.

Mexico, Brazil.

(20.) *Argyractis leucogonialis*, sp. n.

Cataclysta cerrussalis, Druce, Biol. Centr.-Am., Het. ii. p. 273 (part.), nec Feld.

♀. Head and thorax rufous mixed with black and some

white; legs whitish; abdomen pale rufous, the ventral surface whitish. Fore wing deep rufous; the basal area, except costa, whitish thickly irrorated with large black scales; the medial area nearly pure white, with two small rufous spots on costa; the area in and beyond end of cell thickly irrorated with dark brown; a narrow oblique white band from costa beyond middle to vein 2, where it nearly meets a subterminal white band, thus forming a large V-shaped mark; a terminal orange band not quite reaching tornus; a dark brown spot at apex; cilia white, with series of brown points at base. Hind wing white; the basal area and the area from lower angle of cell to apex irrorated with black-brown; a series of about six small black spots on and just before termen from below apex to vein 2, with metallic scales between them and an irregularly waved dark line just before them; cilia white, with a slight dark line near base from apex to vein 1; the underside white, with series of five small black spots just before termen from apex to vein 2.

Hab. Panama, Chiriqui (*Champion*), 1 ♀ type, Godman-Salvin Coll. *Exp.* 24 mm.

(21.) *Argyractis albipunctalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 152.

Madagascar.

(22.) *Argyractis supercilialis*, Hmpsn. Trans. Ent. Soc. 1897, p. 152.

Madagascar.

(23.) *Argyractis coloralis*, Guen. Delt. & Pyr. p. 265.

Mauritius.

(24.) *Argyractis cronialis*, Druce, Biol. Centr.-Am., Het. ii. p. 274, pl. lxiii. fig. 18.

Mexico.

(25.) *Argyractis longipennis*, sp. n.

Cataclysta cronialis, Druce, Biol. Centr.-Am., Het. ii. p. 274 (part.).

♀. Grey; head and thorax tinged with brown. Fore wing long and narrow, with the costal half and middle of inner area suffused with brown, except for grey patches irrorated with fuscous in end of cell and beyond disco-cellulars; an obscure double medial line, highly angled and

sending a spur to termen at middle; a black-edged yellow discoidal lunule; a triangular fulvous patch on costa before apex, defined by a fine white line on inner side and a broad line on outer, its apex on the small wedge-shaped leaden spot at termination of the streak from medial line; a black-edged terminal yellow line. Hind wing with brown-edged silvery discoidal band, with yellow mark on its inner edge; the apical area strongly irrorated with black scales; seven black spots with silver spots between them on apical part of termen; the inner area slightly irrorated with black and with a brown mark near tornus.

Hab. Mexico, Jalapa (*Trujillo*), 9 ♀, Godman-Salvin Coll.; Orizaba, Jalapa (*Schaus*), 1 ♀ type. *Exp.* 32 mm.

(26.) *Argyractis fulicalis,* Clem. Pr. Ac. N. Sci. Phil. 1860, p. 217.

Cataclysta angulatalis, Led. Wien. ent. Mon. 1863, p. 486.
Cataclysta confusalis, Wlk. xxxiv. 1234.

U. S. A.

(27.) *Argyractis annulalis,* Guen. Delt. & Pyr. p. 266.

Centr. America, Brazil.

(28.) *Argyractis samealis,* Feld. Reis. Nov. pl. cxxxvi. fig. 14.

Brazil.

(29.) *Argyractis gratalis,* Wlk. xxxiv. 1335.

Cataclysta cerussalis, Feld. Reis. Nov. pl. cxxxvi. fig. 8.

Mexico, W. Indies, Br. Guiana, Brazil.

(30.) *Argyractis schistopalis,* sp. n.

Cataclysta æalis, Druce, Biol. Centr.-Am., Het. ii. p. 272 (part.), nec Wlk.

Head and thorax ochreous suffused with red-brown; abdomen ochreous slightly banded with brown. Fore wing whitish thickly irrorated with dark brown; the base of costal area suffused with brown; an antemedial whitish band defined on each side by indistinct brown bands on costal half and yellowish bands on inner half; two oblique brown discoidal striæ; a rather oblique yellow fascia from below end of cell to termen; two wedge-shaped white bands from costa before apex to vein 3, where they nearly meet, defined on each side by brown and with yellow before, between, and

beyond them; cilia whitish tinged with brown. Hind wing white; the basal area tinged with brown; an oblique silver band across lower angle of cell, with some yellow before and beyond it; two slight somewhat irregular dark lines from costa near apex to lower angle of cell; four ocelli on termen between apex and vein 2, broken up into small black spots by metallic, somewhat annulate markings; cilia whitish tinged with brown.

Hab. Mexico, Tabasco, Teapa (*H. H. Smith*), 2 ♂, 1 ♀ type, Godman-Salvin Coll. *Exp.* 14 mm.

(31.) *Argyractis capensis*, sp. n.

Head, thorax, and abdomen ochreous yellow; palpi with some blackish at side of second joint; tibiæ, tarsi, and ventral surface of abdomen whitish. Fore wing ochreous yellow irrorated with brown; a diffused, oblique, antemedial, fuscous-brown line; a medial brown line, oblique and defined by whitish on inner side from costa to median nervure, then inwardly oblique and with a yellow band on inner side; an oblique wedge-shaped yellow spot defined by blackish at end of cell; an oblique postmedial brown line from costa to vein 5, defined by whitish on outer side; a silvery-white subterminal band, with black line on its outer edge from costa to vein 4; a short silvery streak in extremity of submedian fold; the terminal area yellow; a terminal series of slight black points; cilia fuscous. Hind wing whitish; a subbasal band formed of two diffused brown spots; a medial yellow band, defined on each side by brown from below costa to inner margin near tornus, and slightly angled at submedian fold; postmedial area irrorated with black down to vein 2; two fine sinuous subterminal lines; four ocellate black spots on middle of termen, with some silvery blue on and between them and two fine black lines between costa and the uppermost spot; the termen yellow towards tornus confluent with the postmedial band; cilia fuscous and silvery white.

Hab. Mashonaland, Salisbury (*Marshall*), 1 ♂; Natal, Pietermaritzburg (*Bowker*), 1 ♀; Durban, 1 ♀; Cape Colony, Annshaw (*Miss F. Barrett*), 1 ♀ type. *Exp.* 16–20 mm.

(32.) *Argyractis nandinalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with fulvous yellow; abdomen with the ventral surface white. Fore wing whitish tinged with fulvous yellow; basal costal

area brown; a rather diffused brown antemedial band, angled outwards on median nervure, then incurved; an oblique white discoidal lunule defined by brown and with brown bar from it to costa; a diffused brown postmedial band defined by whitish on outer side, somewhat angled inwards below costa, then obliquely excurved to vein 3, interrupted to vein 2, then oblique and enclosing a whitish spot below submedian fold; a wedge-shaped white subterminal band, defined by brown on inner side and by a black line on outer, with small brown spot above it on costa and some diffused brown below it at tornus; a terminal series of black striæ; cilia silvery white. Hind wing white; a diffused brown mark on middle of median nervure; a diffused yellow band beyond the cell from below costa to submedian fold, followed by a patch of black irroration; two fine, incurved, slightly waved, subterminal black lines between veins 6 and 2; three ocellate black spots on middle of termen, with some silvery-blue scales between them and a spot below them; cilia pale brown, black-brown beyond the ocelli.

Hab. Br. E. Africa, Eb Urru (*Betton*), 1 ♀ type. *Exp.* 26 mm.

(33.) *Argyractis tetropalis*, sp. n.

Head, thorax, and abdomen yellowish white tinged with brown. Fore wing pale yellowish, with orange-yellow band before the antemedial line, the terminal area orange-yellow; basal part of costal area brown, interrupted by a pale striga representing the subbasal line; a brown subbasal point on inner margin; antemedial line double, brown, excurved from costa to submedian fold, then incurved; medial area irrorated with brown scales; postmedial line blackish, defined by white on outer side, oblique from costa to vein 4, then retracted to below costa and forming a wedge-shaped mark, then obliquely excurved to vein 1 and very oblique to inner margin, along which it runs to antemedial line; a subterminal white band, defined on each side by silvery grey from costa to vein 4 and a silvery spot above tornus; some minute black points on termen towards apex; cilia silvery grey. Hind wing white; an orange-yellow band tinged with brown before the double antemedial line, which is oblique from costa to submedian fold, then retracted to inner margin; costal half of medial area irrorated with black-brown scales, with traces of an obliquely curved line below costa; subterminal line double, black, slightly excurved below costa, then incurved and ending at submedian fold near termen;

two pairs of black ocelli on termen, with silvery-blue centres, a black line from costa to inner edge of subapical ocellus angled outwards below apex.

Hab. Nigeria, Yorubaland, Ogbomoso (*Carter*), 2 ♂, 1 ♀ type. *Exp.* 10–14 mm.

(34.) *Argyractis onyxalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 149.

Mexico, W. Indies, Venezuela.

(35.) *Argyractis moniligeralis*, Led. Wien. ent. Mon. 1863, p. 454, pl. xviii. fig. 10.

W. Indies, Honduras, Colombia.

(36.) *Argyractis pyropalis*, Gueu. Delt. & Pyr. p. 265.

Brazil.

(37.) *Argyractis cæsalis*, Wlk. xxix. 952.

Brazil.

(38.) *Argyractis insulalis*, Wlk. Trans. Ent. Soc. Lond. (3) i. p. 123.

Haiti, Brazil.

(39.) *Argyractis pantheralis*, Wlk. xvii. 442.

Brazil.

(40.) *Argyractis premalis*, Druce, Biol. Centr.-Am., Het. ii. p. 272, pl. lxiii. fig. 11.

Mexico, Brazil, Argentina.

(41.) *Argyractis albulalis*, sp. n.

♂. Head, thorax, and abdomen white; palpi and antennæ brownish; fore tibiæ and tarsi banded with brown; abdomen with dark brown dorsal band on second segment, the medial segments tinged with brown. Fore wing white, the costal area suffused with golden brown interrupted at places by white; the antemedial line represented by a brown patch on costa and oblique band from submedian fold to inner margin, followed by a slight medial line interrupted at middle; two oblique brown discoidal striæ; an oblique white band slightly defined by brown from costa beyond middle to vein 3, where it almost meets a similar subterminal band

with some silvery scales on its lower part, thus forming a V-shaped mark ; a slight oblique dark striga from submedian fold beyond middle to inner margin ; a slight silver streak above tornus. Hind wing white ; two brown striæ on inner area above tornus ; a yellow patch in and below end of cell, with brown point on its inner edge and oblique silver band followed by a brown band on its outer edge ; two inwardly oblique dark lines from costa near apex to lower angle of cell, with black irroration between them ; three black spots on medial part of termen, with incomplete metallic annuli on them, the lowest spot double.

Hab. Jamaica, Runaway Bay (*Walsingham*), 1 ♂ type. *Exp.* 16 mm.

(42.) *Argyractis subornata,* Hmpsn. Trans. Ent. Soc. 1897, p. 151.

Brazil, Argentina.

(43.) *Argyractis harpalis,* Snell. Tijd. v. Ent. xliii. p. 296, pl. xvii. fig. 1 (1900).

Hydrocampa endoralis, Druce, Biol. Centr.-Am., Het. ii. p. 275 (part.), nec Wlk.

Mexico, Guatemala, Costa Rica, Panama.

(44.) *Argyractis micropalis,* sp. n.

Hydrocampa endoralis, Druce, Biol. Centr.-Am., Het. ii. p. 275 (part.), nec Wlk.

♂. Head, thorax, and abdomen white, the thorax tinged in parts with brown, the tarsi with slight brown rings ; abdomen with paired dorsal black spots on first segment. Fore wing white ; subbasal black points on costa and inner margin followed by a larger black spot on inner margin ; the first line medial, brown, angled outwards below costa, then oblique and with black point on it below the cell ; the second line double, very obliquely excurved from costa to vein 4, then almost obsolete, strongly retracted and forming two small blackish spots in submedian fold, a triangular golden-brown patch beyond it from costa ; a fine dark brown subterminal line bent outwards to apex and ending at vein 4, the base of cilia beyond it golden yellow, the cilia fuscous at tips except towards tornus. Hind wing white ; a black subbasal point above inner margin ; a fine curved black antemedial line ; a blackish subterminal striga below costa with black point beyond it ; three small black spots before middle of termen on a golden-yellow patch bounded on inner

side by an irregularly dentate brown line; a slight subapical dark striga with some golden yellow beyond it; the cilia with slight dark line through them from apex to submedian fold.

Hab. Mexico, Tabasco, Teapa (*H. H. Smith*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 12 mm.

(45.) *Argyractis lanceolalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 140.

Brazil.

(46.) *Argyractis argentilinealis*, Hmpsn. Trans. Ent. Soc. 1897, p. 136.

Brazil.

(47.) *Argyractis parthenodalis*, sp. n.

♂. Head, thorax, and abdomen brown mixed with some white and black, the abdomen with slight whitish dorsal segmental lines. Fore wing white suffused and irrorated with golden brown leaving the medial area nearly pure white; a curved blackish subbasal line; antemedial line blackish, rather diffused, excurved below costa, then oblique; postmedial line defined by white on outer side, strong and black towards costa, very slightly angled outwards below costa, strongly and acutely angled outwards at vein 6, then retracted and angled inwards in submedian fold and again angled outwards above inner margin; a fine subterminal black line defined by white on inner side, bent outwards to apex, excurved at middle and slightly angled inwards in submedian fold; cilia yellowish at base, with a black line through them and whitish tips. Hind wing white; a diffused blackish antemedial band; a black medial line excurved at middle and inner margin; a sinuous black postmedial line with two diffused wedge-shaped black spots before it below costa, the area beyond it with some diffused blackish marks, the termen suffused with brown, with a fine black terminal line from apex to vein 2 and indented at discal fold.

Hab. Argentina, Tucuman, Los Vasquez (*Dinelly*) 1 ♂ type. *Exp.* 12 mm.

(48.) *Argyractis iasusalis*, Wlk. xix. 951.

Cataclysta phoxopteralis, Snell. Tijd. v. Ent. xliii. p. 295, pl. xvi. ff. 11, 12 (1901).

Brazil.

(49.) *Argyractis metazonalis*, sp. n.

♂. Head and thorax white almost entirely suffused with fuscous; third joint of palpi, tibiæ, and tarsi white; abdomen whitish, with the base, terminal segments, and slight segmental lines fuscous. Fore wing white almost entirely suffused with fuscous brown; a black discoidal lunule; an obliquely curved black band from costa before apex to middle of inner margin; a curved subterminal line from below apex; a terminal fulvous band defined by brown lines; cilia brown with black line through them, and black points towards apex. Hind wing white with subbasal and postmedial black bands, the latter arising from below costa; a terminal fulvous band edged by black lines and with two white and black ocelli below apex; cilia whitish with a black line through them.

Hab. Brazil, São Paulo. *Exp.* 18 mm. Type in Coll. Rothschild.

(50.) *Argyractis nigerialis*, sp. n.

Fuscous black; abdomen with slight pale segmental dorsal bands. Fore wing with traces of oblique paler medial line slightly excurved at median nervure; a diffused black discoidal spot; a more distinct pale postmedial line oblique from costa to vein 3 near termen, then strongly dentate inwards and excurved again; an obscure apical fulvous patch with dark-edged leaden band on it from below costa to vein 5 and a small fulvous patch above tornus. Hind wing with obscure fulvous patch in cell and diffused black discoidal spot with indistinct pale sinuous line from it to inner margin; a dark-edged pale postmedial line angled outwards below costa and at vein 1, the area beyond it black with a fulvous terminal band with four silver and black ocelli on it.

Hab. Nigeria, Warri (*Roth*), 1 ♂ type. *Exp.* 16 mm.

(51.) *Argyractis leucostrialis*, sp. n.

♂. Head and thorax black-brown; abdomen whitish with diffused black-brown bands; legs whitish and black-brown. Fore wing black-brown; a whitish antemedial band formed by short streaks in the interspaces; a small white discoidal lunule; a whitish medial band formed by streaks in the interspaces from cell to inner margin; a curved postmedial band formed by short white streaks in the interspaces between veins 7 and 3, a bar in submedian interspace and point above inner margin; a subterminal band formed by

short white streaks in the interspaces; cilia whitish and dark brown. Hind wing white slightly tinged with brown; an indistinct double oblique brown antemedial line from below costa to above tornus, where it is met by a rather more distinct double sinuous postmedial line; a brown terminal line; cilia white with a dark line through them.

Hab. Sierra Leone (*Clements*), 1 ♂ type. *Exp.* 16 mm.

(52.) *Argyractis nymphulalis*, sp. n.

♂. Head and thorax fuscous brown; abdomen pale brownish. Fore wing fuscous brown; diffused whitish antemedial and medial shades; an obscure medial black line angled below costa and incurved below cell; the postmedial line strongly angled outwards at vein 5, then bent inwards to below angle of cell; a subterminal series of white points. Hind wing fuscous.

Hab. Natal, Kimbolton (*Hutchinson*), 2 ♂ type. *Exp.* 18 mm.

(3.) *Eristena oligostigmalis*, sp. n.

Hind femora of male short with fringe of long hair behind; hind wing with the termen excised at discal fold, then lobed.

Head, thorax, and abdomen yellow mixed with white; palpi blackish at tips; fore femora and tibiæ above blackish; the fringe of hair on hind femora of male black and whitish. Fore wing orange; a white fascia below the cell extending just into its lower part and at base to vein 1, at extremity expanding to the postmedial band and to above inner margin near tornus; a black spot on costa above end of cell; a slightly incurved white band from costa beyond middle to above tornus, slightly defined on inner side by fuscous except towards costa; a white subterminal band defined by a fuscous line on inner side and a fine black line on outer, meeting the postmedial band above tornus; a fine black terminal line expanding into a spot at apex; cilia brownish white. Hind wing orange; an oblique white medial band from just beyond end of cell to just above middle of inner margin, defined by blackish lines on each side; a fine black terminal line interrupted by three small black spots between veins 5 and 2, the uppermost spot with a small white spot on inner side, the line very fine and double towards apex with a small white lunule on its inner side at apex; cilia white with a fuscous line near base from vein 5 to tornus.

Hab. Andamans (*Rogers*), 1 ♂, 1 ♀ type. *Exp.* 20 mm.

(4.) *Eristena trigonalis*, sp. n.

♀. Head, thorax, and abdomen white tinged with yellow. Fore wing pale yellow; the costal area reddish brown to beyond middle, expanding into a triangular patch on discocellulars, with white streak before it in cell and defined on outer side by a white band; a very oblique brown line from middle of vein 1 to inner margin before middle; a silvery-white subterminal band defined on each side by fine fuscous lines from costa to submedian fold; a terminal series of black points; cilia silvery white. Hind wing with the basal half white, the terminal half pale yellow; a slight oblique black line beyond lower angle of cell from vein 5 to submedian fold; five small black spots on middle of termen defined on inner side by silvery-white lunules, then by a minutely waved brown line connected with costa by a silvery line, some orange on termen between the spots; cilia silvery white.

Ab. 1.—Fore wing with the area between the discoidal triangular patch and subterminal band red-brown.

Hab. N. Guinea, Kapaur (*Doherty*), 4 ♂ type. *Exp.* 20 mm.

(4.) *Arxama ochracealis*, sp. n.

♀. Fore wing with vein 11 shortly stalked with 8, 9, 10. Head and thorax pale brownish ochreous; abdomen ochreous white. Fore wing pale brownish; an indistinct, very oblique, sinuous, fuscous, antemedial line; a black discoidal point; an indistinct, irregularly dentate, postmedial line, bent outwards below costa and angled inwards in submedian fold; a terminal series of black points. Hind wing white slightly tinged with ochreous; traces of a curved postmedial line; a terminal series of black points.

Hab. N. Borneo, Mt. Mulu (*Hose*). *Exp.* 26 mm. Type in Coll. Rothschild.

(5.) *Arxama cretacealis*, sp. n.

Hind wing with vein 5 from lower angle of cell and approximated to 4 for a short distance.

♂. Head, thorax, and abdomen white faintly tinged with brown; second joint of palpi at sides and maxillary palpi except tips black; fore and mid femora above with some black; tarsi banded with black above. Fore wing white, the costal area faintly tinged with rufous, the costal edge black; a black discoidal point; a slight white striga from

costa before apex with black points on each side of it at costa; a pale brownish terminal band suffused with silver; black terminal points at discal and submedian folds; cilia blackish and silvery at base, whitish at tips. Hind wing white faintly tinged with brown; a terminal series of blackish striæ; the underside with slight discoidal point and curved postmedial line strongly bent inwards to costa.

Hab. Solomon Is., Florida (*Meek*), 1 ♂ type. *Exp.* 18 mm.

(34 *a*.) *Nymphula expatrialis*, sp. n.

♀. Head and thorax purplish fuscous; abdomen fuscous. Fore wing fuscous suffused with purplish grey, leaving obscure dark patches at base, an antemedial line bent outwards below median nervure; a discoidal patch with line from it to inner margin angled inwards on vein 1; a postmedial band expanding towards costa and slightly bent inwards at vein 2; a terminal band. Hind wing white, the inner margin fuscous; a subterminal band from costa to vein 2 confluent at apex with the terminal band which terminates before tornus.

Hab. New Guinea, Humboldt Bay (*Doherty*), Milne Bay (*Meek*), 1 ♀; Fergusson I. (*Meek*), 1 ♀ type. *Exp.* 30–40 mm.

(52 *a*.) *Nymphula polystictalis*, sp. n.

♀. Head, thorax, and abdomen white slightly tinged with brown; fore tarsi with slight fuscous rings. Fore wing white tinged with pale reddish brown except on costal and postmedial areas; a subbasal fuscous spot on costa; an antemedial fuscous spot on costa and traces of a diffused mark on vein 1; a fuscous discoidal spot; a fuscous postmedial band from costa to vein 4, then curved inwards and with diffused brown patch extending to lower angle of cell; a curved brown subterminal line, the area beyond it tinged with yellow; a fine brown terminal line; cilia brownish. Hind wing white tinged with pale brown; a series of six subterminal black spots between vein 7 and submedian fold; cilia pale brown.

Hab. Ron I. (*Doherty*), 1 ♀; N. Guinea, Milne Bay (*Meek*), 1 ♀ type. *Exp.* 20 mm.

(2.) *Symphonia albioculalis*, sp. n.

Antennæ of male annulate.

♂. Head, thorax, and abdomen black-brown, some white on frons and vertex of head; antennæ ringed white and

black; palpi black, white at base; pectus, legs, and ventral surface of abdomen white; fore tibiæ with brown band at extremity. Fore wing dark brown with a metallic-blue gloss, the medial area yellowish except towards costa; antemedial line dark, defined by yellowish on inner side; a quadrate white spot in end of cell defined by blackish on each side; postmedial line dark, defined by yellowish on outer side, expanding into a spot at costa, the line excurved between veins 5 and 2, then retracted to below angle of cell; cilia with whitish line at base, wholly white above tornus. Hind wing with the basal half pale yellowish, the terminal half dark brown with a metallic-blue gloss; two slight subbasal black spots; a black discoidal lunule; postmedial line dark, defined by yellowish on outer side, excurved between veins 5 and 2; cilia whitish at submedian interspace.

Hab. Nigeria, Old Calabar (*Crompton, Sampson*), 3 ♂ type. *Exp.* 14 mm.

(1 *a*.) *Cataclysta euclidialis*, sp. n.

Antennæ of male much longer than fore wing; fore wing with a very large fovea in and below end of cell on underside; hind wing with vein 8 becoming coincident with 7.

♂. Head, thorax, and abdomen white tinged in parts with red. Fore wing whitish mostly suffused with red; an indistinct postmedial line from costa to vein 3. Hind wing white with diffused blood-red before and beyond a white postmedial band which is broad from costa to vein 2, where it is bent inwards, then narrower and oblique to termen at vein 1. Underside of fore wing white, subbasal, antemedial, medial, and postmedial red marks on costa, the medial part of costal area yellow; a large triangular yellow patch from costa beyond middle to vein 2 enclosing a wedge-shaped white patch from costa; a triangular red patch on termen between veins 5 and 2 with its apex at vein 6; hind wing white with faint brownish suffusion from costa towards apex.

♀. More suffused with red; hind wing wholly suffused with red except the base and postmedial band, which is narrower; cilia with a red line near base; underside of fore wing with the markings yellower and less red, yellow patches in middle of cell and below cell at middle and extremity, the costal area yellow towards apex; hind wing with yellowish patch on middle of costa and band across apical area.

Hab. Nigeria, Old Calabar (*Samps n*), 1 ♂ type, Sapele (*Sampson*), 1 ♀. *Exp.* 18 mm.

(26 *a*.) *Cataclysta melatornalis*, sp. n.

♀. Head and thorax pale brown; legs whitish tinged with brown; abdomen whitish mixed with brown and with slight dark segmental lines. Fore wing pale yellow-brown slightly irrorated with black; an oblique black striga near base of inner margin, a point in discal fold near end of cell and a small discoidal spot above angle of cell; traces of a punctiform postmedial line oblique from costa to vein 5, then subterminal; a small wedge-shaped white mark from costa before apex, followed by a slight whitish line defined on each side by fuscous and slightly excurved at discal fold; termen with slight punctiform black line. Hind wing whitish suffused with pale brown and irrorated with fuscous; some black scales at base of inner margin; two indistinct diffused antemedial lines, blacker towards inner margin; an indistinct diffused postmedial line excurved in submedian interspace, ending in a black patch at tornus; two indistinct fuscous subterminal lines before middle of termen; a narrow terminal fuscous band; cilia fuscous with fine white line at base.

Hab. S. Brazil, Organ Mts., Tijuca (*Wagner*), 1 ♀ type. *Exp.* 22 mm.

[To be continued.]

LVI.—*Note on* Doliichthys stellatus, *Sauvage*.

By L. S. Berg (St. Petersburg).

In the 'Revue et Magasin de Zoologie,' (3) t. ii. 1874, p. 336, Sauvage has described a new genus of Gobioid fish from the Don at Voronesh (S. Russia), which he names *Doliichthys stellatus*. It is clearly seen from the description that we have here to do with a fish described in 1787 by Pallas (Nov. Acta Acad. Petr. i. p. 52, pl. vii. figs. 4–6) from the Caspian Sea under the name of *Gobius macrocephalus*, and regarded by Eichwald (Bull. Soc. Nat. Moscou, 1838, no. 2, p. 139) as a type of a distinct genus, *Benthophilus*. This fish is widely distributed on the shores of the Caspian Sea, Black Sea, and the Sea of Asov, especially at the mouths of the South-Russian rivers, often entering fresh water. I myself have seen it in the Dniester at Bendery. The specimens described by Sauvage belong to the subspecies, found in the basin of the Black Sea, named by Kessler ('Fishes of the Aralo-Caspio-Pontine Region,' St. Petersburg, 1877, pp. 40–45) *Benthophilus macrocephalus*, variety *c*.

