THE ANNALS

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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"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 veré 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.

CONTENTS OF VOL. XVII.

[EIGHTH SERIES.]

NUMBER 97.

NUMBER 98.

NUMBER 99.

NUMBER 100.

NUMBER 101.

NUMBER 102.

PLATES IN VOL. XVII.

Plate I.	Sabellidæ.
II.	
III.	
IV.	
V.	New Lepidoptera from Dutch New Guinea.
VI.	
VII.	
VIII.	
IX.	Freshwater shells from Japan.
X.	Internal carotid canal in Viverridæ and Felidæ.
XI.	
XII.	A new Sphingid and little-known butterflies from Africa.

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MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circum vitreos consilite 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 trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasi, Ecl. 1.

No. 97. JANUARY 1916.

I.—*Notes from the Gatty Marine Laboratory, St. Andrews.* —No. XXXVIII. By Prof. M'Intosh, M.D., LL.D., F.R.S., &c.

[Plates I.–IV.]

1. On the British *Sabellidæ*.
2. On the *Sabellidæ* dredged by H.M.S. 'Porcupine' in 1869 and 1870, and by H.M.S. 'Knight Errant' in 1882.
3. On the *Terebellidæ* and *Sabellidæ* dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves in 1871–73.
4. On the *Sabellidæ* dredged by Canon A. M. Norman off Norway and Finmark.

1. *On the British* Sabellidæ.

The British Sabellids number more than twenty, exclusive of some forms not yet fully investigated from lack of good material. In this respect, therefore, they compare favourably, in this preliminary notice, with those from other areas.

Thus, for example, Sars* in 1861 gave 10 species of Sabellids, including one of *Myxicola*, as occurring in the prolific Norwegian waters. De Quatrefages, in his 'Annelés,' mentions about a dozen of the forms which have been found in Britain, excluding double entries like *Sabella penicillus*

* Forhandl. Videnskabs-Selsk. Christiania, 1861, pp. 116–131.

and *S. pavonina*, *Sabella reniformis* and *S. saxicava*, and *Fabricia amphicora* and *F. johnstoni*. In Malmgren's 'Annulata Polychæta,' of Spitzbergen, Greenland, Iceland, and Scandinavia, nineteen Sabellids (including *Myxicola*) are entered, and some of these appear to be purely northern in distribution, and do not occur in our waters. Only six are entered by Dr. Johnston in the 'Catalogue of Worms in the British Museum' (1865), but two refer to the same form, viz., *Sabella penicillus*, and another (*S. savignii*) is uncertain.

Six species, including *Myxicola steenstrupi*, are recorded by Théel * (1879) from Nova Zembla. Langerhans (1880) found ten species at Madeira. About twenty-seven species of Sabellids occur in the laborious memoir of Miss Katherine Bush † from the vast area of the Pacific. Fifteen species occur in the careful 'Survey of Clare Island, on the rich West Coast of Ireland' by Mr. Southern (1914), several not having hitherto been found in Britain. Thirteen species of Sabellids are entered by Prof. Fauvel (1914) in his fine work on the Polychæta procured by the Prince of Monaco in his yachts 'Hirondelle' and 'Princess Alice.' In the recent (1915) list of the Polychæta procured at Plymouth by Dr. Allen, thirteen species are entered, and a few are exclusively southern forms. Comparatively few species (*e. g.*, from two to five) pertaining to this family, as a rule, occur in local catalogues in the British area. These will be elsewhere alluded to. Moreover, it is perhaps more difficult to separate the Sabellids by their bristles and hooks than, for instance, the Terebellids, and coloration disappears, as a rule, in spirit-specimens.

The first form is the widely distributed *Sabella penicillus*, L. When the branchiæ of this species are thrown off the cephalic region presents a truncated surface, in the centre of which is a frilled eminence, which, when carefully inspected, shows two lateral membranous wings, which unite in the middle line below and send a process ventrally between the two great ventral laminæ; whilst the upper edges pass above the mouth in a series of short frills. In the mid-dorsal line over the mouth is a triangular flap with an acute apex, the base of which is grooved dorsally, the whole resembling an epistome. Dorsally the cephalic plate is deeply grooved by the dorsal furrow, the firm and thick edge of the rim which carries the branchiæ being severed and neatly curved on

* Kongl. Sv. Vet.-Akad. Handl. Bd. 16, No. 3, p. 65.

† 'Harriman Expedition to Alaska' (New York, 1905).

each side; the rim, then passing ventrally to the base of the great flaps, is folded inward and upward, and is fused on each side with the firm median mass over the mouth. In the perfect condition with the branchiæ attached, the pedicle between the ventral flaps passes upward as a bifid process, then expands into a lateral flap or wing on each side, which, after a short progress, bends backward and upward, making a kind of frilled knee, and becomes continuous with the lining membrane of the branchiæ of its side, its outer border inferiorly passing into the basal semicircle of the branchiæ, to which it is fixed throughout. Such is the arrangement connected with the floor of the mouth and the lower lip. Dorsally the membrane forming the roof of the mouth splits, considerably in front of the median fissure of the lower lip, into two limbs, each of which at the base has an axis with a narrow ventral web, and a thinner and broader dorsal web which tapers distally and goes much further along the axis than the former, the axis finally tapering to a long delicate tip. The whole forms the so-called tentacle which in the preparations is concealed in each branchial semicircle. Viewed from the inner surface of each branchial fan the "tentacle" has the web on its dorsal edge connected with the dorsal edge of the fan, whilst its ventral web passes ventrally to the central region dorsad of the mouth. The inrush of water along the inner surface of the branchial fan would thus be swept toward the mouth, the tentacles and their webs probably aiding in this function and keeping the stream in each fan to its own side, as it rushes down the groove by the outer border of the smaller anterior web into the mouth.

The branchial fan arises on each side from the firm base formerly mentioned, a spiral twist being evident dorsally and more especially ventrally at its commencement. Each in preservation has the ventral edge curved inward, and a narrow membranous web passes from the frill of the inferior oral membrane for some distance along its edge. This ventral border is the thickest, and gives origin to the majority of the branchial stems, the rest springing from the middle and posterior parts of the basal semicircle. The number of these filaments varies, the two sides seldom being identical—thus, for instance, 38 may occur on the right and 41 on the left. The fan on each side is long and graceful, banded with regular markings of dull red and white. The circles of colour do not go evenly round the expanded fan, but slant from the ventral fissure. Dorsally a greenish hue occurs in some at the base of the fan. In

others green or purple predominate, and the fluid in which the animals lie is always tinged with green (Dalyell).

Each filament has an elastic chordoid and camerated axis, the cameræ being after the fashion of the bristles of *Nereis* or *Aricia*. They are united by a web inferiorly (about the level of the first pigment-band), but free throughout the rest of their extent, and are somewhat flattened processes with a smooth external edge, near which the axis lies; whilst its inner border is fringed with a dense series of slender pinnæ, which likewise have a translucent axis jointed at intervals like the bristles of the Chloræmidæ. The filaments and their translucent axis gradually diminish distally, but the axis can be traced almost to the extremity. Toward the tip of the filament the pinnæ gradually diminish in length, finally forming mere papillæ, and thereafter the tapering tip is smooth and of moderate length. When the branchiæ have lost their distal ends and regeneration has considerably advanced, the long filamentous processes projecting from the tips give a novel character to the organs.

Anteriorly the buccal segment occupies a hollow between the two pillars of the dorsal fan, a more or less separate fan-shaped lamella occurring on each side, tinted of a deep reddish brown. From this the marginal collar passes ventrally to expand into the prominent and generally reflexed lamella on each side of the median fissure, where it is distinctly thickened. A band on each side of the median oral process joins it to the fold a little higher.

The first shield on the ventral surface behind the collar is continuous from side to side, and is the largest of the series of glandular scutes. Though it is opposite the first bristle-bundle, that would seem to pertain to the segment behind it.

The mouth leads into a simple alimentary canal, which, when seen from the dorsum, forms a moniliform tract from end to end—wider anteriorly and narrower posteriorly. The septum in each segment retains it firmly in position. The contents can be seen through the transparent walls of the canal, and in one consisted anteriorly of pale granules and posteriorly of muddy sand.

The *body* shows little or no narrowing anteriorly, remains of similar diameter for a considerable distance, then in preservation may increase in breadth behind the anterior third, and thereafter gradually tapers to the tail, ending in the anus, which is often bilobed. In lateral view the margin of the vent slopes from above downward and backward, the ventral edge thus projecting considerably. From above the aperture is bifid inferiorly, and a triangular area

is differentiated on the dorsum in front of the aperture. Both dorsal and ventral surfaces are plano-convex, thus in transverse section being more or less elliptical, the dorsal, however, being generally more smoothly rounded, with a pale streak in the middle line from the dorsal vessel. The ventral surface has a continuous series of scutes from one end to the other, and, with the exception of the first, all are divided by the median groove, giving a right and a left scute to every segment. The number of segments varies from 200–270 or more.

The first region of the body (the so-called thoracic region) is distinguished by the direction of the bristle-tufts, which slope upward and backward, and by the presence of ventral rows of hooks. The setigerous processes of this region vary from seven to eleven pairs, one side occasionally having nine or ten and the other ten or eleven. The first setigerous process arises immediately behind the dorso-lateral lamella, and is smaller than those following; moreover, it has no row of hooks dorsally. The bristles are arranged in a rather dense group and show a longer and a shorter series. The longer forms have cylindrical striated shafts, slightly narrowed toward the origin of the wings, which are narrow, the bristle thereafter ending in a translucent and somewhat strong though flexible tip. No serrations on the edges of the wings have been seen in these, though striæ go to the edge. The bulk of the group of bristles is made up of these with shorter shafts and broader wings, the whole tip being rather broad until near its extremity, where it is somewhat abruptly tapered to a fine point. In the cluster of bristles in the tuft various stages occur in the developing bristles—some resembling a long narrow knife-blade, others a deep-bellied shorter blade. The succeeding tufts are of similar shape (that is, somewhat flattened), but they are longer and stronger, and the edges have distinct serrations. The anterior setigerous processes form a somewhat flattened cone, the base ventrally being prolonged into a prominent ridge, bearing the hooks which lie between two raised margins, constituting a narrow flap posteriorly in each segment. Moreover, a distinct papilla occurs on the anterior edge of the tip.

The setigerous processes of the second region form stiff narrow cones which project nearly straight outward, the bristles only being visible at the tip. A soft and rather swollen process bearing the hooks lies above their dorsal edges. The bristles form a kind of pillar, narrow at the base and enlarging at the tip to about double the diameter at the base of the wings, which give to the distal end a

characteristic lanceolate enlargement, from which the tapering tips slope slightly inward. These differ from the anterior groups in being all of one length, and appear to be ranged round a central papilla. The tips are comparatively short, with somewhat broad wings, which are obliquely striated and serrated along the wide or lower edge. The setigerous processes and bristle-tufts remain of the foregoing structure till near the posterior end, where longer and finer bristles project from the small processes. In these modified processes the bristles are fewer and of two kinds—viz., a long slender series without a visible wing, which have long, gently tapered, and slightly curved tips; and, secondly, a shorter series with rather longer tips than those in front and with striated wings.

The anterior hooks are typical avicularian forms with a marked forward curvature of the crown and a single acute main fang, the free edge of which is minutely serrated throughout the greater part of its extent, leaving little more than a third smooth, and the tip is often slightly turned up. The anterior outline has a wide gulf under the fang and a boldly rounded prow, whilst the posterior outline is convex, and the base is considerably prolonged in this direction and abruptly finished. Curved striæ occur at the throat, longitudinal striæ on the body, and horizontal striæ in the base of the hook. The hooks form a single row. Accompanying each hook in this region is a paddle-shaped bristle, the wings and tip of which are membranous and translucent. The hooks in the middle and posterior regions likewise form a single row, and have very much the same structure as those above-mentioned, except that the prolongation of the base posteriorly is less, and no paddle-shaped bristles occur. The posterior hooks, moreover, are considerably less.

In a small specimen, $\frac{4}{10}$ of an inch long, only three rows of ventral hooks were present, so that the number increases with age. Six brown pigment-specks occur behind the branchiæ. The tube of this example is leathery and brownish, with minute mud-particles on its surface and clear granules here and there. Another young form was in a tube projecting from a mass of *Alcyonidium parasiticum* growing on *Sertularia rugosa* and Ascidians tossed on shore at St. Andrews.

A young example procured on the West Sands, after an October storm, measured after preservation $\frac{8}{10}$ of an inch, and it had about 66 segments. The first two bristle-tufts are somewhat short, the third to the sixth are long, and

these corresponded to the first region of the body, consequently only five pairs of dorsal hook-rows are present. The seventh pair of bristle-tufts is slender and small, so that the outline is narrowed, the adjoining tufts being longer. Toward the tip of the tail elongated, slender, simple bristles occur as in the adult. The bristles correspond in arrangement and structure with those of the adult. The anterior hooks differ in having a shorter posterior basal process, but they are accompanied by the same paddle-shaped bristles.

The anal segment is bilobed, and has a peculiar series of dark pigment-specks. Four pairs of setigerous processes bearing short bristles occur behind the last hooks, which are small and only three in number. The bristles increase in length at the sixth from the tip. The opaque glandular tissue splits at the termination of the rows of dorsal hooks at the second ring from the latter, since the first has a bar obliquely bevelled at the lower edge. The splitting continues to the tip of the tail and gives a regular arrangement to the parts.

Both anteriorly and posteriorly the bristles commence before the hooks. Four pairs of bristles occur before hooks appear, the first hooks being between the fourth and fifth bristle-tufts, and their bases are undeveloped. The first five pairs of bristles are short, but the sixth are decidedly longer.

The tube may reach a length of 2 feet, and is fixed to a stone or other structure.

No form has attracted greater interest than the second species, viz., *Potamilla reniformis*, Leuckart, the *Sabella saxicava* of De Quatrefages—which abounds amongst calcareous formations, such as *Cellepora*, *Lithothamnion*, the *Balani* of the Gouliot caves of Sark and elsewhere, and is of special interest in connection with its power of perforating such structures.

The cephalic plate, when the branchiæ are shed, presents dorsally a bilobed collar or lamella, the deep dorsal furrow terminating in the centre. The outer edge of each flap is continued as a broad rim nearly to the mid-ventral line, where a notch separates the two sides, which curve forward. The truncated surface has a projecting transverse fold at the upper end of the ventral incurvation, and two folds meet above it—so as to make a triradiate aperture.

The branchiæ are about 10 or 11 in number on each side, and comparatively short, whilst the pinnæ are long. Each filament has the transversely barred or camerated chordoid

axis, and tapers to a short, slender, filiform tip, which, however, is usually enveloped by the long pinnæ or is in screw-like coils. The pinnæ have the translucent axis, as in *S. penicillus*, with long joints, and are richly ciliated. In life the branchiæ are of a pale green marked with white touches, so that they form a whitish ring around the collar within which they are attached. The pinnæ are variegated with pale greenish and white, and show vermiform movements when cast off. In some the branchiæ are of a pale buff hue, with a little yellow at the tips of the filaments. In contraction they are generally of a dull stone-colour. Leuckart's examples had whitish branchiæ with brownish touches, and De St. Joseph describes his examples as vinous-brown. Sars states that his specimens had yellowish-white branchiæ with four or five orange bands. Just above the whitish ring at the base most of the filaments, externally, have two boldly marked and elevated brown or reddish-brown ocular specks, separated by an interval from each other. De St. Joseph states that in his specimens each contained about thirty ovoid "crystallines" in a mass of brownish pigment. Moreover, the eyes of those from the Mediterranean are more numerous than those from the north, whilst Marion considered that those from deep water had fewer eyes than the littoral forms. They are absent in a few of the filaments. The longest filaments are dorsal, those at the ventral edge being considerably shorter and slightly reflexed. The ocular pigment in some fades in spirit. The tentacle is comparatively short, but its membranous web on each side appears to agree with that in *Sabella penicillus*.

The *body* is comparatively short—about $\frac{3}{4}$ of an inch in length—and has from 60 to 100 segments. It is rounded dorsally, slightly flattened ventrally, and marked by a groove which at the tenth segment bends from the side inward to the middle line and divides all the scutes which follow into two. The nine or ten scutes in front of these are split transversely. The ventral scutes are conspicuous by their whitish or pinkish colour, and are even visible through certain parts of the tube. Anteriorly the brownish dorsum is marked with dark brown pigment at the bases of eleven setigerous processes, the succeeding region of the dorsum being reddish brown. The body is paler in the median line dorsally and ventrally. It is slightly tapered posteriorly, and ends in a papillose anus, three papillæ being distinct, and the colour of the tip is orange rather than brown.

The setigerous processes are ranged along the lateral

regions from the second segment backward, a differentiation occurring anteriorly by the inflection of the groove which often passes behind the tenth bristle-tuft to the mid-ventral line, though in others it is further back. Each of the setigerous processes anteriorly has dorsally three longer bristles with straight shafts, tips bent backward, and moderate wings. The edges of the wings appear to be minutely serrated. Following these is a double series of comparatively stout bristles, with short and broad wings, making a spatulate tip with a filament in the centre. These bristles also have a dorsal curve, the filament trending in that direction, so that they would brush an opposing structure with the convex surface. From the nature of the parts, the shafts are somewhat abruptly tapered at the tip. Some of the bristles have modified tips, so that they resemble a short and broad knife-blade, as in certain forms in *Chætopterus*, the shaft not being continued along the centre as in the ordinary winged types.

In the posterior segments the bristles alter, being shorter, fewer in number, and with modified tips, which have moderately wide wings at the base, but they soon diminish, and the long central tapering tip projects far beyond them—thus performing the functions of the simple bristles of this region in other forms.

The anterior rows of hooks are below the setigerous processes, and consist of a long series of avicular forms, with serrated rows sloping to the sharp main fang, a rather long, slightly striated neck with straight sides, the anterior outline curving forward into the rounded prow and the posterior into the well-marked basal process. Accompanying each is a broad bristle, the shaft of which has a curvature toward the distal end, and the tip has a region with short wings so modified as to resemble a hook with a long shaft and a main fang. Two forms of accompanying bristles thus are present in this species, viz., those with broadly spatulate tips and those with a slightly enlarged posterior curve and a beak-like point anteriorly, nearly at right angles to the shaft. In a small example from Perelle Bay, the latter was large and with distinct wings. The hook has a larger space between the main fang and the prow than in *Sabella penicillus*.

The hooks behind the foregoing region are above the setigerous processes, and they become fewer and fewer, as well as smaller and with a longer base, in their progress toward the tail.

The tube is formed of a tough horny secretion of an olive

hue, and the exposed parts are covered with minute sand-particles.

An allied species (AB) occurred under stones between tide-marks both in Guernsey and Herm, with only five pairs of anterior bristles, and shows differences from both *Potamilla reniformis* and *P. torelli*. The cephalic plate has a narrower collar than in *P. reniformis*, a feature well marked in the small, pointed, ventral lobes. The edge is smooth at and near the mid-dorsal groove, then at each side is a lateral flap which trends to the lamellæ on the ventral surface. These lamellæ are smaller than in *Sabella pavonina*. Besides the small lamellæ which project ventrally, the margin is incurved at the middle line.

The body is comparatively small, about ¾ of an inch in length, and the number of segments is between sixty and seventy. It is rounded dorsally, with the exception of the region of the dorsal groove anteriorly, slightly flattened ventrally where a median furrow runs from the middle of the sixth scute backward to the tail. The anterior region is composed of five bristled segments and apparently the same number of uncinigerous rows. Posteriorly it tapers to a somewhat pointed tail. The branchiæ seem to be comparatively short—like those of *Potamilla reniformis*, and the pinnæ of moderate length or rather short, whilst the terminal filament is long, large, and is often in screw-coils, thus differing essentially from those of *P. reniformis*, *P. torelli*, and *P. neglecta*. Moreover, there are no ocelli on the filaments, and none on the first segment or on the tail.

The first region of the body has only five pairs of setigerous processes. Each bears a tuft of comparatively short bristles, the tips of which, unfortunately, had for the most part disappeared—probably from their brittle nature as well well as from rough usage. Those which are perfect have shafts which slightly dilate from the base to rather beyond the middle, then diminish at the neck and swell out at the origin of the wings, tapering thereafter to a somewhat long attenuate extremity. At the upper edge of the fascicle are the longer and more slender forms, the shafts of the others being thicker. No trace of spathulate tips is observable. The anterior hooks form a single row, and present a sharp main fang, the rest of the anterior face of the crown above it (about half the extent) being finely serrated in lateral view. As usual in such hooks, when the crown is examined from the front, this region is densely spinous. The posterior outline is more or less straight below the forward bend at the crown, whilst the anterior—also straight immediately

below the main fang—curves forward over the rounded prow. The projection of the base posteriorly is narrow, but somewhat shorter than in *Potamilla reniformis*. Each is accompanied by a short, broad, cuspidate or penniform bristle. The hooks behind the anterior region (in the fragmentary example) do not materially differ, though the neck is longer, the base somewhat stouter, and their size less.

The small number of the anterior segments, so unusual in the group (though this number has been found in *P. torelli*), raises the question as to its relationship to the latter, from which it differs in the terminal processes of the branchiæ and in the narrower web in the anterior bristles, but further investigations may clear up the divergencies. Like other Sabellids it is acid to litmus paper. In the example from St. Peter Port, Guernsey, the tube is composed of a translucent horny secretion, somewhat like that of *Potamilla reniformis*. Some examples have nearly ripe ova.

Potamilla torelli, the third form, is closely allied to the foregoing, and could scarcely be distinguished by the bristles and hooks. The general aspect of the cephalic plate, when the branchiæ are removed, agrees with that of its allies, and in the preserved examples some have a prominent T-shaped projection formed by the developing bases of the branchiæ—a condition not observed in other forms. The collar has a narrow slit dorsally, then it extends on each side laterally and ventrally with an even edge to the ventral lamellæ, which are reflected in protrusion and somewhat triangular in outline, and are separated from each other by a deep V-shaped notch. No eyes are visible in the spirit-preparations from Britain or from Canada.

The branchial filaments are of moderate length and are pale in the preparations. The structure of each filament is typical, and it ends in a short thick process distally. The pinnæ are of average length, and it is only at the tip of the organ that shorter forms occur, the last ten or twelve gradually diminishing to end in a short papilla-like rudiment at the base of the distal process. The number of the filaments appears to be from twelve to fourteen in each fan.

When the oral region is in a state of expansion a fold passes on each side from the ventral lamellæ upward, and its end fuses with the middle of each branchial fan, and, indeed, appears to be the only representative of the tentacle of other forms. Malmgren states that it is very short, broad, and subcircular. This fold is quite separate from the

ventral edge of the basal tissue of the branchiæ. On the other hand, a considerable portion of each dorsal edge of the base of the branchiæ is bordered by a free and mobile flap—the ventral edge adjoining the mouth.

The body is of small size in the examples from Plymouth, viz., about an inch in length and of the thickness of stout thread, whereas in the Canadian forms it is between 2 and 3 inches long and as thick as a crow-quill. De St. Joseph also found large examples at Rocher. It is grooved dorsally in the anterior region, rounded posteriorly; whereas the ventral surface is more or less flattened, and marked by the median groove from the anterior region backward. The first region has a variable number of segments, viz. five to eight (Langerhans, seven to nine). The posterior region has from thirty to fifty. Toward the tail it is flattened and tapered, and ends in the anus, which often presents a lateral projection on each side. De St. Joseph describes the body as brownish, with large spots of white. The first body-segment has two oval eye-spots (*Langerhans*). Fauvel* describes anal eyes, which are absent in the preserved examples from Plymouth†. The first bristle-bundle consists of simple bristles, with moderately tapered tips and distinct rings. The others in this region have two groups—an upper with longer shafts, more tapered and slightly curved tips with narrow wings, and a dense lower group of spatulate forms with a process at the tip. The bristles of the middle region form the usual bristle-pillar of rather short bristles with striated shafts, comparatively broad striated wings, and very finely tapered tips—two series, a longer and a shorter, being conspicuous. The shaft has a distinct curvature at the junction with the tip. The posterior bristles are fewer in number, and have wings distinctly striated and very attenuate tips. In glancing at small preserved specimens, it is found that most have the posterior bristles directed forward, and in several the anterior have the same direction. In the larger forms the anterior bristles are often directed upward, outward, and slightly backward. The anterior hooks, which occur on all the anterior segments except the first, are circular with a sharp main fang, and above it a series of minute teeth on the crown (Langerhans shows about twenty-four), and a moderately long base. Striæ pass from the neck to the base, after curving round the prow. These

* Campag. Sc. p. 315.

† Both are seen in small specimens kindly sent by Major Elwes from Babbacombe.

hooks are accompanied by the short bristles with the spatulate tips. The posterior hooks differ only in their smaller size and the brevity of the base. In comparing the larger with the smaller forms from Plymouth, the essential characters of the bristles and hooks are as well shown by the smaller as the larger.

The tube is composed of a tough internal lining, coated with fine sand-grains, the whole being firm and resistent, especially in the Canadian examples.

A form (BC), procured in numbers at Berehaven in 1886 by the Royal Irish Academy, appears to be a variety of *P. torelli*, though presenting certain features of its own. When the branchiæ are absent the cephalic region presents no deep fissure as in ordinary Sabellids, but the slight dorsal furrow ends in a solid mass which, with an incurvation in the middle, passes from side to side and then bounds the region laterally to the ventral surface. This rim forms a projecting base to the branchiæ. The collar commences as a narrow process on each side of the dorsal fissure, slopes obliquely forward and outward, and inclines laterally and ventrally into a deep though thin lamella, which attains its maximum in the mid-ventral line, where it is separated from its fellows by a fissure. The branchiæ preserve much of their reddish-brown coloration in spirit, and they are of considerable length. The pigment is arranged on the pinnæ so as to make a series of circular bands, as in *S. penicillus* and other forms, thus conferring great beauty on the expanded organs. In some cases, when mounted, the reddish-brown pigment is in isolated masses at intervals along the filament, and patches occur on the terminal process. There are about eleven filaments on each side, springing from the central region of the cephalic plate—a basal fissure, most distinct ventrally, occurring dorsally and ventrally. They are connected only at the base and are free throughout the rest of their extent, and are long tapering organs with proportionally short pinnæ, which, as they reach the tip, gradually diminish in length and end in a series of short papillæ at the base of the terminal strap-shaped tapering process. The chordoid skeleton is continued along the centre of the flattened tip and into each pinna. In young forms the pinnæ are short, but the flattened terminal strap is well developed. The *body* is comparatively small, elongated, and distinctly segmented from one end to the other—a feature characteristic of the species. Fifty-six segments, but the tail in the majority of the examples was in process of reproduction, so that the actual number of segments must

exceed the figure mentioned. The body is widest in front and gradually tapers behind the middle to the posterior end, where the rounded anus is terminal. The dorsal surface is more or less rounded, the ventral flattened and marked by the scutes from end to end. A slight depression occurs in the mid-dorsal line anteriorly, and, continuing to the right behind the sixth bristle-tuft, it crosses the seventh segment obliquely to the middle line, whence it passes to the tip of the tail—cutting the ventral scutes into two in each segment. Six bristled segments are present in the anterior region and five uncinigerous rows, but occasionally only five and four occur respectively. Other variations, apparently arising from lost parts in process of reproduction, show the ventral furrow running to the front or a diminished number of anterior ventral scutes. Moreover, the two anterior scutes may be split by a furrow—quite independently of the main ventral furrow. The first setigerous process is situated behind the collar, and is inconspicuous. It has a small tuft of simple bristles with acutely tapered tips and narrow wings, as in the dorsal group of the anterior region. The bristles of the succeeding segments of the anterior region (five in number) have dorsally translucent bristles with straight shafts and finely tapered tips with narrow wings—the upper having longer and more delicate tips and the lower narrow spatulate forms; the outline of the wings is more or less a long ellipse, the tapering shaft being continued as a fine process distally. Moreover, those with broader tips form a shorter row than those with more elongated tips. The outline of the tip of the latter bristles thus essentially differs from that in *Potamilla reniformis* and also from those of *P. torelli*. In the posterior region the bristles form a tulip-like fascicle, with a knee or curvature on each bristle toward the end of the shaft, the convexity with the wings being external: those with the longest and most delicate tips are dorsal, those with slightly broader wings are ventral, and the former are most conspicuous near the tip of the tail. In the anterior region five uncinigerous rows lie to the ventral edge of the setigerous processes, their inner ends impinging on the scutes opposite them. The first commences opposite the second bristle-tuft, and all are longer than those of the posterior region. The hooks are in a single row, with a main fang and a series of serrations above it, a neck of moderate length with striæ where it enlarges into the boldly convex prow, and an oblique tapered base (corresponding to the shaft). Moreover, a series of short modified bristles occurs with them, the tips

being short, bent at an angle, and with broad wings—the whole resembling a beak. The curved shafts dilate from the base to the neck, where a slight constriction occurs, then it bends forward and tapers to the short tip. In some views slight grooves appear on the enlarged basal part of the tip, so that they at first sight resemble the long hooks of *Terebellides* and other forms. The posterior hooks are smaller, their necks longer, and the bases more oblique. Some examples occur in a tube of tough secretion, with fine sand-grains attached, after the manner of the firm tubes of the Canadian examples of *P. torelli*.