LVII.—*Description of a new Species of* Leucogobio *from Korea.* By L. S. Berg (St. Petersburg).

Leucogobio coreanus, sp. n.

D. III 7. A. III 6. Lin. lat. 35 $\frac{4}{3-2\frac{1}{2}}$.

Pharyngeal teeth 5 . 3—2 . 5 or 5 . 2—2 . 5. Body low and elongated; its greatest depth is contained 4·4–4·5 times in the length (without caudal). Head a little longer than depth of body, 4·1–4·0 in length. Eye long, 3·6–3·5 in head, $1\frac{1}{5}$–$1\frac{1}{4}$ in snout, 1·52–1·46 in postorbital length, 1·14–1·10 in interorbital space. Upper surface of head flat. Snout pointed, the upper jaw overlapping the lower. Mouth anterior, reaching backwards to the vertical from the hind margin of nostrils. The jaws meet about level with the lower margin of the eye. Lips thin. *Barbel long*, quite as long as the eye and reaching the vertical from the hind margin of eye. Origin of dorsal much nearer to end of snout than to root of caudal, the distance between tip of snout and origin of dorsal contained $1\frac{1}{5}$ in distance between origin of dorsal and root of caudal. Pectoral shorter than head, contained 5·6–5·1 in length of body, terminating not far from the ventral. Height of dorsal 4·6–5 in length of body. Ventral reaching or nearly reaching vent. There are 4 series of scales between lateral line and middle of belly. Caudal peduncle as long as pectoral, its least depth about 2 times in its length and $2\frac{1}{5}$–$2\frac{1}{4}$ in depth of body. Belly flattened.

Irregular black dots on the upper surface of head and on the back. A bluish band along the side of the body. Scales of lateral line each with two dark spots. All fins colourless. Peritoneum silvery, with few black pigment spots.

Three specimens (largest 91 mm. long) from S. Korea, province Kyong-sang-do, River Sambau. Collected 18. ix. 1900, by P. J. Schmidt. Type specimens in the Zoological Museum of Acad. of Sciences, St. Petersburg (N. 13801).

I give here a key to distinguish all the known species of *Leucogobio*:—

A. Eye large, less than 4 in length of head; barbels long.
  a. Scales 39; 6 scales between lateral line and middle of belly; barbel equal to

about $\frac{2}{3}$ the orbit; caudal peduncle as long as head. (Japan, L. Biwa) .. *L. biwæ* (Jordan & Snyder) *.

aa. Scales 35; 4–4½ scales between lateral line and middle of belly; barbel as long as or a little longer than eye; caudal peduncle shorter than head. (S. Korea.) ..... *L. coreanus*, Berg.

A.A. Eye small, 4 or more in length of head.

b. Body deep; depth of body not more than 5 in its length (without caudal).

c. Caudal peduncle less than twice as long as deep.

d. Origin of dorsal in advance of ventral; barbel shorter than eye. (Central Japan.) ..... *L. Güntheri*, Ishikawa †.

dd. Dorsal opposite to ventral; barbel very minute. (Head-water of Yangtsekiang.) ..... *L. tæniatus*, Günther ‡.

cc. Caudal peduncle more than twice as long as deep.

e. Maxillary not reaching behind middle of snout. (Hui-hsien, Southern Kansu.) ..... *L. Herzensteini*, Günther §.

ee. Maxillary reaching behind middle of snout. (S. Japan.)..... *L. Mayedæ* (Jordan & Snyder) ||.

bb. Body slender; its depth more than 5 in its length. (Japan, L. Biwa.) .... *L. Jordani*, Ishikawa ¶.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

May 23rd, 1906.—R. S. Herries, M.A., Vice-President, in the Chair.

The following communications were read:—

1. 'On the Importance of *Halimeda* as a Reef-forming Organism; with a Description of the *Halimeda*-Limestones of the New Hebrides.' By Frederick Chapman, A.L.S., F.R.M.S., and Douglas Mawson, B.E., B.Sc.

Calcareous algæ, nullipores, *Lithothamnion*, etc., have been frequently referred to as forming important contributions to the rock of coral-reefs. The material obtained in the great boring, the lagoon-borings, and lagoon-dredging at Funafuti has yielded a

* Proc. U.S. Nat. Mus. xxiii. 1900, p. 340; xxvi. 1903, p. 829.
† Annot. zool. japon. iii. 1901, p. 161.
‡ Ann. Mus. Zool. Pétersb. i. 1896, p. 214.
§ *L. c.* p. 213.
|| Proc. U.S. Nat. Mus. xxiii. p. 342; xxvi. p. 828.
¶ Ann. zool. jap. iii. 1901, p. 163.

considerable quantity of *Halimeda*; and Dr. Guppy has described a *Halimeda*-Limestone in the Solomon Islands. Evidence such as this shows that the important deposits of calcareous plant-remains forming at the present day can scarcely be paralleled by any deposit formed in past geological times except, possibly, the limestones of the Alpine Trias, which owe their origin to the thallophytes *Diplopora* and *Gyroporella*. Among other *Halimeda*-Limestones mentioned by the Authors are those of Christmas Island, Fiji and Tonga, and the New Hebrides. The examples from the last-named group are described in detail. They differ considerably one from the other in the condition of preservation of their chief organic contents. Chemical and microscopic analyses of the several examples are given. *Halimeda* seems to be more liable to decay than *Lithothamnion*, corals, or foraminifera, and yet it appears to retain its structure to a considerable depth in reefs. Much of the fine powdery limestone associated with coral-reefs, and more especially with upraised coral-islands, may be primarily due to lagoon and other deposits formed by the agency of *Halimeda*.

2. 'Notes on the Genera *Omospira*, *Lophospira*, and *Turritoma*; with Descriptions of New Species.' By Miss Jane Donald.

In a previous paper the Author referred to the researches of Ulrich and Koken among the earlier gasteropoda, and to the groups into which they had divided them. Much knowledge is still required, with regard to their origin and relationships, before really-satisfactory divisions can be made. The new species described in the paper belong to three genera, characterized by the possession of a band on all the whorls formed by the gradual filling-up during growth of a sinus, and not a slit, in the outer lip. The genera *Lophospira*, Whitfield, and *Turritoma*, Ulrich, are not really true Murchisonidæ, but are allowed for the present to remain in that family. Ulrich places *Omospira* in the family Raphistomidæ, but it is not a characteristic member, for the whorls are more convex and the spire higher than is the case with the other genera belonging to the family. Ulrich's description is quoted and discussed, and one new species is described from beds of Upper Bala age. Of the genus *Lophospira*, Ulrich's four sections, and subsections of certain of these, are discussed. Five new species are referred to the *perangulata*-section, one new species and one variety to the *bicincta*-section, and one species to the *robusta*-section. One new species is described of *Turritoma*. The specimens dealt with are mainly from the collections of Mrs. Gray, the Sedgwick Museum, the Bristol Museum, and the Geological Survey of Scotland.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 108. DECEMBER 1906.

LVIII.—*On new Species of* Histeridæ *and Notices of others.*

By G. Lewis, F.L.S.

I have lately founded several new genera on species included in *Hister* by Marseul and other authors, a genus which until now has contained nearly 400 species. To these new genera and to Thomson's genus *Atholus* I have assigned 122 species, which will, I think, greatly facilitate the study of the group generally. The characters I have employed are chiefly two—the position and form of the antennal fossæ and the anterior formation of the mesosternum; and to illustrate these differences I have given some figures. With a narrow antennal fossa such as that of *Santalus* and *Zabromorphus* there is an antenna with a funiculus which widens gradually towards the club, and there are other modifications, though slight, in the funiculus when the fossæ are deep and circular.

Throughout the family it is a matter of importance, both generically and specifically, whether the mesosternum is anteriorly emarginate, sinuous, truncate, or projecting; but at the same time there are certain species—viz., *Hister Holubi*, Sch., and *circularis*, Lew.—that have truncate mesosterna which I have not placed in *Atholus* because their general form is very different, and it seems to me better to wait until more cognate species are known, for it is almost certain that they exist, before separating them from *Hister*.

This is the twenty-ninth paper of this series.

List of Species.

Liopygus Andrewesi.
Platylister niponensis.
Santalus piraticus, *Lew.*
Zabromorphus, gen. nov.
Spilodiscus arcuatus, *Say.*
Pachylister pygidialis.
Grammostethus, gen. nov.
—— sinensis.
Peranus, gen. nov.
Atholus. *Thoms.*
Hister (Phelister) gentilis, *Horn.*

Liopygus Andrewesi, sp. n.

Oblongo-ovatus, depressus, parallelus, brunneus, nitidus; fronte leviter impressa, stria antice recta; elytris striis 1–2 integris, 3 in medio late interrupta, 4–5 apicalibus, quinta parve obliqua; propygidio punctato; pygidio cum foveæ transversim excavatæ; mesosterno sinuato, stria integra; tibiis anticis 4-denticulatis.
L. $2\frac{1}{2}$–$2\frac{3}{4}$ mill.

The species is extremely similar to *L. scrobiculatus*, Sch., but it differs by being rather more parallel and by the foveæ in the pygidium being larger and transversely excavated. Those of *scrobiculatus* are circular in outline.

Hab. Nilgiri Hills (*H. L. Andrewes*). Many specimens.

Platylister niponensis, sp. n.

Oblongo-ovatus, subdepressus, niger, nitidus; fronte concava, stria recta sed lævissime impressa; pronoto stria laterali integra; elytris striis 1–3 integris, 4 ante medium abbreviatis, 5 et suturali brevibus lineis punctatis; pygidio marginato, margine utrinque conspicue elevato; mesosterno stria marginali late interrupta; tibiis anticis 4-dentatis.
L. $6\frac{3}{4}$ mill.

Oblong-oval, rather depressed, black and shining; the head, mandibles punctate, forehead and epistoma concave, stria complete, transversely straight, but very fine; the thorax, lateral stria continued behind the head; the elytra, striæ, inner humeral wanting, dorsal 1–3 complete, 4 reaches rather beyond the middle and has somewhat crenulate edges, 5 is apical and shorter, consisting almost wholly of punctures, sutural does not reach the apex nor the middle and is composed of 5 or 6 points; the propygidium is rather coarsely punctured, with the base narrowly smooth; the pygidium is closely, evenly, and coarsely punctate, with the outer rim robust and markedly elevated laterally; the mesosternum, marginal stria widely interrupted anteriorly; the anterior tibiæ are 4-dentate, the two median teeth are rather widely separated.

This species is more oval than *P. ovatus*, Er., and the peculiar dorsal striæ distinguish it from any other species known to me.

Hab. Kioto, Japan.

Santalus piraticus, Lew.

Fig. 1 shows an outline of this species; the antennal fossæ are narrow and the mesosternum is markedly emarginate, and it is similar in all the species of the genus.

Fig. 1. Fig. 2.

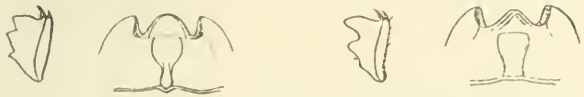


Fig. 1.—*Santalus piraticus*, Lew.
Fig. 2.—*Zabromorphus longicollis*, Mars.

ZABROMORPHUS, gen. nov.

Body oblong-oval, very convex; the head, labrum transverse and narrow, anterior outline arcuate, the funiculus of the antenna is widened out behind the club, similar to that figured for *Contipus subquadratus* in Marseul's Monograph; mandibles canaliculate, outer rim carinate, frontal stria strong and complete and slightly raised behind the mandibles; thorax, marginal stria complete, lateral striæ sometimes three (*pachysomus*), sometimes two (*longicollis*), antennal fossæ in the anterior angle, shallow, somewhat narrow and longitudinal, chiefly opening towards the head; elytra, dorsal striæ well marked, with crenulate edges; pygidium convex; prosternum, anterior lobe bimarginate; mesosternum feebly emarginate or sinuous, marginate anteriorly; anterior tibiæ 3-dentate, apical tooth very robust. The species known are *Hister pachysomus*, Ancey (type); *apis*, *longicollis*, Mars.; *viduus*, Fåhr.; *mombasan* and *zambesius*, Lew.

Fig. 2 represents the antennal fossæ and the form of the anterior tibiæ of *longicollis*.

Spilodiscus arcuatus, Say.

Fig. 3 gives an outline of the sternal plates, antennal fossæ, and the anterior tibiæ of this species. The fossæ are not circular.

Pachylister pygidialis, sp. n.

Ovatus, parum convexus, niger, nitidus; fronte stria integra sed lævissime impressa; pronoto ciliato, utrinque foveolato, stria

laterali interna antice bis interrupta, externa postice abbreviata ; elytris striis 1–3 integris, 4 vix dimidiata, 5 postice vix punctis indicata ; prosterno parce punctulato ; pygidio parum dense punctulato, circum alte marginato ; mesosterno stria marginali late interrupta ; tibiis anticis 3-dentatis.

L. 12½ mill. (absque mandibulis).

Oval, somewhat convex, black and shining ; the head, frontal stria very fine, almost evanescent in the middle ; the thorax deeply foveolate behind the anterior angle, inner stria broken near the eyes and widely interrupted behind the head, external commences at the anterior angle and is not quite dimidiate ; the elytra, striæ, inner humeral dimidiate and straight, 1–3 complete, 4 apical, not reaching the middle, 5 is indicated by a few apical punctures ; the propygidium is finely and sparsely punctulate ; the pygidium is much more densely punctulate and its outer rim is markedly raised ; the mesosternum, marginal stria widely interrupted ; anterior tibiæ 3-dentate.

This species is much less convex than *P. ceylanus*, Mars., and the pygidium is more transverse, but it has a similar marginal rim. Another marked difference is that the inner thoracic lateral stria is relatively further from the edge.

Hab. Yunnan, China.

Fig. 3. Fig. 4.

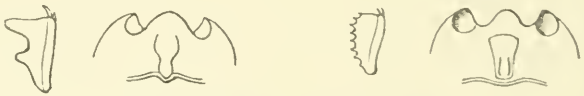


Fig. 3.—*Spilodiscus arcuatus*, Say.
Fig. 4.—*Grammostethus sodalis*, Lew.

GRAMMOSTETHUS, gen. nov.

Body oval or shortly oval, convex ; head, funiculus of the antenna not widening out behind, the club is similar to that figured for *H. merdarius* in Marseul's monograph, labrum length and breadth nearly equal, mandibles somewhat long and convex above, frontal stria well marked, semicircular or bowed in outline ; thorax with one lateral stria strong and complete, usually somewhat sinuous, antennal fossa in the anterior angle, almost circular and open to view below ; elytra, fourth dorsal stria with a detached basal appendage ; prosternum bistriate ; mesosternum, anterior edge feebly sinuous or nearly truncate ; anterior tibia with many small denticles.

The species are *Hister ruficornis*, Grimm. ; *navus*, *stercoriger*, Mars. ; *fractistrius*, *fragosus*, *gentilis*, *impiger*, *indicus*,

niponicus, occidentalis, sinensis, sinuaticollis, socius, sodalis (fig. 4), *stenocephalus,* Lew. Marseul does not mention the prosternal stria of *stercoriger*, and I have not seen the type, but its other characters agree with the above. The prosternal striæ resemble those of a species of *Idister*.

Grammostethus sinensis, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte stria semicirculari; pronoto stria antice distincte bisinuata, fovea ante scutellum minuta; elytris striis 1–3 integris, obsoleto crenulatis, 4 basi abbreviata cum rudimento punctiformis, 5 et suturali apicalibus; prosterno bistriato; mesosterno leviter sinuato; tibiis anticis 6–7-denticulatis.

L. $4\frac{1}{3}$ mill.

This species is very similar to *sodalis,* Lew., but the outline is more perfectly oval, the thoracic stria more distinctly sinuous behind the head, the dorsal striæ are finer and feebly crenulate, the fifth and sutural striæ are distinctly shorter, the appendage to the fourth stria consists of a single puncture, and the mesosternum is slightly less sinuous.

Hab. Chang Yang, near Ichang, China.

Peranus, gen. nov.

Body oval, convex; head, mandibles concave above, labrum transverse and narrow, frontal stria biarcuate; antennæ, joints of the funiculus slightly robust behind the club; thorax narrowed from the base, with one lateral stria, and markedly foveolate behind the anterior angle, antennal fossa is in the anterior angle and closely similar in outline to that of *Atholus*, but wider and less deep; the elytra, the humeral striæ are generally wanting, the fifth and sutural striæ when complete join at the base; pygidium convex and but slightly transverse; prosternum, keel narrow; mesosternum very feebly sinuous anteriorly; anterior tibiæ 3-dentate, posterior multispinose.

Fig. 5.

Peranus scutellaris, Er.

This genus must be placed before *Atholus*; the species are *Hister scutellaris,* Er. (fig. 5), *bipustulatus,* F., *Maindronii,*

Lew., and *depistor*, Mars. I have found *depistor* commonly in Japan and China, but all the specimens I have seen are wholly black. The other species have red elytral markings, but wholly black varieties are very common amongst them.

Genus Atholus, Thomson, Skand. Col. iv. p. 228 (1862).

"Prosternum pone coxas anticas haud dilatatum. Mesosternum antice rotundato-truncatum. Mandibulæ angulo dorsali acuto. Prothorax stria marginali plerumque medio interrupta, subtus fovea antennali profunda, bene determinata. Pygidium inflexum. Elytra stria laterali nulla vel abbreviata. Tibiæ anticæ sulco tarsali recto, posteriores biseriatim spinosæ."

Thomson founded this genus in 1862, but until now it has not been acknowledged or utilized. The name appears as a synonym in the Munich Catalogue, 1868, and although I recently declined to recognize it (Ann. & Mag. Nat. Hist. 1905, xvi. p. 341), I think now that it is well to adopt it. The three most important characters are the narrow prosternal keel, the antennal fossæ, which are deep and not quite circular, and the truncate mesosternum. The species which may be referred to it are numerous and widely distributed both in the Old and New World, viz.:—*Hister æquistrius, bifrons, caramanus, cœlestis, concordans, Goudoti, myrmidon, philippinensis, pirithous, singalanus, torquatus*, Mars.; *confinis, conformis, geminus*, Er.; *corvinus*, Germ.; *bimaculatus*, L.; *americanus*, Payk.; *duodecimstriatus*, Schrk.; *cochinchinæ, Gestroi*, Sch.; *prætermissus*, Peyron; *quinquestriatus*, Mots.; *perplexus*, Lec.; *sedecimstriatus*, Say; *Baberii, cinctipygus, crenatifrons, dentipes, famulus, genuæ, ixion, pennulæ, rubricatus, sectator, silvicola, sessilis, striatipennis, tenuistriatus, terræmotus, tetricus, truncatisternus, vacillans*, and *vestitus*, Lew. Forty-three species.

Fig. 6 represents the form of the antennal fossæ, outline of mesosternum, and the anterior tibiæ of 12-*striatus*, Schrk.

Fig. 6.

Atholus 12-*striatus*, Schrk.

The following isolated description is given for convenient reference; the name does not appear in the 'Zoological Record':—

Hister (*Phelister*) *gentilis*, Horn, Trans. Am. Ent. Soc. x. p. 285 (1883).

"Oval, convex, black, shining. Head and thorax sparsely and finely punctulate. Thorax with an entire, well-impressed, submarginal stria. Elytra more sparsely and finely punctured than the thorax, surface with six entire dorsal and a sutural stria, all sharply impressed, the inner dorsal and sutural joining in an arc; external subhumeral entire, internal absent. Epipleuræ unistriate. Propygidium and pygidium sparsely and finely punctured. Prosternum convex, the striæ distinct, diverging, and ascending in front. Marginal stria of the mesosternum entire. Body beneath sparsely punctulate. Anterior tibiæ very finely serrulate. Length ·10 inch; 2·5 millim.

"It is not without some little doubt that I refer this species to *Phelister*. The antennal fossæ are slightly enclosed in front, approaching *Onthophilus*, but the resemblance extends no further. It might be placed near *H. vernus*, from which, however, it differs in many points.

"*Hab.* Arizona (*H. K. Morrison*)."

Horn does not say whether the mesosternum is projecting or bisinuous, one of the essential characters of *Phelister*. The inner humeral stria is apparently complete.

LIX.—*New and little-known Species of Eastern and Australian Heterocera.* By Colonel C. Swinhoe, M.A., F.L.S., &c.

Family **Syntomidæ**.

Euchromia pelewana, nov.

♂ ♀. Antennæ black, frons white, head glistening blue, sides of neck pale pink; a white spot on each shoulder; some blue longitudinal stripes on the fore part of the thorax, which is black; abdomen with the first segment broadly white, the second and third narrowly dark pale pink, the remainder crimson, as also is the entire ventral surface: wings black; fore wings with a white subbasal spot, one in the middle of the cell, another below it merely separated by the vein, two together in the disk and one above them near the costa: hind wings with a white basal space divided into

three by the veins; a large spot in the disk, with a small one above it and another below it, merely divided by the veins. Underside of the thorax and the legs black, some white streaks on the femora.

Expanse of wings $1\frac{4}{10}$ inch.

Pelew Islands, Carolines; five males, two females.

Marked somewhat as in *E. æmulina*, Butler, from New Guinea; wings narrow and the insect smaller than is usual in the genus.

Family **Eupterotidæ**.

Eupterote pulchra, nov.

♂. Palpi, frons, head, and shafts of antennæ dark chestnut, pectinations ochreous; thorax ochreous fawn-colour; fore wings brownish ochreous fawn-colour, hind wings and abdomen paler and more ochreous: fore wings with several crenulated, transverse, greyish, nearly erect lines, slightly rounded inwards below the costa; both wings with a narrow dark grey discal band, straight and erect on the fore wings, very slightly curved on the hind wings, the space beyond paler, with a row of grey spots, rather close to the band on the fore wings, four or five of them below the costa with white spear-shaped marks edged with grey on their outer sides, those on the hind wings smaller and very nearly in the middle of the marginal space; cilia dark brown. On the underside the discal bands are darker, the inner space on both wings is traversed by three crenulated bands, and the outer space of the hind wings has a medial row of spear-shaped ochreous marks with brown centres.

Expanse of wings $2\frac{2}{10}$ inches.

Nilgiri Hills; two examples.

I have had these two examples for some years in my collection unnamed; there are several others from the same locality unnamed in the B. M. It is allied to *E. mollifera*, Walker, from Ceylon, but has most beautiful shades of colour, quite different from that species, which is yellower, with discal bands differently shaped and much further away from the outer margin.

Family **Lymantriidæ**.

Orgyia nebulosa.

Orgyia nebulosa, Walker, Journ. Linn. Soc. vi. p. 123 (1862); Swinhoe, Cat. Het. Mus. Oxon. i. p. 198 (1892).

Sarawak, Borneo; type (♂) in Mus. Oxon.

♀. Palpi, head, body, and hind wings pale pinkish grey, without any markings; a small brown dorsal tuft on second segment of abdomen: fore wings greyish brown; a rather broad pale pinkish-grey stripe from base to apex, running parallel with the costal margin; an indistinct antemedial line; an oblique and dentated postmedial line, outwardly curved below the costa, outwardly marked with whitish; a submarginal, whitish, rather thick, but similarly disposed line; a double row of marginal brown spots marked with whitish lunules on their inner sides. Underside uniform pale pinkish grey, with indications of a darker postmedial band across both wings.

Expanse of wings $1\frac{8}{10}$ inch.

Surabaya, Java; five pairs.

This species in the male very closely resembles *O. postica*, Walker, from South Burma and Ceylon, but is uniformly quite one third smaller, and the female of the latter has aborted wings; the shape of the wings of the female of the Javan species is very similar to that of *O. thyellina*, Butler, ♀, from Japan.

Genus Pendria.

Pendria, Swinhoe, Ann. & Mag. Nat. Hist. (7) xvii. p. 540 (1906).

Pendria rotundata, nov.

♂. Pure white; palpi black above, antennæ grey, shaft with black dots, base of pectinations black; fore legs with two black bands on the tibiæ, one at the base of the tarsi, mid tarsi with three black bands, hind tarsi with one, ends of all the tarsi and the claws black: fore wings with the costal line blackish for two thirds its length, medial, discal, and submarginal, indistinct greyish, broad, straight transverse bands, only to be seen in certain lights: hind wings with a similar short indistinct mark in the middle of the disk, and another immediately behind it near the margin; cilia of both wings pure white. Underside without markings.

Expanse of wings $1\frac{7}{10}$ inch.

Nias; one example.

Superficially resembles *P. rinaria*, Moore, from Java and Sumatra, but the wings are rounder, and in *rinaria* the costal line is entirely black, and so also is the upper half of the cilia of the fore wings and the middle straight portions of the hind wings.

Dasychira anaha, nov.

♂ ♀. Antennæ, palpi, head, body, and fore wings dark brown; hind wings paler brown; no perceptible markings above except a rather large indistinct spot at end of cell of fore wings and some indications of a rather darker discal band on the hind wings; cilia ochreous, with brown patches; underside dark ochreous grey; a brown shade from base to the end of the cell of the fore wings in the male; both sexes with an indistinct and rather suffused brown discal band with some dark spots on it: hind wings with a brown spot at the end of the cell and indistinct medial and discal, somewhat straight, brown bands, the medial band obsolescent in the female.

Expanse of wings, ♂ $1\frac{2}{10}$, ♀ $1\frac{4}{10}$ inch.

♂, Padang, Sumatra; ♀, Batavia, Java.

Abdomen with dorsal crests on anterior segments; belongs to the *bhana* group; the fore wings of the female are rather shorter and broader than usual.

Family **Aganaidæ**.

Subfamily *Deilemerinæ*.

Deilemera niasana, nov.

♂ ♀. Palpi white below, black above, last joint all black; frons white, with a large black central spot; head and collar yellow; thorax and abdomen white; a large black spot on vertex of head and one on each side of the collar; a broad black stripe on centre of thorax and on each side; abdomen with a greyish disconnected dorsal band and some greyish suffusion: fore wings black, veins on the basal half white; a thin white streak on the hinder margin; a prominent white streak on the second internal vein from base to near the discal band, attenuated and pointed at both ends; discal band composed of seven spots, well divided by the veins, the upper spot long and touching the costa, the second club-shaped, curved, and longest of all; in the females between the outer ends of these two spots are two small white streaks, the remaining spots elongated, nearly parallel, the lowest quite small: hind wings white, with a nearly uniform outer marginal black border, little more than the tenth of an inch broad, its inner side evenly indented on the veins.

Expanse of wings $1\frac{8}{10}$ inch.

Nias; two males, three females.

Belongs to Section II. *d* of the genus * ; the pattern of the fore wings is somewhat similar to that of *D. radiata*, Walker, from Manilla †, but that species has longer wings, the discal band of the fore wings does not touch the costa, and the marginal band of the hind wings is much broader.

Subfamily *Aganainæ*.

Asota carsina, nov.

♂ ♀. Palpi black above, orange beneath, last joint all black ; head and body orange, a black spot on each side of the shoulders, also on each side of the thorax in front ; abdomen with short segmental black bands above and below : fore wings slaty black, veins uniformly whitish and prominent except towards the outer margin ; a large round white spot at the lower end of the cell ; basal patch small, orange below the origin of the median vein, whitish on the costa, three black subcostal spots and two on the orange portion : hind wings white, with a large black spot at the end of the cell and a black marginal border, broad at the apex, narrowing hindwards, more or less dentated inwards, with a rather large indentation immediately before the anal angle ; abdominal margin in the male narrowly blackish, in the female less so, there being merely a shade of colour there. Underside : fore wings black ; a white streak on the subcostal vein from the base in the male only ; a triangular white patch at the lower end of the cell in both sexes : hind wings black, with a large triangular white central patch ; a large round black discoidal spot touching the lower edge of the costal black portion, and in the male a black streak parallel to and near the abdominal margin, and another short black streak from the discoidal spot to the black outer border.

Expanse of wings $2\frac{4}{10}$ inches.

Nias ; one male, two females.

Nearest to *A. leuconeura*, Butler, from the Bismarck Archipelago, but that has the fore wings longer and narrower, the cell-spot oval, and no discoidal spot on the hind wings above.

Family Chalcosiidæ.

Pompelon perakana, nov.

♂. An ochreous band in front of the frons, which is

* Trans. Ent. Soc. 1903, p. 67.

† See Cat. Het. Mus. Oxon. i. pl. v. fig. 10.

black; collar and the entire body below crimson, with black square lateral spots; legs dark grey, striped with glistening blue; antennæ, head, collar, body, and wings above black, tip of abdomen crimson: wings with glistening blue reflections on the fore wings, narrowly along the costa, broadly at the apex, narrowing hindwards, the reflections running in on the veins; on the hind wings broadly at the apex, the inner two thirds of the outer margin broadly white, with some streaks inwards. Underside: wings black, the costa and most of the veins with blue reflections; a large ochreous spot at the upper end of cell of fore wings; the hind wings with the outer margin broadly white as above.

Expanse of wings $2\frac{6}{10}$ inches.

Perak; one example (type in B. M.).

Nearest to *P. valentula*, Swinh., from Burma.

Family Gonopteridæ.

Lineopalpa sugama, nov.

♂. Palpi, head, and thorax dark red-orange colour: fore wings dark red-brown, the base much suffused with orange, a white dot in the cell, transverse lines brown, thin, and sinuous, antemedial line erect, with a square outward projection above its middle; postmedial line from costa one third from apex with two outward square projections, then curves inward below end of cell and then down to the middle of the hinder margin, through a somewhat prominent yellow spot; a discal sinuous line rather close to the margin: hind wings brown, without markings; cilia of both wings whitish: abdomen brown, with a pale ochreous tip.

Expanse of wings 2 inches.

Mackay, Queensland; one example.

There are two examples from Pulo Laut in the B. M., Quadrifid Drawer no. 198. I received it from Australia as *L. lineosa*, Walker, but it is not that species, the colour being different, the lines differently placed, and the costa of the fore wings is much curved, with two small round projections in the middle.

Cosmophila ochreifusa, nov.

♂. Head and collar bright orange-ochreous; palpi and thorax orange-brown: fore wings with the basal portion up to the postmedial line bright orange-ochreous; the rest of the wing is darkly suffused with brown, and there are two smears of white from the costa downwards immediately before the

apex, the first one running nearly halfway down the wing; the antemedial line is not sinuous and is angled outwards to a point a little above the middle; the postmedial line runs straight up from the middle of the hinder margin to the lower end of the cell, then bends outwards, throws out two sharp teeth, and runs up nearly straight to the costa alongside the first white smear; the abdomen and hind wings are pale ochreous brown, darkest towards the outer margin; cilia of both wings brown. On the underside both wings are crossed by a fine outwardly curved discal line.

Expanse of wings $1\frac{8}{10}$ inch.

Padang, W. Sumatra; one example.

There is an example from Singapore in the B. M. unnamed, Quadrifid Drawer no. 176.

Family Quadrifidæ.

Subfamily *Catocalinæ.*

Sypna gluta, nov.

♂ ♀. Antennæ brown above, ochreous beneath; palpi brown, inner sides ochreous; head, body, and wings dark olive-brown: fore wings with duplicate, slightly sinuous, but nearly erect antemedial, ochreous-grey, transverse lines, similar medial lines rather close together, a little more separated on the costa than on the hinder margin, with a rather prominent ochreous-white spot between them in the cell, and a black patch filling up the costal space; a discal, recurved, crenulated, blackish line, almost submarginal, submarginal black and white dots in the interspaces: hind wings without markings; marginal line of both wings ochreous and crenulated; cilia of fore wings and the lower half of hind wings brown, of upper half of hind wings ochreous. On the underside the wings are entirely brown; the fore wings with a black transverse band a little beyond the middle, edged a little on the inner and broadly on the outer side with ochreous white, immediately followed by a broad blackish band; hind wings somewhat similarly marked, but the first black band is medial and narrow and bent outwards in the middle, and is edged outwardly only with dull ochreous grey, and the outer margins of both wings are broadly pale and suffused with ochreous.

Expanse of wings $2\frac{2}{10}$ inches.

Padang, Sumatra; one example.

Subfamily *Ophiusinæ*.

Aramuna punctilinea.

Borsippa punctilinea, Hmpsn. Ill. Het. viii. p. 83, pl. cxlvi. fig. 14 (1891).

Borsippa pallens, Hmpsn. (part.), Moths India, ii. p. 517 (1894).

Gampola, Puttalam, Dumbara, and Haldamulla, Ceylon; two males, four females (*Mackwood*).

Hampson's type (a female) came from the Nilgiri Hills; my Haldamulla example (a female) is identical with it, the others only differ in the obscureness of the discal black spot, in a female from Gampola it is absent. The present confusion as to the sectional position of the various forms of species entered under the genus *Borsippa* in the 'Moths of India' can only be worked out as we get males, which seem to be difficult to capture, most of the species being represented by females only. The males of *Aramuna*, with their shortened hind wings and distorted neuration, are very distinctive: the male of *punctilinea* is in form exactly like the male of *A. marginata*, Moore, also from Ceylon; the marginal band of the wings is similar, but all the other markings are the same as in the female; it differs from the female exactly in the same manner as in Moore's Ceylon species.

Borsippa macoma, nov.

♂ ♀. Antennæ with grey cilia and bristles, shaft ochreous spotted with dark brown; palpi brown, with ochreous tips; head, thorax, and fore wings dark ochreous fawn-colour; a grey, medial, narrow, and indistinct band, outwardly oblique; a row of discal brown dots immediately before the marginal band, which is dull brown, with an inner dark margin edged with whitish, and runs up straight from the hinder margin near the angle for two thirds, then curves towards the outer margin and is attenuated upwards along the margin to the apex, and another dark narrow band runs through the centre of the marginal band: hind wings very slightly darker than the fore wings, without any markings. Underside uniform dark ochreous brown, without markings.

Expanse of wings $1\frac{2}{10}$ inch.

Khasia Hills; two males, one female.

The marginal band of the female is of the same shape as in the male, but rather narrower; it is not nearly allied to anything I know of. There is an example in the B. M. unnamed, Quadrifid Drawer no. 121.

Borsippa calthula, nov.

♂. Palpi blackish brown with yellowish tips; antennæ, head, thorax, and fore wings pale yellowish fawn-colour, with minute grey irrorations, the fore wings without any indications of transverse lines; a brown dot at the end of the cell; a broad dark brown marginal band with a slightly curved inner margin from hinder angle, running inwards and upwards for two thirds, then curved towards the margin, excavated hindwards, and running narrowly up the margin to the apex: hind wings and abdomen pale ochreous grey without any markings.

Expanse of wings $1\frac{3}{16}$ inch.

Kina Balu; one example.

The band is somewhat similar to that of *B. erota*, Swinhoe, from the Andamans, but the band in that species has a straight inner margin and the palpi are yellow; it also somewhat resembles *B. marginata*, Moore, from Sikhim, but that has three transverse, nearly erect, grey lines and the palpi are also yellow.

Bocula caradrinoides.

Bocula caradrinoides, Guen. Noct. iii. p. 296 (1852); Hmpsn. Moths India, iv., App. p. 534 (1896).

Khasia Hills; two males, one female.

The type came from Java; Hampson records it from Ceylon. My Khasia Hills examples only differ from those from Java and Ceylon in being a little paler in colour.

Family **Deltoididæ.**

Nodaria renota, nov.

♀. Of a nearly uniform pale pinkish fawn-colour, irrorated with minute grey atoms, which are rather dense towards outer margin of fore wings, making it darker than the rsst of the wings; a large round black spot at the end of the cell; ante- and postmedial crenulated brown lines, the former nearly erect, the latter much bent outwards below the costa, the crenulations produced into two or three dentations: both wings with a whitish submarginal line, edged inwardly with blackish brown, straight on the fore wings, bent inwards near the anal angle on the hind wings; marginal points black; cilia greyish pink, with pale grey patches. Underside paler; a brown lunule at the end of each cell; two evenly

curved brown annulated discal lines; black marginal points and cilia as above.

Expanse of wings 1 inch.

Padang, Sumatra; one example.

Allied to *N. producta*, Hmpsn., from Ceylon, and *N. kona*, Swinhoe, from Perak; can at once be distinguished by the large round black spot at the end of the cell of the fore wings.

Family Pyralidæ.

Subfamily *Pyralinæ*.

Vitessa stettina, nov.

♂ ♀. Antennæ black, with short branches; last joint of palpi black, remainder of palpi, face, frons, head, thorax, and abdominal tuft orange-ochreous; abdomen black, with white segmental bands, more prominent in the female than in the male; thorax with four large spots in a row in front and one in the middle: fore wings metallic blue-black; a large orange-ochreous subbasal band, narrowing hindwards and not reaching the hinder margin; a broad, white, erect, medial band, with its inner margin even, its outer margin uneven and almost dentated in parts; a discal, rather narrower, white band, with its margins curved; the outer portion of the wing with prominent white streaks on the veins: hind wings white, with some black at the base and broad costal and outer marginal borders, broadest at the apex; cilia of both wings black, with pale outer edges. On the underside the fore wings have only the white discal band; the white streaks on the fore wings are short, there are a few at the apex of the hind wings, and the cilia of both wings are white.

Expanse of wings 2 inches.

Granville, New Guinea; one male, two females.

Nearest to *V. glaucoptera*, Hmpsn., the type of which (from Queenstown) in Coll. Rothschild I have not seen; but there is one of Mr. Knight's beautiful coloured drawings of the type in the B. M., and this form differs from that and from its description in many material points. There are several examples of this form from the Mount Kebea range in both the B. M. and my collections.

Vitessa teleroma, nov.

♂ ♀. Palpi, head, and thorax ochreous; thorax with three conjoined black spots in front; collar with two black

spots; abdomen black, with white segmental bands, anal tuft ochreous: fore wings black, rather dull in colour, not metallic, and without white streaks on the veins; basal space ochreous, with a subbasal black sinuous band; the ochreous space followed by an antemedial black band; a medial somewhat obscure whitish band; the remainder of the wing black, with a large white spot a little beyond the middle below the costa and a white spot a little beyond its lower end, this black portion is joined to the inner black band by a black bar below the costa: hind wings white, with a broad black marginal band, narrowing hindwards to a point at the anal angle and continued evenly along the costa. Underside: thorax white, with black spots; abdomen with black and white bands: legs black, with white bands; fore wings black, with only the two white discal spots; cilia above and below black.

Expanse of wings $1\frac{8}{10}$ inch.

Perak, two males; Kalao Island, one female.

Near *V. suradeva*, Moore, of which it is probably the Island form, but is distinguishable by its non-metallic colour, absence of the prominent white streaks on the outer veins of the fore wings, and the lower white discal spot being further away from the base. There are three examples from Borneo in the B. M. with *suradeva*.

Vitessa temerata, nov.

♂ ♀. Palpi, head, thorax, basal patch on fore wings, and the abdominal tuft bright ochreous; two large black spots on the thorax in front and one small one on each shoulder; abdomen black, with thin white segmental bands: fore wings with the ochreous basal patch occupying one fifth of the wing; it contains one subcostal black spot near the base, and its outer edge is clean cut by an erect, rather narrow, black band, followed by a narrow white band; a rather broader black band; a very broad discal white band; the remainder of the wing black, with white streaks on the veins, all the black more or less metallic: hind wings deep black, without markings; cilia of fore wings black, of hind wings white. Underside: body black; abdomen with white bands; wings black; fore wings with only the white discal band; hind wings with the apical portion and the cilia white; legs black, with white stripes.

Expanse of wings, ♂ $1\frac{8}{10}$, ♀ $2\frac{1}{10}$ inches.

Granville, New Guinea; two males, two females.

Allied to *V. zemire*, Cram., from Amboina; differs in the

greater extent of ochreous at the base of fore wings and in its complete broad white discal band; in *zemire* it is much smaller and rounded both above and below. There are many examples from the Kebea Range in the B. M. and in my collection.

Subfamily *Nymphulinæ*.

Nymphula litanalis.

Botys (?) *litanalis*, Walker, xviii. 706 (1859).
Nymphula litanalis, Swinhoe, Cat. Het. Mus. Oxon. ii. p. 435 (1900).
Endotricha stenialis, Warren, Ann. & Mag. Nat. Hist. (6) viii. p. 68 (1891).

Khasia Hills.

Types (Sarawak, Borneo) in Mus. Oxon., and *stenialis* (Borneo) in B. M.; there is an example from Borneo in the B. M. Not previously recorded from India.

Subfamily *Hymenianæ*.

Ceratoclasis sulpitialis, nov.

♂. Palpi brown, yellow beneath; head and body whitish; abdomen with grey bands; antennæ ochreous, with the distorted thickening black. Wings whitish ochreous, the outer marginal portions beyond the outer line darker and brighter ochreous, markings chestnut-brown: fore wings with some marks at the base; an antemedial transverse line with a black spot on the costa; a small annulus in the cell, another below it; a medial line touching a double annulus at the end of the cell: hind wings with a larger annulus in the cell: both wings with a discal line, twice outwardly curved on the fore wings, bent inwards above the middle on the hind wings, and again very deeply curved inwards in the lower disc; some faint markings on the inner portions of both wings; fore wings with marginal lunules; hind wings with marginal line; cilia of both wings interlined.

Expanse of wings $\frac{8}{10}$ inch.

Padang, Sumatra; one example.

Its generic characters appear to me to be identical with some of the examples of this American genus in the B. M. collection.

Subfamily *Margaroniinæ*.

Margaronia samoana, nov.

♀. White, with a slight primrose tint; palpi blackish

brown on the outer sides; frons with a large pale brown spot and some similar spots on the thorax; abdomen pale red-grey, markings on the wings of the same colour: fore wings with a dark streak from the base, the basal two thirds mostly red-grey; an outwardly oblique whitish band from the costa before the middle, narrowing downwards for two thirds; a large discal spot from the costa, angled on its outer side and narrowing downwards to near the hinder margin, margined with dark brown, the outer dark margin thickened at the costa; a nearly straight line running close alongside it, followed by a similar line; a rather thick, submarginal, straight band: hind wings whitish, with the marginal lines as in the fore wings, forming a marginal band; cilia of both wings dark brown.

Expanse of wings $1\frac{2}{10}$ inch.

Samoa Island; one example.

A Polynesian form of *M. naralis*, Felder.

Subfamily *Pyraustinæ.*

Eporidia phæniusalis.

Botys phæniusalis, Walker, xviii. 684 (1859).
Charemis scabripennis, Warren, Ann. & Mag. Nat. Hist. (6) xvii. p. 131 (1896).
Phryganodes imbecilis, Hmpsn. (part.), Moths India, iv. p. 302 (1896).

Khasia Hills; many examples.

Walker's type from Sarawak is in Mus. Oxon., Warren's type from the Khasia Hills in Coll. Rothschild. I have compared the Khasia-Hill examples with Walker's type. Hampson sinks *scabripennis* to *imbecilis*, Moore (Sikkim), but I cannot agree with him: *phæniusalis* is a well-marked dark brown insect, *imbecilis* is pale and has hardly any markings visible; I have several from Sikkim in my own collection.

Subfamily *Pyraustinæ.*

Loxoneptera albicostalis, nov.

♂. Fore wings shorter than in *L. carnealis* *, Hmpsn., from Sikkim and Assam; coloration of the whole insect very similar, but the fore wings have the costa white, only some slight suffusion towards the end of the cell instead of the two black spots, and there are no blackish lines on the veins, and the curved tuft of hairs on the hinder margin near the angle

* Moths India, iv. p. 406 (fig.).

is not black, but is concolorous with the rest of the wing: the hind wing is brown, pale inwards, the costal space and a large triangular medial patch being whitish flesh-colour.

Expanse of wings $1\frac{3}{10}$ inch.

Padang, Sumatra; one example.

Pyrausta silvosalis, nov.

♂. Palpi and frons brown, the latter yellow at the tips; antennæ with short, white, minute, and evenly disposed cilia; head, body, and wings yellow: fore wings with the costa and outer margin purplish brown, with some paler shading inwards; two brown dots in a line in the cell, a spot at the end, a dot below the inner dot, and two dots on the hind wing below; a brown discal fine line across both wings, with a large outward curve above the middle on the fore wings and smaller similar curve in the middle on the hind wings, which has also a thick marginal dark brown line with some inner brown shading towards the apex; cilia of both wings pale yellow, with a brown line near the base.

Expanse of wings $\frac{8}{10}$ inch.

Khasia Hills; one example.

I know of no near ally; the markings resemble those of a *Pachyzancla*.

LX.—*On* Myriolepis hibernica, *a Palæoniscid Fish from the Irish Coal-Measures.* By A. Smith Woodward, LL.D., F.R.S.

[Plate X.]

Having recently had occasion to study an undetermined species of the Palæoniscid fish *Myriolepis*, from the Hawkesbury Formation of New South Wales, I have been led to a renewed examination of the small form, *M. hibernica*, described by Dr. Traquair in 1893 * from the Coal-Measures of Ireland. The latter species is now known by a nearly complete fish in anthracite from the Jarrow Colliery, Kilkenny, presented to the British Museum by John Gerrard, Esq.; and this specimen proves to be so much more valuable for comparison with the typical Australian fossils than any

* R. H. Traquair, "On a new Palæoniscid Fish, *Myriolepis hibernicus*, sp. nov., from the Coal-Measures, Co. Kilkenny, Ireland," Geol. Mag. [3] vol. x. (1893) pp. 54–56, pl. iii.

of the fragmentary examples described by Dr. Traquair and Mr. Bolton *, that it seems worthy of special description.

The new specimen is shown of the natural size in Pl. X., and indicates a fish originally about 18 cm. in length. It is therefore smaller than the examples previously discovered. It is exposed in direct side view, and is only distorted by the crushing of the head a little downwards and backwards upon the anterior part of the abdominal region.

An impression of part of the cranial roof proves that this must have been coarsely but closely tuberculated. A fragment of the dentary bone is ornamented with fine longitudinal ridges, and its oral border bears a few very large conical teeth which are suggestive of those of *Nematoptychius* and *Pygopterus*. Some indeterminable remains of coarsely tuberculated bones are also shown beneath the mandible.

The axial skeleton of the trunk is well calcified and seen through the thin squamation. There is a vacant space as usual denoting the position of the notochord, while there are no traces of ribs. The long neural spines of the abdominal region in advance of the dorsal fin are clearly separate from their supporting arches. The neural and hæmal arches in the caudal region are comparatively small and fused with their respective spines.

Among the crushed bones at the back of the head the vertically elongated supraclavicle, with rounded lower end, can be distinguished; and its outer face, which is traversed by the usual slime-canal, is ornamented with fine concentric ridges. The large elongate-triangular infraclavicles are similarly ornamented. The pectoral fin of one side is apparently complete and has a rounded shape, with the gently curved anterior border fringed by close-set minute fulcra. All its rays are stout and closely articulated to a point near the base, while all except the few foremost are finely divided distally. When adpressed to the trunk this fin reaches the origin of the pelvic pair, which arises slightly nearer to the origin of the pectorals than to that of the anal fin. The pelvic fins are almost as much elevated as the pectorals and have a similarly arched anterior border, but no fulcra can be seen here. The rays gradually increase in length to the longest, and some of them exhibit a fine longitudinal striation (fig. 1 *b*). The hinder rays are incomplete, and above their insertion, where some scales are displaced, there are a few markings which seem to be due to rod-shaped baseosts. Of

* H. Bolton, "Note on *Myriolepis hibernica*, Traq.," Trans. Manchester Geol. Soc. vol. xxii. (1894) pp. 1–4, pls. i., ii.

the dorsal fin only a fragment remains, but enough is preserved to show that it arises at least as far forwards as the pelvic fins. The anal fin is also incomplete, but there are some good impressions of the long axonosts and short baseosts which support it. The caudal fin is deeply forked and some of its stout rays are ornamented with delicate longitudinal striæ like those of the pelvic fin already mentioned.

The characteristically small scales covering the whole of the trunk are well indicated, but it is not clear whether those of the flank are deeper than broad. At some points near the dorsal and ventral borders of the fish the scales are clearly equilateral. The whole squamation is ornamented with delicate closely arranged ridges, which sometimes bifurcate, are sometimes subdivided into elongated tubercles, and are all disposed in an antero-posterior or horizontal direction (fig. 1 *a*). The course of the lateral line is marked by a simple ridge. On the upper caudal lobe, which is broken away distally, the scales are relatively larger and oat-shaped; but they seem to be preserved only as impressions of the inner face.

Adding the new facts now discovered to those previously ascertained, *M. hibernica* may be briefly diagnosed as follows:—

A stout species attaining a length of about 30 cm. Length of head with opercular apparatus considerably less than the maximum depth of the trunk, and contained somewhat more than four times in the total length of the fish. Cranial roof coarsely tuberculated; mandible longitudinally striated; bones of pectoral arch concentrically striated. Pelvic fins nearly as large as the pectorals, which, when adpressed to the trunk, reach the former; dorsal fin arising opposite the origin of the pelvic pair; anal fin extending back almost as far as the caudal; fin-rays ornamented with fine longitudinal striations. Scales ornamented with close and delicate transverse ridges, which sometimes bifurcate and are sometimes subdivided into elongated tubercles.

There is still nothing to prevent this fish of the Irish Coal-Measures from being assigned to the same genus as the Australian Triassic and Permo-Carboniferous fishes, for which the name *Myriolepis* was originally proposed, although, as remarked by Dr. Traquair, the exact nature of the pectoral fin in the typical species remains unknown. The above specific diagnosis, however, readily distinguishes *M. hibernica*, which is remarkable for the stoutness and shortness of its abdominal region and for the forward position of the dorsal fin.

EXPLANATION OF PLATE X.

Fig. 1. *Myriolepis hibernica*, Traquair; left side view of fish, nat. size.—Coal-Measures; Jarrow Colliery, Kilkenny, Ireland. [Brit. Mus. no. P. 9604.]

Fig. 1 *a*. Scale-ornament of same specimen, five times nat. size.

Fig. 1 *b*. Fin-rays of same specimen, five times nat. size.

LXI.—*Brief Diagnoses of a new Genus and Ten new Forms of Stenodermatous Bats.* By Knud Andersen.

The subjoined diagnoses are preliminary only. A monograph of the genera *Uroderma*, *Enchisthenes*, and *Artibeus*, based on the material in the British Museum and the United States National Museum, is ready in manuscript and will be published elsewhere before long.

Enchisthenes*, gen. nov.

Allied to *Artibeus*, but median upper incisors simple (in *Artibeus* bifid); m^3 in row, *i. e.* situated directly behind m^2, quite or very nearly as broad as the hinder margin of this latter molar (in *Artibeus* rudimentary and situated postero-internally to m^2, or entirely wanting); m_3 comparatively large, equal to about $\frac{1}{4}$ of m_2 (in *Artibeus* equal to $\frac{1}{8}$–$\frac{1}{12}$ of m_2 or entirely wanting). Tragus with a pointed, upwardly directed projection on the inner margin near the tip (no trace of a similar projection in any species of *Artibeus*).

Type.—*Artibeus Harti*, Thos.†; Trinidad.

Species.—The type of the genus is the only species known.

Uroderma Thomasi, sp. n.

Allied to *U. bilobatum*, Ptrs., but with noticeably larger skull, longer tooth-rows, and larger ears and nose-leaves.

Length of skull, in two specimens, from inion to front of canines, 24·7–24·8 mm. (of 22 skulls of *U. bilobatum*, from localities dotted over the whole area inhabited by the species, 22–23·3 mm.); maxillary tooth-row 8·9–9 mm. (7·8–8·5 mm.); length of ear-conch from base of outer margin 18–18·5 mm. (15·7–16·8 mm.); width of ear-conch 12·8–13·7 mm. (11–12 mm.); greatest width of lancet 6·2–6·5 mm. (4·8–5 mm.).

* Ἐγχεισθενής, armed with a spear (ἔγχος or ἔγχεος, spear; σθένος, strength), in allusion to the form of the erect portion of the nose-leaf.

† Ann. & Mag. Nat. Hist. (6) x. pp. 409–410; Nov. 1892.

Type.—♂ ad. (alc.). Bellavista, Bolivia, 15° S., 68° W., 1400 m.; 11 Oct., 1900. Collected by Perry O. Simons. Presented by Oldfield Thomas, Esq. Brit. Mus. no. 1. 2. 1. 37. Collector's number 1259. "Came in the house at night." —A second specimen from Reyes, Bolivia, 13° S., 67° W., presented by Marquis G. Doria.

Artibeus planirostris trinitatis, subsp. n.

Similar to *A. planirostris planirostris*, Spix, but averaging smaller.

The forearm and metacarpals average about 4 mm., the tibia 1·5 mm. shorter than in *A. p. planirostris*; the ears are, generally, a little smaller; the average difference in the size of the skull and teeth is very small.

Type.—♀ ad. (skin). St. Anns, Trinidad; 23 Feb., 1897. Collected by Dr. Percy Rendall. Brit. Mus. no. 97. 6. 7. 1. Collector's number 90.

Range.—The islands of Trinidad and Tobago, W.I.—13 specimens and 9 skulls examined.

Artibeus planirostris grenadensis, subsp. n.

In the size of the skull and teeth very similar to *A. p. planirostris*, in external dimensions rather intermediate between *A. p. trinitatis* and *planirostris*.