Amongst the masses of the foregoing *Sabella*, BC, from Berchaven, are a few characterized by the striking madder-brown pigment-spots on the branchiæ, and without the general arrangement of the pigment characteristic of the former Sabellid. Yet in the disposition of the cephalic collar the two forms appear to be identical. It is true some of them show seven anterior segments with bristles, but others have the normal number—and some, which apparently have lost the cephalic plate and other parts, have fewer. Injury or abnormality also would explain the occurrence of the median ventral furrow from the first sente backward. The anterior hooks and their accompanying bristles and the posterior hooks are identical.

Potamilla incerta, which Dr. Allen procured by the dredge on Yealm ground, Plymouth, seems to be the young of *Potamilla torelli*, and in this Prof. Fauvel agrees. Indeed, it is difficult to find satisfactory distinctions between *Potamilla reniformis* and *P. torelli*, for the absence of ocular points on the branchial filaments may not be of capital importance.

A single example of *Laonome kröyeri*, Malmgren, the fifth form, was obtained by the dredge on a muddy bottom in Inishlyre Harbour by Mr. Southern, who kindly forwarded it for examination. The cephalic collar is somewhat low, being deepest ventrally where the edges overlap at the fissure. In the median line dorsally the gap is both wide and depressed in front, and the edges of the collar there are slightly reflected. The branchiæ are short in proportion to the length of the body and from fourteen to sixteen in number. The filaments have a chordoid axis with narrow transverse septa, and terminate in a slender tapering process. The pinnæ are short at the base, increase in length till near the tip, where they again diminish before reaching the base of the terminal filament. No pigment-specks were visible

in the spirit-preparation. Tentacles comparatively short, bluntly tapered distally.

The *body* is comparatively long and slender, and the example showed little diminution throughout its length, having apparently been preserved in its tube and then slit out. The segments are fairly distinct, those of the anterior region ranging from 8–12 (*Malmgren*). The ventral scutes of the region are distinct and undivided, and there is a dorsal groove, behind which a line marks the mid-dorsal region for some distance. The scutes are continued backward on the ventral surface as a somewhat narrow pale band, the central groove cutting the portion in each segment into two. In the preparation the bristles are inconspicuous. The anterior bristles are of two kinds—a series with slender elongate shafts and short tapering tips with narrow wings, and a larger number with stouter shafts and paddle-like tips with broad wings and a tapering process of the axis. The posterior bristles are of one kind only, viz., those with narrow but distinct wings and long tapering tips. The anterior hooks are avicular, with a characteristic short and stout outline and a high crown, a main fang of moderate size, and six or seven distinct spikes in lateral view above it. The anterior prow is large and bulging, the gulf between it and the great fang is small. The posterior outline is straight, and a small remnant of the base posteriorly is present. The posterior hooks agree in the general outline, but the process of the base is absent posteriorly. It is this hook which Malmgren shows in his figure, unless the Arctic species differs. The tube is composed of secretion and mud, very little of the latter constituent occurring on a third of the length at one end.

Branchiomma vesiculosum, Montagu, the sixth species, comes from various parts of the southern coasts.

Kölliker, in 1858 *, constituted the genus *Branchiomma* for those Sabellids having eyes on their branchiæ, and he gave as a type *Amphitrite bombyx*, Dalyell. Sars, a little later (1861) †, made the genus *Dasychone*, characterized by the dorsal pinnules on the branchiæ. Claparède rightly restricts the term *Branchiomma* to those having subterminal eyes, such as *B. köllikeri*, the form which Kölliker probably studied. Dorsally, the cephalic plate presents a deep fissure between the firm basal pillars of the branchiæ. The somewhat deep collar arises from the outer edge of each pillar,

* Zeitschr. f. wiss. Zool. Bd. ix. p. 536.

† Vidensk. Selsk. Forhandl. 1861, pp. 28 & 33.

and slopes with an unbroken edge downward and forward to the mid-ventral line, where a fissure separates the two sides, each of which is produced into a prominent rounded edge which slightly overlaps its neighbour. The adjoining first scute is indented in the middle line, thus giving a character to the region. Whilst, therefore, the collar is largely developed ventrally, a considerable part of the dorsum is devoid of it. De St. Joseph found two pigment-spots (eyes) over the cephalic ganglia. An otocyst occurs on each side at the base of the branchiæ. The branchiæ are of moderate length ($\frac{1}{6}$ length of body), and their filaments are from eighteen to twenty-four in number. Each filament has the usual structure, and tapers distally, ending in a subulate whitish terminal process, into which the chordoid axis, which is remarkably attenuate towards the tip, does not go. The subulate terminal filament, where no eye is present, has a translucent thin margin, especially at the commencement of its inner edge. It is at this region (viz. the inner base) that the eye develops as a conspicuous dark brownish-violet organ, a stripe of the flattened translucent margin connecting its inner base with the line of the pinnæ; whereas the distal part of the process is slender. The pinnæ are of average length, and provided with a chordoid unjointed axis. When injured, these organs are readily reproduced from the filament, to which they give a feathery appearance when the animal projects itself from its tube. The branchiæ are gracefully spread like the flower of a *Convolvulus* (Claparède). De St. Joseph describes the exterior of the branchiæ as white, or as brownish violet, or alternately of these colours. Sometimes they are entirely "couleur de rouille ou gris de souris." In the examples from Plymouth the colour was pale olive throughout, only the exterior of the filament being marked by an interrupted band of white, which broke up distally into isolated touches. The remarkable delicacy of the pinnæ is characteristic, each branchial process thus resembling a feather with its delicate barbs. When viewed from without, the branchial fan had a slightly barred aspect from the arrangement of the white touches. The pinnæ are pale olive throughout. The eyes vary much in size on the same specimen, and in one case only a single large one was present, the rest being small in varying degrees. All are double, with the terminal process passing off between them.

The anterior region consists of nine segments (six to nine, *De St. Joseph*), eight of which bear pale golden bristle-tufts, which slope in the preparations upward and backward.

The first tuft springs from a setigerous process almost immersed in the tissues of the united first and buccal segments, but the posterior cirrus or process is distinct, though small. The bristles are small tapering forms with very narrow wings (some without evident wings), and in two series, viz., a larger series, more deeply tinted yellow by transmitted light and minutely dotted, and a more translucent smaller series. All have finely tapered and nearly straight tips. The rest of the setigerous processes of the region are characterized by an increasing prominence, and the posterior papilla is considerably larger. Each arises from a broad base, and is somewhat flattened, since its vertical exceeds its transverse diameter, and the distal end has three parts, viz., the posterior process or papilla (not to be confounded with either a dorsal or a ventral cirrus), which springs from the middle posteriorly, and two areas for the bristles. The papilla is short and nearly cylindrical in the preparations, and is directed backward. The upper bristles arise from a curved area above a papilla, so that the long axis of the row is antero-posterior and the convexity of the tip with the wings is turned outward and their points directed backward. They have long shafts and finely-tapered slightly-curved tips with narrow wings. The inferior row of bristles, again, has its long axis vertical, and they have shorter and stouter striated shafts, stouter tips, and broader wings. The tip in all is finely pointed.

The body is somewhat elongate, a large example reaching 100 to 110 mm., with a breadth of 3–5 mm., flattened, and tapered toward the tail, in front of which some examples have the widest part of the body. At the tip is the crenate anus. The dorsum is rather more distinctly flattened than the ventral surface, and has a groove in front leading to the branchial fissure; whilst posteriorly it bends to the right between the eighth and ninth bristle-tufts, and slants to the posterior edge of the ninth bristled segment. The ventral surface has the somewhat prominent median region occupied by the scutes, the first of which, on the united buccal and first segment, is the largest, and characterized by a dimple in front. It is followed by eight others, each of which may have an even margin or a median incurvation. The last of the anterior scutes has posteriorly a median projection, to which the boundary-line from each side slopes. From this point the ventral median groove passes backward to the tail, cutting the succeeding scutes into two equal halves, which occupy a little more than a third the breadth of the body of the preserved specimens, except toward the tail,

where the scutes are somewhat broader and the median groove is wider. The anterior region has nine segments with a wider antero-posterior diameter than those which follow, whilst these, again, are wider than the caudal segments.

The colour of the body is dull orange or of a salmon hue, universally and minutely dotted with white grains. The dorsal collar is pale, and is also minutely dotted with white grains ventrally; the flaps are also pale with a brownish edge—well marked in the anterior dimple of the first shield. The ventral scutes are paler, but also minutely dotted with white, and the ventral groove is reddish. The cilia of the dorsal end carry loose bodies actively forward.

The bristles of the second region are arranged like the inferior group in front, viz. with the long diameter of the row vertical, and they spring from the tip in a double row—that is, on each side of a ridge of tissue. The wings of these are intermediate in character, being narrower than the lower series and wider than the upper series of the first region. Their tips, however, are long, especially the upper forms, and finely attenuate. The chief changes in the bristles toward the tip of the tail are the shortening of the shafts and the great elongation of the tips, which stretch from the side of the flattened body as finely-tapered hairs. A distinct curvature occurs at the commencement of the wings.

Neural canals occur from the second setigerous segment backward. The segmental organs are found in the first, second, and third setigerous segments, and they open by a common canal. The anterior rows of hooks occupy the summit of the rounded ridge, which begins close to the setigerous process and passes ventrally near the scute. Each hook is avicular in shape, with a marked forward curvature of the posterior outline at the crown, a powerful and sharp main fang with a series of very minute serrations above it, a neck of moderate length, and a long tapering base. Bold striæ pass from the crown to the base, into which they curve a little behind the prow. Each hook is accompanied by a short broad bristle, with a spatulate tip bent at an angle and ending in a point, or when seen obliquely the tip is hastate, or on edge a hook-like organ. In a specimen from South Devon in the British Museum, both these and the hooks had their "heads" tinted brown. The posterior hooks are smaller, with a shorter neck and shorter base, and more distinct serrations above the main fang. The tube is leathery, coated externally with coarse sand mingled with

fragments of shells, and the elastic anterior end closes when the branchiæ are withdrawn.

The absence of *Spirographis spallanzanii*, Viviani, from the British area, is noteworthy. It may yet be found in the Channel Islands or on the southern shores of England. It occurs on the opposite shores of France.

In *Bispira volutocornis*, Montagu, the seventh species, the general colour is of a yellowish brown, paler in front dorsally and on the ventral surface. The branchiæ are pale buff with a white (interrupted) border to the filaments, the tips being more or less white. Most of the filaments have a pair of eye-specks, but there is no regularity in their arrangement in the mass, and some have two pairs or an extra spot. Some of these specks are at the base of the white tip, others midway or above the basal insertion. Though not so brilliantly tinted as some species, the delicate shades of fawn and the pure white margins and tips, in addition to the eye-specks, give the branchial fans great elegance. The tips of many of the filaments appear to have been injured, and are in process of reproduction. In the living form the dorsal groove presents a white bar at the edge of the collar, whilst a brown fillet occurs at each side and passes under the large lateral brown flaps bordered with white, and the dorsal edges of which are continuous with a slight ridge on each side of the anterior region. Ventrally the deep purplish-brown collar with its border of pure white is stretched continuously across till it passes in front of the lateral flap. Dorsally and ventrally the anterior region is somewhat paler than the rest, the lateral region, however, being slightly darker—as, indeed, it is all the way backward till near the tip of the tail. Ventrally the scutes are buff (pale brownish) and marked by the coprogogne, which turns to the right at the posterior border of the anterior region and passes dorsally. In an example the segment in front ventrally was entire, but the one anterior to it was split as if it had a coprogogne of its own. Young forms are pale greenish, the branchiæ being pale, and only a little border of white and a few touches of brown are visible ventrally at the collar, which has a deep median fissure. Dorsally none of these hues are present, the rudimentary flaps being pale. The great development and pigmentation of these flaps is an adult feature.

When the branchiæ are removed from the cephalic plate, the dorsal groove abuts on two semicircles of firm tissue, which pass downward to the sides of the mouth. From the

groove a firm process of similar tissue passes straight downward and bifurcates after a short course, its summit giving origin to two short curved flaps like a bifid epistome overhanging the mouth, which appears as a triradiate fissure with two pouting membranous lobes inferiorly. By the sides of the dorsal groove are two thick firm ridges—apparently fused with the basal semicircles supporting the branchiæ. From the outer base of each of these the collar arises by a thick circular flap, from which the large lateral division passes forward and downward to end in a smaller thick attachment at the side of the anterior process of the ornamental (scalloped) first scute. This lateral flap is slightly tinted in the preparation, but in the living form is of the same deep violet-brown bordered with white. Overlapping the ventral edge of this lamella is the ventral plate, which curves downward and extends on each side of the middle line into a triangular reflected flap—the anterior surface of the whole being of a rich deep brownish purple, bordered with white. If the base of the separated branchial system be examined, a facet marks the dorsal end of each of the semicircles of firm tissue of attachment, and the facet fits on the firm pillars on each side of the dorsal furrow. The firm basal mass of each branchial fan is bridged on the ventral side of the facets by a narrow but firm band. From the ventral aspect the basal mass on each side curves forward and inward to end in a thick inrolled edge in the centre of the spire. In the middle line and attached by its basal webs to the bridge of connecting-tissue, on the one hand, and the dorsal edge of the base of the fan, on the other, is the tentacle on each side. These webs are of importance in the directing-currents, and the ventral is incurved. The tentacle is short, broad at the base, and tapered. The exterior of its base is tinted brown, and a ridge formed apparently by the prolongation backward of the thickened margin of the flap guarding the dorsal edge of the channel from the centre of the spire keeps the base of the tentacle stiff. From the firm spiral base the branchial filaments pass forward to the number of forty-five to eighty on each side, the number apparently increasing with age. They are united at the base by a short web, and are comparatively long. Each filament has the camerated axis which extends to the base of the terminal process, but does not seem to enter it, for only an opaque granular central region with a short web at each side is present. On the outer edge of many a pair of well-marked pigment-specks, and in some two or three, but their position is irregular; where three occur, the first is a

short distance above the base and the others at irregular distances. A considerable portion of the tip is always devoid of them. They are dense masses of blackish pigment apparently enclosed in some cases in a capsule. The pinnæ (barbules, *De St. Joseph*) are short, and form a dense double row along the inner edge of the filament, becoming shorter as they approach the tip, where they end abruptly. Their colour is brownish violet in young forms, with twenty branchiæ in each fan, and a pair of black ovoid eyes occurs on the dorsal filaments about a third from the end, whereas the specks are situated near the middle of the ventral filaments.

The *body* is of moderate length for a *Sabella*, varying from 2 to 6 inches (13 cm. long by 1 cm. broad, *De St. Joseph*), and the segments vary from eighty to ninety or more. It is rounded dorsally and flattened ventrally, the mid-ventral line being marked by the groove from the posterior edge of the anterior region to the tail. The body tapers from the posterior third (in spirit) to the tip of the tail, at which the anus is, whilst beneath the tip are two somewhat ovoid papillæ with pigment-dots. The anterior region has nine bristled segments, but the number, as De St. Joseph shows *, varies much (*e. g.*, from five to eleven), and the numbers on the respective sides may differ. The setigerous processes are large, and have the form of short blunt cones. In this region the bristles are directed upward and backward as conspicuous tufts, whilst the rows of hooks stretch on rounded elevations between them and the ventral scutes. The first segment is fused with the buccal, and bears the first bristle-tuft. The segments are deeply cut ventrally in this as in the succeeding region. The first ventral scute has two lunate depressions, upon which the ventral lappets of the collar apparently impinge, the glandular tissue having been absorbed or arrested in development on these areas. The next ten scutes in the example from Plymouth are undivided by the median line, though three show a white streak in the centre—two of these belonging to the posterior region. The scutes are continued to the posterior end as elongated plates on each side of the median groove. The bristles of the anterior region are characterized by their golden hue and their distinct separation into two groups—a longer dorsal row, the long axis of which is nearly horizontal or slightly oblique, and a mass of shorter bristles beneath them. The upper bristles have very long, straight, striated

* Ann. Sc. Nat. 8e sér. xvii. p. 288.

shafts, which taper a little as they approach the tip, which is finely tapered, distinctly curved, serrated, and furnished with narrow wings—these, indeed, in some being indistinct. These bristles, moreover, show a gradation posteriorly, where shorter forms with nearly straight tips and somewhat wider wings occur. The second series forms a dense brush considerably shorter than the foregoing, and, as in other forms, the two groups are moved by separate muscles, so that their special functions may be performed. The shafts of the longer bristles of this group are similar to those of the first series, but shorter and slightly stouter, and the shorter tapered tips have a trace of a curve, and have wider wings, but soon a tendency to form a tip like a knife-blade, in which the wings are fused, is apparent, and by-and-by all the shorter bristles have the translucent flattened tip. This blade varies in length and breadth, as well as in curvature, but the majority of the bristles in these tufts are of this formation. The peculiar flattening of the tips, which are thinnest distally, gives great flexibility to the organs, so that their function of smoothing and brushing is facilitated. All have strong, striated, golden shafts, which gradually dilate from their translucent bases to the distal third, when gentle narrowing again occurs to the origin of the flattened tip. When softened and compressed in glycerine, the various stages in the transformation of a winged form, with an elongated tapering tip and with bold striæ on the wings, to a form in which the tip is broad, flattened, and translucent with but a trace of minute striation, can be followed. With the change of feet in the second division of the body, a reversion to the normal type of bristle takes place, the fascicles consisting of smaller shorter bristles of nearly equal size, with finely-striated straight shafts, similar in formation to the preceding, but which have narrow wings gradually disappearing on the delicately-tapered tips, the minute serrations on the edges being continued far upward. These bristles are grouped in a tulip-like tuft, and each resembles the blade of a pointed scalpel, only a trace of a wing appearing toward the convex edge, which is serrated, the lines sloping outward and upward. De St. Joseph counted sixty long bristles and two hundred shorter in the sixth segment of an example 13 cm. long. In the posterior region the bristles form a cylindrical pencil, a slight swelling occurring distally where the wings project. Their tips are more finely tapered than in the first region, and there is a slight curvature at the commencement of the wings. The pencil springs from a distinct setigerous

papilla. The bristles of the flattened caudal region, again, while retaining the form of a pencil, have the tips of the majority greatly elongated, so that this region of the body is specially hirsute. No wings are visible in these much elongated forms, but in the shorter forms these are well marked and have serrated edges. The anterior hooks, which commence on the second bristled segment, are situated on long low flaps, eight in number, which stretch from the setigerous process almost to the ventral scute in each segment. They are in a single row, and are characterized by their somewhat long necks, from which the main fang arises at less than a right angle, and has eight or nine small teeth above it. The prow is rounded and prominent, but the base is short, for it abruptly tapers to a blunt point posteriorly. A series of bold striæ occupy the central region from the crown to the base, into which they curve. De St. Joseph found no less than one hundred and eight to one hundred and forty hooks in a single row in the anterior region. Each hook is accompanied by a short bristle with a thick shaft, a slight narrowing of the neck, then an enlargement of the base of the flattened tapered tip, which is bent backward at an angle, and according to position is either symmetrical or asymmetrical. The posterior hooks do not differ except in the length of neck and smaller size, and in the presence of short striæ on the neck at the base of the great fang. These may indicate a stage in the development of hook-like points on the region. De St. Joseph states that these have smaller and shorter bases, and he gives the numbers in several examples.

About two-thirds of the large tube is composed of a fairly firm, yet elastic secretion with little mud, and occasionally a shell is attached. The basal region, which appears to be fixed, is coated with greyish mud.

A young example occurred in the fissure of the rock a few inches from the adult. When alive, it appeared to be about half an inch in length. The anterior region has seven setigerous and six uncinigerous processes, whilst the posterior consisted of about thirty-nine segments, the tip of the tail apparently being incomplete. Nine scutes are in front of those split by the mid-ventral line, instead of eleven in the adult, showing that, whilst the two behind the anterior region are constant, the rest increase with age. The cephalic lamellæ and folds are similar. The branchial filaments are respectively eleven and twelve, and they have the beautiful white tints of the adult, and the same basal web. The "ocular" pigment-spots in the preparation, however,

are few and minute, since in all probability they have been bleached by the spirit. The structure of the anterior and posterior bristles and hooks at this stage correspond with that of the adult.

In another young example found under a stone at St. Peter Port, Guernsey, and which was about three-quarters of an inch in length, the reflected lamellæ of the collar were of a rich reddish-brown colour. The anterior region consists of ten bristled segments and nine long scutes, and the region which follows appears to have more than thirty segments. The body is comparatively short, grooved on the dorsum for a short distance behind the fissure of the collar, and rounded behind the anterior groove. The ventral surface is slightly flattened and marked by the median furrow from the tenth scute backward.

Amphicora fabricia, O. F. Müller, the eighth form, is abundant near low-water mark and amongst roots of sea-weeds. The cephalic region has a projecting, broadly conical, ventral median process, and dorsally the margin presents a median notch behind a small conical process connected with the mouth. There is thus an indication of a collar, and it and the next segment are narrower than those which succeed. Two eyes are situated a little behind the anterior border, and beneath are two pale red masses. In front of these, at the base of the tentacles, are two deep red spots—apparently in connection with the blood-vessels. The branchiæ are three in number on each side—that is, the dense series of pinnæ arise from three main stems on each side, and all are quite pale. The pinnæ are longest at the base of the filaments and shorter toward the tip, so that the general effect of the arrangement when the fan is closed is to have a fairly even series at the tip. They are ciliated internally. Internally at their base are two short and nearly cylindrical tentacles, ciliated like the branchiæ. A single vessel occurs in each pinna in the line of the cilia, and the surface has numerous palpocils. Moreover, at the base of the branchiæ are two vascular enlargements, which have been termed "hearts."

The body is rather more than an eighth of an inch (1–2 mm., *De St. Joseph*) in length, cylindrical throughout the greater part of its extent, then tapered toward the tail. The segments are thirteen in all, seven of which pertain to the anterior and six to the posterior region. It is more or less rounded in the preparation, but in life it is often flattened. The first or buccal segment has two black

eyes (*De St. Joseph*). The general colour is brownish or straw-colour. Posteriorly it terminates in a pygidium, which has two eye-specks. The alimentary canal is straw-yellow, is wide anteriorly, bulges here and there in its course, and then narrows posteriorly. On each side of it is a red blood-vessel. The body-cavity is filled with a vast number of granular cells about $\frac{1}{900}$ of an inch in diameter. In front of the eyes at the base of the branchial lobes is a blood-sinus (branchial heart of Ehrenberg and Claparède), and Langerhans counted 25 pulsations per minute. The blood is stated to be red by Meczynikow and Claparède, whereas De St. Joseph says it is green.

The first segment is devoid of bristles, but the second has a tuft on each side about the middle of the segment. The bristles are few, simple, translucent forms with straight shafts and finely tapered tips with narrow wings, and in some views the tip is bent at a slight angle to the shaft. Eleven segments are provided with them, the first and last having none. As usual in the family, the posterior bristles have the largest and most finely tapered tips. The minute anterior hooks are about six in number in each segment, have a comparatively large head, a constriction at the neck, then a well-marked shoulder, after which the long curved shaft tapers posteriorly. The main fang is large, and the crown behind it is flat with about four teeth. The organ is a miniature representative of that of *Chone*.

The last three bristled segments have, instead of the long hooks of those in front, peculiar forms, the posterior outline being incurved and the anterior slightly convex, whilst the crown is long and minutely toothed, no differentiation occurring between the lowest and the adjoining teeth. The base enlarges inferiorly, and is occasionally split, apparently from the pressure used in preparing.

Oria armandi is the ninth species, generally distributed in the south. Claparède (1864) describes a ventral cephalic collar to this species, apparently as distinguished from *Amphicora fabricia*, but so far as observed in the spirit-preparations there is not much difference in this respect—both presenting a conical ventral prolongation and a narrow rim to the dorsal fissure. Claparède states that below the collar is a row of vibratile cilia. Immediately in front of the termination of the collar on the latero-dorsal region is an eye-speck on each side. The second segment bears an "auditory" organ (statocyst) on each side, viz. a capsule with a statolith. The branchiæ are in two groups

of five (*Claparède*) and similar in general appearance. They are ciliated internally and have palpocils externally. The first ventral branchia is reduced to a simple filament without pinnæ. A single vessel occurs in each filament, and it ends blindly where the cilia cease.

The *body* of the examples from Sark is not larger than that of *Amphicora fabricia* from St. Andrews—the advantage in size, indeed, being with the northern form, which is also more translucent. The eyes had disappeared in the preparations (after preservation for 42 years), and yet, as Claparède shows, those of *A. fabricia* are permanent in spirit. The number of segments is at once diagnostic, for *Oria armandi* has fourteen bristled segments besides the first and last. Claparède, however, gives nineteen or twenty segments, though he found a ripe female with fewer than twelve segments. The first segment is achetous. At the tenth segment the bristles change to the ventral border and the shape differs.

The digestive system has a cylindrical colourless œsophagus, and from the third segment the gastro-intestinal canal proceeds backward as a brownish wide tube. A blood-vessel runs on each side of the canal with a transverse branch in each segment—indeed, the gut is surrounded by a vascular rete (*Claparède*). In the seventh segment a pair of folded tubular organs (segmental?) occur.

Fourteen pairs of bristle-bundles characterize those from Sark. The anterior bristles have stouter shafts than those of *Amphicora fabricia*, and the tapering tip is shorter and has wider wings. Eight pairs belong to the anterior and six to the posterior region, the latter being distinguished by their slenderness and the tenuity of their hair-like tip, as well as by the absence of wings. Moreover, they are generally directed forward with a slight curvature, whilst the anterior bristles are directed backward. The anterior hooks have a similar shape to those of *Amphicora fabricia*—that is, have a curved shaft which tapers inferiorly, a shoulder above which is a somewhat narrower neck surmounted by a strong sharp main fang, which comes off at less than a right angle to the throat and with two or three strong teeth above it, the crown being, on the whole, more elevated than in *A. fabricia*. The neck of the hook is also slightly bent backward. The posterior hooks, which, as in *Amphicora fabricia*, occur in the last three bristled segments, differ, as Claparéde observed, from those of the species just mentioned in their shorter form, for the basal region is truncated and the posterior outline short and concave, the

conspicuous part of the hook being the long anterior face and crown, occupied by a small sharp main fang and numerous minute teeth above it. The anterior outline below the main fang bounds a small bay, the prow bending up to circumscribe it. The inferior outline is convex.

The otocysts in this species belong to the second group of Fauvel *, viz. to the closed series in which the otoliths are formed by concentric layers of secretion in the organ.

Amphiglena mediterranea, the tenth species, is a southern type from Plymouth and Torquay. The anterior region bears ten branchiæ each, pinnate, with a double row of barbules, the whole forming, in the preserved examples, a tuft about a third the length of the body. Each filament, according to De St. Joseph, consists of a double row of "cellules cartilagineuses," whereas the barbules have only a single row. The number of ciliated barbules appears to be about thirty, and they are shorter at the base and the tip than in the middle. The tip of the filament ends in a long and slightly tapered process with a narrow web at the base, and it has palpocils. Each branchial filament has a single vessel (*Claparède*).

Besides the two ciliated palps, De St. Joseph, after Claparède, shows a coiled process on each side, filled with brown pigment-granules, and which, after Meyer, he considers to be a fold of the upper lip, forming a superior lateral chamber on each side.

The body is about 8 mm. in length (but some may reach 18 mm., *Claparède*), usually little tapered anteriorly, but distinctly so posteriorly, and ends in a bluntly conical or rounded pygidium, which bears four to six pairs of eyes. The segments vary from 29–33. A pair of spherical statocysts, as mentioned by Claparède, exist in the second segment. They are ciliated internally and have statoliths. Claparède describes a dilatation of the œsophagus in the fourth segment. The circulatory system, according to the same author, consists of a contractile ventral vessel and two lateral trunks applied to the alimentary canal, but he could not detect the cœcal branches ordinarily seen in Sabellids.

The first achetous segment bears four eyes in two pairs; the second segment has two statocysts having a number of statoliths, besides two or three minute winged bristles dorsally; and the next seven segments have dorsal tufts of bristles, the upper having narrower wings, the lower

* Comp. Rend. Acad. Sc. Paris, Dec. 29, 1902.

resembling spatula from the breadth of the wings, gradations occurring between the the two—showing a long hair-like continuation of the shaft as well as the broad wings. The dorsal forms have a long shaft slightly curved backward toward the tip, which is finely tapered and furnished with wings of moderate breadth, which insensibly disappear below the hair-like tip. The inferior bristles of the same group—that is, those next the inferior hook-rows—have wings so short and broad as to make the tip spatulate and often with a slender hair-like continuation in the middle. Both types of bristles are frequent in the Sabellids. Similar bristles occur in the anterior "abdominal" region, but the last six at least are very long, attenuate, and project prominently outward, whilst scarcely a trace of a wing is visible, even in the most anterior long tuft.

A series of minute bristles with the spatulate tip bent at an angle accompany the anterior hooks, which commence on the second bristled segment. These occasionally project beyond the line of the great fangs of the hooks *in situ*. The hooks, of which there are about eleven in each row, themselves have a remarkably long main fang with three or four spines in lateral view above it, making a high crown, the posterior outline is much curved and runs to the basal process, whilst the gulf between the great fang and the prow is rather narrow. The posterior process is comparatively long. In the posterior hooks the spikes above the great fang are more numerous, as well as more evident. The great fang itself is powerful and slightly curved. The gulf anteriorly is as well marked as in the thoracic hooks, but the prow is proportionately broader and more blunt, and the posterior process considerably smaller and shorter. The number of the hooks anteriorly is similar to that found in the "thoracic" region, but posteriorly they diminish, so that in the antepenultimate there may be only one.