The skull, teeth, and external dimensions of *A. p. grenadensis* average somewhat larger than in its nearest relative *A. p. trinitatis*. The skull and teeth almost equal in size, or, if anything, are a trifle larger than, those of *A. p. planirostris*, but externally *A. p. grenadensis* averages somewhat smaller than this latter race.

Type.—♂ ad. (alc.). Grenada, W.I. Presented by T. J. Mann, Esq. Brit. Mus. no. 96. 11. 8. 6.

Range.—The island of Grenada, W.I.—11 specimens and 8 skulls examined.

Artibeus hirsutus, sp. n.

Like a small form of *A. planirostris* (though averaging still smaller), but tibia and interfemoral densely haired, and colour of fur of the upperside of the body in adults drab with a silvery tinge. Maxillary tooth-row 9·5–10·4 mm.; forearm 53·7–59·7 mm.

Type.—♂ ad. (skin). La Salada, Michoacan, Mexico; 16 March, 1903. Collected by Messrs. Nelson and Goldman.

U.S. N. M. (Biological Survey collection) no. 126119. Collectors' number 16168.

Range.—8 specimens, with skulls, have been examined from the States of Michoacan, Colima, and Jalisco, Mexico.

Artibeus jamaicensis æquatorialis, subsp. n.

Similar to *A. jamaicensis jamaicensis*, Leach, but skull, teeth, and external dimensions averaging somewhat larger.

Average measurements of 6 skulls (in parentheses, for comparison, average measurements of 65 skulls of *A. j. jamaicensis*) :—zygomatic width 18·3 mm. (17·4 mm.) ; maxillary width, externally across m^1–m^1, 13·6 mm. (12·6 mm.) ; maxillary tooth-row 11 mm. (10·3 mm.). The forearm and metacarpals average 2·5 to 3 mm. longer than in *A. j. jamaicensis*.

Type.—♂ ad. (skin). Zaruma, Loja, S. Ecuador, 1000 m. ; 17 June, 1899. Collected by Perry O. Simons. Presented by Oldfield Thomas, Esq. Brit. Mus. no. 0. 2. 9. 13. Collector's number 395. "Eating ripe bananas."

Range.—9 specimens (8 skulls) examined from Zaruma, S. Ecuador, and Cali, S. Colombia.

Artibeus jamaicensis præceps, subsp. n.

Similar to *A. jamaicensis palmarum*, Allen, but forearm and hand averaging shorter.

Forearm, in three specimens, 60–66·2 mm. ; in 43 adult examples of *A. j. palmarum* the average length is 70·9 mm., and none have the forearm below 64 mm. Third metacarpal 54·8–61 mm. ; in *A. j. palmarum* 58·5–68·5 mm.

Type.—♂ ad. (alc.). Guadeloupe, W.I. Collected by H. Selwyn Branch. U.S. N. M. no. 113503.

Range.—Guadeloupe and Dominica, W.I.

Artibeus cinereus bogotensis, subsp. n.

Similar to *A. cinereus cinereus*, Gervais, but teeth, skull, and external dimensions averaging larger.

Minimum and maximum measurements of 8 skulls (in parentheses, for comparison, corresponding measurements of 7 skulls of *A. c. cinereus*) :—maxillary width, externally across m^1–m^1, 8·5–8·9 mm. (8–8·6 mm.) ; maxillary tooth-row 6·7–7·2 mm. (6·4–6·8 mm.). The forearm and metacarpals average 2·2–3·5 mm. longer than in *A. c. cinereus*.

Type.— ♂ ad. (skin). Curiche, near Bogota, Colombia ;

16 Aug., 1895. Collected by Mr. G. D. Child. Presented by Oldfield Thomas, Esq. Brit. Mus. no. 99. 11. 4. 35. Collector's number III. 10.

Range.—From Central Colombia to N.W. Venezuela.—9 specimens with skulls examined.

Artibeus aztecus, sp. n.

Allied to *A. toltecus*, Saussure, but in every respect somewhat larger; metacarpals unusually long; interfemoral strongly haired. Forearm 45–46·8 mm.

The skull is in every respect slightly larger and more heavily built than in *A. toltecus*; the teeth a little larger. The external dimensions greater; in the smallest specimen of *A. aztecus* available the forearm is 6 mm. longer than in the smallest *A. toltecus toltecus*, in the largest specimen 3·3 mm. longer than in the largest *A. toltecus toltecus*. The metacarpals unusually lengthened; indices of third, fourth, and fifth metacarpals, respectively, 946, 928, and 954, in *A. toltecus* 912, 898, and 923.

Type.—♂ ad. (skin). Tetela del Volcan, Morelos, Mexico; 12 Feb., 1893. Collected by Mr. E. W. Nelson. U.S. N. M. (Biological Survey collection) no. 52050. Collector's number 4332.

Range.—As yet only known from the State of Morelos, Mexico.—4 specimens with skulls examined.

Artibeus turpis, sp. n.

A peculiar species. Cranial rostrum unusually depressed and slightly, but distinctly, bent upwards; alveolar border of maxillary bone, therefore, more abruptly ascending than usual in the genus. Bony palate shortened: in *A. toltecus* (apparently the nearest relative of *A. turpis*) the length of the palate, from palation to posterior border of incisive foramina, is greater, in *A. turpis* less, than the length of the post-palatal portion of the skull, from palation to basion. Molars $\frac{2}{2}$. Cusp 7 of m^1 large. Length of skull, inion to front of canines, 20; maxillary tooth-row 6·7; forearm 40·5; third metacarpal 37 mm.

Type.—♀ ad. (alc.). Teapa, Tabasco, S. Mexico. Collected by Mr. H. H. Smith. Presented by Messrs. O. Salvin and F. DuCane Godman. Brit. Mus. no. 88. 8. 8. 29.

Range.—The type is the only specimen on record.

Artibæus nanus, sp. n.

Allied to *A. turpis*, with which species it shares all essential cranial and dental characters (see above), but readily distinguished by its conspicuously smaller size. Length of skull, inion to front of canines, 18·2–18·7; maxillary tooth-row 5·8–6·1; forearm 36·5–38; third metacarpal 32·2–35 mm.

Type.— ♀ ad. (alc.). Tierra Colorada, Sierra Madre del Sur, Guerrero, Mexico. Collected by Mr. H. H. Smith. Presented by Messrs. O. Salvin and F. DuCane Godman. Brit. Mus. no. 89. 1. 30. 5.

Range.—12 specimens (5 skulls) have been examined from the States of Guerrero, Colima, Sinaloa, and Vera Cruz, Mexico.

LXII.—*On a new Species of* Lyconus *from the North-east Atlantic*. By E. W. L. Holt and L. W. Byrne.

The genus *Lyconus* originally described by Günther [1887], and by him made the sole genus of his family Lyconidæ, was regarded by that author as allied to the Macruridæ but of a more generalized type. Regan [1903] has joined *Lyconus* with *Bathygadus* and other genera in his subfamily Bathygadinæ of the Macruridæ; and Boulenger [1904] has also placed the genus in the neighbourhood of *Bathygadus* in the family Macruridæ. So far as can be judged from such anatomical details as are discernible on a superficial examination, *Lyconus* certainly appears to be closely allied to *Bathygadus*.

The genus has hitherto been known from a single specimen from the South Atlantic, the type of *Lyconus pinnatus*, Gthr. It is defined by Günther as possessing one canine-like tooth on each side of the vomer; but to admit the form described below the vomerine dentition should be described as consisting of one or more teeth on each side.

Another *Lyconus* was taken by the S.S. 'Helga' on the 5th August, 1906, at Station S. R. 352 off the south-west of Ireland, between 50° 21′ N., 11° 39′ W., and 50° 24′ N., 11° 41′ W., at soundings of 800 fath., in a Petersen pelagic otter-trawl fished on 800 fath. of warp. The depth at which the net chiefly worked is computed at 700 to 750 fath., but though it showed no sign of having actually touched bottom,

it caught some bottom-living Crustacea, and may have been practically on the ocean-floor when it extended its hospitality to *Lyconus*.

This specimen appears to us to be clearly distinguishable specifically from that described by Günther, and may be diagnosed as follows :—

Lyconus brachycolus, sp. n.

Head contained about $5\frac{1}{2}$ times in total length without caudal fin, rather compressed, about twice as long as broad, and as deep as its length without the snout. Eye 4 times in head, slightly shorter than the snout, the length of which is subequal to the width of the nearly flat interorbital space. The extremity of the snout is blunt and abrupt, with a median prominence in front of the eyes. From the snout the dorsal profile rises gently to the origin of the dorsal fin, which is opposite the origin of the pectorals and a little in front of the origin of the ventrals ; the height of the body at the base of the pectorals is slightly less than double its width at the same point and about $\frac{3}{4}$ of the length of the head.

Mouth terminal, jaws subequal, gape slightly oblique, hinder extremity of maxilla behind vertical from eye.

Præmaxilla with 1 (or 2 closely apposed) fang anteriorly, but at some distance from the symphysis, followed by about 15 smaller sharp teeth in a single diminishing series. Mandible with 1 or 2 small teeth near the symphysis, followed by 2 fangs, separated by about 3 smaller sharp teeth, the second fang followed by about 3 smaller teeth, of which the last may be nearly as large as the second fang. The præmaxillary fang smaller than the anterior mandibular fang. Vomer with about 4 teeth on either side.

Pectoral fin with a narrow base and 13 rays, the longest rays extending about halfway to origin of anal, about $\frac{2}{3}$ as long as head ; ventral set a little behind pectoral, with 9 rays, the longest about $\frac{2}{3}$ the length of the longest pectoral rays. None of the rays of either fin truly filamentous. Dorsal fin commencing opposite pectoral, with about 210 rather long and slender rays, continuous throughout as to fin-membrane and spacing of rays, but showing indication of subdivision by inflection of outline (reduction in length of rays) at the tenth ray ; the first four rays (broken in type) possibly somewhat produced. Anal fin with rays shorter than the corresponding rays of dorsal. Skin delicate and rather loose ; scales rather small, thin, cycloid, present everywhere except on jaws, underside of head, and fins ; transverse

formula behind pectorals apparently ca. 6/ca. 15. Lateral line indefinite posteriorly.

Coloration in life silvery, after preservation greyish brown, with the head, vent, and marginal fins darker.

Length of the type 237 mm. (232 mm. without the caudal rays).

Hab. North-east Atlantic, off the south-west of Ireland, *circa* 750 fathoms.

The following table gives the measurements of the types of the two species in millimetres, with the proportions they bear to the lengths of the body and head respectively :—

	L. PINNATUS *.		L. BRACHYCOLUS.	
Length without caudal	120	800 p. c. of head.	232	560 p. c. of head.
,, to origin of dorsal fin	15	12·5 p. c. of length.	45	19 p. c. of length.
,, ,, anal fin .	39	32·5 ,, ,,	94	40 ,, ,,
Height at pectorals	13 (11) *	11 (9) ,, ,,	33	14 ,, ,,
,, anus	8 (7)*	6·6 (6) ,, ,,	21·5	9 ,, ,,
Breadth at pectorals	4	27 p. c. of head.	18	43 p. c. of head.
,, anus	3	20 ,, ,,	11	27 ,, ,,
Length of head.....	15	12·5 p. c. of length.	41·5	18 p. c. of length.
,, snout	3·5	23 p. c. of head.	12	29 p. c. of head.
,, eye	5	33 ,, ,,	10·5	25 ,, ,,
Interorbital width	3	20 ,, ,,	13	31 ,, ,,
Breadth of head	5	33 ,, ,,	13	31 ,, ,,
Length of pectorals.....	27 (16) *	180 (107) p. c. of head.	26	62 ,, ,,
,, ventrals	8 (3·5) *	53 (23) ,, ,,	17	41 ,, ,,

These measurements show that *L. brachycolus* may be, at comparable sizes, a stouter fish than *L. brevipinnis*, and has certainly a comparatively longer head and abdomen and shorter caudal region. In the former species the head is contained about $5\frac{1}{2}$ and the distance to the origin of the anal fin about $2\frac{1}{2}$ times in the total length, while in the latter the proportions borne by these measurements are 8 and 3 respectively. These differences cannot be wholly accounted for by the difference in size and stage of growth, and are, in fact, in

* The type of *L. pinnatus* is not in a particularly good state of preservation, and measurements taken from it must not be regarded as necessarily accurately representing its dimensions while in the flesh; a careful comparison with Günther's figure seems, however, to show that, excepting that the original form was somewhat deeper in the body and that the pectorals and ventrals (as their present state indicates) have been broken, the distortion is not very great. Where the measurements shown by Günther's figure and by the type differ in any material degree, our table shows both measurements, those taken from the actual specimen being given in brackets.

some particulars in a direction contrary to the usual change of developmental proportion.

A further distinction lies in the much longer pectoral fins of *L. pinnatus*; while both specimens are too large to be affected by the great development of the pectorals, which is not uncommon in larval Teleosteans, the present imperfect state of the type of *L. pinnatus* makes it impossible for us to make an exact comparison of the two species in this respect, though we have no reason to doubt the accuracy of Günther's figure.

The relatively much larger eye of *L. pinnatus* may be a youthful character only, and the present state of the type of that species makes any comparison of its scale and fin-ray formulæ with those of *L. brachycolus* impossible.

L. pinnatus has only one canine-like tooth on each side of the vomer; this may be a distinction of importance, because, so far as we know, vomerine teeth tend rather to decrease than to increase in number with age. It has certainly some of the anterior dorsal rays considerably prolonged. In *L. brachycolus* the first four rays are broken, and, though the first ray is slightly stouter than the rest, none of them seem to be stout enough to afford foundation for any considerable production. Moreover, prolongation of the anterior dorsal rays may be a feature of merely sexual importance (cf. *Onus cimbrius*).

The following key should suffice to distinguish the two known species of this genus :—

LYCONUS, Gthr.

1. Head 8 and length to origin of anal fin 3 times in total length (without caudal); pectoral fins longer than (and probably more than half as long again as *) head .. *L. pinnatus*, Gthr.
2. Head $5\frac{1}{2}$ and length to origin of anal fin $2\frac{1}{3}$ times in total length (without caudal); pectoral fins about $\frac{2}{3}$ as long as head .... *L. brachycolus*, H. & By.

References.

BOULENGER [1904]. 'Cambridge Natural History,' Fishes, p. 647.
GÜNTHER [1887]. 'Challenger' Deep-sea Fishes, p. 158.
REGAN [1903]. Ann. & Mag. Nat. Hist. ser. 7, xi. p. 460.

* See footnote on p. 425.

LXIII.—*Natural History Notes from the R.I.M.S. Ship 'Investigator,' Capt. T. H. Heming, R.N., commanding.*—Series III., No. 15. *Second Preliminary Report on the Deep-sea Alcyonaria collected in the Indian Ocean.*

By Prof. J. Arthur Thomson, M.A., and W. D. Henderson, M.A., B.Sc., Carnegie Research Fellow, University of Aberdeen.

In the Ann. & Mag. Nat. Hist. vol. xv. 1905, pp. 547–557, we published a preliminary report on a collection of deep-sea Alcyonarians from the Indian Ocean, entrusted to us for examination by the Trustees of the Indian Museum through Prof. A. Alcock, LL.D., F.R.S. As we have completed our survey, we wish, pending the publication of the memoir, to sum up the general results and to make a few corrections in our first preliminary report.

The collection includes 86 species, of which 61 seem to be new. Descriptions of the new forms are given in the memoir about to be published. The distribution of the new forms is as follows:—6 Stolonifera, 8 Alcyonacea, 3 Pseudaxonia, 22 Axifera, and 22 Stelechotokea. It has been found necessary to establish five new genera—*Stereacanthia* and *Agaricoides* (the latter established by Mr. J. J. Simpson, Zool. Anzeig. xxix. 1905, pp. 263–271, 19 figs.), both in the family Nephthyidæ, subfamily Siphonogorginæ; *Acanthomuricea* and *Calicogorgia* in the family Muriceidæ; and *Thesioides* in the family Kophobelemnonidæ. We submit brief notes on these five new types.

New Types.

The genus *Stereacanthia*, from the Andamans, is a Siphonogorgid in the vicinity of *Lemnalia*. A bare, densely spiculose trunk, made up of large longitudinal canals, with thin spiculose walls, bears a branched polyparium with the polyps disposed singly or in small crowded bundles; the aboral bands of spicules on the infolded tentacles form a simple pseudo-operculum; the spicules are warty spindles or golf-club forms, and there are no quadriradiate double-stars as in *Lemnalia*.

The genus *Agaricoides*, from 6° 31′ N., 79° 33′ 45″ E., is a remarkable Siphonogorgid, perhaps distinctly related to *Lemnalia* (Gray, emend. Bourne), but quite unlike any other type known to us. It is unbranched, mushroom-like, with complex octagonal verrucæ, pedicelled anthocodiæ, intro-

versible zooids, a tentacular operculum, echinate spindles and hockey-club forms, and many peculiarities of structure.

The genus *Acanthomuricea*, represented by *A. ramosa* from 7° 55′ N., 81° 47′ E., 506 fathoms, and *A. spicata* from 6° 31′ N., 79° 38′ 45″ E., 401 fathoms, is a Muriceid, perhaps related to *Placogorgia* (Wright & Studer). The two species are upright colonies, irregularly branched in one plane, with thin bark-like cœnenchyma of rough imbricating scales, with prominent verrucæ on all sides, with conical tentacular opercula, and with very heterogeneous spiculation.

The genus *Calicogorgia*, represented by *C. investigatoris* from 11° 14′ 30″ N., 74° 57′ 15″ E., 68–148 fathoms, and *C. rubrotincta* from the Bay of Bengal, 88 fathoms, is a Muriceid, probably related to Verrill's somewhat vaguely defined *Anthogorgia*. The colonies are irregularly branched in one plane, the verrucæ are prominent with spicules in eight bands, with a conical operculum consisting of a crown and points, with warty spindles straight or curved.

The genus *Thesioides*, from 18° 0′ 15″ N., 93° 30′ 45″ E., 448 fathoms, and 16° 25′ N., 93° 43′ 30″ E., 463 fathoms, is a Kophobelemnonid, near *Bathyptilum*, with a greatly elongated slender rachis borne by a short stalk without pinnules, with long slender autozooids without calyces and without any spicules.

List of Species.

Order I. STOLONIFERA, Hickson.

Family **Cornulariidæ**.

Sympodium indicum, sp. n.
—— decipiens, sp. n.
—— incrustans, sp. n.
Sympodium granulosum, sp. n.
— — tenue, sp. n.
—— pulchrum, sp. n.

Order II. ALCYONACEA, Verrill (pro parte).

Family **Alcyonidæ**.

Sarcophytum aberrans, sp. n.
Sarcophytum agaricoides, sp. n.

Family **Nephthyidæ**.

Subfamily Stongodinæ.

Spongodes uliginosa, sp. n.
—— Alcocki, sp. n.
Lithophytum indicum, sp. n.

Subfamily Siphonogorginæ.

Chironephthya variabilis, *Hickson*.
—— macrospiculata, sp. n.
Stereacanthia indica, gen. et sp. n.
Agaricoides Alcocki, *Simpson*, gen. et sp. n.

Order III. PSEUDAXONIA, G. von Koch.

Family **Briareidæ**.

Subfamily Briareinæ.

Paragorgia splendens, sp. n.

Family **Sclerogorgidæ**.

Suberogorgia Köllikeri, *Wright & Studer*, var. ceylonensis, *Thomson*.
Keroëides Koreni, *Wright & Studer*.
—— gracilis, *Whitelegge*.

Family **Melitodidæ**.

Parisis indica, sp. n.

Family **Corallidæ**.

Pleurocorallium variabile, sp. n.

Order IV. AXIFERA, G. von Koch.

Family **Dasygorgidæ**.

Lepidogorgia Verrilli, *Wright & Studer*.
Chrysogorgia orientalis, *Versluys*.
—— flexilis, *Wright & Studer*.
Chrysogorgia dichotoma, sp. n.
—— irregularis, sp. n.
—— indica, sp. n.

Family **Isidæ**.

Subfamily Ceratoisidinæ.

Ceratoisis gracilis, sp. n.
Acanella rigida, *Wright & Studer*.
Acanella robusta, sp. n.

Family **Primnoidæ**.

Subfamily Primnoinæ.

Stachyodes Allmani (*Wright & Studer*) = Calypterinus Allmani, *Wright & Studer*.
Stenella horrida, sp. n.
Thouarella Moseleyi, *Wright & Studer*, var. spicata, n.
Caligorgia flabellum, *Ehrenberg*.
—— indica, sp. n.
—— dubia, sp. n.

Family **Muriceidæ**.

Acanthogorgia aspera, *Pourtales* (=? A. spinosa, *Hiles*).
Paramuricea indica, sp. n.
Acanthomuricea ramosa, gen. et sp. n.
—— spicata, sp. n.
Anthogorgia Verrilli, sp. n.
Calicogorgia investigatoris, gen. et sp. n.
—— rubrotincta, sp. n.
Placogorgia indica, sp. n.
—— orientalis, sp. n.
Astrogorgia rubra, sp. n.
Acamptogorgia bebrycoides, *von Koch*.
—— ——, var. robusta, n.
—— circium, sp. n.
Acis spinosa, sp. n.
Muricella bengalensis, sp. n.

Family **Gorgonidæ**.

Callistephanus Koreni, *Wright & Studer*.

Family **Gorgonellidæ**.

Nicella flabellata (*Whitelegge*) (=Verrucella flabellata, *Whitelegge*).
Juncella elongata, *Pallas*.
Juncella miniacea, sp. n.
Scirpearella moniliforme, *Wright & Studer*.
—— alba, sp. n.

Order V. STELECHOTOKEA, Bourne.

Section ASIPHONACEA.

Family **Telestidæ**.

Telesto Arthuri, *Hickson & Hiles*.
Telesto rubra, *Hickson*.

Section PENNATULACEA.

Family **Protocaulidæ**.

Protocaulon indicum, sp. n.

Family **Protoptilidæ**.

Protoptilum medium, sp. n.
Distichoptilum gracile, *Verrill*.

Family **Kophobelemnonidæ**.

Kophobelemnon Burgeri, *Herklots*, var. indica, n.
Sclerobelemnon Köllikeri, sp. n.
Bathyptilum indicum, sp. n.
Thesioides inermis, gen. et sp. n.

Family **Umbellulidæ**.

Umbellula durissima, *Kölliker*.
—— dura, sp. n.
—— intermedia, sp. n.
—— rosea, sp. n.
—— purpurea, sp. n.
—— elongata, sp. n.
Umbellula Köllikeri, sp. n.
—— radiata, sp. n.
—— pendula, sp. n.
—— indica, sp. n.
—— sp.

Family **Anthoptilidæ**.

Anthoptilum Murrayi, *Kölliker*.
Anthoptilum decipiens, sp. n.

Family **Funiculinidæ**.

Subfamily FUNICULININÆ.

Funiculina quadrangularis (*Pallas*)=Leptoptilum gracile, *Kölliker*.
—— gracilis, sp. n.

Subfamily STACHYPTILIDÆ.

Stachyptilum maculatum, sp. n.

Family **Virgularidæ**.

Pavonaria Willemoësii (*Kolliker*)=Microptilum Willemoesii, *Kolliker*.

Family **Pennatulidæ.**

Subfamily Pennatulinæ.

Pennatula indica, sp. n.
—— veneris, sp. n.
Pennatula splendens, sp. n.
—— pendula, sp. n.

Subfamily Pteroëidinæ.

Pteroëides triradiata, sp. n.

We regret to have to make the following corrections—some of which are merely verbal, while others indicate unfortunate mistakes—in our provisional list of species : —

For *Sympodium incrustans*, sp. n., read *Sympodium decipiens*, sp. n.
For *Clavularia decipiens*, sp. n., read *Sympodium incrustans*, sp. n.
For *Sarcophytum parvum*, sp. n., read *Sarcophytum aberrans*, sp. n.
For *Sarcophytum fungiforme*, sp. n., read *Sarcophytum agaricoides*, sp. n.
For *Spongodes rosea*, Kükenthal, read *Spongodes Alcocki*, sp. n.
For *Spongodes rakayæ*, Hickson & Hiles, read *Spongodes elegans*, sp. n.
For *Dasygorgia ramosa*, sp. n. } read *Chrysogorgia irregularis*, sp. n.
For *Dasygorgia aurea*, sp. n. }
For *Strophogorgia Verrilli*, W. & S., read *Lepidogorgia Verrilli*, W. & S.
For *Herophila gracilis*, sp. n., read *Chrysogorgia flexilis*, W. & S.
For *Ceratoisis palmæ*, W. & S., read *Ceratoisis gracilis*, sp. n.
Delete *Primnoisis alba*, sp. n.—a misinterpretation.
For *Primnoa Ellisii*, von Koch, read *Caligorgia indica*, sp. n.
For *Juncoptilum Alcocki*, gen. et sp. n., read *Distichoptilum gracile*, Verrill.
For *Stachyptilum fuscum*, sp. n., read *Stachyptilum maculatum*, sp. n.
For *Pennatula Murrayi* read *Pennatula pendula*, sp. n.

It is very difficult to decide what is the best course to pursue in dealing with genera like *Sympodium* and *Umbellula*. It is not easy to give distinctive diagnoses of the new species we have felt compelled to establish, and yet the *tout ensemble* of the characters of each results in a quite characteristic appearance. References to *Sympodium* sp., *Sympodium* sp. (?), *Sympodium* sp. α, and the like are tedious and confusing. It is probable that the investigation of a large number of representatives (which this collection did not include) will show that the differences between some of our species are variational or modificational. The same remarks apply, though not so obviously, to *Acanthogorgia*, *Acamptogorgia*, *Muricella*, *Acis*, and *Pennatula*.

Viviparity.

In 1900 Prof. S. J. Hickson reported his discovery of embryos *in situ* in *Gorgonia capensis*—the first case of viviparity that he had observed in his wide and prolonged study of Alcyonarians.

He pointed out, however, that viviparity had been previously reported in *Corallium rubrum* by Lacaze-Duthiers, in "Clavulaires pétricoles" and in *Sympodium* (*Alcyonium*) *coralloides* by Marion & Kowalevsky, in three species of *Nephthya* (found at depths of 269–761 fathoms) by Koren & Danielssen.

In Prof. W. A. Herdman's collection from Ceylon we found embryos *in sitû* in *Gorgonia capensis* as Hickson had stated. Corroborating Marion & Kowalevsky, we found embryos in *Clavularia pregnans* (Th. & H.) and *C. parvula* (Th. & H.) collected by Mr. Cyril Crossland from Zanzibar and Cape Verde Islands respectively.

In the present collection we found embryos—blastulæ, gastrulæ, and slightly more advanced stages—in eight species:—*Sarcophytum aberrans*, sp. n., *Chrysogorgia flexilis*, W. & S., *Ceratoisis gracilis*, sp. n., *Paramuricea indica*, sp. n., *Distichoptilum gracile*, Verrill, *Umbellula elongata*, sp. n., *Funiculina gracilis*, sp. n., and *Pennatula indica*, sp. n.; meanwhile Mr. James J. Simpson, M.A., B.Sc., has also found embryos in specimens of *Isis hippuris* included in the littoral collection from the Indian Ocean (see Journ. Linn. Soc., Zool. xxix. p. 431, 1906).

We have also found embryos in a species of *Sclerophytum* from the Red Sea and in the British *Primnoa reseda*.

It is therefore clear that viviparity is by no means uncommon in Alcyonarians, and it will be interesting to discover if it is particularly characteristic of deep-sea species.

Some particular Facts of interest in the Collection.

One specimen of *Sarcophytum aberrans*, sp. n., is supported by a siliceous axis like a thick knitting-needle, 300 mm. in length by 2·3 mm. in breadth, probably the spicule of *Monorhaphis* or some allied sponge.

Analogous on a smaller scale is the siliceous sponge-spicule which forms the support of *Sympodium incrustans*, sp. n.

The spicules of *Chironephthya macrospiculata*, sp. n., sometimes attain the unusual length of 8·3 mm., and some of those of *Spongodes uliginosa*, sp. n., are almost equally huge (8 mm.).

Noteworthy is the great heterogeneity of the spicules in some of the forms, *e. g.* plates, disks, triangles, rods, spindles, and "golf-clubs" in *Acanthomuricea spicata*, sp. n.

Besides the very peculiar habit—incrusting a huge siliceous rod—there are many interesting features in *Sarcophytum*

aberrans, sp. n., *e. g.* the occurrence of several sizes of autozooids, the inturning of almost the whole of a large tentacle into the stomodæum, and the presence of ova and embryos in the siphonozooid canals.

The dimorphism which Gray recorded in his *Paragorgia nodosa* is confirmed in *P. splendens*, sp. n.

The complex differentiation of the polyps in *Agaricoides Alcocki*, Simpson, is quite unique. The presence of numerous Foraminifera in the stomodæum is also interesting.

Among other peculiarities we may mention the very remarkable tentacles of *Thesioides inermis*, gen. et sp. n., the remarkable base of *Anthoptilum decipiens*, sp. n., the small number of rays (3) in the pinnules of *Pteroëides triradiata*.

In regard to a collection which is a very feast of colour, we may call special attention to the exquisite colour-schemes of *Pennatula veneris*, *P. pendula*, *P. splendens*, and *P. indica*.

Some of the epizoic animals are interesting, *e. g.* the peculiar Solenogaster (*Rhopalomenia gorgonophila*?) on *Acamptogorgia circium*, sp. n.

LXIV.—*On the Land Molluscan Subgenus* Cœlorus, *Pilsbry*.

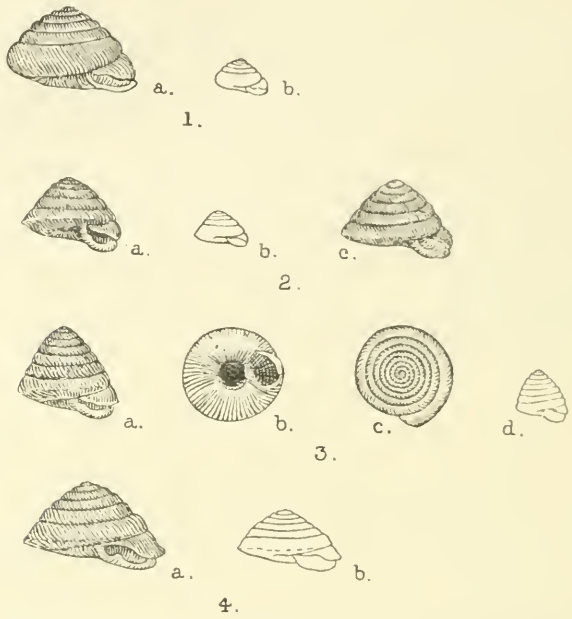
By G. K. Gude, F.Z.S.

Recently Messrs. Sowerby and Fulton submitted to me for examination some shells they had received from Mr. Y. Hirase, of Kyoto. They were labelled *Eulota* (*Cœlorus*) *caviconus*, and at first I was inclined to regard them as an undescribed form, as upon comparison with that species they presented several striking differences, having a more elevated and convex spire, a smaller diameter, a more contracted umbilicus, and a more laterally contracted aperture. Upon receiving further material, however, several intermediate forms were found, and the species, therefore, presents a considerable amount of variation.

The subgenus *Cœlorus*, which, so far as our present knowledge enables us to judge, appears to be restricted to Japan, was established for the reception of the then only known species—*Eulota cavicollis*—by Prof. Pilsbry (Proc. Acad. Nat. Sc. Philad. 1899, p. 528). The group has not yet been investigated anatomically; it will, in all probability, prove to be most nearly allied to *Plectotropis*, to which group, in fact, the first species was originally assigned by the writer. The presence in the two species, subsequently discovered, of

the cuticular processes, so characteristic of *Plectotropis*, goes to confirm this view.

Two of the species not having hitherto been figured, I take this opportunity of giving illustrations of them, while, to facilitate a survey of the group, I have added figures of the type species.



Eulota (*Cœlorus*) *cavicollis*, Pils. (Fig. 1 *a* enlarged, fig. 1 *b* natural size.)

Eulota (*Cœlorus*) *cavicollis*. Pilsbry, Proc. Acad. Nat. Sci. Philad. 1899, p. 527, pl. xxi. figs. 11–13. (Published Feb. 12, 1900.)
Eulota (*Plectotropis*) *Hirasei*, Gude, Proc. Malac. Soc. iv. (March, 1900), p. 10, pl. ii. figs. 4–7.

Kyoto.

Eulota (*Cœlorus*) *caviconus*, Pils. (Figs. 2 *a*–2 *c*, 3 *a*–3 *d*.)

Eulota (*Cœlorus*) *caviconus*, Pilsbry, 'The Nautilus,' xv. (1902), p. 117; xvi. (1902), p. 46.

Goto, Prov. Hizen, Island of Kiushiu (figs. 2 *a*, 2 *b*).

A variety a little larger than the type is recorded by Prof. Pilsbry from Ojikajima, prov. Hizen (fig. 2 *c* enlarged). The shell bears a tubercle on the basal margin of the peristome at the junction with the columellar margin, and the

whorls are spirally sculptured, neither of which features is mentioned in the diagnosis by Prof. Pilsbry. Probably the type is not mature: all the mature specimens I have seen possess the tubercle; on the other hand, one shell, which appears not quite mature, shows but a slight indication of a swelling. The extreme form mentioned above from Goto measures: diam. 5·75 mm., alt. 5 mm. (figs. 3 *a*–3 *c* magnified, fig. 3 *d* natural size).

Eulota (*Cœlorus*) *cavitectum*, Pils. (Fig. 4 *a* enlarged, fig. 4 *b* natural size.)

Eulota (*Cœlorus*) *cavitectum*, Pilsbry, 'The Nautilus,' xvi. (1903) p. 134.

Kochi, prov. Tosa, Island of Shikoku.

As in the case of *E. caviconus*, Prof. Pilsbry makes no mention of the microscopic spirals. This feature, however, is not easily observed, except where the cuticle is worn off.

LXV.—*Descriptions of some new Sharks in the British Museum Collection.* By C. Tate Regan, B.A.

Orectolobus japonicus.

Crossorhinus barbatus (non Gmelin), Müll. & Henle, Plagiost. p. 21, pl. v. (1841); Schleg. Faun. Japon., Poiss. p. 301 (1850).

Crossorhinus barbatus (part.), Duméril, Elasmobr. p. 338 (1865); Günth. Cat. Fish. viii. p. 414 (1870).

Orectolobus barbatus, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 606.

Closely allied to *O. barbatus*, but differing in the following characters:—No papilliform projections above the eye. Nasal cirrhus with a simple branch. On each side 2 or 3 simple dermal lobes above the upper lip, followed by 3 or 4 near the angle of the mouth, the first and last of which are bifid, and by 2, short, broad, and distally notched, at the side of the head. Free edge of dorsal fins straight or slightly concave. Pectoral extending at least $\frac{2}{3}$ of the distance from its origin to that of the ventral. Yellowish, upper surface with brownish vermiculations or reticulations; back with broad dark brown cross-bars with yellow vermiculations.

Hab. Coasts of Japan and China.

Two specimens (♀) of 1000 and 780 mm. from Japan.

The Australian *O. barbatus* has 1 or 2 papilliform projections above the eye, the branch of the nasal cirrhus bifid,

3 to 5 dermal lobes above the upper lip and 4 or 5 near the angle of the mouth. The pectoral fin is shorter than in *O. japonicus* and the coloration is different.

Cestracion amboinensis.

Heterodontus zebra (non Gray), Bleek. Act. Soc. Sc. Neerland. i. 1856, Amboyna, p. 71.
Cestracion Phillippi (part.), Günth. Cat. Fish. viii. p. 415 (1870).

Lateral teeth, in the adult, much enlarged, without keels; anterior teeth, in the adult, obtuse, unicuspid; symphysis of the jaws elongate. Supraorbital ridges low, terminating in advance of the first gill-opening, which is about twice as long as the last or as long as its distance from the fourth. Origin of first dorsal above posterior end of base of pectoral; anterior edge of fin rather strongly convex, free edge rather deeply emarginate; length of base $\frac{1}{2}$ the height of the fin (in the adult); exposed part of spine $\frac{1}{2}$ its length, which is $\frac{1}{2}$ the height of the fin. Second dorsal a little nearer to caudal than to first dorsal, its base $\frac{4}{5}$, its height $\frac{2}{3}$ that of the first. Anal, when laid back, not reaching the caudal. Pectoral extending a little beyond the origin of ventral; ventral nearly reaching to below the second dorsal. Yellowish, with alternate paired and unpaired dark brown bars across the back and sides, each of which is more or less completely split into two; the paired bars are interorbital, postorbital, in front of and behind each of the dorsals and in front of the caudal; anterior and posterior edges of eye corresponding to anterior and posterior edges of the pair of interorbital cross-bars.

Hab. Amboyna.

A single specimen of 580 mm. from Dr. Bleeker's collection.

The Chinese *C. zebra* has the dorsal fins less elevated and the dark cross-bars broader and separated by narrower interspaces, and with less tendency of each bar to split into two.

Centroscymnus macracanthus.

Dermal denticles each with 3 parallel keels ending in a point posteriorly, the middle the strongest. Distance from mouth to end of snout equal to the distance from eye to first gill-opening; nostrils very oblique; length of anterior labial fold about equal to its distance from the symphysis. Anterior dorsal fin shorter than second, the length of its base (without the spine) $\frac{2}{3}$ of its height and $\frac{2}{5}$ of its distance from the second; length of base of second (without the spine) $\frac{2}{3}$ of its distance from upper caudal lobe; spines well developed and strongly projecting. Pectoral extending to the vertical

from spine of first dorsal, with rounded posterior angle. Ventrals not reaching the vertical from posterior end of second dorsal.

Hab. Magellan.

A single specimen (♀) of 640 mm., presented by Capt. Wharton, R.N.

Centroscymnus cryptacanthus.

Centrophorus cælolepis (non Bocage & Capello), Günth. Cat. Fish. viii. p. 423 (1870).

Centroscymnus cælolepis, Goode & Bean, Oceanic Ichthyol. p. 14, pl. iv. fig. 13 (1896).

Dermal denticles imbricated, those on the head and on the upper and lower parts of the body to the level of the first dorsal fin each with 3 parallel keels ending posteriorly in a point, the others smooth, with rounded free edges and with a rounded depression on the free surface of each. Distance from mouth to end of snout greater than that from eye to first gill-opening; nostrils oblique; length of anterior labial fold about equal to its distance from the symphysis. Anterior dorsal fin shorter than the second, the length of its base (without the spine) about $\frac{1}{2}$ its height and $\frac{1}{6}$ of its distance from the second; length of base of second dorsal (without the spine) $\frac{3}{4}$ its distance from the caudal; spines very short, hidden beneath the skin. Pectoral not extending to the vertical from origin of first dorsal, with rounded posterior angle; ventrals extending to the vertical from the posterior end of second dorsal.

Hab. Madeira.

A single specimen (♂) of 700 mm., presented by J. Y. Johnson, Esq.

The relations of the two species of *Centroscymnus* above described are shown in the following synopsis of the species of the genus:—

I. Anterior labial grooves moderate, each about as long as its distance from the middle of the upper jaw; nostrils oblique.	
Dorsal spines well developed and strongly projecting	1. *macracanthus*, sp. n.
Dorsal spines short, slightly projecting	2. *cælolepis*, Boc. & Capell.
Dorsal spines not projecting, hidden beneath the skin	3. *cryptacanthus*, sp. n.
II. Anterior labial grooves long, each about twice as long as its distance from the middle of the upper jaw; nostrils slightly oblique, almost transverse	4. *obscurus*, Vaill.

III. Anterior labial grooves very long, only separated by a narrow interspace: nostrils transverse ..... 5. *crepidater* *, Boc. & [Capell.

Centrophorus Braganciæ.

Centrophorus granulosus (part.), Carlos de Braganca, Res. Inv. 'Amelia,' Ichthyol. ii. p. 71 (1904).

Dermal denticles small, those of the anterior part of the body with 2 or 3 keels which converge to a point posteriorly. Length of snout, in front of eye, a little less than the distance from eye to first gill-opening. Interspace between the nostrils equal to their distance from the end of snout, which is $\frac{2}{3}$ of that from mouth to nostrils. Labial grooves short. Length of base of second dorsal (without the spine) $\frac{3}{5}$ of its distance from the upper lobe of caudal and $\frac{3}{4}$ that of the first (without the spine), which is nearly equal to its height and $\frac{1}{4}$ of the interspace between the two. Dorsal spines well developed and strongly projecting, the second nearly as high as the fin and more than $\frac{3}{5}$ exposed. Posterior angle of pectoral produced and acutely pointed, extending to below the posterior part of the first dorsal. Ventral extending to below spine of second dorsal. Brownish; fins darker and with light edges.

Hab. Deep water off the coast of Portugal.

Two specimens, 440 and 460 mm. in total length, from off Cezimbra, at depths of 276 and 460 fathoms, presented by H.M. the King of Portugal.

The species is especially distinguished from *C. granulosus* by the shorter anterior dorsal fin.

Squatina australis.

Rhina squatina (non Linn.), McCoy, Prodr. Zool. Vict. iv. pl. xxxiv. (1879); Macleay, Proc. Linn. Soc. N. S. Wales, vi. 1881, p. 368; Johnston, Proc. R. Soc. Tasmania, 1883, p. 139.

Folds at sides of head of nearly equal width throughout, not produced into lobes. Nasal flaps fringed, the inner ramose. Distance between spiracles greater than interocular width, equal to the distance between outer edges of eyes. Outer angle of pectoral scarcely more than a right angle; distance from anterior angle to posterior end of base of pectoral a little more than $\frac{3}{5}$ of the extreme length of the fin. Ventral not extending to origin of first dorsal. Breadth of tail a little more than $\frac{1}{4}$ of its length. Base of first dorsal $\frac{3}{5}$

* *Centrophorus Rossi*, Alcock, 1898.

its height, which is nearly equal to the distance from the second; second dorsal scarcely smaller than first; interspace between the dorsals $1\frac{3}{5}$ the distance from second dorsal to caudal, $\frac{2}{3}$ of the distance from base of tail to origin of first dorsal. Posterior edge of upper caudal lobe convex above, obliquely emarginate below; lower lobe obliquely truncate. Upper surface with small pointed denticles, without keels; median series of enlarged denticles inconspicuous; small imbricated denticles at outer edges of paired fins extending on to their lower surface, covering about the outer half of each fin; denticles on lower surface of tail extending forwards to its base; lower surface of head naked; abdomen naked except for a small median patch. Yellowish, with numerous minute dark spots arranged so as to leave small rounded spots of the lighter ground-colour, the larger of which are each surrounded by a ring of enlarged dark spots.

Hab. Southern Australia; Tasmania.

A single specimen of 530 mm. from Port Jackson, presented by the Imperial Institute.

Squatina nebulosa.

Rhina squatina (part.), Günth. Cat. Fish. viii. p. 430 (1870).

Folds at sides of head anteriorly forming two lobes with convex edges on each side, the second the larger and opposite the angle of the mouth. Outer nasal flap with entire edges; inner flap with two nearly simple prolongations, the outer of which has a fringed lobe at its base. Distance between the spiracles a little less than the interocular width. Outer angle of pectoral much more than a right angle; distance from anterior angle to posterior end of base of pectoral a little more than $\frac{1}{2}$ of the extreme length of the fin. Ventral extending beyond the origin of first dorsal. Width of tail a little more than $\frac{1}{5}$ of its length. Base of first dorsal $\frac{2}{3}$ its height, which is equal to its distance from the second; second dorsal a little shorter but scarcely lower than first; interspace between the dorsals $\frac{2}{3}$ of the distance from second dorsal to caudal and $\frac{4}{5}$ of the distance from base of tail to origin of first dorsal. Posterior edge of upper caudal lobe slightly emarginate; lower lobe nearly vertically truncate. Upper surface with small pointed denticles, each with 3 keels; no median series of enlarged denticles; small imbricated denticles at outer edges of paired fins, extending on to their lower surface and on the pectorals forming a strip about equal in width to the distance between eye and spiracle; denticles on lower surface

of tail not extending forward to its base; lower surface of head and abdomen naked. Brownish, obscurely marbled with blackish, and with a few small round whitish spots.

Hab. Japan.

A single specimen of 580 mm.

LXVI.—*Description of a new Lizard and a new Snake from Australia.* By G. A. Boulenger, F.R.S.

Varanus Ingrami.

Similar to *V. Gouldii*, Gray, but snout shorter, its length less than the distance between the anterior border of the orbit and the anterior border of the ear, scales on upper surface of snout, vertex, and occiput much larger than those on the supraocular and temporal regions, and caudal scales much larger. The latter are almost tubercular, and form very well-marked whorls, 7 whorls, in the middle of the tail, corresponding to the length of the snout; the scales on the upper surface of the tail form a double tubercular crest. Pale greyish buff above, with a few dark dots on the head and neck and six irregular, broad, rather darker bands across the body, these bands finely dotted with blackish; belly whitish, unspotted; tail with very irregular blackish rings.

From snout to vent 460 mm.; tail 540.

This very distinct species is described from a skin forming part of a small collection of reptiles from Alexandria, Northern Territory of the Colony of South Australia, made by Mr. W. Stalker, and presented to the British Museum by Sir W. Ingram and the Hon. John Forrest.

Denisonia Forresti.

Eye longer than its distance from the mouth. Rostral broader than deep, just visible from above; internasals half as long as the præfrontals; frontal once and one third as long as broad, twice as broad as the supraocular, as long as its distance from the end of the snout, much shorter than the parietals; nasal entire, separated from the single præocular by the præfrontal, which forms a suture with the second upper labial; two postoculars; temporals 2+2, lower anterior wedged in between the fifth and sixth labials; six upper labials, third and fourth entering the eye; three lower labials

in contact with the anterior chin-shields, which are a little shorter than the posterior. Scales in 19 or 21 rows. Ventrals 176–178; anal entire; subcaudals 33–38. Greyish above, each scale with a narrow black edge; upper surface of head and nape black; a pair of round black spots may be present behind the nape; sides of head yellowish, with a black streak across the upper half of the rostral to the last labial, passing below the eye; lower parts uniform white.

Total length 260 mm.; tail 33.

Two specimens, received along with the new *Varanus*.

This species is allied to *D. suta*, Peters, and *D. frontalis*, Douglas Ogilby. No other known species of *Denisonia* has as many as 21 rows of scales.

LXVII.—*Description of a new Snake of the Genus* Glauconia, *from Somaliland.* By G. A. Boulenger, F.R.S.

Glauconia reticulata.

Snout rounded; supraocular present, small, longer than broad; rostral one third the width of the head, a little broader than the nasal, barely reaching the level of the eyes; nasal completely divided, in contact with the præfrontal, which is a little larger than the supraocular and much larger than the frontal; postocular, parietal, and interparietal large; ocular bordering the lip, between two labials, the anterior of which equals the lower part of the nasal in size and does not reach the eye; six lower labials. 14 scales round the body. Diameter of body 38 times in the total length, length of tail 9½ times. Dark brown above, with white borders to the scales, forming a network; white beneath.

Total length 190 mm.

A single specimen from Wagga, Goolis Mountains, near Berbera, altitude 3000–4000 feet, from the collection of Mr. G. W. Bury. Specimens of *Glauconia Cairi* were also obtained at the same locality by Mr. Bury. This *G. Cairi*, long known from Egypt only, has of late been found near Suakim (*Dr. J. Anderson*), on the White Nile (*Capt. S. Flower*), and at Harrar (*Capt. Citerni*, 1904: Genoa Museum).

The nearest ally of *G. reticulata* is *G. narirostre*, Peters, from Lagos and the Niger, which differs principally in the narrower rostral.

LXVIII.—*Notes on South-American Rodents.*

By Oldfield Thomas.

I.—*A new Name for* Sciurus Roberti, *Thos.*

In 1903 * I gave to an Eastern Brazilian squirrel the above name in honour of its discoverer Mr. Alphonse Robert. But two years before † Mr. Bonhote had already used the same term for a squirrel obtained by Mr. Robert Swinhoe in Formosa, and I would therefore propose for the Brazilian species the name of *Sciurus Alphonsei*.

II.—*On the Allocation of certain Species hitherto referred respectively to* Oryzomys, Thomasomys, *and* Rhipidomys.

In connexion with Mr. W. H. Osgood's work on the genus *Peromyscus*, my attention has been drawn by him to the characters that distinguish the group containing "*Hesperomys* (*Rhipidomys*) *cinereus*, Thos.," which was made the type of a special genus "*Thomasomys*" by Dr. Elliott Coues in 1884 ‡. But with the exception of one more recent description of my own, the name has hitherto been practically ignored. It is used, however, in Trouessart's Catalogue on the authority of that one description.

Now, however, a revision of a number of the species concerned shows that *Thomasomys* (the cacophony of whose name I deplore) is a well-defined group, containing a considerable number of species, and that it may be distinguished from *Oryzomys* by certain characters of the palate, well shown in some admirable figures published by Mr. Outram Bangs in 1900 §, and by the possession, in most of the species, of only 1—2=6 mammæ, as compared with the invariable 2—2=8 of *Oryzomys*.

In *Oryzomys* (including the subgenus *Oligoryzomys*, Bangs) the palate extends some distance behind the posterior border of the last molar, the palatal notch is narrowed or pointed, and on each side of it, between m^3 and the corner of the mesopterygoid fossa ‖, there is a small pit or pair of pits,

* Ann. & Mag. Nat. Hist. (7) xii. p. 463 (1903).

† *Sciurus thaiwanensis Roberti*, Ann. & Mag. Nat. Hist. (7) vii. p. 166 (1901).

‡ Am. Nat. xviii. p. 1275 (1884).

§ Proc. New England Zool. Club, i. p. 94. pl. i. (1900).

‖ A good deal of confusion has arisen as to the use of the words meso- and interpterygoid for the fossæ situated (*a*) between the pterygoids in the middle line and (*b*) those placed laterally between the ecto- and entopterygoids of either side, the former being median and unpaired, the

often deeply excavated and always readily perceptible. This style of palate is shown in Mr. Bangs's figures 1 *b* and 2 *b* of the plate quoted.

In *Thomasomys*, on the other hand, with which I must synonymize *Erioryzomys*, Bangs, the mesopterygoid fossa extends further forward (to between the last molars), is, as a rule, rather more squarely open in front than in *Oryzomys*, and there are no lateral pits. Mr. Bangs's figure 3 *b* shows excellently this type of palate.

To the genus as thus defined the following species, mostly described under *Oryzomys*, prove to be referable, though, of course, the number of mammæ is not as yet known in all of them :—

Thomasomys princeps, Thos.
—— *prætor*, Thos.
—— *aureus*, Tomes.
—— *pyrrhonotus*, Thos.
—— *vestitus*, Thos.
—— *cinereus*, Thos. (Type of genus.)
—— *Kalinowskii*, Thos.
—— *incanus*, Thos.
—— *paramorum*, Thos.
—— *Taczanowskii*, Thos.
—— *lœops*, Thos.
—— *niveipes*, Thos.
—— *laniger*, Thos.
—— *monochromos*, Bangs. (Type of *Erioryzomys*, Bangs.)
—— *ferrugineus*, Thos.
—— *dorsalis*, Hensel.
—— *sublineatus*, Thos.

It will be noticed that nearly all these species are inhabitants of the mountainous regions of N.W. South America, from Colombia to Peru, none of them penetrating into Central

latter lateral and paired. To avoid this confusion I would suggest that while the former, the median one, might still be called the mesopterygoid fossa, the new name of parapterygoid might be given to the lateral ones, the names themselves then explaining the positions that the fossæ respectively bear to the skull as a whole.

Mr. Miller, in figuring a Microtine skull (N. Am. Faun. no. 12, p. 27, 1896), has followed the usage of the human anatomists in calling the lateral fossæ simply "*pterygoid*," and then using interpterygoid for the median one; but other authors have used this latter name for the lateral ones, and as the names do not explain themselves, their misuse is always probable. It would therefore seem advisable to drop them altogether and to use terms which are self-explanatory.

America. But three of them—*sublineatus*, *ferrugineus*, and *dorsalis*—extend into Eastern Brazil, the first-named in the north, the other two in the south. *T. ferrugineus* and *dorsalis* are also exceptional in possessing 2—2=8 mammæ.

No doubt other described species will be found to be referable to *Thomasomys*, but the above are all that I have as yet been able to identify.

But, further, a study of the same mammary and palatal characters in the series of forms that have been allocated to *Rhipidomys* brings out the fact that among these there are two distinct groups differing from each other exactly as do *Oryzomys* and *Thomasomys*; for up to the present no accurate definition of "*Rhipidomys*" has been given, and the fact that the tail of any species is more or less tufted and that the animal had certain other external peculiarities have been taken as sufficient reason for its reference to what I now find to be the composite genus *Rhipidomys*.

The true *Rhipidomys* has 1—2=6 mammæ, a long heavily tufted tail, broad climbing feet, and the palatal characters of *Thomasomys*, from which it is to be distinguished by its external peculiarities and by the presence of well-marked divergent supraorbital ridges, these being practically absent in *Thomasomys*.

The species to which the following specific names have been given appear to belong to this genus:—*leucodactylus*, Tschudi (type of genus); *mastacalis*, Lund; *macrurus*, Gerv.; *latimanus*, Tomes; *ochrogaster* and *Couesi*, Allen; *Sclateri*, *Goodfellowi*, *venezuelæ*, *venustus*, *microtis*, *pictor*, *nitela*, and *fulviventer*, Thos.; and *Macconnelli*, de Winton; but the last-named is somewhat aberrant in other characters than those above mentioned, and may hereafter prove to be separable from the rest.