The change in the setigerous and uncinigerous processes occurs at the tenth segment, the posterior region having the hooks dorsal and the bristles ventral.

The eleventh species, *Dasychone argus*, Sars, a form not to be distinguished from *Sabella luculiana*, D. Chiaje, is generally distributed throughout Britain. When the branchiæ have been shed by the annelid, the cephalic plate has the edge of the collar projecting beyond its surface, which shows at the dorsal inflection two small processes or folds, from which a pear-shaped area passes ventrally to end in the oral ridge. The entire surface is thus symmetrically mapped

out, whilst the margin is formed by the collar, which presents a lateral notch, in the form either of a slit or a shallow excavation, which divides the reflected and somewhat triangular ventral lobes from the rest of the rim, and they are separated from each other by a wider gap in the mid-ventral line. In large examples a dark speck occurs on each side of the surface external to the pear-shaped enlargement, and a dark speck on each side of the dorsal collar. A patch of dark brown pigment also is present in some on the edge of each reflected lobe. When the annelid withdraws itself into its tube the dorsal lamellæ are folded inward and slightly overlap, and the inner process is pressed flat.

The branchiæ are from 12–25 on each side and arise from a firm tissue which is continuous in each semicircle, and apparently formed by the fusion of the bases of the branchiæ, the individual elements being marked by a reddish-brown pigment-speck—linear in outline and interfilamentous in position. From each semicircle the finely coloured organs extend freely distally. The chordoid axis in each is more finely divided than in *Chone infundibuliformis*. The pinnæ, which are in a double row, become shorter at the tip and somewhat suddenly cease at the base of the short terminal process. Along the outer edge of each filament a series of clavate processes (about 18) are attached in pairs, and a pigment-spot occurs on each side just beyond the attachment of the processes, which in life are often curved downward. Sars calculated that there were from 1200 to 1400 eyes in this species, for each eye-speck is compound. As a transparent object the branchial filament shows the chordoid axis with its coating of hypoderm and cuticle, and the pinnæ with jointed chordoid axes (De St. Joseph calls them cartilaginous). In some from Guernsey the branchiæ were of a pale greenish hue, whilst the pinnæ were pale or whitish and the tentacles greenish. Zetlandic examples, again, had the branchiæ tinted dull orange with a tinge of green, whilst on each filament the pinnæ and the dorsal processes were marked with white grains. Others from St. Peter Port, Guernsey, had dull purplish-red branchiæ spotted with white. Four of the dorsal crenated processes also were white. In those from St. Andrews the branchiæ are often brownish purple, and the two tentacular groups are streaked longitudinally with white and purplish brown. The beautiful shades of white and purplish brown and the elegant form of these complicated organs almost baffle description. The general effect of the branchial coloration is striking, for three reddish-brown belts cross the branchiæ, the most

intense being inferior and which is toned down to the white collar. Two white belts separate the three brown bands and various white touches enliven the beautiful fan. Dalyell's specimens were variegated with different shades of brown and yellow, and he mentions one with snow-white plumes located inside an old oyster-shell.

The *body* is moderately elongated, but in contraction almost elliptical, and attains a length of ¾ to 2 inches, and has fifty-eight well-marked segments, of which 5–7 are anterior. It is rounded on the dorsal surface and devoid of any anterior groove, slightly flattened ventrally, and with a median groove from the posterior border of the ninth bristled segment to the tail, where the terminal anus has two slight lateral papillæ. The ventral surface from the collar backward has in each segment a glandular scute. These occupy the middle of the anterior region. The long rows of hooks occur at the sides, and they continue of similar breadth to the posterior end. After the ninth they are split in the mid-ventral line of the groove, and in some a faint line runs from the collar along the middle of the anterior segments. The body is of a madder-brown or dull red colour in some, with white specks both dorsally and ventrally (orpiment-orange, *Dalyell*). In others it is dull orange with only a few whitish grains on the collar, or of a light orange hue—rendered dark here and there by the intestine, whilst the lobes of the collar are speckled with minute dots of white, and two white papillæ occur at the anus, or a white patch in front of it. Young examples between tide-marks in Guernsey and Herm are yellowish green, with the dark specks at each foot. A bold dark brown speck occurs at the ventral edge of each setigerous process in the anterior region, the uncinigerous ridge commencing behind it. At the ninth bristled segment a smaller speck is situated rather behind the setigerous process dorsally, and at the commencement of the uncinigerous row, and so to the posterior end of the annelid. In one from Malahide the collar had many minute brown specks. The alimentary canal commences at the mouth as a wide, though translucent, membranous tube marked by transverse striæ. About the middle of the body it becomes narrower and thicker with powerful and rather coarse transverse fibres and some delicate longitudinal muscles. The dissepiments support the canal in every segment, and thus it assumes a moniliform aspect, or occasionally resembles a coiled spring.

The first setigerous processes are nearer each other than the succeeding, since the line of the bristles anteriorly

trends dorsally. The cervical process is smaller than the second, and bears a series of bristles with more slender winged tips than the succeeding. A typical tuft in the anterior region presents dorsal bristles with more elongated striated shafts and short, tapering, winged tips. The shaft slightly tapers toward the wings and again toward the root. Those at the edge of the series have somewhat broader wings, which are striated and serrated on the edges. A shorter series of bristles occurs at the base, the tips just projecting beyond the skin and having the same gradation as observed in the longer forms. The posterior bristles form a small tuft and are characterized by the great elongation of the tip, especially of the more slender forms, the wings in the preparation being scarcely visible. One or two bristles at the ventral edge have the wings considerably widened at the base, but the tips are attenuate. On examining the anterior tufts of bristles with a lens, the sharpest curve formed by the setigerous process is posterior and the concavities are dorsal. They are considerably stronger than the succeeding tufts. The ninth is less powerful and the dorsal bristles are proportionally longer. In transverse section they agree generally with the condition observed in *Chone infundibuliformis*.

The first bristle-tuft has no hooks on its ventral border, but the next seven have long ventral rows slightly diminishing in length from before backward, and the hooks occur in a single row. The ninth, which begins the posterior series, is dorsal, and is one-third less in breadth than the eighth. Throughout the entire series of rows the hooks maintain the same microscopic characters. The anterior hooks are avicular, have the posterior outline convex and the anterior concave, the great fang leaving the throat at a little less than a right angle, and a series of small teeth occur on the crown above it. The anterior outline, whilst concave at the neck, becomes boldly convex at the prow, which is smoothly rounded anteriorly and inferiorly—ending in a strap-like basal process which is usually bent a little downward posteriorly. The hooks diminish in size posteriorly, and the basal process is shorter.

In connection with this species, it is curious that Sir J. G. Dalyell (1853), in watching the development and reproduction of lost parts, made the following remarkable statement:—"Here we seem to reach a postulate, demanding the indefinite—the universal—diffusion of germs ready for development wherever the obstacles to it cease, or of some creature-power effecting a secretion of such matter as may produce

new organs in forms or substance." Something like Pangenesis was thus thought of before Darwin.

Euchone rubrocincta, Sars, the twelfth form, comes from St. Magnus Bay, Shetland, in 100 fathoms, where it was dredged by Dr. Gwyn Jeffreys. The collar dorsally has a curvature as it approaches the median fissure, whilst ventrally only a spout-like median fold occurs at the rim. The branchiæ are 15–16 on each side (twelve, *Sars*), connected by a web for half their length. The filaments have pinnæ which reach the base of the slender filiform tip, which is often so closely coiled as at first sight to represent a knob. A narrow hypodermic wing is attached to the axis along a considerable area of the pinnate region and to the base of the terminal process. "Five pairs of branched tentacles" (tentacular cirri) "and several unbranched, of which one long ventral pair is attached to the connecting membrane" of the branchiæ, "whilst the others are free" (*Southern*). These organs are in close proximity to the mouth, have an afferent and efferent blood-vessel, and are probably of importance in alimentation. The curve of the vessel is just within the hypodermic tip, which is slightly bulbous. The body is about three-quarters of an inch in spirit, of thirty-two or more segments, of which nine to eleven are included in the anal funnel, which has a furrowed process in front and a crenulated margin. It is somewhat rounded, though the ventral surface is more or less flattened, a little tapered in front, and more distinctly diminished in the caudal region. The segments are two-ringed, and a dorsal furrow runs from end to end, for it does not cease when the ordinary groove bends to the right and passes to the ventral surface between the eighth and ninth segments, and is continued to the anal funnel. The anterior scutes are divided by the transverse furrow of the segment; the posterior scutes are cut into four by the deep and broad ventral furrow.

The anterior bristles are borne on a setigerous process, are pale, and brittle. The first tuft, which arises a little more dorsal than the others and at the base of the collar, consists of a longer and shorter series of finely-tapered bristles with very narrow wings, those on the shorter series being almost invisible. The average anterior tuft has three sets of bristles, the larger having straight shafts, gently tapered and slightly curved tips; the next series has shorter tips with a distinct inclination backward and broader wings, but still their condition is in contrast with the broad spatulate tips of the corresponding series in such as *Euchone*

papillosa. The third series present narrower wings than the last, and the tips project little beyond the surface. So brittle are the tips that the tapered axis, or terminal region of the shaft, often snaps at the base of the wing, leaving a transparent web forming the wings projecting freely beyond it and on one side of the shaft. This is not common.

In his account of the species, Malmgren (1865) did not refer to other than the anterior hooks, which are rather large, have moderately long and boldly curved shafts, also as brittle as the bristles. These dilate from the base up to the shoulder, then are slightly narrowed at the neck. The main fang comes off nearly at a right angle, and in lateral view has eight or nine teeth above it, but the crown is flat, and thus differs from such as *E. papillosa*, in which the crown is more elevated. The *hooks* in the anterior part of the posterior region are avicular, have a main fang which leaves the neck at less than a right angle, a rather high crown with five or six teeth in lateral view, a convex posterior border, a prominent and massive prow, and a small basal process posteriorly. The terminal hooks, again, are considerably smaller, have a much higher crown and more numerous teeth in lateral view, and the posterior basal process is smaller. All the shafts of the bristles and long hooks are slightly brownish by transmitted light.

Enchone normani *, sp. n., the thirteenth form, is unfortunately fragmentary, and nothing is known of the branchiæ. The cephalic collar is fairly developed, with a deep fissure dorsally, the margin sloping thence downward and forward to the ventral process, a slight projection on each side of the middle line with a fissure between occurring there. The *body* appears to be comparatively short, and the anal funnel is short antero-posteriorly and wide, the margin being thin and deep anteriorly with a shallow median notch, whilst the sides are boldly and somewhat regularly crenate for more than the anterior half. The anterior bristles are of two kinds, a longer series dorsally with finely tapered and narrow wings, and those ventrally situated with broader wings and shorter tips. Posteriorly the tips of the bristles are greatly elongated, and the wings very narrow.

The anterior hooks have a long curved shaft tapering to the base, whilst the neck is narrowed above the shoulder and curved backward. The great fang comes off nearly at a right angle, and about four teeth are on the crown above it

* Canon Norman and Dr. Gwyn Jeffreys did much valuable work with the dredge in the Zetlandic seas.

in lateral view, whereas in *Euchone analis* the number of teeth is nearly doubled, and a differentiation of this region from that of the great fang is evident. The base is curiously diminished and narrowed posteriorly, but the prow is large and rounded. The posterior hooks are even more diagnostic than the anterior. The posterior outline is convex, with a slight inflection below the crown, and a short posterior curve at the base, which is small. The great fang is long and sharp, and on the crown above it are six or seven distinct teeth. The anterior outline begins at a little less than a right angle, gently curves forward to the prow, which inferiorly blends with the short truncate base. The lower part of the neck and body have curved striæ. In structure, therefore, these hooks differ from those of *E. analis*, Kröyer, and *E. papillosa*, Sars. Neither is figured by Malmgren.

The representatives of the genus *Chone* in northern waters seem to be in a somewhat confused condition, since the young of certain forms have been described as different species. At least five species, however, are clearly defined, viz. the characteristic *Chone infundibuliformis*, Kröyer, of the arctic seas, which appears to be rare in most collections, but was procured by the 'Valorous' in 1875. This form has often been confounded with another species, viz. *Chone duneri*, Malmgren—indeed, in a named collection from Greenland, procured in the sixties of last century, it is labelled *C. infundibuliformis*. Yet the form of the tips of the branchiæ in the latter, the structure of its hooks, especially the avicular posterior hooks, the bristles, and other features are diagnostic.

The original description of *C. infundibuliformis* by Kröyer*, although unfortunately he gives no figure, is clear in regard to the structure of the branchiæ, the collar, the size, and other features. He adds that it is not rare in Greenlandic seas, and that it inhabits a cuticular tube devoid of mud; yet modern naturalists seem to have seldom met with it. Its posterior hooks are so characteristic that no confusion with *C. duneri* need occur—even in young forms of each species. Of course, it may be a question what form Kröyer meant by his *C. infundibuliformis*, since both it and *C. duneri* are found in the arctic seas, but the typical *C. infundibuliformis* is chiefly arctic in distribution, whereas *C. duneri* has a much wider range. After careful consideration of Malmgren's views and various specimens, it has been deemed prudent to adhere to the diagnosis indicated above. It is, however, right to state that Prof. Fauvel and others hold

* Oversigt Kgl. danske Videnskab. Selskabs Forhandl. 1856–57, p. 83.

C. duneri to be Kröyer's *C. infundibuliformis*, and that the species held here to be *C. infundibuliformis* is only a variety of the former (*C. duneri*). This does not modify either the opinions or the figures in this paper.

Chone duneri has a very wide distribution, ranging from the British seas to Norway, Jan Meyen, Spitzbergen, Greenland, the Gulf of St. Lawrence, and Madeira. A species, which closely approaches *C. duneri*, extends along the eastern shores of Scotland, is thrown by storms on the sands at St. Andrews, is dredged in deep water off Montrose, and occurs in the stomachs of fishes, such as the cod and haddock. It has been termed *C. fauveli* in the meantime, since the processes at the tips of the branchiæ form a contrast with the long filiform processes in *C. duneri*, and its posterior hooks generally show a tooth more above the main fang. Further investigations may clear up certain doubtful points in connection with both forms. Wollebæk's* view that *C. duneri* is a synonym of *C. infundibuliformis* cannot be corroborated. In the fine volume on the Polychæts procured by the Prince of Monaco, Prof. Fauvel† describes and figures *C. duneri* as *C. infundibuliformis*, and it is possible that the rarity of the latter and the abundance of the former in northern waters has led to this misapprehension, which we in Britain equally shared. Prof. Fauvel's figures of the bristles and hooks in his account of the Polychæta from Jan Meyen are excellent. In all probability the species from the area of the Clyde‡ is *Chone fauveli* and not *C. infundibuliformis*, which has not hitherto been met with in British waters. The species described by Miss Katherine Bush§ as *Chone teres* appears to be closely allied to the last-mentioned species, especially in the structure of its posterior hooks. Besides the foregoing forms, *Chone reayi* extends from Shetland to the Channel Islands, and *Chone princei* occurs in the Gulf of St. Lawrence, Canada.

Chone fauveli‖, sp. n., the fourteenth species, is widely distributed in Britain.

The cephalic plate is surrounded by an ample and continuous collar, cleft, however, at the dorsal fissure, and it

* Akrift. Videnskap. Kristiania, 1911, 2 Bind, No. 18, p. 24.

† Campagnes Scient. fasc. xlvi. p. 319, pl. xxxi. figs. 10–18 (1914).

‡ Proc. Roy. Irish Acad. vol. xxxi. no. 47, p. 141.

§ Harriman Alaska Exped. Tubicol. Annel., New York, 1905, p. 215, pl. xxx. fig. 1, and pl. xxxvii. figs. 16–23.

‖ Named after Prof. Fauvel, of the University of Angers, France, who has laboriously studied the Polychæta both of Europe and other regions.

ensheaths the base of the branchiæ. At the dorsal fissure the thickened edges, after the collar ceases, are carried downward, and end in a point above the inflection of the firm rim to which the branchiæ are attached, and which has the outline of a horse's hoof, the rounded ventral arch forming the front and the indented dorsal region the frog. After the branchiæ are shed, a small papilla is usually found in the mid-dorsal, and a larger in the mid-ventral line of the thickened inner rim. The mouth lies above the ventral papilla.

The body of this form is generally more rounded than in the Sabellids proper, reaches the length of 5–6 inches, and has the thickness of a strong goose-quill. The segments are from fifty to ninety. The outline is somewhat spindle-shaped, for, though the cephalic lobe is truncate, the body tapers to it, as well as more distinctly toward the tail, at the point of which is the anus, which in the younger examples sometimes shows two papillæ—a smaller dorsal and a more prominent ventral papilla. The deep dorsal fissure is continued to the second segment, where it is dilated, and from this the mid-dorsal groove passes backward to the anterior border of the eighth segment, where it inclines to the right, cutting off in its course ventralward a narrow portion of the ninth segment, and, reaching the mid-ventral line in this segment, thereafter proceeding to the tip of the tail, the last part of its course being generally more deeply grooved in the preparations. The body of the fresh specimen is pale pinkish, and in the newly-preserved form is of a pale skin-colour.

The branchiæ vary from twelve to thirty-six on each side, and are connected together almost to the tip by a membrane, the dorsal fissure, however, causing a gap in the funnel. In preserved examples the filaments are often slightly spiral and the tips are incurved. The filament is stiffened by a chordoid camerated axis as in *Sabella*, but it is not less in diameter. The tip of each process is characteristically formed with a broad wing at the base and tapering to a fine tip. A slender axis, apparently from the chordoid skeleton, passes along the centre of the bare flattened tip almost to its extremity. The pinnæ are long, even to the base of the flattened terminal process, and have a central (chordoid) axis, the tip being smoothly rounded or occasionally slightly enlarged. The pinnæ at the bases of the filaments (that is, near the mouth) are elongated, the last one or two being so long as to resemble tentacles. When a suitable example is observed the slender tentacles arise at each side of the mouth,

and are quite free from the branchiæ. Six or more occur on each side as delicate filaments little tapered toward the tip. In the centre are two or three folded lobes, apparently in connection with the oral aperture, and near the dorsal fissure is an oblique fold of some length, the distal end of which is split into filaments. What appeared to be the two tentacles proper are on the inner border of each ventral fold, and they terminate in a tapering filament. The mechanism of the entire elaborate apparatus is complex. The length and degree to which the tip is webbed vary considerably, and in the arctic form it is more elongate.

The cutis is smooth, has a finely iridescent or nacreous lustre, and, when removed, has a bluish aspect. In intimate structure it is crossed by fine lines, which give it a fibrous appearance, but at the segment-junctions white bands occur, and these are tesselated. A series of powerful circular fibres occur beneath the skin and its basement-tissue, whilst the longitudinal bands conform to the type of the family.

The collar runs smoothly into the first segment, which is of considerable antero-posterior diameter and uniformly rounded. It has on each side, a little in front of the segment-junction, a small tuft of bristles and a pale spine. The bristles are simple winged forms with tapering tips, the edges of the wings being serrated. They slant dorsally forward. Some of these long anterior bristles present a peculiar twist below the wings, but whether this is artificial or otherwise is unknown. The succeeding seven pairs, which issue just in front of the median ring, have modified tufts, consisting of a dorsal series of bristles with tapering tips, like those of the first series, with serrated edges and a ventral series of bristles of spatulate form, the slope of both being obliquely upward and forward. The spatulate bristle is smallest at the base, and gradually enlarges into a finely-serrated shaft, which remains cylindrical until the wings appear, and then tapers to a blunt point. The wings rapidly widen on each side, and soon end in a blunt tip, are obliquely striated, and have serrated edges laterally. Moreover, the tip often presents a slight marginal fold. When the tip of the shaft is broken, the transparent web connecting the wings is evident and the margins of the wings are stiffened by incurvation and slight thickening. There is little difference between the first tuft and the last, except that the posterior are rather more obtuse at the tip. In transverse section the exterior of the bristle is hyaline, the centre granular from the fibres. On examining the bristle-tufts of this region with a lens, a

double series of black dots appears—caused by the central stalk of each spatulate bristle.

The anterior tufts of simple bristles (at and after the ninth) are characteristic when contrasted with the northern *Chone infundibuliformis* from Greenland; for in lateral view the shafts are curved, constricted as they approach the wings, and the tip leaves the shaft at an angle, whilst it is finely tempered and bordered with the narrow wings. In antero-posterior view the constriction at the upper end of the shaft is distinct, the base of the tip (continuation of the shaft) being considerably broader. On the other hand, the bristles of the Greenlandic species are much more slender, the tips longer and more attenuate, and the wings just visible. The constriction of the shaft below and its dilation above the commencement of the tip scarcely attract notice.

A change occurs at the ninth bristle-bundle, which is now ventral to the row of hooks, for all have tapering tips with the serrate wings, and slant upward and backward. The succeeding tufts are equally powerful, and have the same direction till the posterior fifth is reached, and there the bristles gradually assume an opposite direction—that is, downward and forward. These posterior bristles are longer and smoother, presenting no serrations, and the terminal wings narrower, so that the shaft is more conspicuous. The free portion of the bristle increases disproportionately, the shaft being little more than a quarter of the length. Further, whilst the bristles of the anterior region are in front of the median ring of the segment and the hooks behind it, the posterior bristles are more nearly in a line, though still anterior to the row of hooks. Generally speaking, the anterior bristles have most of their shaft below the skin and a shorter tip, whilst the posterior have a short shaft under cover and a long tip—conditions doubtless connected with their functions.

The rows of hooks commence on the second bristled segment to the ventral side of the bristles, and the first seven—that is, those of the anterior region—are longer and more boldly marked than the succeeding, appearing like minutely dotted dark lines under a lens. The hooks are arranged alternately in a double row, but toward the ends of the row, especially ventrally, appear to form a single series. Each presents a long, curved, striated shaft, deeply inserted into the muscular coats, and tapering from the well-marked shoulder to the base. The neck is translucent, finely striated, especially superiorly, narrowed above the shoulder, and again slightly dilated as it approaches the

head, which has a powerful main fang extending from the throat at more than a right angle, and with five or more smaller teeth on the crown in lateral view, and they extend to the downward curve of the crown posteriorly. In contrasting these with the hooks of *C. infundibuliformis*, the curvature is less, the neck shorter, and the crown somewhat flatter. Moreover, whilst the body of the arctic specimen is larger, the hooks are proportionally smaller. The hooks in the seven rows maintain the same structure, the posterior, perhaps, being slightly stronger. In transverse section of the shaft of the hooks the centre is fibrous, and at the shoulder it is somewhat flattened, with an indentation of the fibrous area, a condition which explains the peculiar blank always seen on one side of the shaft. At the ninth segment the hooks change to the dorsal side of the bristles, and they maintain that position to the posterior end of the body. These hooks are avicularian, and form a single row, diminishing in size from the dorsal to the ventral end adjoining the bristles. There are about thirty-six hooks in each row anteriorly. Moreover, the hooks at the upper end of the row have a larger base than those next the bristles, for in the last hooks the base is in a line with the neck and devoid of the anterior prow. In the upper hooks the main fang is large and sharp, the anterior outline below it deeply concave to the prow, after which it is nearly straight. Four distinct teeth occur above the main fang. The posterior outline is irregular, a slight hollow occurring at the neck, then a convexity from which a straight line runs to the angle at the upper part of the base, another straight line joining that bounding the free end. The base and neck are boldly striated, the former transversely, the latter longitudinally. At the lower end of the row the posterior outline of the hook is nearly straight, only a slight elevation occurring in the middle; whilst the anterior outline of the base is prolonged downward with a slight posterior inclination, so that the hook has a base elongated in the line of the neck. In some large forms from St. Andrews these hooks were of a deep brown hue.

In *Chone infundibuliformis* the hook in the middle of the body considerably diverges from that of *C. fauveli*, since the base is more massive; the prow has a slight process projecting downward, and the gulf below the acute main fang, instead of having a nearly uniform outline on its inner edge, has a distinct indentation, marking off, as it were, the region of the prow. But the most divergent feature is the crown, which is flatttened and provided at its

posterior edge only with five or six small teeth in lateral view (and which do not affect the straight outline of the crown) in contrast with the four large teeth of the British form, which project well over the main fang, and the striæ from which occupy a considerable portion of the neck; and the striæ adjoining these (in front) are parallel, whereas in the arctic hook the long striæ from the smaller hooks on the crown are indistinct, the striæ in front being alone conspicuous. The posterior outline in the two hooks likewise differs, the arctic form being evenly convex till near the base, where it is truncated, the British having this portion of the posterior edge concave.

The distinctions noted continue posteriorly. Thus the bristles near the tip of the tail in the British form, while they have greatly elongated tips, retain the marked constriction of the shaft below the tip and the dilatation beyond it. On the other hand, the extremely slender tips of *C. infundibuliformis* have only a trace of wings, and the slight constriction of the shaft below and dilatation above the commencement of the wings would not at first sight be noticed. The terminal hooks in the British form have a more regular posterior outline, but otherwise keep to the type seen in front, the main fang and the teeth above it being especially distinct. On the other hand, those of *C. infundibuliformis* retain all the distinctive features already mentioned, the minute teeth at the back of the flattened crown being so indistinct as to suggest fusion.

When the digestive tract is exposed, it presents anteriorly prominent oral papillæ and glandular organs on each side. The anterior region of the tract is brownish in colour, chitinous, and very friable, and after a short course it merges into a rounded and more distinctly moniliform portion, which, gradually diminishing in calibre, ends in a small anus. The contents of the gut showed many diatoms, fragments of the spicula of sponges, fragments of minute crustacea, amidst muddy sand. A large and firm glandular body is attached to the intestine, and above the intestine lies the dorsal blood-vessel, which has in the preparation a brownish barred aspect.

The anterior half of the intestine is of a pale brownish hue and somewhat firm, as if chitinous, and in minute structure is finely striated transversely, and hence the readiness with which the gut ruptures. Few muscular fibres occur in the anterior region of the gut, but at the point where it becomes moniliform a layer of muscular fibres lies beneath the chitinous coat, which becomes thin

and translucent posteriorly, whilst the muscular fibres increase in bulk and power. A complex reticulation of blood-vessels covers the wall of the canal anteriorly. Strong fibres from the body-wall cross the canal, but are not attached to it. The intestine is coated throughout with the brownish digestive gland, which is deeply tinged with yellow pigment. It ceases within a quarter of an inch of the vent.

Clone dunerı, Malmgren, the fifteenth, a widely-distributed species, extends from British waters to Spitzbergen and the Gulf of St. Lawrence, Canada. The cephalic collar forms a considerable web dorso-laterally, passing backward to the line of the second bristle-tuft, and doubling forward along the edge of the dorsal fissure on each side so as to make conspicuous parallel edges to the fissure, as far as the base of the pedicle for the branchiæ. The pedicle, after removal of the branchiæ, does not project beyond the rim of the collar. The branchiæ are distinguished by their comparative length and the long slender terminal processes. The structure of the filaments is typical, and they slightly taper distally, ending in a remarkably long winged process, which tapers to a delicate tip and has a slender continuation of the chordoid axis in the centre. The number of filaments ranges from six to twenty-two on each side according to size, the latter being the number in a fine example from Jan Meyen, kindly sent by Prof. Fauvel, and they are united by membrane throughout the greater part of their length, the tip being free. The pinnæ are of considerable length, each having the jointed chordoid axis. They continue long till near the basal web of the terminal process, when a few shorter occur.

The body in all the examples observed is considerably smaller than that of *C. fauveli*, and is nearly of the same diameter throughout the anterior three-fourths, though a little tapered in front. It then diminishes gently to the tail, which is by no means acute. It is somewhat flattened and grooved anteriorly on the dorsum, and grooved ventrally from the ninth scute backward. A papilla marks the anus at the tip. The number of segments would appear to be about fifty, and they are distinctly marked, with the exception of the minute caudal rings. The anterior bristles are in two groups—an upper, with longer shafts and tapering winged tips, and a lower, of spatulate form, with a short tapering process at the tip. The tufts are fewer and smaller than in *C. fauveli*. Posteriorly in front of the tail the tips

of the bristles are greatly elongated, and they slope forward rather than backward, projecting on each side as a fine fringe.

The anterior hooks are similar to those of *Chone fauveli*, though smaller, the posterior part of the crown is less rounded, and the three or four teeth above it very sharp. The posterior hooks, while generally resembling those of the common species, have somewhat higher crowns, five to six teeth being clearly visible above the great fang. The posterior part of the crown is also less rounded, as is the posterior outline. The main fang is proportionally shorter, since its point does not project beyond the line of the prow. Another feature is that the crown with its small teeth is on a level with the outer surface of the main fang, whereas in *C. fauveli* the four large teeth above the main fang fit into a convex outline. The figure of Langerhaus *, though poor, clearly indicates the species.

Chone reayi †, sp. n., the sixteenth form, comes from Shetland, off the coast of Ireland, and from the Channel Islands.