The species belonging to the second group have absolutely the skull of *Oryzomys*, and they also, so far as is known, have 2—2=8 mammæ. It is clear, therefore, that they should be altogether removed from *Rhipidomys*, and either assigned to *Oryzomys* or form a special group of their own.

On the whole it appears to me they may best be regarded as a subgenus of *Oryzomys*, as follows:—

Œcomys*, subgen. nov.

Number of mammæ (2—2=8) and essential skull-characters as in *Oryzomys*, though there is a tendency for the brain-case

* οἶκος, a house. Quite a number of specimens, of different species, are noted as having been caught in native houses.

to be proportionally larger, more rounded, and *Rhipidomys*-like. Feet broad, suited for climbing; fifth hind toe proportionally long. Tail with the body-fur encroaching on its base for half an inch or more; terminal part well haired—more so than in true *Oryzomys*—and generally pencilled, though never so heavily as in *Rhipidomys*.

Type. *Rhipidomys benevolens*, Thos.

The following is the list of species belonging to this group:—

Oryzomys (*Œcomys*) *bicolor*, Tomes.
—— (——) *dryas*, Thos. (probably = *bicolor*).
—— (——) *benevolens*, Thos. (Type.)
—— (——) *marmosurus*, Thos.
—— (——) *mamoræ*, Thos. (*infrà*).
—— (——) *phœotis*, Thos.
—— (——) *paricola*, Thos.
—— (——) *rosilla*, Thos.
—— (——) *Roberti*, Thos.

Rhipidomys rufescens, Thos., also probably belongs to *Œcomys*, but the essential parts of the type skull have unfortunately been broken away.

In the transference of these species to *Oryzomys* only one name—*dryas*—clashes with a term already in use in that genus. But it so happens that this animal is probably the same as Tomes's *bicolor*, which, as the type now shows, was described from a discoloured specimen with a broken tail, while my distinction of *dryas* was based on the difference of colour and the longer tail as compared with Tomes's description, the type not being then available for examination.

With regard to *Nyctomys*, hitherto somewhat doubtfully separated from *Rhipidomys*, I am able to point out an important character which will distinguish it from that genus. This is that the first upper molar, instead of being evenly oblong, with six subequal cusps, has only five well-developed, the antero-internal one being almost or quite obsolete. The group may therefore possibly be an offshoot of the *Peromyscus* stock, with no close relationship to *Rhipidomys* at all.

III.—*A new* Œcomys *and Two new Species of* Holochilus.

Oryzomys (*Œcomys*) *mamoræ*, sp. n.

One of the largest species of the group, as large as a medium-sized *Rhipidomys*, about the same size as *O.* (*Œ.*) *marmosurus*. Hairs of back about 10 mm. in length.

General colour of the type evidently somewhat altered by spirit, but apparently of the usual fulvous colour, with pure sharply defined white * belly. Hands and feet dull buffy whitish. Basal half-inch of tail furry like the body, the remainder well haired to the tip, but scarcely pencilled; pale brown throughout. Mammæ 2—2=8.

Skull very like that of a medium-sized *Rhipidomys* in general appearance, but the palate absolutely of the *Oryzomys* type. Interorbital region narrow, its edges sharply defined, with delicate ridges evenly diverging backwards; very different to the strong overhanging ledges of *O.* (*Œ.*) *marmosurus*. Palatine foramina large and open, extending back just to the level of the front of m^1. Mesopterygoid fossa broad, parallel-sided, its anterior edge evenly rounded.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 130 mm.; tail 161; hind foot 27; ear 20.

Skull: greatest length 33·5; basilar length 25·6; greatest breadth 17·5; interorbital breadth 5·2; palatilar length 14·1; diastema 8·6; palatal foramina 5·7; length of upper molar series 5·3.

Hab. Mosetenes, Upper Mamoré, Yungas, Bolivia.

Type. Adult female. B.M. no. 0. 8. 3. 21. Collected by L. Balzan; presented by the Museo Civico, Genoa.

The species of *Œcomys*, being distinguished from each other almost entirely by size and skull-characters, with a remarkable uniformity of coloration, I have no doubt (in spite of the discoloration of the type) about the distinction of this animal, which may be separated from its only equal in size, *O.* (*Œ.*) *marmosurus*, by its narrower interorbital region, less developed orbital ledges, and larger palatal foramina.

Holochilus chacarius, sp. n.

Allied to *H. vulpinus*, but with more slender feet and teeth.

General colour as in *H. vulpinus*. Back near "raw-umber"; sides buffy, brightening to ochraceous buff along their lower edge; belly "buff," the hairs white basally; throat, chest, and inguinal region entirely white. Ears mixed buffy and brown. Upper surface of hands pale brownish buffy, of feet glossy greyish white. The feet themselves smaller and narrower than in other species. Tail shorter than head and body, brown above, greyish white below.

* Yellow in the specimen, but this has certainly been affected by the spirit.

Skull lightly built. Back of nasals and front part of frontals markedly concave upwards along the middle line. Supraorbital edges sharp, not heavily ridged. Palatal foramina well open. Molars decidedly narrower than in other species. Last upper molar rather simpler than in other species, its anterior lamina directly transverse, scarcely thickened internally, not connected with the second lamina.

Dimensions of the type (measured in flesh):—

Head and body 175 mm.; tail 164; hind foot 38; ear 17.

Skull: greatest length 36·7; basilar length 30; greatest breadth 19·5; nasals 14; interorbital breadth 4·5; palatilar length 18; diastema 10·6; palatal foramina 7·5 × 2·5; upper molar series 6·9; breadth of m^1 2·1.

Hab. Chaco 1 league N.W. of Concepcion, Paraguay.

Type. Female. B.M. no. 1. 3. 11. 2. Collected 12th March, 1900, by Mr. T. Insley. One specimen.

"Inhabits swamps.—Raises a nest on weeds about a foot above the water."—*T. I.*

This species is distinguishable from *H. vulpinus* of the lower Parana and La Plata, which it resembles in colour, by its delicate feet and narrow molars. When further examples, of different ages, of both forms are available for examination, I also think it probable that a real difference in the structure of m^3 will be definable.

Holochilus balnearum, sp. n.

A small species, with short tail and large teeth.

Fur long and fine, the hairs of the back 14–15 mm. in length. General colour of the usual type, the back rather greyer than in *H. chacarius*, the sides rather duller buff and the belly a deeper buff, so that there is less difference between the sides and belly, the hairs of the last-named part broadly slaty at base; pectoral and inguinal light patches more strongly contrasted white. Feet comparatively short; soles naked, granulated, with more strongly marked pads than in the allied species. Tail comparatively short, blackish above, dull greyish below.

Skull short and thickly built. Interorbital region but slightly concave mesially. Palatal foramina broad, but not widely open, owing to their rounded margins and the breadth of the septum, so that the actual slits are unusually narrow. Molars unusually broad and heavy, their length scarcely more than in *H. chacarius*, but their breadth considerably greater. Anterior lamina of m^3 thickened internally and connected with the next lamina by an enamel band. In their position also

the molars differ by facing further outwards than usual, the line of the two grinding-surfaces, if produced internally, meeting at an angle almost approaching a right angle, *i. e.* about 110°. In *H. chacarius* they meet at about 130°, and in a large example of *H. vulpinus* at over 150°. I cannot find that there is any appreciable age-variation in this character, though its exact definition is not easy.

Dimensions of the type (measured in the flesh) :—

Head and body "132" mm.*; tail 133; hind foot 35·5; ear 18.

Skull: greatest length 35; basilar length 29·5; greatest breadth 20; nasals 13·3; interorbital breadth 4·3; palatilar length 18·2; diastema 10; palatal foramina 7·3; length of upper molar series 7·5; breadth of m^1 2·5.

Hab. Bañado de S. Felipe, Tucuman. Alt. 435 m.

Type. Female. B.M. no. 4. 10. 2. 5. Collected 18th June, 1904, by L. Dinelli. One specimen.

This small species is remarkable for its thick and heavy molars and the unusually oblique angle at which they are set.

LXIX.—*A new Species of* Pteridium *(Scopoli) from the North-east Atlantic.* By L. W. Byrne.

Only a single species of *Pteridium* (Scopoli), as defined by Günther† ('Challenger' Deep-sea Fishes, p. 105), has hitherto been described—*P. atrum* (Risso), a denizen of the Mediterranean coast of France, where, however, it appears to be uncommon.

On a recent cruise in the northern portion of the Bay of Biscay the S.S. 'Huxley,' employed by the Marine Biological Association of the United Kingdom upon the International Fishery Investigations, took a fish of this genus which appears to be referable to a previously undescribed species, which I propose to name in honour of my friend Dr. E. J. Allen, the Director of the Association.

Pteridium Alleni.

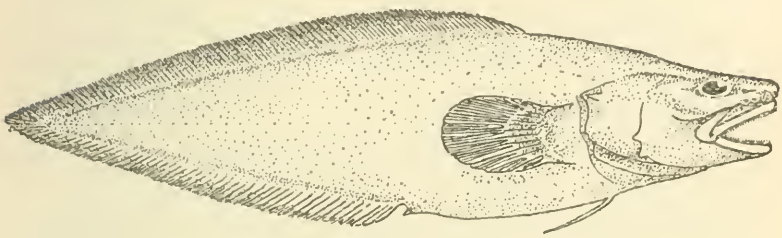
Form stout; body compressed in caudal region, its greatest height about 4 times in its length (without caudal fin).

* This would appear to be an under-measurement: the skin looks contracted, but the head and body still measure over 140 mm.

† The "some slightly enlarged teeth along the inner series of the mandible and on the vomer," mentioned by Günther, are stated by Moreau, on the authority of Bellotti, to be found in the male only.

Head depressed, $3\frac{1}{2}$ times in length (without caudal), nearly twice as long as broad, its breadth about equal to its height at isthmus. Snout rounded, with numerous mucous glands, about $4\frac{1}{4}$ times in head. Eye of moderate size, longer than the flat interorbital space is wide, 6 times in head and less than $1\frac{1}{2}$ times in snout. Gape $2\frac{2}{3}$ times in head, barely reaching beyond the level of the hind margin of orbit; maxilla weak and but little expanded distally. Villiform teeth in both jaws and in a V-shaped band on vomer.

Marginal fins continuous, their bases covered with skin and scales; fin-rays difficult to count, probably D. *ca.* 90, A. *ca.* 55. Ventrals each with two closely apposed rays.



Pteridium Alleni, × 1.

Body covered with a copious mucous secretion; scales very small, approximately 105 in a longitudinal and 35 in a transverse series. Lateral line very indistinct and broken.

Colour, after preservation, umber-brown, darker on top of head and front part of dorsum, paler on belly. Rays of marginal fins dark.

Length of type 101 mm. (96 mm. without caudal).

Hab. Mouth of English Channel, near La Chapelle Bank, *ca.* 450 fath.

The chief dimensions of the type are as follows:—Length 96 mm.; length, including caudal fin, 101 mm.; length to origin of dorsal fin 33 mm., to origin of anal fin 49 mm.; greatest height of body 23 mm.; length of head 27·5 mm., of snout 6·5 mm., of eye 4·5 mm.; interorbital width 4 mm.; height of head at isthmus 15 mm.; breadth of head 15 mm.; length of upper jaw 10·5 mm.

While the general form and proportions of the body are somewhat stouter in *P. Alleni* than in *P. atrum*, neither they nor the fin-ray and scale formulæ afford a ready means of identifying the species. In *P. Alleni*, however, the head is slightly larger and markedly more depressed than in *P. atrum*,

the eye is larger, and the interorbital space far narrower; in contradistinction to the comparatively short gape and weak maxilla in *P. Alleni*, *P. atrum* has a gape extending far beyond the hind margin of the eye and a stout maxilla with a broad distal end.

These points are shown by the following percentages, taken from three specimens 80–90 mm. long (without caudal) of *P. atrum* and the type of *P. Alleni*:—

	P. atrum.	*P. Alleni.*
Length of head	26-25	28 p. c. of total length (without caudal).
„ snout	25-23	24 p. c. of head.
„ eye	14-12·5	16·5 „ „
Interorbital width	26-23	15 „ „
Height of head	70	55 „ „
Breadth „	50-45	55 „ „
Length of upper jaw ..	60-55	35 „ „

The following key should suffice (at any rate until further material is available) to distinguish the species apart:—

PTERIDIUM (Scopoli), Günther.

1. Breadth of head not more than half its length or $\frac{3}{4}$ of its height at isthmus. Interorbital width about equal to snout and more than $1\frac{1}{2}$ times as long as eye. Upper jaw broad distally and extending far beyond hind margin of eye ..... *P. atrum* (Risso).
2. Breadth of head more than half its length and equal to its height at isthmus. Interorbital width less than length of eye and more than $1\frac{1}{2}$ times in snout. Upper jaw narrow distally, reaching as far as hind margin of eye ..... *P. Alleni*, Bv.

LXX.—*A Collection of Fishes from the King River, Western Australia.* By C. TATE REGAN, B.A.

A SMALL series of freshwater fishes from the King River, Western Australia, collected by Mr. G. C. Shortridge and presented to the British Museum by W. E. Balston, Esq., is of some interest, although only six species are represented.

Galaxiidæ.

Galaxias occidentalis, Ogilby, 1899.

This species is the only *Galaxias* so far recorded from Western Australia.

Atherinidæ.

Atherina elongata, Klünz. 1880.

NANNATHERINA, gen. nov.

Body moderately elongate, compressed. Scales rather large, cycloid; no lateral line. Mouth wide, oblique, the maxillary exposed distally and extending to below the eye; præmaxillaries a little protractile; bands of small pointed teeth in the jaws and on the vomer and palatines. Dorsal fins connected at the base, with VIII–IX, I 8–9 rays, the spines pungent; anal with III 8–9 rays, opposite the soft dorsal; caudal rounded or subtruncate. Pectorals symmetrical, rounded, placed rather low (as in normal Perciform fishes rather than as in other Atherinids); ventrals with I 5 rays, inserted behind the base of the pectorals. Vertebræ 31 (14+17).

Nannatherina Balstoni, sp. n.

Depth of body equal to or a little less than the length of head, which is 3 in the length of the fish. Snout shorter than eye, the diameter of which is 3 in the length of head; interorbital width 4 in the length of head. Upper surface of head scaly, except the snout; cheeks and opercles scaly. Jaws equal anteriorly; maxillary extending to below middle of eye. Gill-rakers represented by a series of very short projections. 35 scales in a longitudinal series. Dorsal VIII–IX, I 8–9; origin above posterior part of pectoral; second or third spine longest, a little less than $\frac{1}{3}$ the length of head; soft fin higher, the rays nearly $\frac{2}{3}$ the length of head. Anal III 8–9, opposite and similar to the second dorsal. Caudal rounded or subtruncate. Pectoral a little more than $\frac{1}{2}$ the length of head; insertion of ventrals below the middle of pectoral. Brownish, with several dark vertical bars and an indistinct broken lateral stripe or series of spots.

Two specimens, 50 mm. in total length.

The connected dorsal fins and the low position of the pectorals suggested that this little fish might prove to be the type of a family distinct from the Atherinidæ, but dissection of one side of one of the specimens shows that the vertebral column and pectoral arch are as in typical Atherinidæ; the pelvic bones are quite remote from the clavicles, to which they are connected by a ligament.

Serranidæ.

Bostockia.

Bostockia, Casteln. Proc. Zool. Soc. Vict. ii. 1873, p. 126.

Closely allied to *Percalates*, Ramsay & Ogilby, but with the lateral line incomplete, ending below the spinous dorsal. Dorsal fins with VIII–IX, I 16–17 rays, the spinous portion not longer than the soft; anal with III 11 rays; caudal rounded; pectorals symmetrical, rounded, with 14 or 15 rays.

Bostockia porosa.

Bostockia porosa, Casteln. Proc. Zool. Soc. Vict. ii. 1873, p. 126.

Depth of body 3 in the length, length of head $2\frac{2}{3}$. Snout slightly longer than eye, the diameter of which is 5 in the length of head and equal to the interorbital width. Lower jaw projecting; maxillary extending to below middle of eye; præorbital and suborbitals entire; cheeks and opercles scaly; præoperculum with downwardly directed serræ on the lower part of the posterior limb and with antrorse serræ on the inferior limb; 8 rather short gill-rakers on the lower part of anterior arch. About 45 scales in a longitudinal series. Dorsal VIII–IX, I 16–17; origin behind axil of pectoral; fourth spine longest, nearly $\frac{1}{3}$ the length of head. Anal III 11, second spine longer than third, nearly $\frac{1}{4}$ the length of head. Pectoral $\frac{1}{2}$ the length of head. Brownish.

A specimen measuring 82 mm. to the base of caudal and five much smaller ones.

Castelnau described the lateral line as complete, extending from head to caudal fin. It seems probable that his specimens, like the ones I have examined, were preserved in strong spirit, and that he mistook the upper of three longitudinal grooves which are produced in shrunken specimens for the continuation of the lateral line.

Centrarchidæ.

Edelia.

Edelia, Casteln. Proc. Zool. Soc. Vict. ii. 1873, p. 123.

Body oblong, strongly compressed; scales large, ciliated. Lateral line anteriorly parallel to the dorsal profile, posteriorly running along the middle of the side of the tail, the two portions usually disconnected; tube straight, extending the whole length of the exposed part of the scale; muciparous scales mostly not adjacent, but separated from each other by one or more ordinary scales. Mouth small, protractile; teeth

in jaws in villiform bands; teeth on vomer and palatines; tongue smooth. Præorbital with finely serrated posterior edge; suborbitals ligamentous; præoperculum entire; operculum with two spines. Head scaly except the snout. Gill-membranes narrowly united; pseudobranchiæ well-developed; gill-rakers rather long. Dorsal fins connected at the base, with VII–VIII, I 8–10 rays, the spinous portion longer than the soft. Anal as much developed as the soft dorsal, with III 6–8 rays. Caudal rounded. Pectorals obtuse; ventrals behind base of pectorals, close together, each with a strong spine. Præmaxillary processes not reaching the frontals; supraoccipital crest not extending on the upper surface of the cranium; no parietal crests. Vertebræ 28 (12 + 16).

This genus, hitherto unrepresented in the British Museum collection, proves to be closely allied to *Kuhlia*, Gill. In addition to the species described below, the genus includes the *Paradules obscurus* of Klunzinger.

Nanoperca, Gthr., 1861, is very closely allied to *Edelia*, but the præorbital has only two rather strong serræ and the interorbital region is naked. *Microperca* (non Putnam), Casteln., must also be very near to *Edelia*.

Edelia vittata.

Edelia vittata, Casteln. Proc. Zool. Soc. Vict. ii. 1873, p. 124.
Edelia viridis, Casteln. *t. c.* p. 125.

Depth of body 2½ to 3 in the length, length of head 3⅓. Snout nearly as long as eye, the diameter of which is 3 to 3½ in the length of head and about equal to the interorbital width. Maxillary not extending to below the eye. About 30 scales in a longitudinal series. Dorsal VII–VIII, I 8–9; second spine longest, ⅔ the length of head. Anal III 7–8; second and third spines subequal, about ⅖ the length of head. Pectoral ½ the length of head. A dark lateral band from snout to base of caudal, often interrupted; scales below the band silvery; usually a dark spot above the base of pectoral and another at the root of the caudal.

Several specimens, measuring up to 50 mm. in total length.

Gobiidæ.

Gobius ornatus, Rüpp. 1828.

This marine species is known to range from the Red Sea to the coasts of North-western Australia.

LXXI.—*Description of a Second new Species of Mangabey* (Cercocebus Jamrachi). By R. I. Pocock, F.L.S., F.Z.S., Superintendent of the Zoological Society's Gardens.

[Plate XI.]

The young male monkey upon which this new species is based was deposited in the Zoological Gardens by Mr. Rothschild, who has placed its determination and description in my hands. I propose to name it after Mr. Albert E. Jamrach, the well-known importer of wild animals, who procured the specimen.

Cercocebus Jamrachi, sp. n. (Pl. XI.)

The face, ears, palms of the hands, and soles of the feet flesh-coloured, the face much more pallid than the hands and feet, which are of a decided rosy pink; one or two small asymmetrically disposed pigment-spots on the face and ears. The iris of the eyes olive-brown; the white of the eye with a faint grey-blue tinge. The hair everywhere a uniform dirty white. On the posterior portion of the crown of the head the hair is thick and long, forming an occipito-parietal tuft as in *C. Hamlyni* *; it is also long behind the ears, but on the cheeks it is quite short and sparse, whereas on the brow there is a scanty and shaggy fringe of long, semierect, and partially porrect hairs.

Length from the crown of the head to the root of the tail 12 English inches (=300 mm.); length of the tail 19 inches (=475 mm.).

Loc. Molinga (? Mlungu), Lake Mweru.

The great interest attaching to this monkey lies in its remarkable coloration, which is unique in the genus *Cercocebus*. That the specimen is not a true and complete albino is shown by the normal tint of the eyes. It may be an albinescent variety of some species of *Cercocebus*, but of this there is as yet no proof. In the paper containing the description of *C. Hamlyni* I have discussed the possibility of the types of that species and of *C. congicus* being partially albino sports of *C. albigena Rothschildi* or an allied species. The reasons therein given for dismissing the hypothesis of albinism apply also to the present case, except for the total absence in this species of pattern showing symmetrical arrangement. Moreover, *C. Jamrachi* differs from the three forms just named

* Ann. & Mag. Nat. Hist. (7) xviii. pp. 208–210, pl. vii. (1906).

and resembles the typical form of *Cercocebus albigena* in possessing a brow-fringe and in the shortness of the hair on the cheeks. Hence it cannot be regarded, on the evidence, as a further stage in the albinescence, if albinescence it be, traceable from *C. albigena Rothschildi* to *C. congicus* and thence to *C. Hamlyni*. In fact, *C. Jamrachi* stands by itself. It may be at once distinguished from *C. albigena albigena*, its nearest ally, by its uniformly whitish coloration.

A further point to be noted in connexion with this species is its occurrence in a locality lying about 10° S. latitude in tropical Africa. It is, therefore, the southernmost representative of the genus *Cercocebus* known up to the present time.

EXPLANATION OF PLATE XI.

Cercocebus Jamrachi, sp. n. (Drawn from a photograph of the living animal.)

LXXII.—*Descriptions of new* Pyralidæ *of the Subfamilies* Hydrocampinæ *and* Scopariane. By Sir George F. Hampson, Bart., B.A., F.Z.S., &c.

[Continued from p. 393.]

Genus Metaclysta, nov.

Palpi upturned, the third joint long and acuminate; maxillary palpi moderate, filiform; antennæ of male somewhat laminate, with a tuft of hair on upperside of shaft near base; hind tibiæ with a tuft of hair replacing the medial spurs. Fore wing with convergent fringes of hair on basal area below costa and above inner margin, with a fold between them forming an elongate pouch on underside; veins 2, 3, 5 from angle of cell, 4 absent; 10, 11 free. Hind wing with vein 2 from towards angle of cell; 3 and 5 from angle, 4 absent; the termen slightly excised below apex and towards tornus.

(1.) *Metaclysta tetrommata*, sp. n.

♂. Head, thorax, and abdomen white marked with pale yellow; fore tibiæ and tarsi blackish above. Fore wing pale yellow; the costal edge black to beyond middle; an antemedial black spot above inner margin and a black discoidal spot; a white fascia from middle of cell to below costa beyond the cell; a curved white postmedial band

defined by punctiform black lines and at vein 2 recurved to middle of median nervure; a terminal series of black points. Hind wing with the basal half white, its outer edge oblique, with a black line on it from discal to submedian folds; the outer half pale yellow; an oblique white streak across apical area; an oblique line with three black striæ on its outer edge from termen above middle to vein 1; four black spots on medial part of termen, with the base of cilia beyond them golden.

Hab. Louisiades, St. Aignan (*Meek*), 1 ♂ type. *Exp.* 16 mm.

(3.) *Symphonia leucostictalis*, sp. n.

Antennæ of male with long cilia; maxillary palpi filiform. ♂. Head and thorax black-brown, some whitish on vertex of head and mesothorax; palpi with some yellowish at base of first joint and white at base of second joint; pectus and legs white, the fore femora and tibiæ with black bands at extremities; abdomen white, dorsally suffused with fuscous except first segment. Fore wing black-brown with a cupreous tinge, the medial area yellowish on inner half; a subbasal white line from costa to median nervure; antemedial line black defined by white on inner side, expanding into a spot below cell, where the line is slightly excurved; a black discoidal lunule with white patch before it and some whitish beyond it; postmedial line black defined by white on outer side, forming a triangular mark at costa, small spots at middle and a spot in sinus below vein 2, the line slightly excurved below costa, excurved between veins 5 and 2, then retracted to below angle of cell and sinuous to inner margin; a punctiform white line at base of cilia, which are white above tornus. Hind wing with the basal half pale yellowish, the terminal half black-brown; a little black at base; a black discoidal spot; postmedial line fine, black defined by white on outer side, excurved between veins 5 and 2, then retracted to below angle of cell and oblique to inner margin, where it expands on inner side into a triangular spot; cilia white, with a black line through them, the tips blackish at apex and middle; the underside paler.

Hab. New Guinea, Milne Bay (*Meek*), 1 ♂ type. *Exp.* 20 mm.

(9 *a*.) *Ambia mesoscotalis*, sp. n.

White; palpi at base, front of thorax, and parts of fore and mid legs tinged with fuscous. Fore wing with the base fuscous, with obscure white subbasal line and an orange-

yellow band on its outer edge; a medial orange-yellow band expanding outwards on costal area, and with a white discoidal lunule on it and some fuscous on its lower edge; an orange-yellow band edged by a fuscous line curving round from costa before apex to lower angle of cell and emitting a streak on costa to apex; a terminal orange band with fine fuscous line on its inner side, and suddenly bent outwards on to the cilia just before apex, where there is a black point. Hind wing with fuscous medial band with some orange on its inner edge; a postmedial orange band not extending below vein 2 and emitting streaks to apex and termen at veins 5, 3, and 2.

Hab. Banda (*Doherty*), 1 ♂ type; Louisiades, St. Aignan (*Meek*). *Exp.* 12 mm.

(10 *a*.) *Ambia oligalis*, sp. n.

White; palpi, fore legs, and abdomen slightly tinged with fuscous. Fore wing with the costa fuscous towards base; a prominent black discoidal spot; an orange postmedial line oblique from costa to vein 2, where it is retracted, terminating below middle of cell; a curved subterminal band expanding towards costa, developed into a spot on inner margin, and with a black line on its outer edge; a terminal band with black line on its inner edge; cilia with black line at base. Hind wing with black point in middle of cell; prominent black spots on discocellulars and below middle of cell, with an oblique orange band between them; an obliquely curved orange postmedial band edged by fuscous lines: a terminal band with black line on its inner side; six black points on termen, the two towards apex with black points on the cilia beyond them.

Hab. Louisiades, St. Aignan, Goodenough (*Meek*). *Exp.* 20 mm. Type in Coll. Rothschild.

(12 *a*.) *Ambia chalcichroalis*, sp. n.

♀. Head, thorax, and abdomen bronze-yellow. Fore wing bronze-yellow suffused in parts with fuscous; an antemedial white band, defined by black formed by a bar from costa to median nervure, and an oblique wedge-shaped patch from cell to inner margin; a small white discoidal lunule defined by black; a postmedial white band defined by black from costa to vein 4, its inner edge sinuous and expanding at and below costa; a conical white patch defined by black from below end of cell to inner margin; a subterminal white band defined by black, excurved and interrupted at middle.

Hind wing bronze-yellow suffused in parts with fuscous; an ill-defined whitish subbasal band; an antemedial quadrate white patch defined by black from costa to median nervure, with a narrow white band defined by black from it to inner margin; a postmedial curved white band defined by black from costa to vein 4, its inner edge sinuous and expanding at and below costa, and a curved white band defined by black from below end of cell to inner margin; a subterminal maculate white band defined by black formed by a subapical spot; three conjoined spots between veins 7 and 4 and two spots towards tornus.

Hab. Cape Colony, Annshaw (*Miss F. Barrett*), 1 ♀ type. *Exp.* 16 mm.

(12 *b*.) *Ambia melanalis*, sp. n.

♀. Head, thorax, and abdomen black-brown mixed with some whitish; pectus and ventral surface of abdomen white. Fore wing black-brown, suffused with greyish and tinged with yellowish in places; an antemedial white spot on costa with slight oblique sinuous whitish line from it to inner margin; a slight white discoidal lunule defined by black; a postmedial white spot on costa, with excurved line from it to vein 4, then almost obsolete and retracted to a white patch on inner area below end of cell; a white subapical point and slight subterminal line between veins 7 and 4; cilia black intersected with white in places. Hind wing black-brown tinged with yellowish and slightly suffused with grey; two small white spots at end of cell; postmedial line represented by a white bar from costa and traces of a line towards tornus; a white terminal line from costa to vein 6 angled outwards at apex.

Hab. Cape Colony, Transkei (*Miss F. Barrett*), 1 ♀ type. *Exp.* 14 mm.

(27 *a*.) *Ambia phœochroalis*, sp. n.

Head, thorax, and abdomen fuscous brown mixed with some white; pectus, legs, and ventral surface of abdomen mostly white. Fore wing fuscous brown, the postmedial and terminal areas with a yellowish tinge; a slight white subbasal line, angled outwards in cell, where it is produced to a short streak; antemedial line white, angled outwards just below cell; a small white spot below middle of costa; a black discoidal spot, with two slight white streaks beyond it and others, more minute and further from cell, above veins 6, 7; postmedial line white defined on each side by blackish,

slightly incurved below costa, excurved to vein 3, then retracted to below end of cell and very oblique to inner margin; a curved subterminal white line defined on each side by black, acutely bent outwards to apex; cilia black intersected with white. Hind wing fuscous brown with a yellowish tinge except on medial area; a slight subbasal white line; a slightly waved antemedial line; a black discoidal spot; postmedial line white defined by black on outer side, excurved from costa to vein 2, then retracted to below end of cell and again slightly excurved; subterminal line white defined on each side by blackish, bent outwards to apex, excurved at middle and ending at vein 2; cilia blackish intersected with white.

Hab. Jamaica, Moneague (*Walsingham*), 1 ♂, 1 ♀ type. *Exp.* 12 mm.

(27 *b.*) *Ambia leucocymalis,* sp. n.

♂. Head and thorax yellow and white slightly irrorated with fuscous; antennæ ringed with black; abdomen yellow slightly irrorated with fuscous and with segmental white bands. Fore wing orange-yellow irrorated with fuscous; curved white subbasal and antemedial bands defined on each side with fuscous; the subcostal fovea and two conjoined spots below cell white; three short white streaks beyond the cell above veins 5, 6, 7; a postmedial white band defined by fuscous, excurved from costa to vein 3, then retracted to below end of cell and very oblique to inner margin near tornus; a curved white subterminal band defined on each side by fuscous, bent outwards to apex; cilia chequered fuscous and white. Hind wing orange-yellow irrorated with fuscous; rather diffused white subbasal and antemedial bands; an oblique black discoidal striga, with slight white spot before it in cell and three slight streaks beyond it; postmedial band white defined on each side by fuscous, excurved from costa to vein 3, then retracted to below end of cell and again excurved to inner margin; a white subterminal band defined on each side by fuscous, bent outwards to apex, interrupted at discal fold and ending at vein 2; cilia chequered fuscous and white.

Hab. Jamaica, Moneague (*Walsingham*), 1 ♂ type. *Exp.* 14 mm.

(27 *c.*) *Ambia œdizonalis,* sp. n.

♂. Head and thorax yellow and white irrorated with fuscous; pectus and legs almost entirely white; abdomen yellow slightly irrorated with fuscous and with segmental white bands, the base and ventral surface white. Fore wing

orange-yellow, the base with a whitish patch and some fuscous irroration; subbasal and antemedial white bands defined on each side by black, the former slightly irregular, the latter expanding somewhat to inner margin; the subcostal fovea white; three white streaks beyond the cell above veins 5, 6, 7, the two upper irrorated with black; postmedial band white defined by black, excurved from costa to vein 3, then retracted to below end of cell and forming a slightly irregular triangular patch on inner area; a curved subterminal white band with slightly waved black edges except towards apex, to which it is bent outwards; cilia white, with fine black line at base and some black at apex and middle. Hind wing orange-yellow; a white patch at base; an antemedial white band defined on each side by black, expanding into a large patch on costal half; two white streaks beyond the cell; postmedial band white defined on each side by black, broader, excurved, and with sinuous inner edge from costa to vein 2, where it is bent inwards; subterminal band formed of two conjoined white spots below costa and three at middle, defined on outer side by black and on inner side slightly by fuscous; a rather diffused maculate terminal black line; cilia white, black at apex, middle, vein 2, and tornus.

Hab. Jamaica, Runaway Bay (*Walsingham*), 1 ♂ type. *Exp.* 18 mm.

(28 *a*.) *Ambia albitessellalis*, sp. n.

♂. Fore wing with the swelling on costa and gland below it considerably distorting the neuration, in one specimen veins 6, 7 being stalked.

White; palpi fulvous except third joint; abdomen with some fulvous on dorsum. Fore wing with the costal area orange, with fuscous on its lower edge and white subbasal, antemedial, medial, and subapical spots; an antemedial orange and brown inwardly oblique line across inner area and a postmedial outwardly oblique line; a subterminal orange band edged by brown lines, curved from costa to vein 2, where it emits a tooth on inner side, and ending at tornus; an orange patch on termen and cilia just below apex, with a line from it, edged on inner side by a brown line and bent inwards to the subterminal band just above tornus. Hind wing with orange and brown antemedial and medial lines from costa to submedian fold, the latter slightly angled outwards below costa and at median nervure bent inwards to the antemedial line; a postmedial line curved from costa to submedian fold, where it is dentate on inner

side, and emits a streak to termen on outer, then ending on termen; a terminal band from apex to vein 2, the termen being very much excised below apex and dentate at veins 7, 6, 4, 3, 2.

Hab. Jamaica, Moneague (*Walsingham*), 2 ♂, 4 ♀ type; Newcastle. *Exp.* 16 mm.

(30 *a*.) *Ambia fusalis*, sp. n.

♂. Orange suffused with fuscous. Both wings with indistinct, curved, grey antemedial line; the fovea of fore wing whitish; a discoidal black spot; a dark-edged grey postmedial band incurved below vein 3; a terminal orange band with fuscous terminal spots, and defined on inner side by a black line with grey line inside it; cilia fuscous.

Hab. Bali (*Doherty*), 1 ♂ type. *Exp.* 20 mm.

(33 *a*.) *Ambia vagilinealis*, sp. n.

Head, thorax, and abdomen white slightly marked with brown. Fore wing brown, with oblique, straight, white subbasal line; a white lunule in middle of cell with the antemedial line excurved round it, emitting two branches at costa and retracted at median nervure; a white line from costa to lower angle of cell, with a fork to costa and a short branch at middle of discocellulars; the postmedial line bent outwards to costa, with a short spur at vein 5, and at vein 2 retracted to lower angle of cell; a sinuous black subterminal line with slight white line on its inner edge; a fine terminal fuscous line; cilia white and fuscous. Hind wing brown, with black-edged, straight, antemedial, white band; a wedge-shaped, black-edged, white discoidal patch from costa to lower end of cell, where it joins the sinuous postmedial line, which is retracted at vein 2 and interrupted by the brands; a subterminal white line with black outer edge, angled inwards at vein 5; a fine terminal black line.

Hab. N. Guinea, Kapaur (*Doherty*), 1 ♂ type; Louisiades, St. Aignan (*Meek*), 1 ♀. *Exp.* 16 mm.

(38 *a*.) *Ambia albibasalis*, sp. n.

♂. Antennæ laminate; head and thorax white mixed with pale fulvous; abdomen white tinged with pale fulvous and with diffused dorsal dark bands. Fore wing with the basal area pure white, edged by a blackish line angled below costa and on median nervure, the rest of the wing thickly irrorated and suffused with black-brown; the costal area

fulvous; a diffused black discoidal spot, with a curved line from it to inner margin; a curved line from costa beyond middle to termen at vein 5, defined by white on outer side and with diffused bluish-white scales on its inner side; a terminal series of small black and white spots; cilia pale fulvous, their tips whitish, dark at middle. Hind wing with the basal and costal areas white, the rest of wing thickly irrorated and suffused with black-brown; the long spatulate scales below the cell black and white; a minutely dentate postmedial line, excurved beyond lower angle of cell and towards tornus, where it is developed into a black spot; a maculate black terminal line, defined by white on inner side; cilia pale fulvous, whitish at tips.

Hab. Surinam, Paramaribo (*Ellacombe*); Brazil, São Paulo (*Jones*), 1 ♂ type. *Exp.* 14 mm.

(38 *b*.) *Ambia phæozonalis*, sp. n.

Head, thorax, and abdomen white tinged with golden brown, the last with blackish and white dorsal bands on subterminal segments; pectus, legs, and ventral surface of abdomen almost entirely white. Fore wing white, mostly suffused with golden brown and with some dark irroration; two brown striæ from costa near base, with an oblique brown band beyond them from cell to inner margin, with some black scales on it below cell; an indistinct double antemedial line, with some black scales on it, oblique from costa, then erect; a narrow white discoidal lunule defined by some dark scales; postmedial line double, filled in with white, oblique from costa to vein 4, then retracted to below end of cell and oblique to inner margin, with black suffusion between it and antemedial line from cell to inner margin, some yellow beyond it on costal area; a fine waved black subterminal line, defined by white on inner side, incurved from just below apex to vein 4; the termen yellow; cilia brownish at base, white at tips. Hind wing white; two brown subbasal lines from cell to inner margin; two medial blackish lines filled in with blackish from cell to inner margin; a dark minutely waved postmedial line, excurved from costa to vein 4, then retracted and becoming the outer medial line, the area from just beyond it brown, with subterminal series of slight white lunules and black point on termen at submedian fold; cilia white, blackish at tornus.

Hab. Mexico, Guerrero (*H. H. Smith*), 1 ♂, 1 ♀ type. Godman-Salvin Coll. *Exp.* 18 mm.

(5 *a*.) *Oligostigma alicialis*, sp. n.

♀. Head and thorax pale brown; abdomen brown mixed with black and banded with white, the ventral surface white. Fore wing pale brown diffused in parts with blackish; an oblique orange wedge-shaped patch beyond the cell from vein 7 to 2, defined on each side by fuscous lines; a curved white subterminal band bent inwards above inner margin, defined on inner side by blackish suffusion from costa to apex of the wedge-shaped patch and on outer by a black line followed by an orange terminal band; a fine black terminal line; cilia whitish, with a fuscous line through them. Hind wing with the base black, followed by a broad white band, then a broad black band, then a white band expanding somewhat at middle and defined on outer side by a fuscous line; a terminal orange band and fine black terminal line; cilia grey, with black spots divided by fine white streaks at the medial lobe.

Hab. Ceylon, Udagama (*Mackwood*), 1 ♀ type. *Exp.* 14 mm.

(18 *a*.) *Oligostigma melanotalis*, sp. n.

Head, thorax, and abdomen whitish mixed with orange; fore femora and tibiæ tinged with fuscous. Fore wing whitish suffused with orange, especially on costal and terminal areas; a black spot on middle of costa, with traces of an oblique orange line from it towards inner margin; a rounded orange discoidal spot; a sinuous whitish postmedial line slightly defined by orange on inner side, followed by an orange band with fine black line on its outer edge, then an orange terminal band; a terminal series of slight black points; cilia whitish tinged with yellow. Hind wing with the basal area whitish; a blackish medial line not reaching costa or inner margin; the terminal half orange; a subterminal whitish band between veins 5 and 1, defined on inner side by a sinuous fuscous line and on outer by a blackish line; a fine fuscous terminal line, with three small black spots at middle; cilia white, with a fine fuscous line through them.

Hab. Ceylon, Maskeliya (*de Mowbray*), 1 ♂; Pundaloya (*Green*), 2 ♀ type. *Exp.* 18–20 mm.

(18 *b*.) *Oligostigma bipunctalis*, sp. n.

♀. White; palpi and head slightly tinged with fuscous. Fore wing with the basal half of costal area irrorated with

brown; black points in middle of cell and on discocellulars; a postmedial orange band, curved to vein 4, then oblique to inner margin near base; a curved subterminal band edged with fuscous on outer side and a terminal band edged with fuscous on inner side; cilia fuscous and white. Hind wing with orange spot at base; a fuscous discoidal point; a medial fuscous-irrorated orange band, curved from costa to lower angle of cell, then oblique; a curved postmedial orange band edged by waved fuscous lines and conjoined at costa to a terminal band with waved fuscous line on its inner and outer sides; cilia with four black points towards apex and a black line towards tornus.

Hab. Nigeria, Sapele (*Sampson*), 1 ♀ type; Warri (*Roth*). *Exp.* 18 mm.

(19 *a*.) *Oligostigma discalis*, sp. n.

♂. Head, thorax, and legs white and orange, fore tibiæ blackish; abdomen orange above, with white segmental lines, the ventral surface white. Fore wing orange; a white fascia, with diffused fuscous on its edges below basal half of cell, at extremity conjoined to a fuscous-edged oblique band from subcostal nervure to vein 1; a large, fuscous-edged, elliptical, orange, discoidal spot extending to costa and with a wedge-shaped white patch on its outer side; a black-edged white subterminal band from below costa to above inner margin; a terminal series of black points; cilia fuscous. Hind wing white, with broad orange terminal band with curved black line on its inner edge, sinuous and ending before inner margin; a subapical white spot; two white points, with black points beyond them above middle, with fine black lines from them to vein 1; cilia white.

Hab. Celebes, Bonthain (*Everett*), 1 ♂ type. *Exp.* 28 mm.

(24 *a*.) *Oligostigma camptoteles*, sp. n.

White; head, thorax, legs, and abdomen with some fuscous markings. Fore wing with the costal edge fuscous; an orange fascia below basal half of costa ending in a black point; a diffuse black streak along median nervure; two black streaks below the cell meeting in a point below its extremity; a wedge-shaped oblique black-edged orange spot on discocellulars; an orange postmedial spot on costa with black line from it to submedian fold, where it is bent upwards to lower angle of cell; a black-suffused orange sinuous subterminal band from costa ending in a point in submedian fold; an orange terminal band edged by black lines and bent

outwards to a black point below apex; cilia chequered white and brown. Hind wing with medial black line from below costa to submedian fold, then oblique to inner margin near base, giving off an oblique hook on its outer side near its upper extremity; a terminal orange band with curved black line on its inner side with a white line on its outer side on costal half; a black-edged white subapical spot, three black spots on termen above middle, the two upper with white points before them, with fine black subterminal and terminal lines from them, the former not reaching tornus; cilia intersected with fuscous.

Hab. Tambora (*Doherty*), 1 ♂ type. *Exp.* 22 mm.

(27 *a.*) *Oligostigma grisealis*, sp. n.

♂. Dark fuscous grey. Fore wing with blackish subbasal line with white point and some black scales beyond it below the cell; a sinuous white antemedial line defined by black; a yellow reniform discoidal spot, a minutely dentate white postmedial line defined by black on inner side. Hind wing with the basal area yellow irrorated with black scales; a sinuous white subbasal line from cell to inner margin; a discoidal yellow spot; a minutely dentate white postmedial line angled inwards on inner area; cilia of both wings with series of white points. Underside of hind wing suffused with white except costal area.

Hab. Jamaica, Newcastle, 1 ♂ type. *Exp.* 18 mm.

(28 *a.*) *Oligostigma palleuca*, sp. n.

♂. Pure white; antennæ and dorsal spots on abdomen pale fulvous. Fore wing with three subbasal dark points; a curved pale fulvous antemedial line obtusely angled on median nervure; a nearly straight medial line connected by streaks on subcostal and median nervure with the postmedial line; a large fulvous-outlined reniform stigma connected by streaks on the veins with the postmedial line, which is minutely waved from costa to vein 3, then retracted to below angle of cell; an indistinct minutely waved subterminal line; the veins of terminal area streaked with fulvous; a fine terminal line. Hind wing with subbasal line on inner area; a discoidal point; the sinuous medial line retracted at vein 3 to the discoidal point; the postmedial line bent outwards between veins 5 and 2, then retracted to below angle of cell; a subterminal line angled inwards on vein 2; a fine terminal line.

Hab. Borneo, Kina Balu. *Exp.* 20 mm. Type in Coll. Rothschild.

(28 *b*.) *Oligostigma ectogonalis*, sp. n.

♀. White; abdomen dorsally banded with pale yellow. Fore wing with subbasal, antemedial, and medial yellow bands, the last angled outwards and emitting a spur below costa; a fine black discoidal lunule; the postmedial line white, defined on outer side by a fine black line, strongly angled outwards at middle and incurved towards costa and inner margin, with patches of yellow before and beyond it; a subterminal white band with fine crenulate black line on its outer edge, bent outwards to apex and excurved at middle. Hind wing with the basal half white, with sinuous yellow subbasal band and black discoidal lunule; the terminal half yellow with white postmedial band, defined on outer side by a slight black line and strongly angled outwards at middle; a crenulate subterminal band defined on outer side by a fine black line.

Hab. Louisiades, St. Aignan (*Meek*), 2 ♀ type. *Exp.* 16 mm.

(30 *a*.) *Oligostigma auropunctalis*, sp. n.

White; abdomen tinged with ochreous towards extremity. Fore wing slightly irrorated with brown; a medial yellow patch on inner area; a medial black point on costa with fuscous line from it to inner margin, where it meets an oblique postmedial line; a fuscous-edged orange discoidal lunule; a subterminal rather wedge-shaped orange band hardly reaching inner margin; a terminal orange band with black line on its inner edge; a series of black points on termen and apical spot. Hind wing with oblique antemedial brownish band; the terminal area orange, with curved black line on its inner edge and two fine terminal lines interrupted at middle by two black points on the lobe.

Hab. Bhutan (*Dudgeon*), 1 ♀ type; Madras, Palni Hills, Kodikanal, 1 ♂. *Exp.* 18 mm.

Subsp. 1.—Fore wing with the postmedial line straighter; hind wing with the subbasal band yellow with black line on outer edge. *Hab.* Java, Arjuno (*Doherty*), 2 ♀.

(32 *a*.) *Oligostigma albifurcalis*, sp. n.

♂. Head, thorax, and abdomen orange; palpi with fuscous patch on second joint above; base of proboscis and frons fuscous; abdomen whitish below. Fore wing orange; the base of costa irrorated with fuscous; a whitish fascia irrorated with fuscous in and below cell; a black spot with some whitish on inner side on costa above end of cell; an incurved fuscous line with white band on its outer side from

below costa beyond middle to above inner margin near tornus, where it is met by an obliquely curved fuscous line from lower angle of cell, forming a triangular mark filled in with whitish irrorated with fuscous; a curved white subterminal band, defined by a fuscous line on inner side and a fine black line on outer side, meeting the postmedial band above tornus; a fine black terminal line expanding into a black spot at apex; cilia brownish white with a fuscous line near base. Hind wing orange; an obliquely curved white medial band, defined on each side by fuscous lines, from just below costa to above inner margin; a fine black line just before termen slightly incurved at submedian fold; a black terminal line interrupted by three small lunulate black spots between veins 5 and 2; a little brownish white inside the subterminal line at apex; cilia brownish white with a slight fuscous line near base. Underside of fore wing suffused with fuscous except terminal area.

Hab. Assam, Khásis, 1 ♂ type. *Exp.* 22 mm.

(9 *a*.) *Aulacodes cyclozonalis*, sp. n.

♀. Head and thorax white; palpi with the extremity of second joint red-brown; shoulders, tips of patagia, and metathorax red-brown; prothorax with yellow patch; abdomen white with dorsal brown band on third segment, the four following segments with yellow bands. Fore wing white; the costal area red-brown to beyond middle; a small red-brown spot in middle of cell and large patch below the cell; a red-brown band from middle of costa curving outwards to submedian fold, then up to costa before apex, and with the red-brown costal area forming a nearly complete circle; an orange terminal band bent inwards on terminal part of inner margin, defined on inner side by a fine black line and on termen by a series of black striæ; cilia brownish white. Hind wing white; a yellow postmedial band expanding to termen from just below costa to vein 3 and interrupted by an oblique silvery line across apical area, defined on each side by fine fuscous lines between vein 5 and submedian fold; a terminal yellow band with two small black and white ocelli on it below veins 5 and 4, followed by a small black spot below vein 3, and defined on each side by fine black lines at middle; cilia silvery white.

Hab. Br. N. Guinea, Ekeikei (*Pratt*), 1 ♀ type. *Exp.* 28 mm.

(30 *a*.) *Aulacodes metataxalis*, sp. n.

♂. White; palpi, sides of frons, antennæ, and legs tinged with rufous, tarsi with dark rings. Fore wing with the

costa tinged with rufous; the inner area tinged with yellow and with an oblique dark medial line from vein 1 to inner margin; a pale yellow postmedial band edged with dark lines, contracting towards costa, and below vein 2 bent upwards to the discocellulars; a yellow terminal band with fuscous line on its inner edge and black striæ on termen. Hind wing with incurved fuscous postmedial line between discal and submedian folds, a diffused yellow band beyond it bent outwards below apex and angled strongly inwards on inner area; the termen yellow, expanding on medial area and with seven black-edged white spots with black points on their outer edges.

Hab. Br. N. Guinea, Moroka (*Anthony*), 1 ♂ type. *Exp.* 24 mm.

(31 *a*.) *Aulacodes pentopalis*, sp. n.

♀. Head and thorax golden yellow mixed with some white; fore femora blackish above, the tibiæ with black band at extremity; abdomen yellow, the first segment and ventral surface white. Fore wing silvery white, the costal area brown to beyond middle; an oblique antemedial brown line; an oblique brown band from just below middle of costa, below which it forks, to above inner margin towards tornus, a large rounded white patch beyond it extending to lower angle of cell and defined by brown on outer side; the terminal area orange, with a silvery-grey subterminal band formed of small conjoined spots defined on each side by fine waved black lines from just below costa to the oblique brown band; a terminal series of small black spots; cilia silvery grey. Hind wing white; a black line from lower angle of cell, strongly angled outwards in submedian fold and ending above inner margin near tornus; terminal area orange; a subterminal band greyish towards costa and tornus, black and diffused inwardly at middle, angled outwards to the uppermost of the five small black spots on medial part of termen and to termen at submedian fold, not reaching tornus, the middle spot of the five with small white spot on its inner side, some silvery scales on lower part of subterminal band; cilia brown and silvery.

Hab. Solomons, Choiseul (*Meek*), 1 ♀ type. *Exp.* 20 mm.

(41 *a*.) *Aulacodes goniophoralis*, sp. n.

♂. Orange; head and thorax mixed with fulvous; pectus, legs, and ventral surface of abdomen whitish, fore tibiæ and tarsi banded with fuscous. Fore wing suffused with fulvous; a whitish spot in middle of cell; an orange fascia on terminal

half of inner margin met by an oblique whitish fascia from origin of vein 2; a wedge-shaped white mark beyond the cell, its base below costa and apex on vein 3; a terminal orange band with series of black points on each edge and with a white band on its inner side not reaching costa or inner margin. Hind wing with the basal area whitish with oblique brown subbasal band, its oblique outer edge defined by a few dark scales developed into a strong line between veins 6 and 2; a curved white subapical mark; an oblique postmedial white line between veins 4 and 1 defined by fuscous on each side and with two black points on its outer edge; two subterminal white points edged by black and with black points on their outer edge just above middle; a fine black terminal line towards apex and a point followed by a line below the ocelli; cilia whitish with fuscous line at base except towards apex.

Hab. Br. N. Guinea, Mailu (*Anthony*). *Exp.* 20 mm. Type in Coll. Rothschild.

Genus Ridleyana, nov.

Type *R. paradoxa*.

Proboscis fully developed; palpi porrect, straight, extending about length of head, the second joint fringed with hair below; maxillary palpi minute, filiform; antennæ annulate, about four times length of fore wing; legs very long and slender, the tarsi extremely long, the outer spurs about two thirds length of inner; abdomen long and slender. Fore wing with very large lobe on middle of costa forming a hollow below and with slight tuft of scales on costa; the cell long, the end of cell filled by a large fovea. Another fovea below end of cell above base of vein 2, which is strongly curved downwards at base; veins 3 and 4 from angle, 4 curved upwards at base, 5 from well above angle, distorted and curved upwards at base, where there are foveas above and below it; 6, 7 from upper angle; 8, 9, 10 stalked, 8 and 10 from a point, 10 very short; 11 from angle and short; cilia emitting scale-teeth. Hind wing with veins 3, 4, 5 from angle of cell; 6, 7 from upper angle; 8 anastomosing with 7 almost to apex; cilia forming a series of large down-curved saw-like scale-teeth.

Named in honour of Mr. H. N. Ridley, who has enriched the British Museum with very large collections of moths from Singapore and the Malay Peninsula, containing a very large number of new species.

Teratauxta paradoxa, Hering, Stett. ent. Zeit. xlii. p. 345 (1901); id. xliv. pl. i. f. 28 (1903).

Hab. Singapore (*Ridley*); Sumatra.

(8 *a*.) *Parthenodes immanis*, sp. n.