The cephalic plate has a thinner but fuller collar than in *Chone fauveli*, and its edges are turned in dorsally, sloped inward and backward to be fixed to the first segment on each side of the middle line and to the sides of the groove in front; but its anterior margin is well behind the free edge of the collar above, and no continuation of this part occurs in front—a distinctive feature with such as *Chone duneri* and others. As in the former species, the fissure presents a pouch at the attachment of the collar posteriorly. The collar passes with a slightly crenate margin nearly straight to the ventral surface, but from attachment the free rim is there narrow. The pedicle of the branchiæ does not project beyond its edge. In this species the bases to which the branchiæ are attached are different, for they form two semicircular soft grooved lobes, which do not project beyond the margin of the collar in lateral view. To the inner (median) or straight edges the tentacles are attached, and the whole base is constricted posteriorly, so that it is mushroom-like. There is no bifid process of the lip-membrane as described by Southern in *Chone filicaudata*.

Each branchial filament has a large camerated chordoid

* Zeitsch. f. w. Zool. Bd. xxxiv. p. 114, Taf. vi. fig. 34.

† Named after Lord Reay, K.T., who has so long taken an interest in the marine work at St. Andrews, and who auspiciously opened the Gatty Marine Laboratory in 1896.

axis, which extends into the elongated terminal process as a fine thread. The long pinnæ arise in a double row, and continue to the base of the terminal group, the sides of which have a series of short pinnæ, giving a character to the organ, and which gradually diminish, leaving a smooth subulate filament—much shorter than in *Chone duneri* and of a different character—at the end of the branchia. As a transparent object the filament presents a series of rounded areas inside the chordoid axis, which probably represent the bases of the pinnæ. Few species show a more distinct structure of these organs.

The body is shorter and smaller than in *C. fauveli*, the largest example being fully an inch in spirit and having about fifty-five segments, of which eight bristled are anterior. It is rounded throughout the greater part of its extent, especially dorsally, and only at the posterior third is the ventral surface flattened as it tapers to the tail, the tip of which projects as a special process with an oblique end, the slope of the anus being from above downward and forward. A little pigment occurs dorsally and ventrally at the tip, which in a small example had a minute filiform process, so that *C. filicaudata* is not the only form so provided. From the dorsal fissure at the collar a groove runs backward in the middle line to the end of the seventh bristled segment, then slants to the right across the eighth dorsally and the ninth ventrally to the middle line at its posterior border, and thence backward to the tip of the tail. The segments show a few transverse markings, but only a few of the anterior ventrally are distinctly divided into two rings. The anterior region has eight bristle-tufts and seven uncinigerous rows.

The first bristle-tuft consists of simple bristles, but the second and those following in the anterior region consist of two kinds—viz., a dorsal series of translucent bristles, with a pale golden sheen when viewed under a lens, and long tapering tips with very narrow wings, which disappear before reaching the extremity, and of a spatulate ventral series with cylindrical shafts, the tips of which project little from the surface and end in a delicate filament. The wings are at first narrow, expand into a spathulate region, then gradually cease as a narrow rim on the base of the terminal filament. The prolongation at the tip distinguishes this bristle from the corresponding one found in *C. fauveli*. The succeeding region of the body has only the narrow winged tapering bristles, which, as in front, have a distinct curvature. Toward the posterior end the bristles elongate, and are

directed downward and backward, or just in front of the tail downward and forward. In these elongated bristles the wings are indistinguishable. A few shorter bristles, probably in process of development, occur in these tufts.

The striated shafts of the long anterior hooks are even more tapered at the insertion than in *C. fauveli*, and they increase in diameter upward to the shoulder, which gently diminishes to the stout neck. The great fang leaves the throat nearly at a right angle, and on the crown above it in lateral view are five or six teeth. The neck and shoulder of these hooks have a forward curve, so that the head is carried backward. The posterior hooks have a convex anterior and a concave posterior outline, but the base is not bent backward as in the ordinary avicularian forms. The main fang leaves the throat at somewhat less than a right angle, and is strong and sharp. Above it is a series of four or five or more small but distinct teeth. The slightly-curved neck dilates a little as it merges into the stunted shaft or base, which has a slight flexure backward, the character of the hook being thus diagnostic, and so different from those of species of *Chone* hitherto described. In a variety from Finmark the bases of these hooks are tapered into shaft-like processes, and the whole series constitute in each foot an elegant fan. They form a single row.

Chone filicaudata, Southern, from Clew Bay, Ireland, is the seventeenth species, and differs from *Chone duneri*, Malmgren, which it approaches in the presence of a bifid process of the lip-membrane, in the form of the posterior hooks, which have a higher crown and more numerous teeth above the great fang in lateral view. It also has a conical anal appendage. The terminal process of the branchial filament has a central axis and a web on each side. It is the rule, however, for the posterior hooks in most species of this genus to have higher crowns. The occurrence of a caudal filament on *Chone duneri* in certain cases, however, makes the distinction less evident, yet the posterior hooks diverge.

Jasmineira elegans, De St. Joseph, a southern form, is the eighteenth species. The cephalic lobe, when the branchiæ are removed, presents a mushroom-shaped basal region—that is, it is constricted proximally and dilated distally, and has a median cleft. It is marked externally by longitudinal lines or grooves. From the ventral edge of each half three or four slender smooth tentacles (four to six, *De St. Joseph*)

project. A well-marked collar is present, with a dorsal fissure as in *Chone* and an entire ventral margin. De St. Joseph describes linear eyes on the fused buccal and first segment, but these were not observable in the spirit-specimens. The number of the branchiæ is from eight to twelve on each side, and they show two chordoid cells in transverse section. They have a double row of ciliated barbules, and terminate in a naked process with a thickened base.

De St. Joseph observes that the foregoing fused segments have, besides the eyes, two branchial heads, two red thoracic organs debouching by a common canal at the base of the branchiæ dorsally, and two otocysts with trembling otoliths. Fauvel*, however, states that in the closed otocysts, to which group those of *Jasmineira* belong, the "trembling" is due to Brownian movement only, as there are no cilia.

The body, which in spirit is about an inch in length, has the outline of *Chone*, and is little tapered till the posterior third. It ends in a slender tip, with a conical papilla above the anus. The anterior region consists of nine segments, the posterior of twenty-four or twenty-five segments, or even more (De St. Joseph gives a total of forty). The ventral groove cuts through the right edge of the eighth ventral shield in its progress to the dorsum. The ventral shields commence anteriorly by two small ones, and the next seven, which are entire, rather increase from before backward. The scutes of the posterior region are in pairs, being distinctly separated by the broad ventral groove. Diminishing in size, they become invisible on the minute terminal segments. The first bristle-tuft is small and occurs near the posterior border of the united buccal and first segments. It consists of simple but by no means feeble bristles, the shaft a little diminished at the neck, so that the slightly curved tip with its narrow wings and acute point is clearly differentiated. Nine bristle-tufts occur anteriorly. The bristles of the anterior region generally consist of two kinds, viz., winged capillary bristles with the slightly curved and acutely tapered tips, and spatulate forms the wings of which rapidly dilate, terminate abruptly, and have a short median process, often bent. The bristles of the posterior region, which are below the hooks, are of one kind only (viz., the simple, winged, tapering form), but the tips have, even in the first part of the region, a tendency to elongation, and toward the end of the tail the tips of the bristles are extremely elongated, so as to resemble fine hairs, though the narrow wings

* *Op. cit.*

can generally be noticed at the end of the shaft. The distinctions in this respect had not been observed by De St. Joseph.

The anterior crotchets have long curved shafts, commencing as narrow bases, but gradually dilating to the shoulder, which continues the curve and is narrower than the adjoining part of the shaft. The neck is not constricted and the main fang leaves it nearly at a right angle, whilst on the crown are numerous small teeth. The whole crotchet has the curvature of a bow. De St. Joseph speaks of nine crotchets only, but occasionally about twenty are present; and since their narrow bases occupy a comparatively small area, the group has the form of a fan, the broad tips requiring more space for the action of their armature. The hooks of the posterior region differ from those of *Chone* and *Euchone*, and more resemble the type of the Sabellidæ. They are characteristically S-shaped, the base being smoothly curved anteriorly, convex inferiorly, and turned upward posteriorly. A slight constriction occurs at the neck, from which the main fang comes off at less than a right angle, and is long and sharp, whilst on the crown above are numerous minute teeth. The posterior outline bends forward at the crown, then backward, and has a bold forward curve in the main part of the body.

The differences between this species and *J. caudata*, Langerhans, which Mr. Southern procured in Clew Bay, seem to be slight—mainly the elongated caudal process, as in the form procured at Madeira by Langerhans.

Jasmineira caudata, Langerhans, 1880, is the nineteenth representative, and it appears to differ from *J. elegans* only in the presence of a filiform anal appendage. Mr. Southern states that the structures of the bristles and hooks agree, but that the number of "abdominal" segments is twenty (seventeen, *Langerhans*), whilst *J. elegans* had from twenty-eight to thirty-two. The collar of *J. caudata* appears to be somewhat higher than, and not so oblique as, that of *J. elegans*. Mature specimens occurred in May. Dredged in 17 fathoms in Clew Bay.

The twentieth species is *Haplobranchus æstuarius*, A. G. Bourne, a minute aberrant Sabellid from the estuaries of southern rivers and also from the mouth of the Liffey, Dublin (*Southern*).

The twenty-first form is *Myxicola infundibulum*, Montagu,

in which the cephalic region differs from that of a Sabellid in the absence of a collar, for the first segment is smoothly rounded on each side to the base of the branchial fans, whilst ventrally a triangular process passes forward in the middle line below the division between the branchial fans, and dorsally a slight projection also points between the fans from the anterior end of the groove. Montagu describes the mouth as purple, whilst the lips are bordered with chestnut. Dalyell found no tentacles, and Malmgren's tentacles refer to the frilled processes on each side of the mouth.

The branchial fans appear to cling more tenaciously to their bases than in ordinary Sabellids, and comparatively few of the preparations are devoid of them. The filaments range from twenty-one in each fan (Shetland) to thirty-seven (South Devon), and they are connected by a web (which Claparède states is ciliated externally) almost to the tip, as in *Chone*. In structure each filament agrees in the main with that in *Sabella*, the camerated chordoid axis passing along its entire length, and a slender continuation of it reaching to the tip of the terminal process, which has a tapering web on each side, and is often deeply tinted purple. The pinnæ are comparatively long, and likewise have a chordoid axis (not distinctly camerated), and they taper a little from base to apex. Toward the tip of the filament the rows of pinnæ terminate in a double series of papillæ, which, like the pinnæ, are alternate. The branchial plumes or fans are of a rich dark chocolate-brown in life, the brown being chiefly confined to the filament externally, and the pinnæ, which are capable of independent motion, are of a rich purplish red. The bases externally, however, are of the colour of the body, viz., a dull orange hue. The two branchial fans are often separated to their bases during the movements of the animal. Montagu describes them as singularly beautiful and of a purple colour, darkest at the tips of the rays, and the pinnæ of a chestnut colour, shaded to purple near the centre. In the Zetlandic specimens, 2 or $2\frac{1}{2}$ inches long, the body had the diameter of an ordinary quill. the branchial fan measured about $\frac{1}{2}$ inch antero-posteriorly, but when the fans were flatly extended laterally their diameter was about an inch.

The body in the preparations is somewhat fusiform, for, besides the distinct tapering posteriorly, it is narrowed in front, and in life it sometimes assumes the same outline. It is rounded throughout except anteriorly, where, on the dorsal surface, a groove passes backward in the middle line

to the eighth segment, which it cuts obliquely as it goes to the right, and ends ventrally about the middle of the ninth. In some, traces of the median groove are found behind the slope to the right in the eighth segment. It is of a dull orange hue throughout, or in some pale, though in the Zetlandic specimens a distinct white ring went entirely round the body in front of the third segment-junction. Montagu mentions that the body is "of an orange colour annulated with whitish." The number of segments varies, for Montagu gives the large southern form of 8 or 10 inches in length no less than one hundred and fifty to one hundred and sixty segments, whereas the smaller Zetlandic examples (of 2 or $2\frac{1}{2}$ inches) had but forty-five to fifty-two. The segments are distinct, but little differentiated dorsally and ventrally, and therein differing from the ordinary Sabellids, but they often show one or more rings—especially one ventrally near the posterior border, and in some examples a slight peak occurs at the posterior border of each near the posterior third. The segments become narrow at the tapering posterior end, and terminate in a median anus at the somewhat blunt tip.

The vascular system contains greenish blood, and is similar in arrangement to that of the Sabellids (*Claparède*). This author holds that a contractile sinus envelops the intestine, and he is probably right. Contrary to the view of De Quatrefages, Claparède states that the nerve-cords, double in front, are not separated behind, but form a single cord with a large neural canal (his "fibre tubulaire"), and in certain sections that canal has a larger area than the nerve-tissue, which would seem to show that the term "neural canal" (1879) is not out of place.

The anterior region has eight bundles of bristles, which are of uniform structure, viz., they have long, straight, slender, cylindrical shafts, and finely tapered though rather short tips slightly bent backward, and with narrow wings. In rear of the fascicles of bristles Claparède (1870) mentions the occurrence of minute ocular spots, formed of a crystalline body surrounded by pigment. This has not been observed in the preparations. Posteriorly the translucent bristles are both more minute and more slender, and the shafts are tapered toward the tip, which has a curvature as in front and a trace of a wing on each side. The forward projection of the prow approaches that of the Polycinids, but the great size of the secondary tooth differs.

The anterior region ventrally has groups of about eight long crotchets, which in general outline somewhat resemble

those of Oligochæts. The shaft is long, gently curved, tapered inferiorly, dilating at its distal third into an indistinct shoulder, from which it is gently tapered to the throat below the main fang. The neck is stout and nearly straight, and the main fang, which arises at a wide angle to the neck, is blunt, whilst on the crown, which slopes downward in lateral view, are a few small teeth. Under pressure the hook often lies so as to give an antero-posterior outline, which is hastate, a constriction occurring behind the great fang, from which a gradual enlargement occurs to the shoulder, beneath which it again tapers to the base. The usually acute Claparède had overlooked these organs. The terminal hook of the row shows a more simple form, without spikes in the crown. The posterior hooks are large and avicular, are identical with the type as figured by Malmgren, have a base much produced anteriorly, the anterior outline of the neck curving from the main fang in a convex manner downward to a blunt prow, the inferior outline being slightly concave, as also is the posterior outline. The main fang is long and sharp, and above it is a comparatively large secondary tooth.

This is, in all probability, the *Myxicola steenstrupi* of Kröyer *, though the description is so lax that it is difficult to be certain. He did not observe the hooks.

A *Myxicola* procured between tide-marks, Herm, in 1868, offers certain peculiarities distinguishing it from *M. infundibulum* and *M. viridis*, as well as *M. dinardensis* of De St. Joseph, though the absence of anterior hooks leaves a margin of doubt in relation to the last-mentioned. It is a small form, measuring about $\frac{3}{4}$ inch in total length, and having the typical condition of the cephalic region and collar. The branchiæ are of moderate length, and have broader wings and less tapered tips on the distal processes of the filaments than in *M. infundibulum*.

The anterior region seems to be short, as in *M. dinardensis*, which has only three segments, and in the specimen from Herm the long crotchets appeared to have only a single tooth above the main fang, as in *M. viridis*. The posterior hooks came far forward, and in structure they differed from those of their allies, for the main fang is proportionally larger and the tooth above it is only about half its length, and thus contrasts with the condition in other forms. The basal region has a nearly straight inferior border, to which the prow curves downward.

* Oversigt Kgl. danske Vidensk. Selsk. Forhandl. 1856, p. 35.

Whether this is an example with the anterior region in course of reproduction or a variety is uncertain, but its features are worthy of note.

Myxicola viridis, Milne-Edwards, the twenty-second species, occurred in the mud of a mass of *Filograna* procured off the Bell Rock, St. Andrews Bay. The cephalic region seems to agree with that of *M. infundibulum* both in the absence of a collar and in other respects.

The branchiæ form a rich green spiral mass in repose, a position often assumed in its sheath under examination; but when it protrudes, the anterior end of the branchiæ spread out as a double fan of nine or ten filaments, which have a chordoid axis and a terminal process, which differs from the tapering elongated one of *M. infundibulum* in maintaining its strap-like breadth till near the tip, where a short tapered region occurs. The body is capable of considerable elongation, and the total number of segments is about forty-seven, eight anterior and thirty-nine posterior. A well-marked papilla at the anus terminates the body posteriorly. The colour is a rich green, the central interspace being darker. The first pair of bristle-tufts has a different direction from those which follow, being directed obliquely forward and outward. The anterior bristles are the most conspicuous—indeed, in a specimen so minute the posterior at first escape notice. The typical anterior bristle has a slender translucent shaft and finely tapered tip and narrow wings. The posterior bristles are more minute and the wings less distinct. Many present a curvature at the commencement of the tip.

The anterior hooks are in groups of five or six, and are long *f*-shaped structures which resemble somewhat those of Oligochæts. The wide region or shoulder is in front of the middle, the shaft tapering posteriorly to the base and anteriorly to the long neck, which is almost straight. The main fang leaves the neck nearly at a right angle, and is short and sharp, and on the crown above is a single prominent tooth. The whole organ thus characteristically differs from that of *M. infundibulum*. The posterior hooks are minute, having a long sharp main fang, and another above it almost as long, a nearly straight posterior outline, and a short base directed forward. The annelid secretes a transparent gelatinous tube in captivity.

At least two species of *Myxicola* thus inhabit British waters; but, in regard to the green example, it may be a question whether it is not a marked variety, with more transparent branchiæ, of the type with the minute bifid

anterior hooks. Fresh investigations are necessary. Only a single specimen has hitherto been obtained.

A *Myxicola* from Plymouth, while agreeing generally with *M. infundibulum*, differs in the structure of the anterior hooks, for they are rather slender, with a slight enlargement at the shoulder, and the distal end is curved like a shepherd's crook with a sharp point (main fang). It is a question how far this is due to the age and size of the specimen, but it was a feature in every hook observed. It is curious that no example of this genus was procured by the 'Challenger,' its representatives, perhaps, being chiefly littoral or confined to comparatively shallow water.

Dr. Allen includes *Myxicola æsthetica*, Claparède, in the fauna of Plymouth, but the distinctions indicated by the Swiss author are uncertain, and he overlooked the long crotchets in the anterior region of *Myxicola infundibulum*.

2. *On the* Sabellidæ *dredged by H.M.S. 'Porcupine' in* 1869 *and* 1870, *and by H.M.S. 'Knight Errant' in* 1882.

In the 'Porcupine' Expedition of 1869 *Sabella penicillus* came from various parts of the west coast of Ireland, and *Potamilla reniformis* in 90–100 fathoms on "Porcupine Bank" off Ireland. In the Expeditions of 1870 *Sabella penicillus* was dredged in 30–40 fathoms off Dingle Bay, and again at Station 50, lat. 36° 14′ N., long. 17° 30′ E., in 7–51 fathoms, on sand and muddy sand. *Sabella hystricis*, sp. n., was procured at No. 27 in 322 fathoms, in fine grey mud, bottom-temperature 51°; *Chone duneri* at No. 29, in 227 fathoms, bottom-temperature 55°. *Branchiomma kollikeri*? was brought up on the sounding-lead in 64 fathoms in Setubal Bay. A fragment of a *Sabella* occurred 9 miles off Cape Finisterre in 81 fathoms, on a hard bottom with sandy mud; bottom-temperature 53°; and another from Ras el Amoud in 45 fathoms. In the 'Knight Errant' *Sabella southerni*, sp. n., was met with at Station 8, in 540 fathoms; *Sabella murrayi*, sp. n., in 555 fathoms at Station 11; and *Chone duneri* in 53 fathoms at Station 3.

Sabella hystricis, sp. n.

Dredged in the 'Porcupine' Expedition of 1870 at Station 27 in 322 fathoms, in fine grey mud. The single example appears to have been dried, but, so far as can be observed, the branchiæ and the general surface are pale. The collar shows a wide dorsal gap in the middle line, and

the wide lateral flap is separated from the ventral flaps by a notch, and the frilled flaps themselves almost touch in the middle line. The number of the branchiæ in each fan is not less than twenty, the filaments are of moderate length and appear to have a terminal process of considerable length, but the specimen is not in a condition to be certain on this point. The specimen is incomplete, only the injured anterior region adhering to its tube remaining; but the rounded dorsal surface shows no trace of a groove, whilst the slightly flattened ventral surface has a pale median streak with a dotted line on each side, as if a nerve-cord were indicated.

The segments of the anterior region are narrow (anteroposteriorly) and the ventral scutes are indistinct. Above the closely arranged bristle-tufts of the region is a small dark speck. The anterior bristles are in three groups, the longer upper series (Pl. IV. fig. 1) having straight shafts and slightly curved, finely tapered tips, without distinct traces of wings. The next series is only a little shorter, but the tips are diminished and the wings broader (Pl. IV. fig. 2). The third series projects little beyond the surface of the setigerous lobe, and their tips have fully broader wings than the second series. The little pigment-speck near the commencement of the row of hooks is somewhat conical in outline, since it is pointed internally and appears to be composed of granules of dark pigment. The anterior hooks are avicular and characterized by the distinctness of the teeth above the main fang (Pl. IV. fig. 3), about six being visible in lateral view. The main fang leaves the neck at considerably less than a right angle, the posterior outline curves forward at the crown, so that the region is convex, the prow projects almost as far as the tip of the main fang, and the posterior process is short and slightly tapered distally, and in contrast with such hooks as those of *Potamilla reniformis* it would appear to be rudimentary. Only faint striation occurs at the curvature between neck and base. No accessory short bristles accompany the hooks. The tube is composed of tough secretion coated at one end with fine mud.

Sabella southerni *, sp. n., was dredged by the 'Knight Errant' at Station No. 8, 17th August, 1882, at 540 fathoms, along with a sponge. The fragmentary specimens appear to

* Named after Mr. R. Southern, B.Sc., of the Irish Fisheries Department, who has done so much good work on the Annelids and other marine forms on the western and other coasts of Ireland.

belong to a small species about an inch or a little more in length. Thus the cephalic plate and collar were so injured that all that can be said is that the ventral edge of the collar was rather full and the two sides separated only by a narrow fissure; but no reflection seemed to occur. The lateral regions appeared to be entire up to the dorsal edge. Dorsally in every instance the parts adhered to the tube, and the collar seemed to be rudimentary. Behind the ventral collar were two inner curved ridges surmounted by the bases of the branchiæ. The branchiæ in the preparation were pale and about ten in number in each fan, the pinnæ being of moderate length and continuing nearly to the tip, which in some was blunt, in others with a short subulate process; but the preparation was unsatisfactory, the tips being incurved and adherent to the tube. The anterior bristles are pale golden and in two groups—a dorsal longer series, few in number, with straight shafts and finely tapered winged tips (Pl. II. fig. 1), and a more numerous series, with oar-like tips from the breadth of the wings (Pl. II. fig. 3), some having and others not having a slender median prolongation of the axis at the tip. The tips of the small posterior bristles are much elongated, especially dorsally, and have a distinct curve. Narrow wings occur in the longer and broader in the shorter forms (Pl. II. fig. 2). The anterior hooks (Pl. I. fig. 10) have a rather high crown, which is often indicated by a transverse line, a long neck, and a wide gulf anteriorly, whilst the posterior outline is nearly straight except the forward curve at the crown. The base forms a wide angle with the posterior outline, and the prow is only moderately prominent. The base is comparatively short. Numerous small teeth occur above the main fang. These hooks are accompanied by a series of short bristles, the tips of which in certain views looked like an elephant's foot from the thickness of the shaft, though in most views the tip ended in a point (Pl. I. fig. 11). The posterior hooks are smaller, but retain the characteristic features of the anterior.

The tube is composed of fine grains of sand mixed with a number of minute Foraminifera.

Sabella murrayi, sp. n.*

Hab. Dredged at Station 11 by the 'Knight Errant' on 23rd August, 1882, at a depth of 555 fathoms.

* Named in honour of the late Sir John Murray, whose career, from the time of his being sent in 1871, by Sir Wyville Thomson, to Murthly

The cephalic region dorsally has a wide collar which passed inward and forward in the median furrow to which it was attached. Thus the collar participated in the groove and thinned off at its anterior end. Moreover, the frilled edge passed backward to the anterior border of the second bristled segment, and, forming a V, coursed forward again to join the lateral rim of the collar. The edges of the V were free, and thus greatly contributed to the extension of the collar. Laterally the collar was apparently unbroken, and continued to the large ventral recurved lappets which were fixed at their inner edge to the cephalic plate, the free lamella on each side covering much of the first scute. From the inner edge of each lappet a conspicuous membrane stretched forward to be attached to the edge of the branchial fan, thus extending about a fourth of the total length of the branchiæ. The basal region of this peculiar web was expanded into a wide disk or lamella, the edges of which were more or less curved (Pl. I. figs. 1 & 2), so that from the ventral surface a large semicircular plate flanked the vertical ridge at each side. The function of this remarkable apparatus was probably connected with alimentation in its abyssal habitat, an unusually powerful and extensive current being thus directed forward between the lamellæ to the region of the mouth. The whole arrangement of the collar is, so far as known, unique, and carries further the condition indicated by those of *Chone duneri* and to a less degree by those of *C. infundibuliformis*. In front of the groove with the fixed anterior folds of the collar, the branchiæ dorsally presented a solid base, whereas ventrally a wide groove ran forward between the fans, and over the mouth lay a mass of débris rich in Foraminifera, fragments of Echinoderms, and other organic structures. The anterior edge of the ventral membranous ridge was fixed to the base of the lower edge of the branchial fan of its side, and to this were attached five or six short and slender branchial filaments, the rest being much larger, the total number being about fifteen in each fan. The branchial filaments were softened and injured, but they seemed to have the normal structure, only a single filament having a tip more

(to be initiated into the preservation of marine animals) to his successful conclusion of the 'Challenger' publications, has been watched with interest. Sir Wyville then thought he would attend to the preservation of the contents of the dredges and trawls as well as to the skins of birds. He afterwards had much work with the tow-nets, and was anxious to describe the Radiolarians, but these went to Prof. Haeckel. To Sir John was assigned the bottom-deposits.

or less complete. In this the stout filament tapered distally, the pinnæ diminishing to small papillæ, then a free process from the tip of which a very long thread-like appendage projected. If such is the normal condition in this curious species, it is little wonder no others were perfect. The body is about $1\frac{1}{2}$ inches long, the branchial region being fully $\frac{1}{2}$ inch more, and the segments are about fifty-eight. It is flattened both dorsally and ventrally with the exception of the anterior region of the sentes, a median groove running the entire length dorsally and from behind the anterior region ventrally. The tail especially is flattened and oar- or spatula-shaped, the diminution at the tip being slight. The anal slit is ventral, and on each side is a rounded papilla (or cirrus) on a short stalk. The flattening throughout the greater part of the body is characteristic; and the constriction in front of the spatulate tail is well-marked. The anterior bristles follow the normal condition in the genus, viz., a longer and a shorter series. The longer bristles (Pl. 1. fig. 3) have cylindrical golden shafts with a marked slant backward after the commencement of the narrow wings and a finely tapered tip. The shorter forms (Pl. I. fig. 4) have a broad paddle-shaped tip with a distal median process—the continuation of the tapering shaft. Whilst the latter presents no striæ, the broad wings which form the paddle are striated longitudinally. Posteriorly the tips of the longer bristles become more and more elongated and the wings narrower, until toward the end of the tail they are invisible on the hair-like extremities of the attenuated bristles. The shorter forms, again, undergo a similar change, the tips elongating and the wings becoming narrower, though they always retain a much broader and shorter tip than the foregoing. Indeed, in the caudal region the bristles increase much in strength while diminishing in number, and a tendency to assume the knife-blade outline is noticeable, a constriction of the shaft occurring below the tip. These stout caudal bristles evidently have special functions.

The anterior hooks (Pl. I. fig. 6) are remarkable for their high crowns and for the great proportional length of the base, which in this species appears to be of a tougher nature—in fact, they simulate the condition in such forms as *Pista*, *Terebellides*, and *Chone*. The main fang makes a small angle with the neck, and its base is differentiated almost to the posterior outline of the hook, whilst above it the elevated and bluntly conical crown shows in lateral view five distinct teeth and several indistinct upper ones. The

nearly straight posterior outline presents a hump above the base; the prow is rounded in front, and the elongated base is gradually tapered backward and curved, so that, mingled with the largely developed bristles which accompany them, the structure of the hook-row is noteworthy, and it is often difficult to distinguish the shaft of the bristle from the long basal pedicle of the hook. The cuspidate bristles (Pl. I. figs. 7 & 8) which accompany the hooks have long curved shafts, narrowed at the basal extremity, and also constricted below the spear-shaped tip, which is bent at an angle to the shaft and tapered to a fine point—longer in some, shorter in others. So far as observed, no other species has similar bristles, the majority showing the short paddle-like forms. The posterior hooks (Pl. I. fig. 9) are sharply defined from the anterior by the truncate base and the anterior projection or prow. They have the high crown with the boldly marked teeth, and the absence of a prow makes the neck long. The bases vary in length, that represented being an average example.

Branchiomma kollikeri, Claparède*, var. of *B. vesiculosum*?.

Procured during the 'Porcupine' Expedition of 1870, in 64 fathoms, in Setubal Bay. It was brought up on the cup-lead. In general outline this somewhat resembles *Chone*, though readily distinguished by the large eyes at the tips of the branchial filaments and the number of the anterior scutes. Dorsally the collar presents a deep median furrow, with an eminence or boss on each side covered by a rounded flap. A little behind this is the origin of the collar proper, which springs from the dorsum of the second segment, passes downward and forward, and ends in a rounded edge on the ventral surface, but as the example had been injured it was difficult to compare it with *B. vesiculosum*.

Half of the branchial funnel seemed to be present, viz. about thirty-one filaments, the first dorsal of each side being much larger than the others. The filaments generally are stiffer than those of *Sabella*, and in the preparation are slightly coiled and the tips incurved. Each consists of a stem flattened laterally and externally, the former having the larger diameter and diminishing toward the tip, which ends in a pair of compound eyes and a median process or tentacle (Pl. IV. fig. 7), a slender tapering process. The pinnæ are of great length and slenderness, forming a delicate fringe to the inner edge of each filament, and they

* Annél. Chétop. Nap. p. 423, pl. xxii. fig. 4.

are especially long a short distance from the tip; then diminishing in length, they end rather abruptly a short distance within the ocular region, which is somewhat clavate with the tapering tentacle projecting distally. The filament has a similar chordoid skeleton to that of *Sabella* and a jointed axis continued into each pinna. The whole apparatus is stiffer than in the ordinary *Sabellæ*, and the pinnæ finer and more thread-like. Some of the filaments have no eyes, the diminished tip ending in a long slender tentacle with a chordoid axis in the centre. Moreover, the pinnæ in these do not terminate abruptly, but gradually becoming shorter end in a series of short papillæ (rudimentary pinnæ), from which the long tentacular process projects. A series of short tentacular filaments project from each side of the oral fissure. No large tentacle occurred in this injured example. As Claparède observes, the eyes are confined to the dorsal half of the fan.

The body is of considerable length—probably, when complete, having a length of 4–5 inches. It is flattened anteriorly on the dorsum, as well as grooved for some distance from the collar backward. The ventral surface is rounded anteriorly, the first region having eleven scutes which have their long diameter transverse, whereas the median furrow splits the succeeding scutes, the long diameter of which is longitudinal. The specimen is imperfect posteriorly.

The anterior region has eleven setigerous processes, the first being small, but all the bristles have the same structure, viz. straight striated shafts with tapered bases, and tapering tips with moderate rings, obliquely striated and with serrated edges. The same structure characterizes the posterior bristles, except that the tips are more elongated. The most posterior, however, are absent. All the bristles are deeply immersed in the tissues. Ten rows of hooks in single series occur on each side in the anterior region, and these are longer than those in the next division. The anterior hooks (Pl. III. fig. 10) are avicular, being distinguished by their moderate necks and greatly elongated tapering bases. The main fang has a series of very fine teeth above it, and these are so fine that in preparations which have been long mounted they are difficult to see. The crown has a forward curvature, but thereafter the posterior outline is straight till it reaches the base. As the great fang leaves the neck at less than a right angle, and as the prow is prominent, the anterior outline is deeply concave. The somewhat tapered prolongation of the base is marked, and the neck and base are striated. These hooks

are accompanied by short flattened bristles with spatulate or beaked tips and pennant-like flaps. The posterior hooks do not differ from the foregoing, except in size and in the shorter bases (Pl. III. fig. 11). The tube of the example is fully 10 inches in length and thicker than a goose-quill. It is composed internally of tough secretion—tinted at one end of an ochreous hue, and coated externally with minute pebbles or coarse sand-particles, fitted neatly together, and with an occasional fragment of shell.

Claparède separated *B. kollikeri* from *B. vesiculosum* by the presence of the two eyes on the tips of the branchial filaments, but the British species has the same arrangement, and, unfortunately, he does not figure the hooks of each, so that certain features still require elucidation. So far as can be observed, the bristles and hooks in each case are practically identical, and so with the smaller flag-bristles which accompany the anterior hooks. The terminal process of the branchial filament is longer in the large 'Porcupine' form, but such may be the effect of age. On the whole, it would appear to be a variety of *B. vesiculosum*.

3. *On the* Terebellidæ *and* Sabellidæ *dredged in the Gulf of St. Lawrence, Canada, by Dr. Whiteaves in* 1871–73.

Amongst the Terebellidæ procured were *Amphitrite grœnlandica*, off Port Hood, Cape Breton, the widely distributed *Amphitrite cirrata*, O. F. Müller, off Cape Rosier Lighthouse; *Sabella*, AB, from the same locality. *Pista cristata* was not uncommon at Station A 1, 1872; between Cape Rosier and Cape Gaspé, in 75–80 fathoms, on stony ground, No. 2, 1872; and in 210 fathoms, S.W. point of Anticosti. In the first-mentioned the tube was composed of hard secretion, minute stones, and mud. The ubiquitous *Thelepus cincinnatus*, O. Fabr., abounded in various localities, such as near Orphan Bank, off Anticosti, and off Cape Rosier Lighthouse. Many of the tubes were smaller than the British representatives, and attached on one side, but made of similar materials. The curious *Lanassa nordenskioldi*, Mgrn, was dredged off Nova Scotia at Station No. 6, 1872, and Nos. 35 and 36, 1873, whilst the equally interesting *Artacama proboscidea*, Mgrn., occurred in Gaspé Bay in 30 fathoms. Fragments, apparently of *Erentho smitti*, Mgrn., again, were found in 170 fathoms off Caribou Island, and between Cape Rosier and Cape Gaspé. No form was more abundant than *Terebellides strœmi*, Sars, which seemed to range over the whole area, from 100 to 220 fathoms. The

widely distributed *Sabella penicillus*, L., was procured at Station No. 10, 1872, and Nos. 35 and 36, 1873, besides being dredged in 220 fathoms between Anticosti and the shore. *Potamilla reniformis*, O. F. M., occurred between Pictou Island and Cape Bear, Nos. 46–48, 1873, in firm sandy tubes. *Potamilla torelli*, Malmgren, was common at Stations Nos. 46–48, 1873, and between Pictou Island and Cape Bear, No. 56, 1873. *Chone duneri*, Malmgren, along with a fragmentary *Euchone*, occurred at Station No. 2, 1872, and *Chone princei*, sp. n., at various Stations in the Gulf of St. Lawrence; whilst further north, in Godhavn Harbour, Disco, a form approaching *Chone fauveli*, occurs.

Euchone (?) *lawrencii*, sp. n.

Dredged in the Gulf of St. Lawrence at Station 2, 1872.

Only a fragment of the anterior end without the branchiæ is present along with *Chone princei*. The collar, which is rather full, runs from the ventral surface, where it is entire, with a very slight slope backward to the dorsal surface, where its edge turns in to be attached to the middle line as far forward as the base of the pillar for the branchiæ, which does not project so far as the rim of the collar. Eight segments are bristled anteriorly, and the dorsal furrow passes downward between the eighth and ninth segments, cutting the ninth obliquely to the median line, along which it is continued. The species seems to be a large one, the body being about 3 mm. in diameter anteriorly. The bristles were absent. The lower anterior hooks (Pl. II. fig. 11) had stout curved shafts, in which a long enlargement below the indistinct shoulder and a short neck occurred, the bold striæ of the shaft passing upward almost to the main fang, which forms a little more than a right angle with the shaft, and there were several (three or four) small teeth above it. The posterior hooks differ from those of *Chone*, and more nearly approach those of *Euchone*, having a nearly straight and long posterior outline (Pl. II. fig. 12), an almost straight anterior outline, and a truncated base, the neck being finely striated.

Chone princei *, sp. n.

Dredged at Stations 2, 6, 9, 11, 1872, and Stations 35 and 36, 1873, in the Gulf of St. Lawrence, by Dr. Whiteaves.

When the branchiæ are removed, the cephalic region (Pl. III. figs. 3 & 4) differs from *Chone reayi* in having

* Named after my early student, fellow-worker, and friend, Prof. E. E. Prince, now Dominion Commissioner of Fisheries for Canada.

the branchial basal region or pedicle more prominent and the tentacles on each side of the fissure well developed. Moreover, the collar is narrower, and it slopes from below upward and backward to the dorsal surface, where it ends in a broad, free, V-shaped pocket on each side—separated by a central fissure. Instead of the high fold on each side of the dorsal fissure the narrow collar makes a W of a characteristic form, since the inner margins run forward to the median groove of the pedicle, and the whole facies of the anterior end differs. A glandular or tubular organ is visible in each space of the W, for the cephalic plate is largely exposed in a dorsal view; ventrally the mouth appears as a longitudinal slit with thickened edges below the basal pillars of the branchiæ, and in some the thin buccal membrane is distended with mud. Moreover, the ventral margin of the collar is symmetrically sinuous, being prominent at the sides, and then passing with a curve to the central dimple. A distinctive feature is the prominence of the bases of the branchiæ, and their separation anteriorly.

The body, which is about 2 inches long and $\frac{1}{8}$ inch in diameter, is somewhat flattened anteriorly, more rounded posteriorly, and the segments appear to range from sixty to seventy. From the mid-dorsal fissure a groove passes backward to the posterior border of the eighth bristled segment, runs in the furrow between the eighth and ninth, then ventrally crosses the ninth obliquely to the middle line, and then passes to the posterior end. The segments are distinctly marked, those of the anterior region presenting a two-ringed condition ventrally. It tapers gently posteriorly, and then rather abruptly ends in a point with the anus at the tip, the segments being numerous and crowded in this region.

The branchiæ are of considerable length, are devoid of a web, and have a regularly camerated axis continued as a slender central process in the very long, tapering, terminal process, which has a few short pinnæ or papillæ at its base, the longer pinnæ gradually diminishing and ceasing at the base of the process. The number of the branchiæ would appear to be about a dozen on each side, and, besides the filiform cirri, two short, flattened, tapering tentacles occur dorsally.

The anterior segments have a median prominence in the form of a flattened cone laterally, and thus the bristles are unusually conspicuous, especially as a distinct setigerous process is present. The first tuft is composed only of

bristles with tapering tips and well-marked wings which are obliquely striated and probably minutely serrated at the edges, though this was not clearly seen in the spirit-preparations. The tips are slightly curved backward, and the shafts faintly striated. The tips of a shorter series, probably for replacement, project from the edge of the setigerous process. The succeeding bristles of the anterior region are arranged in two series—an upper with long straight shafts and shorter more finely tapered tips (Pl. IV. fig. 14), with proportionally broader wings than in the first series, the backward curvature occurring beyond the commencement of the wings, and a lower with spatulate tips terminated by a median filament (Pl. III. fig. 8). In the developing bristle various degrees of enlargement of the spatulate tips are observed, and the wings are more or less longitudinally striated. These bristles form a group moved by distinct muscles, as might be anticipated from their functions. The posterior bristles are longer and more slender, the shafts, however, being comparatively short, whilst the tips are of great length and finely tapered, with but slight curvature. The wings are so narrow as to be almost indistinguishable, though in the developing bristles with a portion of the tip protruding they are more easily recognized. These posterior tufts do not show a shorter series.

The anterior hooks (Pl. III. figs. 5, 6) have long curved shafts, which dilate from the base (proximal end) to the shoulder, where a slight constriction marks the commencement of the short neck, which again expands a little distally as it runs into the main fang in front and the rounded crown posteriorly. When inverted these organs simulate the human foot and leg. The main fang leaves the neck at rather more than a right angle, but the crown is quite flat except at the rounded posterior "keel." Numerous small teeth occur on the crown behind the main fang. The posterior hooks (Pl. III. fig. 7) lean to the type of *Chone reayi*, though quite different, for the shaft ends abruptly after only a slight curvature, so that no proper prow is formed and the neck is little differentiated. The main fang leaves the neck at an angle of 45°, the posterior outline curves forward to the somewhat high crown which has numerous minute teeth above the great fang.

Reproduction. A male had nearly ripe sperms in August.

Tube. The tube is a smoothly rounded firm structure of mud, which coats the internal chitinous lining. It is friable.

A *Chone* resembling *C. fauveli* comes from Godhavn Harbour, Disco, where it was dredged by H.M.S. 'Valorous,'

in 5–20 fathoms in 1875. The collar is deep all round like that of *C. reayi*, but the single example does not show the pedicle for the branchiæ (which are absent) on a level with the margin as in that species. Eight bristled segments occur anteriorly, the dorsal tufts having moderately elongated tapering tips with distinct, though rather narrow, wings and with a slight curve. The lower bristles are spatulate, with stout shafts which remain nearly cylindrical to the wings, then slightly diminish to a blunt tip, and the web is somewhat short with a smoothly rounded end. The bristles of the second region have shafts which are constricted distally, the tip thereafter making an angle with the shaft, the winged tip then tapering to a fine point. The bristles are of moderate length and rather stout, one in each tuft especially surpassing the others in size. They become longer and more slender toward the tail. The anterior hooks have stout curved shafts, which increase from the root or base to the shoulder and are striated and yellowish by transmitted light. The neck is translucent, stout, and the main fang, which leaves the neck at an obtuse angle, is short and strong, and has about four distinct teeth above it, the crown posteriorly projecting a little. The posterior hooks (Pl. III. fig. 9) approach those of *Chone fauveli*, but show only three teeth above the main fang instead of four in the British form, the base is less massive and the striation differs, yet there is a close resemblance, which is interesting in forms so divergent in habitat. As mentioned, this is the type of hook Prof. Fauvel associated with *Chone infundibuliformis*, Kröyer, but it is essentially different, as are likewise the bristles.

4. *On the* Sabellidæ *dredged by Canon A. M. Norman off Norway and Finmark.*

Besides *Sabella nordenskiöldi* and *Chone normani* described subsequently, *Sabella penicillus*, L., was obtained at several stations along with *Potamilla reniformis*, Kr., *Amphicora fabricii*, O. F. M., and *Chone duneri*, Mgrn.

Sabella nordenskiöldi *, sp. n.

A Sabellid which at first sight resembled *Sabella crassicornis* from its finely coloured branchiæ and the disposition of the collar, and nearly 2 inches long, was dredged by Canon Norman off Finmark. The collar

* Named after Dr. Erik Nordenskiöld, of the University of Helsingfors, a former worker in the Gatty Marine Laboratory, St. Andrews.

(Pl. III. figs. 12 & 13) arises as a somewhat thick process on each side of the dorsal fissure—leaving, however, a considerable portion of the centre bone (where the two ridges pass forward, one on each side of the deep central fissure). It then passes laterally and is separated by a notch from the ventral border, which has two median flaps. This collar has certain resemblances to that of *Branchiomma*. In the centre in front of these is the symmetrical process formed by the lips. The branchiæ are comparatively short, are richly banded with purple and white, and number about fourteen or fifteen on each side, terminating in a short slightly-tapered process, flattened and grooved internally. The pinnæ are rather thick and short, diminish toward the tip of the filament, and end somewhat abruptly at the base of the terminal process. Each bears three or four pairs of eyes externally, the distal pair apparently being most differentiated. Each eye is elevated above the filament and is composed of a series of somewhat regularly arranged pigment-cells with a clear corneal surface, the whole being only less differentiated than the larger eyes of *Branchiomma*. The tentacles are somewhat short, flattened at the base, and tapered distally. They are not quite one-third the length of the branchiæ. The anterior region consists of nine segments, the dorsum being very slightly hollowed at the fissure, whilst the rest is more or less rounded. The ventral surface is flattened, nine entire scutes being in front, and thereafter each is bisected by the median furrow which passes to the tail. The body appears to be rather short and stout, tapering gently to the posterior end. Nine pairs of bristles are found anteriorly, the upper bristles (Pl. IV. fig. 4) having longer striated shafts and tapering tips with narrow wings and serrated edges. The tips of the inferior bristles (Pl. IV. fig. 5) just project beyond the skin, and these are shorter and have wider wings, the shafts also having striæ which are continued into the tips, and the shafts are slightly narrowed below the wings. The posterior bristles are shorter and fewer in number in each tuft, but the length and slenderness of the tips increase toward the tail. The constriction of the neck below the wings and the projection of the base of the winged region give a character to each tuft posteriorly, so that it is tulip-like, and the tips are comparatively short. The anterior hooks (Pl. IV. fig. 6) have a somewhat short and sharp main fang, which leaves the neck at less than a right angle. The crown above it is high with numerous minute teeth. The dorsal outline is convex and

bends forward at the crown and backward over the somewhat short base. A little behind the long row of teeth on the crown is a shorter row at the end of the striæ which pass up the neck. The anterior outline is smoothly curved below the great fang, then gently extends forward to the prow and below the short basal process, which is striated. The chief features are the depth of the crown, the short and sharp main fang, the minuteness of the serrations above it, the narrowness of the neck, and the comparatively short base. The posterior hooks differ from the anterior chiefly in size, but the lateral row of teeth on the crown is more distinct than in front. The tube is chiefly composed of a horny secretion which clings tenaciously to the body of the annelid in the preparation. Few grains of sand or other extraneous structures are present.

In the brilliant coloration of the branchiæ this form approaches *Sabella crassicornis*, Sars, procured during the 'Valorous' Expedition in 1875, and its collar is also similar, but the presence of well-formed paired eyes differs from the bold pigment-touches of the arctic species. Moreover, the branchial filaments of *S. nordenskiöldi* are short and stout, and the pinnæ rather short, whereas the filaments of *S. crassicornis* are longer and more slender, and so with the pinnæ. The terminal processes are also longer and more slender. The rich coloration of the branchiæ in both species is noteworthy—Sars * describing those of *S. crassicornis* as banded with white and red, or often wholly red, and having four or five intensely red oval spots equally distant.

Chone normani †, sp. n., was dredged by Canon Norman off Finmark, and is distinguished by the great length of the branchiæ, which are not much shorter than the body, the terminal processes especially being greatly developed, so that each resembles a linear lanceolate leaf (Pl. III. fig. 14) with a slender midrib. The filaments bear very slender pinnæ which are of considerable length, and the edge of each is also webbed for a considerable distance, the membrane connecting the filaments with each other occurring only below it. The body is about an inch in length, very little tapered in front, but diminishing gradually to the tail, rounded generally, though slightly flattened ventrally

* Nyt. Mag. 6 Bd. p. 202 (1851).

† Named after Canon Norman, who, for many years, has so richly added to the fauna of the British and neighbouring seas, and to whose courtesy with specimens I have long been indebted.

after the median groove appears. The collar has a deep dorsal fissure, and is formed much after the shape of that of *Chone reayi*, viz., slopes a little forward from the dorsal groove, and preserves an even outline throughout the rest of its extent. It differs, however, in so far as the collar forms a free edge dorsally on each side as far back as the posterior border of the first segment. From the point of attachment a prominent ridge goes forward on each side to the pedicle of the branchiæ, which does not project so far forward as the collar. The edge of the collar throughout is entire. The segments of the body are two-ringed, and there are about sixty of them.

The anterior region consists apparently of eight bristled segments, but the bristles are inconspicuous, and the dorsal furrow passes ventrally between the eighth and ninth segments. Behind the collar is a single ring, then the following segments are two-ringed. The anterior bristles consist of an upper series (Pl. II. fig. 13) with winged tips finely tapered and a ventral series of spatulate forms (Pl. II. fig. 14), the shafts of which are stouter and only slightly tapered distally, the tip often having a filiform process.

The anterior hooks are comparatively short, have a somewhat long main fang (Pl. II. fig. 15), and six or seven teeth on the crown behind it. The neck is short and distinctly striated longitudinally, and the curve of the shaft is marked as it tapers to the basal region. The posterior hooks (Pl. III. fig. 15) have a main fang with a nearly straight upper outline, and the six or seven teeth on the crown behind it are slightly prominent. The posterior curve is not quite straight superiorly, then bends nearly at a right angle to the base. The anterior curve has a slight prow and the outline of the base is sinuous. The tube is formed chiefly of a firm, though brittle, secretion, with a Foraminifer studded here and there on the surface. It resembled that of *Potamilla reniformis*, but was less tough.

It was at first thought probable that this was a northern variety of *Chone duneri* or an allied form, but a consideration of all the features negatived such a view. Though it is known that the posterior (avicular) hooks of such forms vary somewhat in the number of visible teeth on the crown above the main fang, yet the outline in each species has certain limits in this respect. The peculiar structure of the branchiæ and the terminal processes in the present form are also factors of importance. A fragmentary form procured by the 'Valorous' in 1875 in the Arctic seas, has a

posterior hook almost identical with the foregoing, so that its distribution may be extensive, though the absence of branchiæ and other parts in the Arctic fragment leave a margin of doubt.

EXPLANATION OF THE PLATES *.

Plate I.

Fig. 1. Dorsal aspect of the region of the collar and the branchial base in *Sabella murrayi*, sp. n., from H.M.S. 'Knight Errant.' Enlarged under a lens.
Fig. 2. Lateral view of the same region.
Fig. 3. Slightly winged dorsal bristle of the longer type. × Zeiss oc. 4, obj. D.
Fig. 4. Spatulate bristle with filament at the tip. Ditto.
Fig. 5. Posterior bristle.
Fig. 6. Remarkable anterior hook with a differentiation of the posterior border behind the prow and a greatly elongated shaft. × oc. 4, obj. D.
Figs. 7, 8. Minute bristles accompanying the long anterior hooks. × 450 diam.
Fig. 9. Posterior hook of the same. × oc. 2, obj. F.
Fig. 10. Anterior hook of *Sabella southerni*, sp. n., with long basal process. × oc. 4, obj. D, with 2-in. draw-tube.
Fig. 11. Posterior hook of the foregoing with abbreviated base. × oc. 4, obj. D, with 1-in. draw-tube.

Plate II.

Fig. 1. Anterior winged bristle of *Sabella southerni*, 'Knight Errant.' × oc. 4, obj. D, with 1-in. draw-tube.
Fig. 2. Posterior bristle with longer tip. Ditto.
Fig. 3. Spatulate bristle of the same. × oc. 4, obj. D, with 1-in. draw-tube.
Fig. 4. Anterior winged bristle of *Chone duneri*, Malmgren. × oc. 4, obj. D, with 1½-in. draw-tube.
Fig. 5. Spatulate bristle of the foregoing. × oc. 4, obj. F.
Fig. 6. Anterior hook. × oc. 4, obj. D.
Fig. 7. Posterior hook. × oc. 4, obj. F.
Fig. 8. Posterior hook of *Chone fauveli*, St. Andrews (? marked variety of *C. duneri*).
Fig. 9. Posterior hook of typical *Chone infundibuliformis*, Kr., from Greenland. × oc. 4, obj. D.
Fig. 10. Posterior hook of *Chone reayi*, sp. n. × oc. 4, obj. F.
Fig. 11. Anterior hook of *Euchone lawrencii*, sp. n.? × 500 diam.
Fig. 12. Posterior hook. × 500 diam.
Fig. 13. Longer winged bristle of *Sabella nordenskiöldi*, sp. n. × 450 diam.
Fig. 14. Spatulate bristle. × 450 diam.
Fig. 15. Anterior hook of the same. × 450 diam.

Plate III.

Figs. 1, 2. Minute cuspidate bristles accompanying the anterior hooks of *Sabella southerni*. × oc. 4, obj. D, with draw-tube.

* I am indebted to the Carnegie Trust for the majority of these figures.

Fig. 3. Dorsal view of the collar-region of *Chone princei*, sp. n. Gulf of St. Lawrence, Canada. Enlarged under a lens.
Fig. 4. Ventral aspect of the foregoing. Similarly magnified.
Figs. 5, 6. Anterior hooks. × oc. 4, obj. D, with full draw-tube.
Fig. 7. Posterior hook. × 800 diam.
Fig. 8. Spatulate bristle of the anterior region. × oc. 4, obj. D.
Fig. 9. Posterior hook of a *Chone* (p. 63) from the Arctic Expedition of 1875–76. × about 800 diam.
Fig. 10. Anterior hook of *Branchiomma kollikeri*, Claparède, or var. *B. vesiculosum*, 'Porcupine' Expedition, 1870. × oc. 4, obj. D.
Fig. 11. Posterior hook of the same. Ditto.
Fig. 12. Dorsal view of the collar-region of *Sabella nordenskiöldi*, sp. n. Enlarged under a lens.
Fig. 13. Ventral view of the same. Similarly magnified.
Fig. 14. Linear lanceolate process at the tip of a branchial filament. × 60 diam.
Fig. 15. Posterior hook of the foregoing. × 700 diam.

PLATE IV.

Fig. 1. Longer dorsal bristle of *Sabella hystricis*, sp. n., from the 'Porcupine' Expedition of 1870. × oc. 4, obj. D, with 1-in. draw-tube.
Fig. 2. Shorter form with more distinct wings. Ditto.
Fig. 3. Anterior hook. × oc. 4, obj. D, with 2-in. draw-tube.
Fig. 4. Longer dorsal bristle of *Sabella nordenskiöldi*, sp. n., from Finmark. × oc. 4, obj. D, with 1-in. draw-tube.
Fig. 5. Shorter bristle with broad wings. Ditto.
Fig. 6. Anterior hook. Ditto.
Fig. 7. Branchial eyes of *Branchiomma kollikeri*, Claparède, or var. of *B. vesiculosum*. × oc. 2, obj. A.
Fig. 8. Long dorsal bristle (anterior) of *Chone reayi*, sp. n. × oc. 2, obj. D, with draw-tube.
Fig. 9. Intermediate bristle with wide wings. × oc. 4, obj. D.
Fig. 10. Paddle-like form with filament at the tip. × oc. 4, obj. D, with draw-tube.
Fig. 11. Anterior hook. × 450 diam.
Fig. 12. Dorsal view of the collar and pedicle of the branchiæ. Enlarged under a lens.
Fig. 13. Ventral view of the foregoing.
Fig. 14. Winged bristle of *Chone princei*. × oc. 4, obj. D.

II.—*New Lepidoptera from Dutch New Guinea.* By J. J. JOICEY, F.L.S., F.Z.S., F.E.S., and G. TALBOT, F.E.S.

[Plates V.–VIII.]

THE forty-four species herein described were obtained by Messrs. A., C., and F. Pratt in November 1914 during their expedition to the district of Geelvink Bay, North Dutch New Guinea.

The species from the Coast District, Geelvink Bay, were

collected in Wandammen Bay, and a short distance inland from here are the Wandammen Mountains, where the majority were taken.

Our thanks are due to Lord Rothschild, Dr. K. Jordan, and to Mr. G. T. Bethune-Baker for help given and the opportunity afforded of comparing specimens.

In the following descriptions some species referred to as described by Joicey & Noakes and Joicey & Talbot will shortly be published in the Trans. Ent. Soc. Lond.

Rhopalocera.

Papilionidæ.

1. *Papilio* (*Troides*) *chimæra dracæna*, subsp. n.
(Pl. V. fig. 1.)

♀. *Fore wing* with cell-patch large, subapical spots large and closer together than in typical form, submarginal spots small. *Hind wing* with a large spot in end of cell; distal edge of band not so strongly scalloped, so that the black margin is broader on the whole. Below, the base of costa is yellow.

Abdomen with shorter hair and reduced black on the segments, these being much more yellow basally than in the typical form.

Three examples, Wandammen Mtns., 3000–4000 feet, Nov. A specimen, supposed to be the ♂, was nearly taken by a native collector, who stated that the hind wing was without black spots.

This race appears intermediate between the typical form and a ♀ from Central Dutch New Guinea, described as *charybdis* by R. Van Eecke in 'Rhopalocera of the Third Dutch Expedition to New Guinea,' p. 56, pl. ii. fig. 1, March 1915.

Pieridæ.

2. *Delias mariæ*, sp. n.
(Pl. VI. fig. 1, ♂, 2, ♀.)

This distinct species is apparently most nearly allied to *clathrata*, R. & J.

♂. *Upperside.*—*Fore wing* with broad apical and outer black margin; costa black to base, extending into the cell and connected with a black discocellular spot; basal two-thirds of wing thinly scaled with white over black and forming a transitional stage to the completely black wing of *elongatus*,

Kenr.; two white apical dots. *Hind wing* white, with a narrow black border from vein 7 to inner angle, widest above vein 3.

Underside.—Fore wing black, with a broad white median band, extending along inner margin from base to near tornus, slightly invading cell between veins 2 and 4, its outer edge, placed at right angles to costa, slightly dentate, curved from veins 4–6, the inner edge between these veins not touching cell, and thus forming a narrow anterior part; three orange-yellow apical spots, below which are three vertical marginal streaks in 2–4. *Hind wing* with black ground-colour; base behind præcostal, base of cell, and inner margin nearly to vein 2 powdered with dark orange; a curved pale yellow spot below origin of vein 2; a somewhat oval-shaped pale yellow discal patch, its lower edge evenly convex, its upper irregular, lying mostly within the cell and extending a little beyond the discocellulars, which are white; a broad creamy submarginal band from costa above vein 7 to 1 *b*, widest in 2 and 3, where the inner edge projects more inwardly, outer edge dentate between the veins and leaving a narrow black margin.

♀. *Upperside.—Fore wing* with extended black, leaving a grey-white median patch as below, but only extending above vein 3 as a small yellowish spot at base of 3, and as a narrow curved yellowish streak from 4 to 6; a narrow yellowish suffusion bordering lower edge of cell between 2 and 4; three yellowish apical dots, one in 6 the larger. *Hind wing* with a broader marginal border than in ♂.