♀. Very dark brown. Fore wing with the medial area very slightly irrorated with grey; a very obscure pale sinuous antemedial line; the postmedial line very indistinct, sinuous and retracted at vein 2 to angle of cell. Hind wing with pale-centred discoidal lunule, the pale medial line obtusely angled just below it; the postmedial line bent outwards and obtusely angled at vein 3, then sinuous; some grey on termen between vein 3 and tornus. Underside paler with discoidal lunules on each wing.

Hab. N. Borneo, Kina Balu. *Exp.* 42 mm. Type in Coll. Rothschild.

(8 *b*.) *Parthenodes scotalis*, sp. n.

Palpi with the third joint long; fore wing with vein 10 from the cell.

♀. Head, thorax, and abdomen blackish brown; pectus and legs rather greyer. Fore wing blackish brown; antemedial line indistinct, greyish, slightly defined on each side by blackish, oblique from costa to subcostal nervure, inwardly oblique below submedian fold; an indistinct dark discoidal spot; postmedial line indistinct, greyish, slightly defined on each side by blackish, slightly incurved from below costa to vein 6, excurved to vein 3, then incurved and again excurved to inner margin; a subterminal series of small rather triangular grey spots in the interspaces with black points on their outer edges; cilia grey-brown with a slight fuscous line near base. Hind wing grey suffused with brown; a small dark discoidal spot; an oblique dark line defined by greyish on inner side from median nervure near lower angle of cell to submedian fold; a slight dark postmedial line defined by greyish on outer side, excurved from costa to vein 2, then almost obsolete, pale and ending at tornus, a slight dark line just before termen except towards tornus; cilia greyish with slight fuscous line near base; the underside grey tinged with brown, a small dark discoidal spot.

Hab. Zambesi (*Longstaff*), 1 ♀ type. *Exp.* 40 mm.

(9 *a*.) *Parthenodes africalis*, sp. n.

♂. White; head and thorax slightly marked with ochreous brown; abdomen dorsally banded with ochreous. Fore wing irrorated and suffused with ochreous brown; some

ochreous marks at base; a broad diffused antemedial band, its outer edge angled outwards in cell and with a line parallel to it; a postmedial line dentate outwards below costa, angled inwards on vein 2, then sinuous, followed after a white line by a broad band with its outer edge dentate from costa to vein 5; a terminal band with irregularly sinuous outer edge. Hind wing with antemedial line from cell to inner margin, angled outwards in submedian fold, defined on inner side by white, with an ochreous-brown patch before it; a discoidal spot; a postmedial sinuous line defined by white on outer side, then with broad band; a fine terminal line.

♀ marked with fuscous brown instead of ochreous.

Hab. Nigeria, Sapele (*Sampson*), 7 ♀, Warri (*Roth*), 1 ♀; Nyasaland, Chiromo (*De Jersey*), 1 ♂ type. *Exp.*, ♂ 16, ♀ 20 mm.

(10 *b.*) *Parthenodes chalcialis*, sp. n.

♀. Head and thorax bronze-brown mixed with white and black; tarsi white banded with black; abdomen bronze-brown with slight fuscous segmental lines, the second segment with whitish band. Fore wing bronze-brown slightly irrorated with fuscous, the basal area white except towards costa, with a blackish subbasal band from cell to inner margin; antemedial line white, defined on each side by bronze and on outer side by blackish from cell to inner margin, oblique from costa to median nervure, incurved below vein 1; the medial area with white patches on costa and inner margin; a black spot at upper angle of cell; postmedial line defined by white on outer side, forming an oblique triangular mark filled in with white from costa to vein 5, then from costa on inner side of discoidal spot obliquely with a slight inward curve to just above inner margin, where it is slightly angled; a white subterminal line slightly defined on each side by black, bent outwards to apex, then slightly curved to above inner margin, where it is toothed inwards; a black terminal line; cilia chequered white and bronze. Hind wing white; an indistinct diffused bronze-brown subbasal band; a similar oblique medial band ending on termen above tornus; a postmedial band expanding into a triangular patch at middle and ending on termen at vein 1; a narrow terminal band and black terminal line from apex to submedian fold; cilia white with a slight bronze line near base; the underside whitish suffused with pale bronze-brown.

Hab. Brazil, São Paulo, 1 ♀ type. *Exp.* 16 mm.

(10 *c*.) *Parthenodes nymphulalis*, sp. n.

Head and thorax whitish mostly suffused with golden brown; antennæ ringed white and brown; abdomen suffused with golden brown at base and fuscous towards extremity, leaving whitish segmental lines. Fore wing whitish almost wholly suffused with golden brown and rather thickly irrorated with fuscous; an oblique blackish antemedial line angled outwards below costa and cell, defined by whitish on inner side; postmedial line black, defined by white on outer side, very obliquely curved from costa to vein 3, then retracted to lower angle of cell and sinuous to inner margin; two black points on costa towards apex; a rather diffused blackish terminal line. Hind wing white, mostly suffused with golden brown and irrorated with fuscous; two black discoidal points; postmedial line blackish, sinuous, outwardly oblique from costa to median nervules, where it is excurved, then very oblique inwardly to tornus; a black line on termen, which is indented at discal fold, ending at submedian fold; cilia yellowish at base and with two fine blackish lines through them except towards tornus.

Hab. Mexico, Tabasco, Teapa (*H. H. Smith*), 1 ♂ type, Godman-Salvin Coll.; Panama, Cana Mines (*Tylecote*), 1 ♂. *Exp.* 12 mm.

(14 *a*.) *Parthenodes ectopalis*, sp. n.

♂. White; palpi black, the maxillary palpi very long and white at tips; antennæ fulvous; fore legs brown in front; abdomen dorsally tinged with fulvous. Fore wing with broad subbasal orange band confluent with a patch extending from costa to submedian fold and to beyond the cell and enclosing a white patch in end of cell; a diffused postmedial line curved from costa to vein 3, where it is bent inwards and connected with the patch, and above vein 1 again bent inwards and connected with the patch; termen orange. Hind wing with orange spot below base of cell; a wedge-shaped orange patch extending from upper angle of cell to tornus; a terminal band from costa to a black band with patches of silver scales on it extending from above vein 5 to submedian fold.

Hab. N. Borneo, Mt. Mulu (*Hose*). *Exp.* 32 mm. Type in Coll. Rothschild.

[To be continued.]

LXXIII.—*On a new Chameleon from Mount Ruwenzori.* By G. A. Boulenger, F.R.S.

A single specimen of a small female chameleon, which I then referred provisionally to *Chamæleon bitæniatus*, Fischer, was presented by Sir Harry Johnston to the British Museum in 1901. Further specimens which have since come into my hands induce me to regard this chameleon as the type of a new species, for which I would propose the name of

Chamæleon rudis.

Differing from *Ch. bitæniatus* in the coarser scaling and in the much longer scales forming the gular and ventral crest, the longest of these, on the throat, measuring half the diameter of the orbit. Uniform blackish olive.

From snout to vent 52 mm.; tail 47.

I hope later to give a detailed description and figure of this chameleon, which has been briefly alluded to by Mr. J. L. Monk, 'Zoologist,' 1903, p. 324, as likely to prove a new species.

MISCELLANEOUS.

A common British Starfish.

To the Editors of the 'Annals and Magazine of Natural History.'

Gentlemen,—Prof. Clark, of Cambridge, U.S.A., has kindly called my attention to a blunder in the synonymy of *Solaster papposus* on page 89 of my 'Catalogue of British Echinoderms'; as it refers to a common species, perhaps you will allow me to correct it. The specific term *papposa* was first used for a starfish by Linnæus in the 12th edition of the 'Systema Naturæ,' page 1098, so that its date is 1767. I have no palliation to offer for the blunder.

F. Jeffrey Bell.

A Correction.

Paramilionia rubroplagata, B.-B., *ante*, p. 345.

I wish to withdraw this name, inasmuch as it falls under *Sangala gloriosa*. Some little time ago I bought from a soldier who had just returned from one of the West-African expeditions a few insects, nearly all Lycænidæ, but among them were two specimens of this moth. I referred carefully to several of the most important Old-World collections and could not name them. Hence I

described them as new, and it was only when I showed the specimens to my friend Mr. Herbert Druce, and he recognized them at once as a well-known South-American insect, that I discovered my error. The soldier has never been to America in his life, and I conclude some friend must have given them to him, but unfortunately the supposition that they came from Sierra Leone put me off the scent altogether. The simplest plan will be to withdraw the name and treat the description as *non est*. G. T. Bethune-Baker.

Trichoniscus pygmæus, *G. O. Sars, a Woodlouse new to the British Fauna*. By Richard S. Bagnall, F.E.S.

Early this month I discovered a tiny woodlouse that seemed to find its home in soft and worm-riddled earth, and which upon examination proved to be *Trichoniscus pygmæus*, G. O. Sars, a species that, so far as I am aware, has not been taken since Prof. Sars described it from Christiania in 1897. As I hope to describe and figure this and other interesting Isopoda in a future part of the 'Transactions of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne,' the briefest account will herein be sufficient.

Trichoniscus pygmæus, G. O. Sars.

Trichoniscus pygmæus, G. O. Sars, Crustacea of Norway, ii. p. 162, pl. lxxii. fig. 2.

Easily recognized from other species of *Trichoniscus* by its small size and by its comparatively broad antennæ, which have the flagellum only triarticulate. The dorsal face is roughened by numerous tubercles arranged in transverse rows, whilst the lateral parts of thoracic segments are edged with small spicules. Length 2 mm. and about one third the length in breadth. *T. pygmæus* bears a strong resemblance to *Trichoniscoides albidus*, Budde-Lund, but apart from the smaller size may easily be separated by the three visual elements of each eye, the eyes of *Trichoniscoides* being simple. *T. pygmæus* is, moreover, easily recognized from other species of its genus by its slow, rhythmic, and almost worm-like movements, and here again it strangely resembles *T. albidus*, the habits of both species, in fact, being practically identical.

Taken in numbers in gardens at Winlaton (Co. Durham), October, and several from garden of Hancock Museum, Newcastle-on-Tyne, November 1906.

Prof. G. S. Brady, F.R.S., and the Rev. Canon Norman, F.R.S., have most kindly confirmed my identification of this species, and through Dr. Norman's generosity I have had the additional satisfaction of examining co-types of both species mentioned in this short and hastily prepared note, from Prof. Sars, Norway.

Winlaton-on-Tyne,
November 10th, 1906.

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END OF THE EIGHTEENTH VOLUME.

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RED LION COURT, FLEET STREET.

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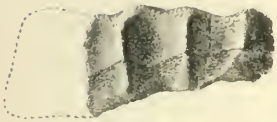

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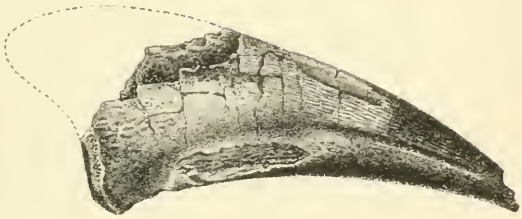

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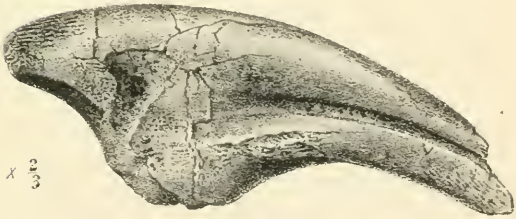

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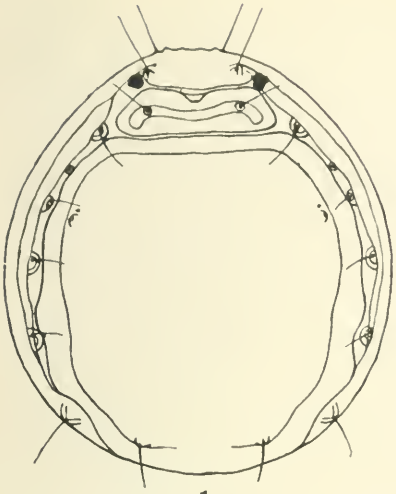
1, 2. CERATODUS TEETH. 3,4. MEGALOSAURIAN CLAWS.



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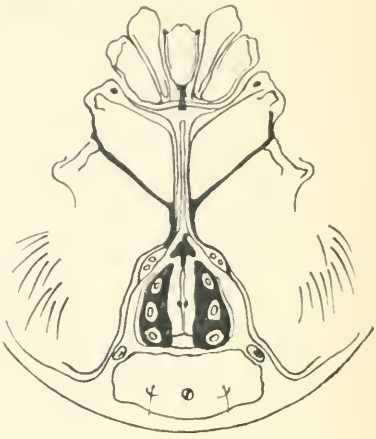

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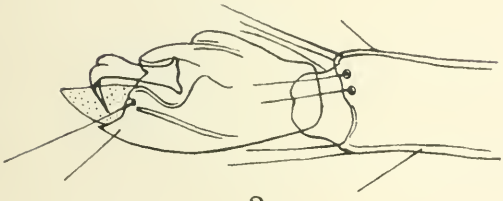

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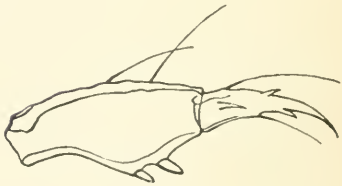

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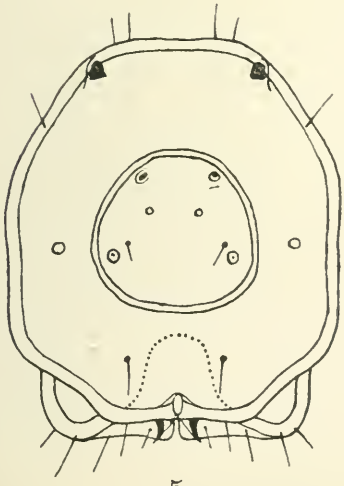

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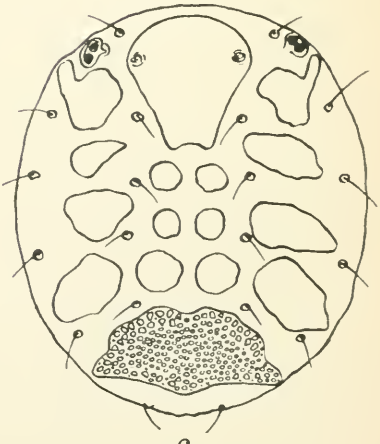

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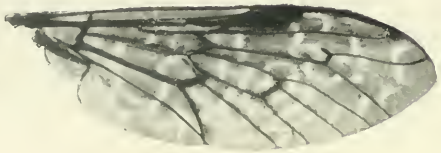

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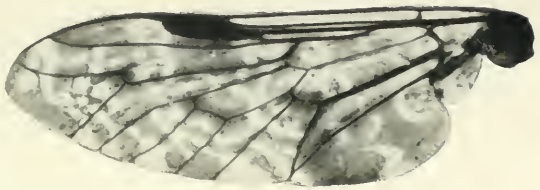

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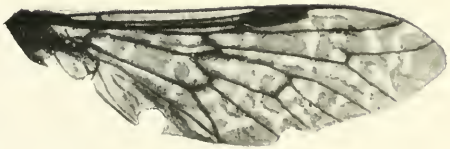

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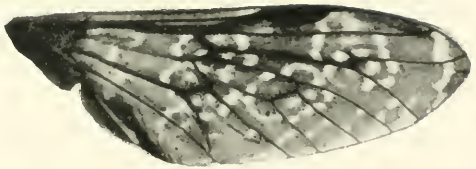

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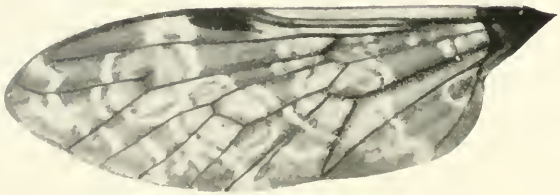

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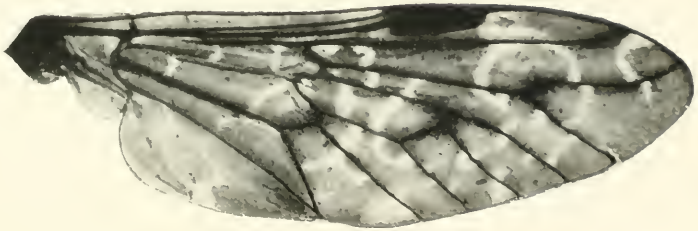

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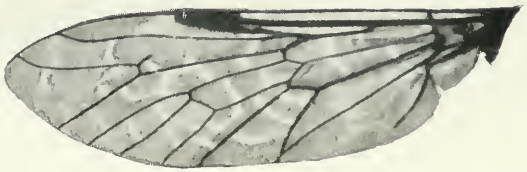

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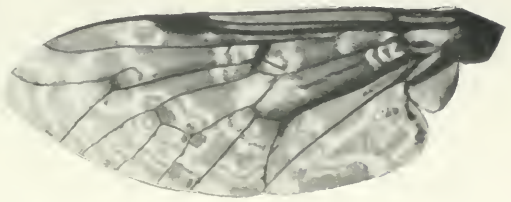

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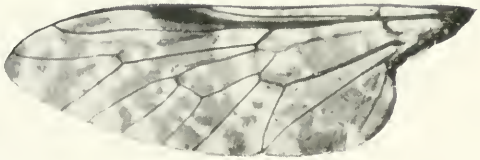

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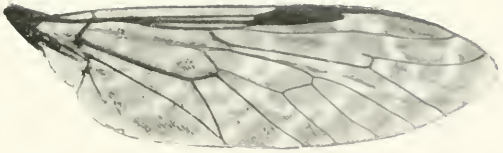

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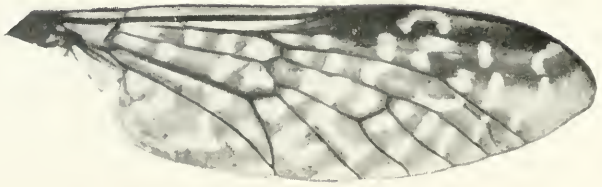

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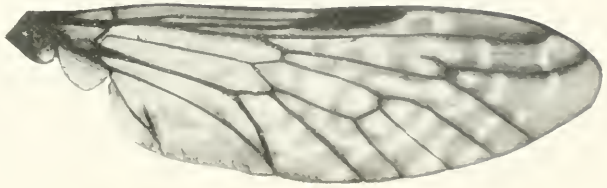

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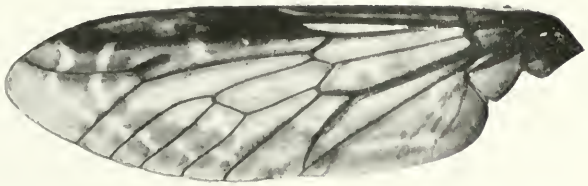

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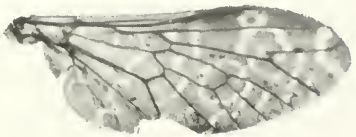

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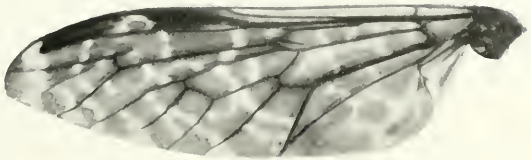

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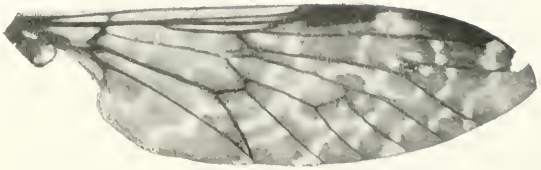

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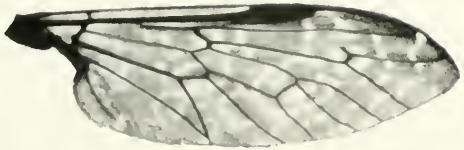

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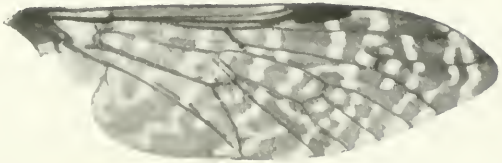

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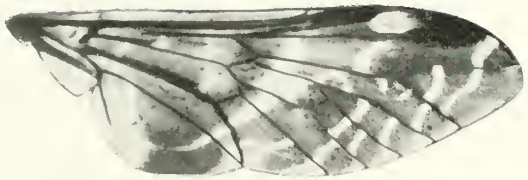

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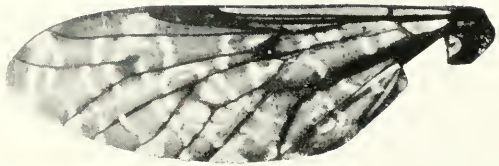

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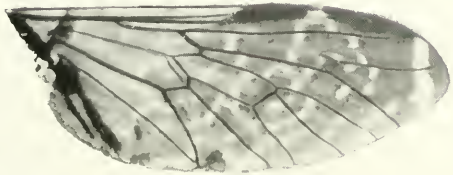

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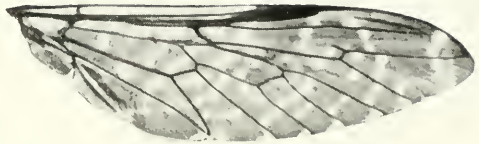

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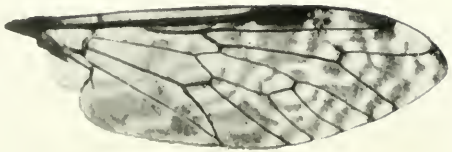
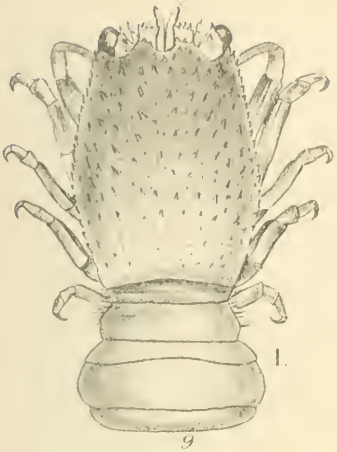
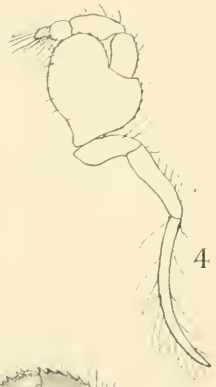
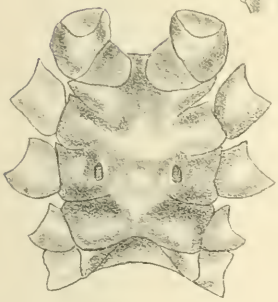


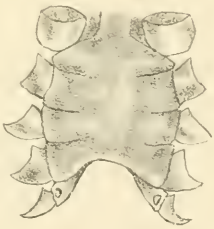
J. Green del. et lith.

HAMLYN'S MANGABEY.
Cercocebus Hamlyni.









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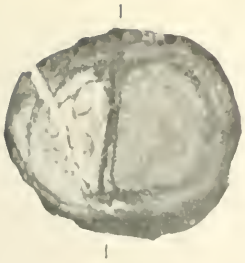

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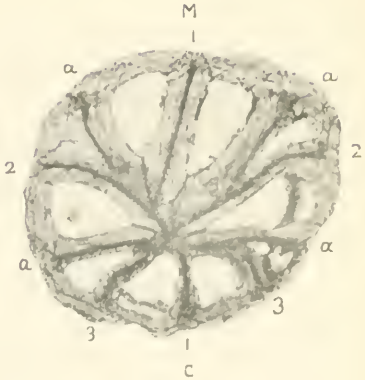

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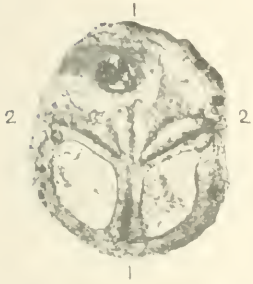

Fig. 2.

Fig. 7.

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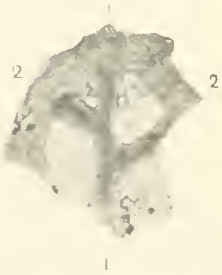
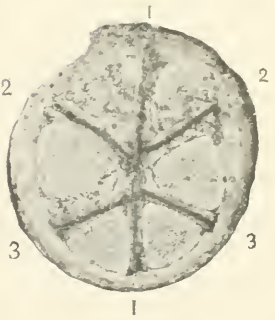


Fig. 6 *a*.

Fig. 6 *b*.



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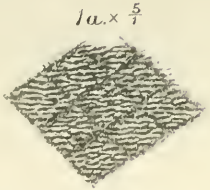

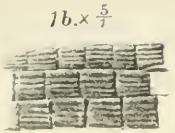

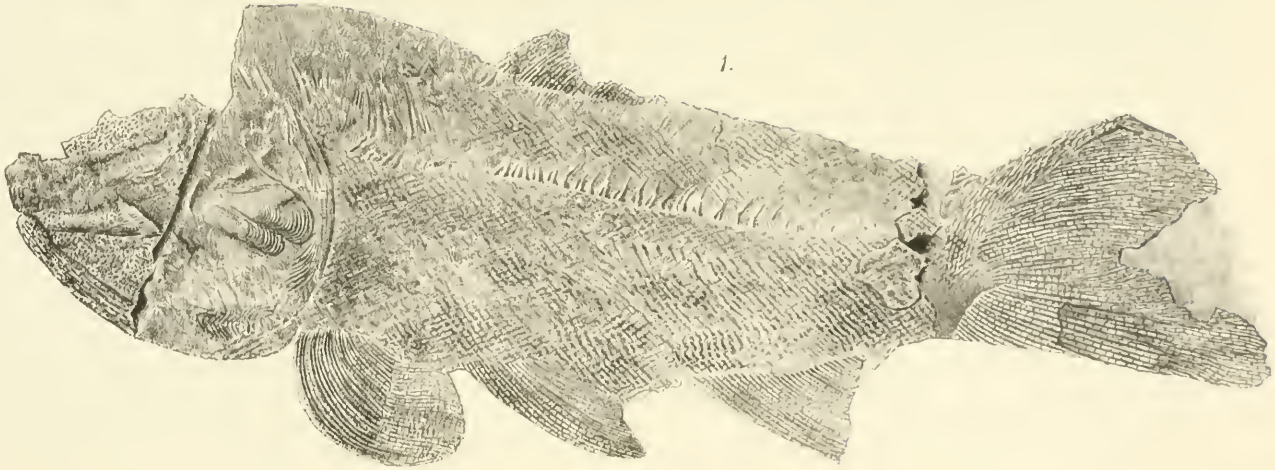

A.H.Searle, del et lith.

MYRIOLEPIS HIBERNICA

J. Green, Lith.

JAMRACH'S MANGABEY.
Cercocebus Jamracni