Underside of fore wing as in ♂. Hind wing with discal patch somewhat reduced and spot below vein 2 minute.

Length of fore wing, ♂ 28, ♀ 30 mm.

2 ♂♂, 2 ♀♀, 6000 feet, Wandammen Mtns., Nov.

3. *Delias tessei*, sp. n.
(Pl. VI. fig. 3, ♂, 4, ♀.)

Nearest to *hapalina*, Jord., more especially in the ♂. Whilst the ♀ of *hapalina* resembles the ♂, the ♀ of the present species is much more divergent.

♂. *Upperside* of fore wing with outer black area a little more extended than in *hapalina*, its inner edge not indented in cellule 4.

Underside.—Fore wing with more extended apical black and reduced costal streak; yellow apical spots larger. *Hind wing* without yellow on the disc or with only a slight trace; basal streak yellow at base and white outwardly; subbasal

black bar narrower ; inner black margin extended to vein 2 and forming a short marginal border to middle of cellule 3; black discal line widened posteriorly from cellule 4, being widest where it joins the inner marginal black ; the red distal border is not curved below vein 2, but invades the black to 1 *b* ; inner margin washed with yellow near the base only.

♀. *Upperside.—Fore wing* with much more extended black. *Hind wing* with a broad black outer margin.

Underside.—Fore wing with black outer area as above ; basal three-quarters of cell washed with pale yellow. *Hind wing* with whole inner and outer margin black, leaving red line better defined than in ♂ and narrowly bordered with white distally.

Length of fore wing, ♂ 30, ♀ 27 mm.

A series of both sexes, 6000 feet, Wandammen Mtns., Nov.

4. *Delias caroli wandammenensæ*, subsp. n.
(Pl. V. fig. 2.)

♂. *Upperside* of fore wing with black area extended to origin of vein 2 and to inner margin before tornus. Hind wing with broader margin, especially at apex.

Underside of fore wing with mostly only three apical dots. Hind wing with the red submarginal line more broken at the veins, forming separate bars in some specimens.

♀ with black area on both wings more extended ; white area tinged with pale yellow distally; apical spots as in *caroli*. Underside as in typical form, apical spots smaller.

A series of ♂ ♂ and 3 ♀ ♀, 6000 feet, Wandammen Mtns., Nov.

5. *Delias thompsoni*, sp. n.
(Pl. V. fig. 3, ♂, 4, ♀.)

The pattern of the hind wing of this species is unlike any known form of the genus.

♂. *Upperside.—Fore wing* with basal half white to end of cell and to before the tornus, outer edge indented below vein 8 ; outer half black and costa black to base. *Hind wing* white, with a narrow black margin, which widens at vein 6.

Underside.—Fore wing black ; inner margin, from base to before tornus, white to submedian fold. Apex with two brick-red spots, and three dots of same colour in 3–5. *Hind wing* black ; a yellow spot at base of costa ; an elongate brick-red subcostal spot in 6, and below it in middle of cell

a small round spot of similar colour; a brick-red costal spot before the apex and joined to the first of a submarginal row ot white spots, the first two being farther apart from the others, which are more or less connected to form a line to the anal angle; traces of white scaling in cellule 7 along vein 6.

♀. *Upperside* with more extended black on both wings, the hind-wing margin being widest between vein 4 and costa; basal white of fore wing and inner margin of hind wing with a slight yellowish tinge. Apex of fore wing with two brick-red spots.

Underside of fore wing with reduced white at inner margin and larger apical spots continued as faint streak to the tornus. Hind wing as in ♂, but with submarginal spots tinged here and there with red.

Length of fore wing, ♂ ♀, 25 mm.

A small series of both sexes, 6000 feet, Wandammen Mtns., Nov.

6. *Elodina definita*, sp. n.

Differs from all other New Guinea species of this genus in the reduced costal and basal black on fore wing above, this only slightly invading cell at extreme base. The black marginal border is regularly incurved and only slightly waved; it terminates below vein 2 and is rounded at this vein

Underside of fore wing at base lemon-yellow in cell, costa narrowly margined, a well-marked subapical black band terminating below vein 2. Hind wing lemon-yellow at base in cellule 8. Ground-colour chalky white on both sides.

Length of fore wing 22 mm.

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

Danainæ.

7. *Danaida melusine commixta*, subsp. n.

This form, of which we only possess a damaged ♀ specimen, partakes of the characters of *grosesmithi*, Joicey & Noakes, whilst connecting this with the race *œtakwensis*, Joicey & Noakes.

♀. *Fore wing* with apical spots and median patches larger than in *grosesmithi*, but smaller than in *œtakwensis*. The upper median patch is as long as in the more typical *melusine* forms, but does not touch the cell; submarginal spots large, as in *grosesmithi*.

Hind wing with three apical spots smaller than in *grose-*

smithi; discal patch well defined, no spot at base of 6. Underside with large submarginal spots, only four of which can be seen owing to the damage sustained by the specimen; a spot at base of 8.

Ground-colour of underside as in typical forms, not pale as in *grosesmithi*.

1 ♀, 3000–4000 feet, Wandammen Mtns., Nov.

8. *Ideopsis vitrea serena*, subsp. n.

♀. Nearest *arfakensis*, Fruh., but distinguished by more sharply defined markings.

Fore wing with the vitreous postmedian area sharply defined distally and quite clear in areas 2 and 3. *Hind wing* with a larger black apical patch; greenish-yellow ground-colour quite clear and without any dark lines in the cell.

4 ♀ ♀, 3000–4000 feet, Wandammen Mtns., Nov.

Nymphalidæ.

9. *Cynthia arsinoë rebeli*, Fruh., aberration. (Pl. VII. figs. 1, 2.)

This is a melanic aberration affecting three wings on both sides, whilst the left hind wing remains normal. The black markings are condensed to form patches. On the fore wing is a heavy black submarginal line, a large postdiscal costal patch, and a patch in the cell. The right hind wing has a wide marginal black border. Below, the basal half of fore wings is dark purplish brown mixed with black and the distal part of hind wing is darker than the normal.

1 ♂, Coast District, Geelvink Bay, Nov.

Amathusiidæ.

10. *Morphotænaris schoenbergi wandammenensis*, subsp. n. (Pl. VI. fig. 5.)

Nearest to *kenricki*, B.-Baker, from the Arfak.

♂ ♀. *Fore wing* with cell black as in allied form, this colour also darkening the band to more than halfway between cell and margin, whilst the distal brown part is much darker than it is in *kenricki*; in one ♂ the brown at the tornus is much more obscured with black. Apical ocelli absent or only two small ones present. *Hind wing* below with a variable number of ocelli; the three middle ones may be either absent or partly so.

Some specimens of *kenricki* are transitional to the above

form, having increased black on fore wing and reduced ocelli.

2 ♂♂, 3 ♀♀, 3000–4000 feet, Wandammen Mtns., Nov.

Satyridæ.

11. *Erycinidia maudei*, sp. n.
(Pl. VII. fig. 3.)

This species is distinct from any other in the genus, but above it resembles white forms of *Platypthima*.

♂. *Upperside.—Fore wing* with a median patch of dull silvery white, extending into the cell below vein 2 and forming a spot between 2 and 3, filling angle of vein 3; rest of cell and costa below vein 3 to base greyish brown; apical half black; a small, square, white costal spot, nearer cell than to apex.

Hind wing dull silvery white, dark greyish at base and inner margin, as also the tail and margin in cellule 2; rest of marginal border black, widest at apex, and between vein 4 and end of tail is traversed by two thin white lines; some greyish scaling at end and base of tail; a small black submarginal ocellus in 2, ringed with white and with a white pupil.

Underside with dark grey ground-colour sparsely scaled with bluish grey. *Fore wing* with white median triangular patch not entering cell; a bar across cell to costa between veins 2 and 3, white near the cell, anteriorly paler than ground-colour; white costal spot as above; a bluish-grey submarginal triangular patch extending from costa to a point on vein 2, and including the costal spot at its proximal edge; in centre of patch a row of four small ocelli in 3–6; a submarginal dark line. *Hind wing* with a dark irregular subbasal line from costa to middle of 1 *c*, crossing cell before vein 7 and at origin of 2; a straight postmedian line from costa to middle of vein 3, then bent shortly inwards and straight to above marginal ocellus, then bent inwards to vein 2; distally of this line a row of four small ocelli in 3–6, and a larger ocellus near margin in 2; apical area grey-brown, with a submarginal narrow band of bluish grey defined by dark grey edges and extending to vein 3; tail black.

Head, thorax, and abdomen smoky black, greyish below. Antennæ dark yellow-brown, lower part of club black on inside.

♀. *Upperside* similar. Fore wing with white bar across cell, which is only faintly indicated in ♂; costal spot larger.

Underside much paler than in ♂ and with a brownish ground-colour.

Length of fore wing, ♂ 21, ♀ 22 mm.

A series of both sexes, 6000 feet, Wandammen Mtns., Nov.

12. *Platypthima euptychioides*, sp. n.
(Pl. VIII. fig. 1.)

Allied to *klossi*, Roths.*

♂. *Upperside* dark smoky brown, darker at the margins, without markings.

Underside paler than above. *Fore wing* with apex and outer margin to vein 3 reddish brown, bordered proximally by a black band which widens posteriorly to vein 2 and touches margin between this vein and 3; proximally of this a pale indistinct postmedian band; inner marginal area smoky grey. *Hind wing* with a postmedian band formed of seven ocelli in 1 *c*–7, the one in 5 shifted inwards, the one in 6 outwards, and the seventh farther in than the others; each ocellus has a white pupil and black iris ringed with yellow-brown and outwardly with black; the sixth and seventh are only represented by a larger white pupil; the seventh is bordered posteriorly by steel-blue, and the others are similarly bordered proximally and distally, forming a steel-blue band which encloses the ocelli; the inner border of the band is thicker than the outer. A discal band paler than the ground-colour entering the cell at its end and posteriorly joined to the similarly coloured inner margin; outer margin reddish brown, with a thin black terminal line.

Length of fore wing 21 mm.

A series, 6000 feet, Wandammen Mtns., Nov.

13. *Platypthima pandora*, sp. n.
(Pl. VI. fig. 6.)

Allied to *pedaloidina*, Joicey & Noakes, from the Arfak.

♂. *Upperside* smoky brown. *Fore wing* with a pale median band close to cell and reaching inner margin, narrowed anteriorly to vein 6, outer edge almost parallel with margin. *Hind wing* with pale band showing through from below and outwardly suffused; two anal ocelli in 2 and 3, black ringed with pale brown, the one in 2 the larger; a submarginal violet line, distinct from anal angle to vein 4, and then evanescent.

* *Platypthima klossi*, Roths. Lep. of B. O. U. & Wollast. Exped. p. 14 (1915).

Underside.—Fore wing with paler ground-colour. A pale yellowish median band as above, but more clearly defined and extending nearly to base at inner margin; two ocelli contiguous in 4 and 5 and surrounded by a lead-coloured line; costa and apex above ocelli and distally of the band reddish brown; a strongly waved lead-coloured submarginal line from before the apex to middle of cellule 2; a red-brown marginal line. *Hind wing* pattern similar to *pedaloidina*. A somewhat irregular discal cream-coloured band from costa to first submedian, crossing cell near end; basal half of wing deep chocolate-brown sparsely scaled with grey, but more so at inner margin as far as anal angle; outer half of wing dark reddish brown, this area entering the cell; four outer ocelli, black with pale brown rings and a white pupil, the lower three surrounded by a violet-grey line, the apical one similarly enclosed; a submarginal violet-grey line and a pale brown marginal one; a black submarginal patch between veins 4 and 6 and a black patch at inner angle. Fringes black chequered with greyish yellow between the veins.

♀. Wings more rounded, colour paler, and the two ocelli on hind wing much more distinct.

Length of fore wing, ♂ ♀, 22–24 mm.

A series of both sexes, 6000 feet, Wandammen Mtns., Nov.

14. *Mycalesis fulvianetta semicastanea*, subsp. n.
(Pl. V. fig. 5.)

Differs from *fulvianetta*, Roths.*, in more extended costal and apical black, which nearly touches vein 4 and includes anterior half of cell; a black submarginal border reaching tornus and invaded slightly on veins 2 and 3 by the ground-colour. Hind wing with two dark submarginal lines, inner one thicker.

Underside pinkish brown, costal margin of fore wing darker, discal area on both wings between outer rufous line and ocelli much paler. On fore wing the two middle ocelli smaller than the others, and in the type obsolescent. On hind wing are two additional ocelli, one minute near first submedian and one in cellule 6.

Easily distinguished from the allied *mahadeva*, Bdv., which occurred in the same collection, by the postmedian stripe on fore wing below being *straight*, and *not* inwardly curved.

2 ♂♂, 3000–4000 feet, Wandammen Mtns., Nov.

* *M. fulvianetta*, Roths. Lep. of B. O. U. & Wollast. Exped. in Dutch New Guinea, p. 16 (1915).

15. *Mycalesis barbara pallida*, subsp. n.

♂. Upperside similar to *barbara*, Gr.-Sm., but the bands paler brown. Fore wing with inner edge of band curved inwards below submedian, ocellus in 2 not touching the band and with a pale brownish ring. Hind wing with broader band than in *barbara*, the ocelli ringed with fulvous yellow, the one in 3 being anteriorly obscured by ground-colour.

Underside with white postmedian bands on both wings broader, marginal area whiter.

♀. The bands are white and much broader. Hind wing with a fulvous-yellow anal suffusion. Underside with basal area of both wings dark grey-brown and marginal area darker than in ♂.

Length of fore wing, ♂ 26, ♀ 29 mm.

7 ♂♂, 1 ♀, 3000–4000 feet, Wandammen Mtns., Nov.

Nemeobiinæ.

16. *Prætaxila postalba wandammanensis*, subsp. n.
(Pl. V. fig. 6.)

♀. Fore wing more rounded; apical spots a little larger; spot in cellule 3 not connected with bar in 4 and 5; spot in 2 distinctly larger. Hind wing with white band scarcely projecting in cellule 3; in 5 a white subapical spot.

Underside of fore wing with cell-bar broader and better defined than in typical form; band wider posteriorly; on the hind wing the anal spot and one next it shorter.

2 ♀♀, 3000–4000 feet, Wandammen Mtns., Nov.

17. *Dicallaneura virgo*, sp. n.
(Pl. VIII. fig. 2.)

♀. Resembles *leucomelas*, Roths., above, and *exiguus*, Joicey & Noakes, below.

Upperside.—*Fore wing* with smoky-brown basal area extending to vein 2, discal white patch from upper angle of cell to lower submedian, leaving basal two-thirds of inner margin smoky brown, remainder merged in the black outer area. Tornus widely black, thus making the discal patch much smaller than in other species. *Hind wing* as in *leucomelas*, but paler and with reduced costal white.

Underside.—*Fore wing* with discal patch nearer the submarginal line than in *exiguus*, and not traversed by any line. *Hind wing* with reduced costal white and subapical brown bars in cellules 4 and 5 enlarged.

Length of fore wing 20 mm.

7 ♀♀, 3000–4000 feet; 1 ♀, Coast District, Geelvink Bay, Nov.

18. *Dicallaneura albosignata*, sp. n.
(Pl. VIII. fig. 3.)

♀. Resembles *virgo*, but is distinctly different below. *Upperside* of fore wing similar to *virgo*, discal patch more extended towards outer angle, its lower edge rounded a little below vein 2 and just touching 1 *b*. Hind wing with three submarginal black spots and one on the tail.

Underside of fore wing similar to *virgo*; extended basal median area, two curved grey marks in the cell, the outer one bordering the brown spot; a subterminal line more faintly marked than in *virgo*, and proximally of it a series of six white spots, the first three in 8–6 larger than the lower three in 5–3, the spot in 5 placed more proximal than the rest, two white apical spots. *Hind wing* with *two* grey stripes in the cell, a grey stripe outside it between 4 and 7 and continued along costa to base; a grey postcellular band from inner margin to vein 4, narrowly separated from a grey submarginal band about half its width and reaching vein 4; a stripe beyond cell from costa to 4, anteriorly white and merging into grey below vein 6; three white apical spots in 4–6; three black submarginal spots in 3–5, the upper one with a white dot in centre, lower ones edged distally with white on inside; a second submarginal grey band half width of first and close to it, continued beyond 5 as a thin line; a black square tail-spot edged with white distally; two black submarginal bars in 1 *b* and 1 *c* similar to the one in 3.

Length of fore wing 23 mm.

1 ♀ only, 3000–4000 feet, Wandammen Mtns., Nov.

19. *Dicallaneura amabilis mimica*, subsp. n.
(Pl. VIII. fig. 4.)

Resembles the ♀ of *decorata*, Hew., above, but is allied to *angustifascia*, Joicey & Noakes. Paler yellow-brown, more extended on fore wing; slightly darker at base.

Upperside.—Fore wing with yellow-brown extended to end of lower submedian, very slightly indented in 1 *b* and 1 *c*, and not at all in cellule 3. Hind wing with costa and apical part paler than rest of wing.

Underside paler than in *angustifascia* ♀. Fore wing with transverse band joined to submarginal streak, and lines traversing it much thinner. Inner margin yellowish except

at extreme base. Hind-wing markings as in *angustijascia*. Two white dots in cellules 4 and 5 near margin; front discal bars in cellules 2 and 3 triangularly shaped, being prolonged basad.

1 ♀, Coast District, Geelvink Bay, Nov. 1914.

Lycænidæ.

20. *Cyaniris pullus*, sp. n.
(Pl. VII. fig. 4.)

Allied to *acesina*, B.-Baker.

♂. *Upperside.*—Fore wing dark blue, with a broad black outer margin which is scarcely narrower at the tornus. Hind wing brownish black, paler costally, and thinly scaled with blue on the disc.

Underside smoky grey, with spots of same colour outlined with white. *Fore wing* paler in median area; a spot across end of cell; a narrow postmedian band formed of seven spots joined together, the first on the costa indistinct, second to fifth in a line to vein 3, sixth in 2 parallel to margin, seventh below sixth, a spot placed proximally of the second; a marginal row of four indistinct round spots. *Hind wing* with a subbasal line of three spots; a spot across end of cell; two rounded spots, one below the other, beyond middle of costa, larger than any of the others; a spot on inner margin; a postmedian series of five spots in 1*c*–5, those in 2 and 3 more proximal than the others; a marginal row of indistinct small rounded spots. Fringes white, dark at veins and on fore wing anteriorly.

Length of fore wing 13 mm.

5 ♂♂, 3000–4000 feet, Wandammen Mtns., Nov.

21. *Nacaduba proxima*, Roths.

Nacaduba proxima, Rothschild, Lep. of B. O. U. & Wollast. Exped. in Dutch New Guinea, p. 29. no. 134 (1915), ♂.

♀. The costal and terminal areas on both wings are much broader; in other respects it resembles the ♂.

Length of fore wing 13 mm.

♂ ♀, Wandammen Mtns., 3000–4000 feet, Nov.

22. *Lampides wandammenensis*, sp. n.
(Pl. VIII. fig. 6.)

Allied to *pactolus*, Feld., from Amboina.

♂. *Upperside* glistening pale sky-blue, hind wing whitish at costa.

Underside with dark grey ground-colour. *Fore wing* with inner edge of median band nearly straight, outer edge curved outwardly to vein 2, then forming a straight bar below this vein. A postdiscal band of four spots, the first near costa indistinct, the second in cellule 6 shifted inwards, the third placed more distal, the fourth below it and in line with its inner edge, a bar crossing cellule 3. Submarginal band regular and of even breadth, the inner edge thicker than the outer, an antemarginal white line. *Hind wing* with a narrow, subbasal, nearly straight band, which is parallel to central part of median band; costal spot of median band larger and not connected with band. Postdiscal band of four spots, the two lower placed distally of first two, a short bar near base of cellule 2. Submarginal line of short curved bars; a marginal row of four rounded spots. Anal spot in 2 edged inwardly with orange-yellow, and two small spots of this colour at anal angle.

Length of fore wing 21 mm.

4 ♂♂, Wandammen Mtns., 3000–4000 feet, November.

23. *Lampides nitens*, sp. n.
(Pl. VIII. fig. 5.)

Closely allied to *malaguna*, Ribbe, from the Bismarck Islands.

♂. *Upperside* brilliant sky-blue. *Underside* similar to *amphissa*, Feld. Ground-colour dark grey. Hind wing with the two anal spots edged proximally with orange-yellow.

Length of fore wing 20 mm.

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

24. *Callictita cyara albiplaga*, subsp. n.
(Pl. VII. fig. 5.)

♂. Distinguished from *cyara*, B.-Baker *, in the smaller patch on hind wing above and the differently shaped basal brown below.

Upperside of hind wing with more extended blackish and smaller creamy discal patch which extends anteriorly to vein 6 and posteriorly to 2, its inner edge not reaching the bases of 2 and 7, and outer edge nearest the margin in 4 and 5.

Underside of fore wing with increased black-brown colour, the narrow stripes being creamy white. Hind wing with creamy ground-colour which invades the basal brown from

* *Callictita cyara*, B.-Baker, P. Z. S. 1903, p. 119, pl. viii. fig. 1.

the costa ; basal stripe angled outwards at vein 5, which it nearly touches at cell-end ; submarginal row of brown spots ; an anal marginal spot in 1 *c*, not developed in *cyara*.

Length of fore wing 14 mm.

7 ♂ ♂ obtained, 3000–4000 feet, Wandammen Mtns., Nov.

25. *Parelodina mima*, sp. n.
(Pl. VII. fig. 6.)

Allied to *aroa*, B.-Baker, but differs in the differently shaped apical area, the reduced basal black, and heavier costal black on fore wing. The bluish sheen at base of wings is also absent. One specimen is chalky white.

♂. *Upperside* of fore wing with apical black to below origin of vein 6, two-thirds along vein 4, nearly halfway along vein 3, and along a third of 2 ; costal black extending along the length of upper part of cell. Hind wing with a little black at base.

♀. Fore wing with slightly reduced apical and basal black. Hind wing with reduced basal black.

Length of fore wing, ♂ ♀, 15 mm.

6 ♂ ♂, 1 ♀, 3000–4000 feet, Wandammen Mtns., Nov.

26. *Candalides pruina*, Druce, ♀.

Candalides pruina, H. H. Druce. Ann. & Mag. Nat. Hist. ser. 7, vol. xiii. p. 140, ♂ (1904) (Upper Aroa River).

♀. Wings more rounded, ground-colour a little paler. Fore wing with a narrow whitish median stripe, tinged with pale blue and extending from base along lower edge of cell to halfway between cell and margin, being much broader beyond the cell.

Underside without any dark apical or costal suffusion on fore wing.

Length of fore wing 17 mm.

One specimen, also 4 ♂ ♂, 3000–4000 feet, Wandammen Mtns., Nov.

27. *Candalides ignobilis*, sp. n.

Similar to *innotatus*, Misk., and *marginata*, Gr.-Sm., but darker blue and wings more rounded than the former, and with narrower margins than the latter.

Fore wing with costa narrowly black, outer margin below vein 4 broader than in *innotatus*.

Length of fore wing 14 mm.

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

28. *Thysonotis mamberano*, sp. n.

Nearest *helga*, Gr.-Sm., from Jobi.

♂. *Upperside* with narrower margins on both wings. Fore wing with an indistinct white band from inner margin to vein 4. Hind wing with white band narrower, leaving more basal blue than in *helga*.

Underside of fore wing with broader costal blue beyond cell, and between veins 2 and 3 the blue line almost touches the white band. Hind wing with white band as above.

Length of fore wing 20 mm.

1 ♂, River Mamberano, N. Dutch New Guinea, Dec. 1913.

29. *Thysonotis melane*, sp. n.
(Pl. VII. fig. 7.)

♂. *Upperside* black, hind wing paler at costal margin.

Underside with black ground-colour. *Fore wing* with white median band from inner margin to vein 5, narrowing anteriorly and incurved on outer edge; basal two-thirds of costa blue. *Hind wing* with white discal band narrowing sharply to inner margin, a basal blue line, a marginal row of black spots edged with blue and separated by the veins.

Head, thorax, and abdomen black, paler below; antennæ black.

Length of fore wing 15 mm.

A small series, 3000–4000 feet, Wandammen Mtns., Nov.

30. *Waigeum bakeri*, sp. n.
(Pl. VII. fig. 8.)

Not nearly allied to any known form.

♀. *Upperside.—Fore wing* black, with a broad, somewhat ovate, white median patch, extending from base and entering cell along its lower edge, covering basal half of vein 2, more still of vein 3, and nearly reaching 4, where it is about 3 mm. from margin; a short basal stripe of metallic greenish blue in the cell and a short basal stripe of very pale metallic blue on inner margin reaching to edge of median patch. *Hind wing* black; costa white to vein 7; a little greenish-blue scaling at the base. Fringes white between the veins.

Underside with black ground-colour. *Fore wing* with a broad white median patch tinged slightly with yellow, broader than above, reaching the submarginal spots between veins 2 and 4, and extended as a line to apex and round to the subapical bar; costa metallic greenish blue traversed by

the dark veins; a short greenish-blue subapical bar; a submarginal row of greenish-blue lunules, their concavities filled in with black. *Hind wing* with a basal cream-coloured stripe including the costa to apex and crossing cell at its middle, this stripe invaded by a black basal bar not reaching costa; a large and almost D-shaped greenish-blue area occupying distal half of wing, its outer edge cream-coloured, with metallic scaling on inside; a submarginal greenish-blue line from base to apex.

Head, antennæ, thorax, and abdomen black; thorax with some metallic greenish scaling above.

Length of fore wing 19 mm.

3 ♀ ♀, 3000–4000 feet, Wandammen Mtns., Nov.

31. *Deudorix littoralis*, sp. n.

Near *woodfordi*, Druce, from Solomons. At once distinguished by the reduced brown on fore wing, which reaches very little above vein 2 and hardly touches the submedian. Hind wing with brown reduced to an oblique bar from lower end of cell to near margin between veins 2 and 3; spot on anal lobe yellowish.

Underside darker and more brownish than in *woodfordi*. Fore wing with postdiscal band straighter. Hind wing with spots well defined by grey; anal spot ringed with yellowish, anal green scaling much reduced.

♀. More resembles the ♀ of *epijarbas*, Moore. Similar above, but on the underside the bands are narrower and better defined. Anal spot in 2 ringed with pale yellow, and between this and inner margin is a metallic yellowish-green line.

Length of fore wing, ♂ 22, ♀ 21 mm.

Types from Kapaur, ex Coll. Grose-Smith; also 1 ♂, Coast District, Geelvink Bay; 3 ♂ ♂, German New Guinea.

The co-types have more extended brown on the hind wing.

Heterocera.

Arctiadæ.

32. *Asura wandammenensæ*, sp. n.

Allied to *phryctopa*, Meyr.

♂. Upperside of *fore wing* with dark grey ground-colour, veins darker. A rounded yellow basal spot edged with red and with a red spot at its outer edge; three subbasal red spots—one at costa, one below vein 2, and one at inner margin—another distally of the latter, a dot above it near second

subbasal spot ; at end of cell a large spot, red anteriorly and yellow posteriorly, where it is outwardly rounded, and extending beyond cell, its inner edge slightly convex from costa to vein 3, its outer edge incurved to vein 6 ; a narrow postdiscal band of small red spots divided by the veins, curved inward at costa, then outwardly between veins 7 and 3, thence inwardly to inner margin below the cell-spot ; a red terminal border marked with yellow, widest at apex and in cellules 4 and 5 ; costa narrowly red from apical spot to postdiscal band. *Hind wing* pale yellowish tinged with red, more especially on costa and upper distal portion.

Underside of fore wing red tinged with ochreous, of hind wing as above, costa red.

Head and thorax dark grey marked with red, frons and base of head red, thorax with a red mesial line, abdomen pale yellowish tinged with red. Legs and underside of thorax and abdomen red.

Length of fore wing 17 mm.

2 ♂ ♂, Wandammen Mtns., 3000–4000 feet, Nov.

33. *Diacrisia nigricorna*, sp. n.

This strongly resembles *biagi f. angiana*, Joicey & Talbot, and also *elongata*, Roths. It is most nearly allied to the latter in shape of wing, but *elongata* has not the black thoracic patch. No other forms of this group have black antennæ.

♂. Ground-colour pale ochreous, fore wing with a greyish tinge. Upperside of *fore wing* with a small black subbasal spot above submedian ; a dot below cell at vein 2 ; at end of cell two black wedge-shaped spots nearly touching one another ; two black dots on discocellulars ; two postdiscal bands of spots, the first of eight spots from cellule 5 to inner margin, spots 2–4 only separated by the veins, 5 and 6 separated by vein 2, 7 and 8 by the submedian, spots 1 and 6 smaller than the others ; second band of eleven spots from cellule 7 to inner margin in four groups ; a subterminal band of six spots on veins 3–8. *Hind wing* with a large quadrate spot closing the cell ; submarginal spots in 1 *b*, 1 *c*, 2, 4, and 5.

Underside ochreous yellow, markings as above.

Palpi, frons, and antennæ black ; vertex, tegulæ, and patagia brownish ochreous ; central part of thorax black ; abdomen pale orange above with a black dorsal line below brownish ochreous with a black lateral stripe ; pectus and legs black, fore coxæ fringed with orange hair, hind tibiæ fringed with orange and grey hair on inside.

Length of fore wing 23 mm,

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

Noctuidæ.

Erastrianæ.

34. *Smicroloba costifascia*, sp. n.

Near *quadrapex*, Hampson.

Upperside with reddish-brown ground-colour, basal half paler, washed with purplish. *Fore wing* with a thick dark brown postdiscal stripe, straight and obliquely placed from apex to inner margin; this is accompanied by an irregularly dentate outer line joining it below the apex, the space between the two being tinged with purple; two brown costal lines, the inner beyond middle of costa, forming a greyish band which curves upwards to join the postdiscal line just below apex; a faint irregular subbasal line, a black dot in cell, a faint subterminal dentate line. *Hind wing* with costa broadly pale ochreous, inner margin narrowly so. A short brown median stripe, followed by a faint postdiscal dentate line, which is emphasized by dots on the veins; a faint dentate subterminal line.

Underside reddish brown speckled with black, postdiscal lines marked. *Fore wing* with costa and inner margin pale ochreous; *hind wing* with basal area pale ochreous.

Head and tegulæ pale ochreous; thorax and base of abdomen pale reddish brown; rest of abdomen above black mixed with ochreous, below ochreous, and black at sides; pectus grey-white, legs ochreous speckled with black, tarsi black fringed with white at apices of segments.

Length of fore wing 12 mm.

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

Hypsidæ.

35. *Deilemera dinawa*, B.-Baker, ab. *nigripuncta*, ab. n.

The hind wing bears on the reduced white area a triangle-shaped spot of ground-colour at base of cellule 2. The band of fore wing is reduced and somewhat broken, leaving a rounded spot at end of cell.

Three other specimens of the species from the same locality vary in width of band on fore wing. In one of these the band is very broad and has a projection from the discocellular into the cell nearly to vein 2.

1 ♀, Angi Lakes, Arfak Mtns., 6000 feet, Jan.–Feb.

Eupterotidæ.

36. *Eupterote punctata*, sp. n.

Allied to *styx*, B.-Baker, from British New Guinea.

♂. Upperside with fawn-brown ground-colour. *Fore wing* much irrorated with black. A black basal line; a black median band followed by four black discal lines which are waved and become thinner posteriorly; basal line straight and outwardly oblique, other lines inwardly oblique and anteriorly curved inwards to costa; a waved, well-defined, pale outer discal line, followed by a strongly dentate black subterminal line, the space between being much irrorated with black scaling. At end of cell a round ochreous spot. *Hind wing* with two dark basal lines, two slightly waved discal lines, the outer the broader, followed by a black dentate subterminal line, the space between being thinly irrorated with black scaling.

Underside paler than above. On *fore wing* the outer discal line is most strongly indicated. The *hind wing* is darker and five waved lines are clearly marked, followed by the straighter and darker outer line.

Head and thorax deep velvety brown. At base of antennæ on each side of frons is an ochreous tuft. Antennæ, legs, thorax below, and abdomen fawn-brown.

Length of fore wing 48 mm.

6 ♂ ♂, Wandammen Mtns., 3000–4000 feet, Nov.

Geometridæ.

37. *Milionia wandammenensæ*, sp. n.
(Pl. VIII. fig. 7.)

Allied to *aroensis*, Roths.

♂ ♀. *Upperside* with only a faint bluish gloss over the wings. *Fore wing* with a wider red band than in *aroensis*, being widened proximally; basal blue reduced, deep in colour, and faintly metallic. *Hind wing* with blue reduced to area of cell and below it, a metallic streak along lower edge of cell and along submedian.

Underside of fore wing with reduced metallic blue at base. Hind wing as in *aroensis*, bearing also the subapical patch of short black hair as in that species, this being absent in the ♀.

Head and thorax deep blue, frons, sides of head, and tegulæ metallic greenish blue; abdomen black with a deep greenish-blue gloss.

Length of fore wing, ♂ 24, ♀ 22 mm.

A single pair, 6000 feet, Wandammen Mtns., Nov.

38. *Milionia witleyensis*, sp. n.
(Pl. VIII. fig. 8.)

Allied to *diva*, Roths.

♂. *Upperside.—Fore wing* with an abbreviated transverse red band which does not quite reach upper edge of cell and crosses it proximally of veins 2 and 3, part within the cell narrowest, outer edge evenly curved, inner edge curved outwards in lower median space. *Hind wing* with a streak of dark metallic blue along lower edge of cell and one along submedian, as in *diva*. Both wings with a deep blue gloss.

Underside of fore wing with the red band reduced to a rounded spot reaching vein 2, and a minute spot in cell above origin of 2 ; a metallic greenish-blue patch from subcostal to just below vein 2, filling outer end of cell, the base of 3, and inner half of 2 ; metallic greenish-blue streaks at base, one on costa, two within cell. Hind wing with metallic greenish-blue basal costal streak, and one along lower edge of cell. Hind wing and apical area of fore wing suffused with deep blue.

Length of fore wing 20 mm.

One example, 6000 feet, Wandammen Mtns., Nov.

39. *Eubordeta mars*, sp. n.
(Pl. VIII. fig. 9, ♂.)

Allied to *accrita*, Jord., and to *rubroplagata*, B.-Baker.

♂ ♀. *Upperside.*—Fore wing with a red transverse band which is narrower than in either of the allied forms, being reduced proximally. Hind wing with a small yellow or reddish costal stripe placed near the apex and varying in size. Both wings black with a deep blue gloss, which is more intense over basal area of hind wing.

Underside of fore wing as in *rubroplagata*, but with a narrow stripe. Hind wing as in *accrita*, but with a narrower yellow band, which is typically not entire, but broken on the costa, its anterior end more widely separated from the basal streak than in *rubroplagata*. Both wings with a deep blue gloss which is more intense over basal area of hind wing.

Two ♀ ♀ have the band on the hind wing entire as in *accrita*, and in one ♂ and three ♀ ♀ the band is much less widely interrupted than is typically the case.

Length of fore wing, ♂ ♀, 17–21 mm.

9 ♂ ♂, 8 ♀ ♀, 3000–4000 feet, Wandammen Mtns., Nov.

40. *Euborbeta flammens discus*, subsp. n.
(Pl. VIII. fig. 10.)

♀. *Upperside.*—Fore wing as in *flammens*, B.-Baker. Hind wing with a narrower black margin, the red band nearest the margin from vein 4 to anal angle; basal black extended, invading cell to a greater extent than in *flammens*.

Underside of fore wing as in the typical form. Hind wing with a large black discal patch almost joined to a basal spot; in one specimen it is merged into the basal black so as to fill nearly all the cell.

Some specimens of *flammens* from the Arfak Mtns. possess a small discal spot.

4 ♀ ♀, 3000–4000 feet, Wandammen Mtns., Nov.

Saturniadæ.

41. *Coscinocera hercules heraclides*, subsp. n.

♂. *Upperside* with basal band of fore wing more oblique in its lower part and crossing vein 2 midway between the cell and postdiscal band; its upper lunate portion is only 3·5 mm. from the black outer border of the eye-spot. The eye-spot on fore wing is about twice the size of the one on the hind wing; on the underside they are only faintly edged with yellow-brown.

A specimen from the Angi Lakes is transitional to *eurystheus*, Roths., in having the basal line on the fore wing shifted nearer the cell and its upper part farther from the eye-spot. The eye-spots below are thinly edged with yellow-brown proximally.

1 ♂ (type), Wandammen Mtns., 6000 feet, Nov.; 1 ♂, Angi Lakes, Arfak, 6000 feet, Jan.–Feb.; 1 ♂ in Tring Museum from Arfak.

Uraniidæ.

42. *Urapteroides semiobsoleta reducta*, subsp. n.

♂ ♀. The fore wing has a narrower margin, but it is broader along basal part of costa than in the typical form from British New Guinea.

5 ♂ ♂, 2 ♀ ♀, Wandammen Mtns., 3000–4000 feet, Nov.

Cossidæ.

43. *Zeuzera caudata*, sp. n.

Allied to *postexcisa*, Hampson.

♂. Fore wing with all spots obsolescent except costal and

marginal ones. Spots in cell rounded, those outside it more ovate, and all more or less joined transversely. Marginal spots prominent and a larger one at apex.

Hind wing with spots obsolescent; one in lower part of cell and some minute ones in cellules 1 *c*–3; anal lobe edged with black and a small spot at end of veins 2 and 3.

Length of fore wing 25 mm.

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

44. *Zeuzera reticulata*, sp. n.

Allied to *coffeæ*, Nietn.

♂. The obsolescent spots on fore wing are all larger and more or less joined transversely. Hind wing with many small obsolescent spots, all separate, and small defined marginal spots at ends of veins 1 *b*–7.

Length of fore wing 21 mm.

1 ♂, Wandammen Mtns., 3000–4000 feet, Nov.

EXPLANATION OF THE PLATES.

Plate V.

Fig. 1. *Papilio* (*Troides*) *chimæra draccena*, ♀.
Fig. 2. *Delias caroli wandammenensæ*, ♂.
Fig. 3. —— *thompsoni*, ♂.
Fig. 4. —— ——, ♀.
Fig. 5. *Mycalesis fulvianetta semicastanea*, ♂.
Fig. 6. *Prætaxila postalba wandammenensis*, ♀.

Plate VI.

Fig. 1. *Delias mariæ*, ♂.
Fig. 2. —— ——, ♀.
Fig. 3. —— *tessei*, ♂.
Fig. 4. —— ——, ♀.
Fig. 5. *Morphotænaris schoenbergi wandammenensis*, ♂.
Fig. 6. *Platypthima pandora*, ♂.

Plate VII.

Fig. 1. *Cynthia arsinoë rebeli*, Fruh., aberration.
Fig. 2. —— —— ——. Underside.
Fig. 3. *Erycinidia maudei*, ♂.
Fig. 4. *Cyaniris pullus*, ♂.
Fig. 5. *Callictita cyara albiplaga*, ♂.
Fig. 6. *Parelodina mima*, ♂.
Fig. 7. *Thysonotis melane*, ♂.
Fig. 8. *Waigeum bakeri*, ♀.

PLATE VIII.

Fig. 1. *Platypthima euptychioides*, ♂.
Fig. 2. *Dicallaneura virgo*, ♀.
Fig. 3. —— *albosignata*, ♀.
Fig. 4. —— *amabilis mimica*, ♀.
Fig. 5. *Lampides nitens*, ♂.
Fig. 6. —— *wandammenensis*, ♂.
Fig. 7. *Milionia wandammenensæ*, ♂.
Fig. 8. —— *witleyensis*, ♂.
Fig. 9. *Eubordeta mars*, ♂.
Fig. 10. ——*flammens discus*, ♀.

III.—*New Species of Lice.* By BRUCE F. CUMMINGS, British Museum (Natural History).

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ANOPLURA.

AMONG the dry material, mounted on cardboard in the collection of the British Museum, two specimens were discovered labelled simply "*Pedetes capensis.*" These, on being washed in caustic potash and mounted on a slide in Canada balsam, proved to be two females of an interesting and hitherto undescribed form.

EULINOGNATHUS, gen. nov.

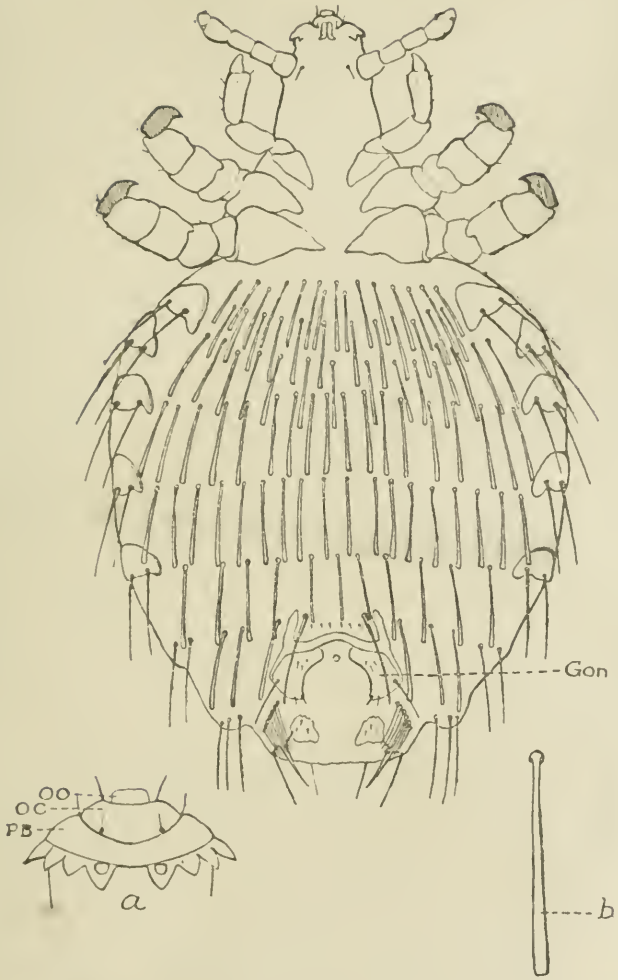
Head longer than broad, antennæ arising just in front of halfway, broader behind the antennæ than in front. No projecting postero-lateral angles. Behind, the head is sunk deep into the thorax. Around the mouth in front a circlet of triangular denticles. Abdomen without tergites or sternites. Five pairs of pleurites, the anterior pair well developed. First pair of legs small. Hairs on the abdomen modified, being long, flattened, parallel-sided, truncate at the tip.

On *Pedetes capensis*, now known as *Pedetes caffer*, Pall. (family Pedetidæ).

Eulinognathus denticulatus, sp. n.

External Form. Female.—Head: the outline is well shown in the figure (text-fig. 1). The characteristic features of the head are the circlet of denticles around the mouth, the absence of postero-lateral angles and also of any "neck" or narrowing of the head just before entering the thorax, so that

Fig. 1.



Eulinognathus denticulatus, sp. n., ♀. *Gon*=Gonopod.

a. Preantennal part of the head, greatly enlarged. *OO*=Oral opening; *OC*=Oral cone; *PB*=Peristomial band.

b. Hair (enlarged).

the swollen base of the head is held in a "stiff collar" formed by the thorax, and apparently, therefore, incapable of much lateral motion. The median areas of both dorsal and ventral surfaces are composed of rather thin, smooth chitin, but both behind and in front of the antennæ the head on each side is strengthened by chitinous areas of greater thickness. Behind the antenna this thickened area on the dorsal surface begins as a more or less circular, raised or embossed patch bearing a long bristle and a minute hair. This patch extends down on each side to the ventral surface, where it occupies the margin and runs forward past the antenna to join the peristomial band. This band is a strong circular support, from which arise the triangular denticles (fig. 1 *a*, *PB*). Each denticle appears to be a triangular plate; its apex points backwards and its base is set transversely to the peristomial band. In the centre of two of the denticles there is a hole as in a set-square. Within the peristomial band lies the small oral cone (fig. 1 *a*, *OC*), at the apex of which is the short columnar oral opening (fig. 1 *a*, *OO*). Behind the antennæ dorsally is a shallow, indistinct, transverse groove. Antenna 5-segmented, slightly club-shaped as the fourth segment is broader than the second, third, or fifth, and its postaxial margin is longer and somewhat convex. There is a circular sensorium between segments 4 and 5 on the ventral surface and another on segment 5 on the postaxial line.

Thorax much broader than the head, and broader behind than in front. Claws on the front tarsi, which in both specimens carry two hairs, are either absent or minute. On the other legs the claws are large, in shape like the beak of an accipitrine bird.

Abdomen much broader than the thorax, ovate, large. Neither sternites nor tergites present. On each of the first five segments a pair of pleurites. A fairly broad chitinous band runs transversely over the dorsum of the terminal segment. A chitinous framework supports the flat rounded gonopods. This consists of a cross-bar running from the base of one gonopod to the other, and running back from each extremity of this cross-bar in the direction of the head a short band slightly bending inwards. The gonopod is a flattened lobe, convex at the extremity, a little concave along the inner margin.

Chætotaxy. Female.—Head: on the upper surface is an elongate bristle, reaching nearly down to the abdomen, along with a minute hair close to it situated on the small embossed area behind each antenna. Two minute hairs, widely sepa-

rated, on dorsal surface towards the occiput. A minute hair on the lateral margin of the head a little way behind the antenna. A larger hair on the dorsal surface in front of the embossed area near the base of the antenna. Two minute hairs on the postantennal groove. At the base of the oral cone above, four small hairs widely spaced. A longer one on each side at the base of the columnar oral opening. On the ventral surface, at about the level of the middle of the first segment of the antenna, two fairly small hairs, one on each side of the middle line. Five or six minute hairs with large alveoli on ventral surface of the oral cone.

Thorax: the usual spiracular bristle. A small one on each "shoulder" of the pronotum.

Abdomen: the abdomen is thickly covered both dorsally and ventrally by rows of elongate hairs of peculiar shape (see fig. 1 *b*). Each hair is very long, with a rather small circular "neck" broadening at once into a flat scabbard-like structure, the lateral margins being parallel to each other and the end truncate. Most of these clumsy-looking integumentary appendages are twisted. A few are pointed at the tips.

There is a transverse row of these hairs, very closely placed on the tergum of each segment, excepting the last, where, on the anterior margin of the transverse band, there are two of the long modified hairs, and on the posterior margin two widely separated normal hairs, with a couple of elongate hairs at each lower lateral angle. Ventrally, there is a transverse row of closely-placed, modified hairs on each segment (up to segment 7), although at the base of the abdomen over the first three segments (and the qualification applies to the dorsal surface also) the chætotaxy in the only two preparations at my disposal remains somewhat uncertain.

On each gonopod, a single long bristle inside the margin postero-laterally. Two or three short hairs on the margin at the inner angle. Inside the inner margin just behind the cross-bar three small hairs on each side. In front of the cross-bar six minute hairs in a row. Running from just behind the gonopod in an oblique row outwards, eight or nine long spines placed closely to each other so that their alveoli are contiguous. At the end of this row, but placed a little further in, a powerful spine on each side of the genital opening. Between these two spines or "thorns" are two small patches of chitin of irregular outline, each with three or four short hairs.

On each pleurite two elongate bristles, situated along the

lower margin. On the soft chitin, just in front of the first pleurite, a group of eight or nine of the modified hairs. Two bristles also on each pleurum behind the seventh segment.

Measurements of Eulinognathus denticulatus (*millimetre-scale*).

	Length.	Breadth.
Head	·29 (at margin)	·23
Thorax	·3	·51
Abdomen	1·2	1·05
Total	1·79	
Length of antenna	·25	

Mallophaga.

Family Trichodectidæ.

Described below is a curious new form belonging to this family, which is of especial interest on account of the phylogenetic position of its host, an Edentate.

The material from which the new form is described, consisting of a ♂, three ♀♀, and a larva, was very kindly presented to the British Museum by Mr. A. J. Engel Terzi, and, in spite of their poor condition of preservation (the specimens had been attacked by a species of mite), the main features in the morphology of the skeleton have been made out, although much of the chætotaxy still remains uncertain or obscure.

They were collected on the two-toed sloth (*Cholœpus didactylus*, Linn.) in British Guiana. So far as I know, the only other species of Mallophaga recorded from an Edentate is *Gyropus hispidus*, Nitzsch, from *Bradypus tridactylus*. Among the Anoplura, the remarkable *Hybophthirus notophallus* (Neumann), Enderlein, a parasite of the Cape anteater (*Orycteropus afer*, Pall.), is the only species with an Edentate host.

Trichodectes gastrodes *, sp. n.

The new species is readily distinguished by its large dimensions (see p. 100), the form of the head (see figs. 2 & 3, p. 96), and by the character of the abdomen, which, being in both male and female without tergites or sternites, is loose and

* "The Potbellied Louse" is suggested as a popular name.

sac-like, without any external signs of segmentation except in the ♂. In this sex there is a pair of rather large pleurites on the two basal segments; on each of the others, up to the seventh, a pair of small, narrow, chitinous slips situated transversely in the pleural region on each side. In the ♀ these slips are absent, but there are two pairs of large pleurites at the base and one pair at the end, on the penultimate segment of the abdomen.

External Form. Male.—Head: fig. 2 is an accurate representation of the outline of the head, and makes unnecessary the usual circumlocutionary phrases. The notable features are the rather deep semicircular frontal sinus (which has a deep marginal band of dark brown chitin divided into two parts by a median longitudinal line), the large size of the basal segment of the antenna, and a gular plate (see fig. 3, *GP*) broader than long, lying between the two longitudinal bands that run forward on the ventral surface of the skull *.

There are two small circular sensoria close together on the ventral surface of the third segment of the antenna.

Thorax: the parts were too crushed to allow of description. Apparently it resembles that of the ♀ closely.

Abdomen: the first two pairs of pleurites are large plates with a firm outer but an irregular inner margin, the second pair a little smaller than the first, both of a deep brown colour. On the succeeding segments the pleurites are small, thin, transverse slips. At the posterior end of the last segment are two lobes forming the hind margin of the segment and apparently the posterior lip of the genital opening. These two lobe-like pieces are rounded and white, covered with short bristles; they run in towards one another, but do not meet. Two brown bands of chitin run forward on the ventral surface as far as halfway to the base of the abdomen, one on each side of the copulatory apparatus, which is seen through the transparent integument.

The above description is necessarily incomplete, and may have to be emended in some respects when new and better-preserved material is forthcoming.

External Form. Female (fig. 3).—The usual sexual differences in the antennæ (see figure).

Thorax: pronotum is quite short; lateral margins slightly divergent the one from the other. Meso + metanotum equally

* A gular plate of this character is present in many Mallophaga, *e. g.*, *Nirmus varius*, Nitzsch, *Nirmus vulgatus*, Kell., *Lipeurus quadripustulatus*, Piag. The peculiar structures in this part of the head in *Ancistrona* and *Pseudomenopon tridens* are, perhaps, modified gular plates.

Fig. 2.

Fig. 3.

Fig. 2.—*Trichodectes gastrodes*, sp. n. Head, ♂, dorsal view.
Fig. 3.—Ditto, ♀. *GP*=Gular plate; *M.St*=Mesosternum; *Gon*=Gonopod.

short, a little broader, with lateral margins convex. Posterior margin straight. A considerable area adjoining the posterior margin medially is pale or white, the chitin being thin, and the thicker, deep brown chitin ceasing in an irregular edge.

A strongly developed mesosternum is present, and shown in the figure. Within the prothorax on each side a thin rod runs from the dorsal side to the ventral, taking its origin from the posterior margin of pronotum, and then running downwards and outwards to be inserted into the anterior lateral angle *ventrally*. On the ventral surface of the meso + metathorax on each side are the usual two acetabular bars—strong, rather short, running inwards and downwards on the under surface of the meso + metanotal wing, and helping to suspend the coxæ, into which they are inserted.

Abdomen: as in the ♂, there are at the base two large pleurites on each side. In the ♀ these are succeeded on the next segment by a minute atrophied pleurite on each side, the chitin of which appears to be partially disintegrated. On the other segments, except the penultimate, the pleurites are completely absent. The penultimate pair are large plates, with irregular inside margin, lying in the dorsal surface. The basal plates lie laterally. Tergites and sternites are absent except for a tergite on the last segment, almost divided in two by a median longitudinal line of weak chitinization. On the sternum of the same segment, partly covered by the large gonopods, is a brown mark of peculiar shape (see fig. 3).

The gonopods are strongly chitinized flaps of considerable size, articulated ventro-laterally so as to cover much of the lower surface of the last segment. In dorsal view, the free edge of the gonopod is seen on each side, at its base articulating by a rather wide and circular hinge with the pleurite of the penultimate segment.

In both ♂ and ♀ the abdomen is large, loose, and "baggy."

Chætotaxy. Male.—Head: around and just behind the rim of the frontal sinus on the dorsal surface four widely-spaced hairs. A little way in the rear of the first and fourth, another hair. In front of the antenna, a small hair. Around the temple margin, four or five small hairs. Inside the margin, one behind the other, five hairs of somewhat larger size, the first separated by a wide space from the ones behind. Three or four hairs on the promontory on each side of the sinus. Other hairs on dorsal surface arranged as shown in the figure. Ventral surface apparently bare. On upper surface of first segment of the antenna, a row of six large

hairs well spaced one beside the other and extending from the proximal to the distal extremity. Preaxially a single hair. On segment 2, three hairs on the upper surface and one long one on postaxial margin. On segment 3, at the postaxial angle of the distal end, four or five stout hook-shaped denticles; on the preaxial side a patch of short spines. Preaxially three hairs, postaxially two, on dorsal surface two.

Thorax and abdomen: chætotaxy too uncertain to justify description.

Chætotaxy. Female.—Antennæ more heavily set with hairs.

Thorax: a short hair on each lateral margin of the prothorax and two on each lateral margin of the meso-metathorax.

Abdomen: on the dorsal surface, probably a row of small hairs across each segment.

A moderately long bristle on each pleurite of penultimate segment. Several fairly long hairs along lower margin of tergite, two of these close together at the postero-lateral corner of the tergite. On the terminal sternum two patches of minute hairs, closely set one on each side of the middle line. Along the lower margin of the gonopod, seven or eight longish hairs.

Mouth-parts.—The left mandible is a powerful, gnarled-looking weapon, complex in form and moulding*. For the purpose of description it may be divided into halves—a proximal and distal—by a transverse band of dark brown chitin on the ventral surface. The proximal half is a kind of pedestal on which the rest of the mandible is set. The distal half, narrower than the base, ends in three distinct apices irregularly placed. There are the usual two articular surfaces, one a rounded condyle beneath the basal process, and the other a rather large concavity into which fits a big tendon. The basal process is rather long and bent, as usual, so as to point horizontally. Distally the opposable surface of the mandible possesses the usual transverse ridges, disposed in two series separated from one another by a smooth, concave area.

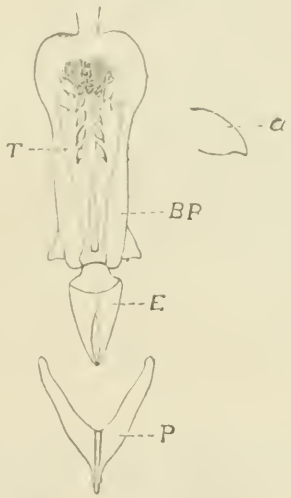
The right mandible possesses a wide straight base-line, and from the outside two-thirds of this the main body of the mandible arises, leaning outwards at first and then bending inwards sharply, making an angle on the outer margin,

* The mouth-parts, especially the mandibles and the œsophageal sclerite (or lyriform organ), afford useful systematic characters in the Mallophaga.

where the tendon of the large extensor muscle is inserted. The inner third of the base of the mandible is a short rectangular projection. There is a single sharp apex and a series of oblique ridges on the opposable surface. A small plate with a round even margin overlaps the outer edge just behind the apex, giving the appearance of a casque or hood over the outer margin.

Labium.—The anterior margin is straight, without lobes or prominences. At each lateral angle, set in a dark brown socket of thick chitin, is the so-called paraglossa—a stout

Fig. 1.



Trichodectes gastrodes, sp. n. Copulatory apparatus, ♂, × 45.
BP=Basal plate; *E*=Endomere; *P*=Paramere; *T*=Denticle on sac. *a*. Denticle enlarged.

single-segmented lobe, tapering slightly at the distal end. The tip of this appendage is obliquely truncate, the outer margin being longer than the inner. On the apex pointing inwards are four or five minute spines set on relatively large round pedestals. On the ventral surface of the labium between the paraglossæ are eight spines arranged in a circle. Immediately behind this circle is a transverse brown band, which splits into two branches at each end, one running up to the front margin and the other running backwards and disappearing in the clear chitin behind the mouth. This is probably a supporting sclerite for the labium.

Isopogometric Apparatus.—Anterior cornua of the sclerite as long as the main body. The distal end of each cornu rounded, narrower than at the base. The main body is lemon-shaped, the posterior narrow end drawn out into a short truncate "tab." The upper surface is concave; on each side a narrow chitinous band runs up on each side of the pharynx. This band partly arises from the basal part of the anterior cornu. The "glands" or basal pieces are rounded oval, each with a thick stout tendon inserted into it behind, some way in front of the posterior margin. Around the bifurcating chitinous chords is a thin plate (? hypopharynx. A similar piece is present and has been described in *Lipeurus ferox*, P. Z. S. 1913, p. 129).

Male Copulatory Apparatus (fig. 4, p. 99).—The *basal plate* is of rather complex sculpture, sufficiently shown in the figure. In the median area it is thin and transparent, the lateral margins, however, being thickly chitinized. *Parameres* fused at the tips. Each paramere is a short band, narrow at the base, broader at the end, where it fuses with its fellow along the whole line of its breadth and projects in front as a small, somewhat depressed beak. *Endomeres* are fused together at the base and shaped like a pair of tweezers. The "*preputial sac*" is remarkable for the possession of a number of large denticles, of which there are two longitudinal rows, four in each, with a large number of smaller teeth in a group behind. This description, it must be pointed out, is made of the apparatus *retracted*.

By reference to the sketch of the genitalia of *T. mephitidis* in the paper by V. L. Kellogg and G. F. Ferris ("Anoplura and Mallophaga of N. American Mammals," Stanford University Publications, 1915, pl. viii. fig. 4), it may be surmised that the genitalia of that species closely resemble *T. gastrodes*. On this and other smaller characters *T. mephitidis*, Osb., and *T. interrupto-fasciatus* should, perhaps, be regarded as the nearest allies of *T. gastrodes*.

Measurements (*millimetre-scale*).

	♂.		♀.	
	Length.	Greatest width.	Length.	Greatest width.
Head.....	·71	·85	·73	·87
Thorax.....	·32	·71	·35	·72
Abdomen.....	1·73	·90	1·72	1·10
Total.....	2·76		2·80	

	♂.		♀.	
	Length.	Width.	Length.	Width.
Antennæ:				
Segment 1 ..	·30	·16	·11	·09
2 ..	·19	·08	·13	·06
3 ..	·18	·08	·19	·07
Total.....	·67		·43	

	♂.			♀.		
Length of legs:	1st.	2nd.	3rd.	1st.	2nd.	3rd.
Femur	·21	·30	·33	·20	·30	·30
Tibia+tarsus..	·31 (+claw)	·38	·38	·3 (+claw)	·40	·38
Claw	..	·12	·15	..	·13	·12
Total	·52	·80	·86	·50	·83	·80

Family Docophoridæ.

Paragoniocotes, gen. nov.

This is a new parrot genus known to me by several species, only one of which has hitherto been described, viz., the species from *Calopsittacus nova-hollandiæ* named in 1880 by the indefatigable Piaget *Goniocotes fasciatus* ('Les Pédiculines,' 1880, p. 236, pl. xix. fig. 11). *G. fasciatus* is a simple member of the genus in which the two large recurved frontal processes one on each side of the head, so characteristic a feature of the new species about to be described, are absent.

The genus may be shortly diagnosed as follows:—

Head broader than long. Front margin circular, temples rounded, with an elongate bristle. Prothorax narrow, abdomen short and small. Small species infesting parrots.

The mouth-parts and male copulatory apparatus may also provide some generic characters. Although the general facies recalls the Goniodidæ, the genitalia in the male are distinctly Nirmoid in character, so that in all probability it is more correct to include this genus in the family Docophoridæ, raised by Mjöberg in 1910 to include the genera *Docophorus*, *Nirmus*, and *Pseudonirmus*.

Paragoniocotes gripocephalus, sp. n.

This species is described from spirit-material, probably of some considerable age, in the collection of the British Museum, and taken, according to the label inside the tube, on *Chrysotis augusta* [now known as *Amazona augusta*, G. R. Gray], the only other information available concerning them being the locality indicated in the two words "August Amazon" (*sic*).

So far as I am aware, the only other member of the Mallophaga known from a *Chrysotis* is *Nirmus ligulatus*, Neumann, from *C. brasiliensis* (Bull. Soc. Hist. Nat. Toulouse, 1890, xxiv. p. 60, "Contribution à l'étude des oiseaux de la famille des Psittacidæ").

External Form. Male (fig. 5).—Head: pale in colour; in front of the antenna on each side is a large process, slightly curved, running downwards and backwards beneath the base of each antenna. Each process has a brown-coloured tip. The firm circular margin of the temples, the occipital line, and the two incrassations—one in front of each antenna—are notable characteristics. On each of the third and fifth segments of the antenna there is a minute hair, probably of a sensory nature, set in a large alveolus.

Prothorax much narrower than the head, short, parallel-sided. Clavicles* apparently absent. Meso+metathorax broadens out upon the abdomen, the sides being divergent.

Abdomen small, rather short; broadest at the sixth segment. Pale or whitish.

External Form. Female.—Head and thorax as in the ♂. Abdomen more regularly ovate, especially noticeable at the end of the abdomen, where the terminal segments maintain a firm unbroken curve, unbroken as in the ♂ by the somewhat sudden narrowing of the last segment. On each segment in the pleural region are two tergites, one on each side, leaving an uncovered median area. Tergites pale brown in colour. Gonopods small, represented by two delicate lobes. A rather long, almost parallel-sided genital plate, semitransparent or whitish. Posterior margin straight, transverse, and fringed with hairs. On each side of the plate, at about the level of the sixth segment, a small brown chitinous patch.

Chætotaxy. Male.—Head: along the frontal margin between the two incrassations four well-spaced hairs, the two middle ones short. Behind these, and between them and the mandibles on the dorsal surface two longer hairs. At about the level of the postaxial margin of the antenna on the dorsal surface, a short bristle, one on each side near the margin. Around the temple margin four hairs, well-spaced, the first three short, the fourth very long. Along the occipital line several short hairs. On the ventral surface, four well-spaced fairly long hairs on preantennal area behind the anterior margin.

Thorax: on the posterior lateral angle of the pronotum, a

* "Clavicle" is a term I borrowed in 1913 from vertebrate anatomy to signify the two endoskeletal rods in many Mallophaga which run from the "shoulder" of the pronotum down to the prosternum.

stout bristle. Along the hind margin of meso + metanotum a row of very elongate bristles, five or six on each side, leaving the line in the median part bare. On the sterna there are two bristles between each pair of coxæ.

Abdomen: provided with many very elongate bristles. On the dorsal surface, at the base of the abdomen there are four

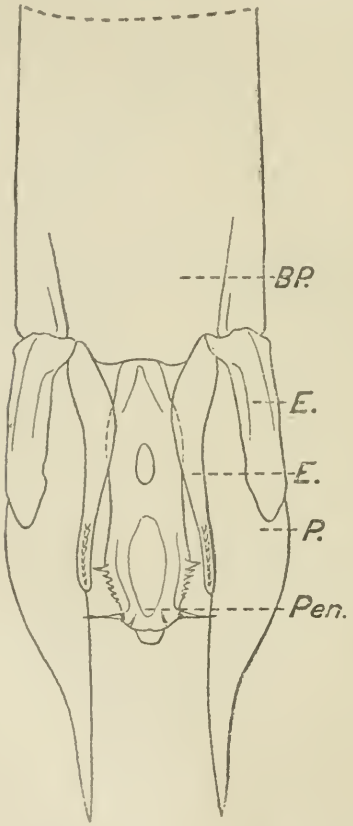
Fig. 5.

Paragoniocotes gripocephalus, sp. n., ♂.

well-spaced long hairs, the two outside ones situated further forward than the middle ones. Behind these are six hairs, a group of three in a row on each side of the middle line. An elongate bristle near the lateral margin on each side. On the next segment there is a closely-set row of four hairs on each side of the bare median area, with a very elongate pleural bristle. Similarly on the next three segments, in which the

short rows are set one on each side of the basal plate. Behind these are a couple of widely-spaced hairs on each side, and behind these again the usual two short transverse rows, three hairs on one side and four on the other. On the last tergum,

Fig. 6.



Paragoniocotes grippocephalus, sp. n. Copulatory apparatus, ♂ (ventral view), × 268.

BP. = Basal plate; *E.* and *E.* = Endomeral parts (?); *P.* = Paramere; *Pen.* = Penis, complex.

near the posterior margin, a semicircular row of six very small hairs. Along margin of upper lip of the genital opening six long bristles, one beside the other on each side. Several long bristles along margin of lower lip.

On the ventral surface of the last segment are scattered a large number of very elongate bristles. Chætotaxy elsewhere difficult to analyse with certainty: apparently five transverse rows of well-spaced thin hairs.

Chætotaxy. Female.—Abdomen: there are at least two long hairs on the median dorsal area of each segment except the last. On each of the lateral tergites 2 to 6 there is along the posterior margin a single elongate bristle (present also in the ♂). A pair of elongate straight bristles on the terminal margin of the abdomen.

Ventrally, at the base of the abdomen four widely-spaced hairs, the two middle ones very long. A row of seven or eight well-spaced hairs on the next five segments. Posterior segments covered by genital plate, which is bare except for the hind marginal fringe and a few minute pale hairs along the longitudinal furrows lying one on each side of the plate. Five stout bristles on each gonopod. Between the gonopod and the lateral margin three elongate bristles, two in front and one behind.

Male Copulatory Apparatus (fig. 6).—The male copulatory apparatus presents several interesting features. In the description which follows the attempt which has been made to homologize the parts must be regarded as merely tentative. The apparatus in this species is specialized, and rather difficult to interpret without intermediate species — forthcoming, perhaps, in other parrot parasites of the genus.

Basal plate delicate, thin, transparent, quadrilateral.

The rest of the genitalia are strongly chitinized and deep brown in colour:—

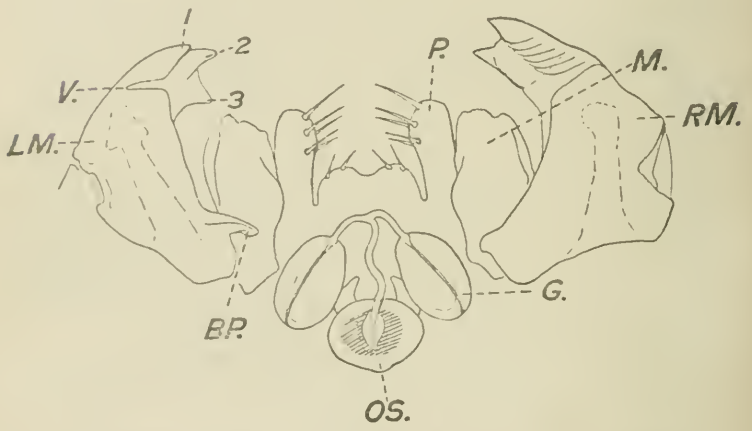
Parameres.—I regard as parameres the two broad blades which articulate with the middle part of the posterior margin of the basal plate, and overlie, so as almost to completely hide from view, the rest of the genitalia. Usually the parameres are attached laterally. Each paramere is elegantly curved on the outer margin and narrows to a slender tip, where a directive hair is situate.

Mesosome.—On each side of the parameres and articulated to the posterior lateral angles of the basal plate is a smaller piece shaped somewhat like a rabbit's ear. In rather close connexion with this piece, but attached to the basal plate ventrally so as to be quite hidden by the parameres, is still another appendage, narrow, rod-like, half as long as the paramere, and with a toothed lower edge. These two shorter appendages on each side—one dorsal and one ventral—may represent the endomeral parts of the mesodome. The Rev. J. Waterston has pointed out to me that

the endomeral portion of the copulatory sac is sometimes chitinized unevenly on each side into a more or less separate dorsal and ventral band. In the present case, if we suppose the intervening thin chitin of the sac to have disappeared, we are left with the two separate endodermal appendages on each side.

Penis.—Within the two inner rods lies a compound structure, an oblong hone-shaped box, consisting of fused penis, hypomeres, and endomeres, with two longitudinal rows of curved hooks on the lower surface, occupying the distal half of each lateral margin. The hooks are unequal in size. Near the

Fig. 7.



Paragoniocotes gripocephalus, sp. n. Mouth-parts, × about 260.

LM. = Left mandible; *RM.* = Right mandible; *BP.* = Basal process; *M.* = First maxilla; *P.* = Paraglossa; *OS.* = the so-called œsophageal sclerite; *G.* = "Gland."

tip, springing out from each lateral margin, is a directive hair, much longer than the longest hook, very straight, and of a whitish colour.

Mouth-parts (fig. 7).—Mandibles of a pale whitish colour proximally. A fairly strong ginglymus joint in front and a rather large rounded condyle behind. To each point of articulation a strong bar of chitin runs from the apical end.

On the *left* mandible there are three apices—two at the tip side by side and a large, broad, flat one projecting below these like a webbed toe. There is, in addition, the usual large basal process. On the lower or inner surface of the mandible, at the base of the first apical angle, is a small

V-shaped (V., fig. 7) groove running in transversely from the cutting-edge. The *right* mandible has two apices. At the base the lower of these two apical teeth is transversely ribbed, this ribbed surface working against a surface similarly ribbed on the lower side (and therefore not visible in the figure) of the first apical tooth of the opposite mandible.

First Maxillæ.—Soft lobes, longer than broad, with a small piece of thicker chitin on the outer margin as a support.

Labium.—The so-called paraglossæ, columnar, straight, are rather long with soft, rounded, distal ends. On the inner surface at the tip, four or five spines nearly as long as the lobe itself and all pointing inwards. Between these two appendages, the anterior margin of the labium runs out into two small round prominences, each possessing a few small spines.

Isopogometric Apparatus. — Œsophageal sclerite very rounded, a little broader than long. No posterior cornua. Anterior cornua thinly chitinized, short, rather broad, and invisible without dissection.

Measurements (*millimetre-scale*).

	♂.		♀.	
	Length.	Breadth.	Length.	Breadth.
Head	·35	·50	·4	·62
Pro thorax	·20	·28	·3	·32
Meso thorax		·50		·50
Abdomen	·67	·55	·88	·80
Total	1·2		1·58	

Length of antenna:	♂.
Segment 1	·082
2	·065
3	·041
4	·027
5	·032

Linognathoides citelli, sp. n.

In the 'Bulletin for Entomological Research' (vol. v. pt. 2, Sept. 1914, p. 160) I described a new species of Anoplura from a Sciurid, *Citellus leptodactylus*, under the name *Linognathoides spermophili*. Mr. Lancelot Harrison, B.Sc., has kindly pointed out that this name has already been used by Grube under a figure of *Linognathus laviusculus* (Grube) in Middendorff's 'Sibirischer Reise gesamm. Parasiten Zool.,' vol. ii. p. 498, t. ii. fig. 3 (1851). I therefore rename *Linognathoides spermophili* as *Linognathoides citelli*.

IV.—*On the Systematic Position of the Genus* Mycetobia, *Mg.* (*Diptera Nematocera*). By F. W. Edwards, B.A., F.E.S.

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For many years the small gnats of the genus *Mycetobia* have been a great puzzle to all Dipterists who have attempted to arrive at a natural classification of the order, owing to the fact that the adults appear to diverge very slightly in structure from typical members of the Mycetophilidæ, while, on the other hand, the larvæ differ little, if at all, from those of the family Rhyphidæ *, which has always been regarded as widely separated from the Mycetophilidæ.

Osten-Sacken, the foremost Dipterist of the last century, thus states the problem (Berl. ent. Zeit. vol. xxxvii. p. 442): "... I have shown the perfect unity of type prevailing among the larvæ of the different genera of this family. There is one exception to this rule, however.... It is the larva of *Mycetobia pallipes*, which is not peripneustic, like the larvæ of the other Mycetophilidæ, but amphipneustic; it shows the most remarkable resemblance to the larva of *Rhyphus*, and often occurs together with it. Three trustworthy observers have described the larvæ as amphipneustic: Lyonet, Dufour, and Perris. The two latter have found the larva together with that of *Rhyphus*, and were struck by their resemblance, although fully aware of the differences.... If there is a real relationship between the larvæ of *Mycetobia* and *Rhyphus*, we have a right to expect a corresponding relationship among the imagos. But, as this relationship does not exist, this is a problem yet to solve."

In spite of the high standing of the observers quoted by Osten-Sacken, a recent writer (Knab, Ann. Ent. Soc. Amer., March 1915, p. 95) has got over the difficulty by suggesting "that the supposed difference rests upon an error of observation." That this is not the case, however, has recently been found by Mons. D. Keilin, whose studies (as yet unpublished) have not only confirmed the observations of the early authors †, but have shown that the resemblance between the larvæ of *Mycetobia* and *Rhyphus* is even greater than they supposed.

* Throughout this paper the term *Rhyphus* has been used, though strictly, according to the rules of priority, it should be replaced by *Anisopus*.

† The main facts were also confirmed by Johannsen in 1910 ('Maine Agricultural Experiment Station, Bulletin 177').

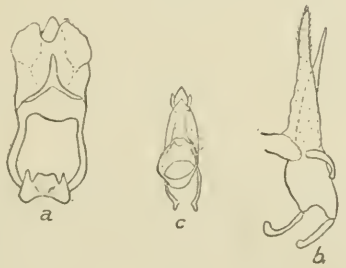
At M. Keilin's suggestion, I have devoted some study to the adult structure of the MYCETOPHILIDÆ and RHYPHIDÆ, in order to ascertain whether any characters can be found to support conclusions based on the study of larvæ and pupæ. Without claiming to have made at all an exhaustive investigation, I think I may safely state not only that such characters do exist, but that they should be taken into account in the classification of the Diptera as a whole.

In order to explain clearly what these characters are, it will be necessary to give a brief comparative account of the structure of the mouth-parts and the venation in the two families in question. In referring to the mouth-parts of the MYCETOPHILIDÆ I am relying partly on my own observations, but chiefly on the excellent work lately published by Dr. R. Frey (Acta Soc. Fauna et Flora Fennica, xxxvii. no. 2, 1913).

MOUTH-PARTS.

Mandibles.—There seems to be no trace of these in either of the two families.

Fig. 1.



Labrum, epipharynx, and hypopharynx of (*a*) *Olbiogaster africanus*, Edw., (*b*) *Rhyphus fenestralis*, Scop., and (*c*) *Mycetobia pallipes*, Mg.

Labrum.—In both the MYCETOPHILIDÆ and RHYPHIDÆ the labrum is very much reduced, being, as a rule, almost entirely membranous. There is, nevertheless, a considerable amount of variation. In the Rhyphid genus *Olbiogaster* a distinct chitinized piece is present on the upper side, the lower side (the so-called epipharynx) being chiefly membranous; in *Rhyphus* the upper side is membranous, the lower side more or less chitinized and provided with a fringe of hairs towards the tip; in *Mycetobia* the whole labrum is membranous.

Hypopharynx (fig. 1. p. 109).—Frey has found that in most Mycetophilidæ, as also in Sciaridæ and Cecidomyiidæ, the hypopharynx is but poorly developed, and is fused on to the upper surface of the labium. The only exception he noted was in the genus *Bolitophila*, in which the hypopharynx is free at the tip; he had not, however, examined a large number of forms, and *Mycetobia* was not among them—it has the hypopharynx very well developed and entirely free from the labium, being connected rather with the labrum. *Rhyphus* and *Olbiogaster* likewise have a free hypopharynx, though its form is very diverse in the three genera. In *Mycetobia* it is trilobed at the tip, the middle lobe having a finely toothed margin; in *Olbiogaster* it is simple, and also in *Rhyphus*, though in the last-named genus it is straighter and more pointed. It is connected with the "pharyngeal pump," which seems to be rather better developed in *Mycetobia* than in other Mycetophilidæ, and is even more conspicuous in the Rhyphidæ.

Maxillæ (fig. 2).—In both families the parts of the maxillæ present are stipes, galea, and palpus. The stipites are apparently absent in *Ditomyia* (fig. 4 *a*) and perhaps in *Macrocera*; small in *Platyura* (fig. 4 *b*); well developed in the other genera, attaining their greatest size in the more typical Mycetophilidæ, such as *Phronia* (see fig. 4 *d*), *Exechia*, and *Mycetophila*. In these last-mentioned forms the galea or blade of the maxilla is very much reduced, but in the more primitive Mycetophilidæ and in the Rhyphidæ it is quite large.

The maxillary palpi of *Rhyphus* are four-jointed (without reckoning the small basal palpiger, which may be a true joint). The second joint is somewhat enlarged, and contains a peculiar gland provided with a duct which opens by a pore at the tip of the joint. *Olbiogaster* has similar palpi, but the joints differ in their relative lengths, and the duct of the gland in the second joint is shorter; the palpiger has more the appearance of a true joint. In *Mycetobia* the palpi are only three-jointed, but, as the basal joint contains a gland very similar to that of *Rhyphus*, it is probably safe to assume that the palpi have become three-jointed by the fusion of the first two. In both genera the penultimate joint is roundish, the terminal one more elongate. Many Mycetophilidæ possess a structure in the second palpal joint which is, perhaps, comparable with the gland above referred to; but in no other case that I have observed is this gland provided with a duct, nor does it (except in the case of *Simulium*,

where it is well developed) appear to possess any opening to the exterior.

Labium (fig. 2).—The homologies of the different parts of the labium are still very uncertain. The structures usually

Fig. 2.

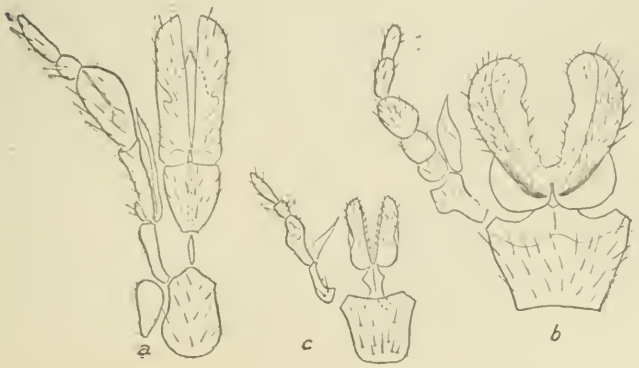


Fig. 3.

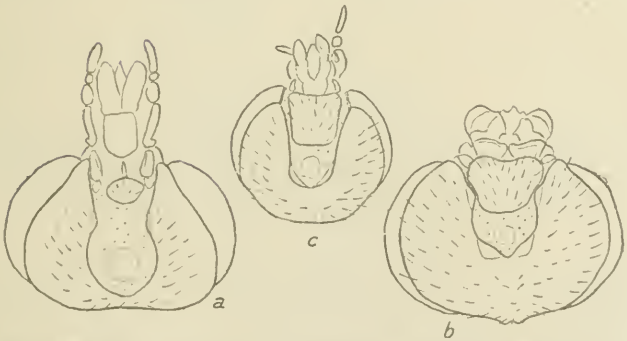


Fig. 2.—Maxilla and labium of (*a*) *Rhyphus fenestralis*, Scop., (*b*) *Olbiogaster africanus*, Edw., and (*c*) *Mycetobia pallipes*, Mg.

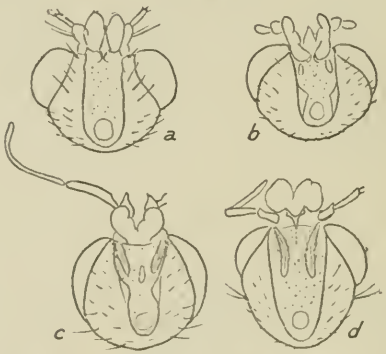
Fig. 3.—Under surface of head of (*a*) *Rhyphus punctatus*, Fabr., (*b*) *Olbiogaster africanus*, Edw., (*c*) *Mycetobia pallipes*, Mg. Note the large hairy gular plate.

known as labella in Diptera are regarded by Kellogg and others as being paraglossæ, by Frey as representing the labial palpi. The piece to which they are attached is

described by Kellogg simply as the "basal labial sclerite"; Frey homologizes it with the mentum. I am by no means certain that Frey's view is correct, since it usually shows a median groove or suture, indicating that it may have arisen by the fusion of paired structures. For convenience, however, it may be well to follow Frey.

In MYCETOPHILIDÆ the labium consists of the two large labella, usually two-jointed, attached to the mentum, at the base of which an ill-defined submentum is sometimes discernible. *Mycetobia* differs from all the other MYCETOPHILIDÆ * in possessing at the base of the labium a large hairy gular plate (figs. 2 *c* and 3 *c*) covering the forked end

Fig. 4.



Under surface of head of (*a*) *Ditomyia fasciata*, Mg., (*b*) *Platyura nemoralis*, Mg., (*c*) *Empalia vitripennis*, Mg., (*d*) *Phronia forcipula*, Winn. Note absence of gular plate, except in *c*; also great development of the maxillary stipites in *c* and *d*.

of the mentum †; to the anterior angles of this plate are attached the bases of the maxillary stipites. The only other Mycetophilid in which I have found any gular plate at all is *Empalia vitripennis*; in this case the plate is very small, bears no hairs, and is quite remote from the labium (fig. 4 *c*).

* I have examined from this point of view the following species:—*Diadocidia ferruginosa*, *Ditomyia fasciata*, *Symmerus annulatus*, *Bolitophila cinerea*, *Macrocera stigma*, *Platyura fasciata*, *P. nemoralis*, *Mycomyia inscisurata*, *Sciophila hirta*, *Empalia vitripennis*, *Tetragoneura sylvatica*, *Allactoneura cincta*, *Boletina sciarina*, *Docosia valida*, *Leiomyia subfasciata*, *Phronia forcipula*, *Exechia fungorum*, and *Mycetophila punctata*.

† It is possible that this "gular plate" is really the true mentum, which in that case is absent in the other MYCETOPHILIDÆ.

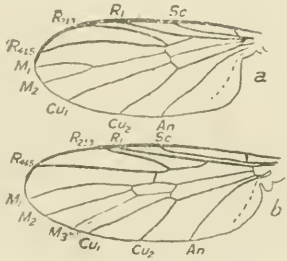
Turning to the Rhyphidæ, we find that in *Olbiogaster* (fig. 2 *b*) the labium differs from that of *Mycetobia* chiefly in having the mentum completely fused on to the gular plate, while the former, instead of the latter, provides the attachment for the maxillary stipites. *Rhyphus* (fig. 2 *a*) presents a very different structure: there is a well-marked median organ situated between the labella, which is regarded by Kellogg ('Psyche,' vol. viii. p. 356) as representing the fused glossæ; a small narrow plate is inserted between the mentum and the gular plate, on each side of which last is another plate, which may, perhaps, be regarded as the cardo of the maxilla.

A gular plate entirely comparable with that of the Rhyphidæ occurs in *Ptychoptera* and in *Trichocera*, though it appears to be absent in *Dixa*. A similar plate is to be found in at least some of the Brachycera and in the Muscidæ, where it is fused with the head-skeleton; it has been figured for *Musca* by Wesché (J. R. Micr. Soc. 1909, pl. iv.), who regards it as the mentum.

Venation.

The Rhyphidæ and Mycetophilidæ agree in having a costa which does not extend beyond the tip of the wing, but

Fig. 5.



Wing of (*a*) *Mycetobia pallipes*, Mg., (*b*) *Olbiogaster sackeni*, Edw.

differ widely in that the former have a three-branched media and a discal cell, whereas the latter never have more than a two-branched media and no discal cell.

At first sight it is not easy to connect these two types, but if in the wing of *Rhyphus* we suppress the third branch of the media, and with it the cross-vein forming the discal cell, a condition very much resembling that of *Mycetobia* is arrived

at, and the following points of resemblance between the two genera become more apparent:—(1) the radial sector forks basally to the R-M cross-vein, or, in other words, the small cross-vein is situated on the third longitudinal vein, instead of on the præfurca; (2) the lower branch of the cubitus is distinctly sinuous, the cell Cu_1 having a convexity on the lower side towards the base. The resemblance between the venation of *Mycetobia* (fig. 5 *a*) and *Olbiogaster* (fig. 5 *b*) is in some respects still more marked, and it is worthy of particular notice that in *Olbiogaster africanus*, Edw., and still more conspicuously in *O. sackeni*, Edw., the lowest of the three veins arising from the discal cell (M_3) is less strongly chitinized than the other two, suggesting that the venation of *Mycetobia* has arisen directly from that of *Olbiogaster* through the obsolescence of M_3.

In almost all other MYCETOPHILIDÆ the radial sector, when it forks at all, does so nearer the wing-apex than the position of the R-M cross-vein, which, besides, is usually sloping, and not straight as it is in *Mycetobia*. The only exception to this rule is the genus *Pachyneura*, in which the radial sector forks exactly at the R-M cross-vein. In all other MYCETOPHILIDÆ, with the exception of *Leiomyia* (*Glaphyroptera*) and its allies, the cell Cu_1 is concave instead of convex on its lower margin. *Ditomyia* and *Symmerus*, genera which, together with *Mycetobia*, have been made to form the subfamily MYCETOBIINÆ, agree in both these respects with the other MYCETOPHILIDÆ, and I therefore consider that they are not at all closely related to *Mycetobia*. The genus *Mesochria*, recently described from the Seychelles Islands, is, on the other hand, closely related to *Mycetobia*. Its venation is very interesting, as the media is evanescent; it evidently represents a further stage of evolution from *Mycetobia*, in which the lowest branch of the originally three-branched media has already disappeared.

A comparison with other Diptera as regards the position of the radial fork reveals the fact that in the Tipulidæ, Culicidæ, Psychodidæ, Orthorrhapha Brachycera, and Cyclorrhapha it always takes place anteriorly to the R-M cross-vein, whereas in the Chironomidæ, Simulidæ, and Bibionidæ the radial sector is usually simple, but when it forks does so beyond the R-M cross-vein. An apparent exception to this rule, however, is the Bibionid genus *Eupeitenus*. It is also noteworthy that in the families of the first group the media is primitively three-branched, while in those of the second it is never more than two-branched.

Other Characters.

As regards the other characters—those of the thorax, abdomen, and legs,—not much need be said. *Rhyphus* is peculiar in having holoptic eyes in the male and greatly enlarged empodia ; it does not, however, share either of these characters with *Olbiogaster*, which resembles the Mycetophilidæ rather than *Rhyphus* in both these respects.

Of the male genitalia, which usually provide sound indications of relationship, I have made no comparative study ; but it is noteworthy that *Mycetobia* appears to be the only Mycetophilid which possesses chitinous spermathecæ in the female. Of these, there are two in *Mycetobia*, two (or, perhaps, three) in *Olbiogaster*, one in *Rhyphus*.

Conclusions.

1. *Mycetobia* agrees with the Rhyphidæ and diverges from the Mycetophilidæ in the possession of a large gular plate, in the structure of the second palpal joint, in the position of the forking of the radial vein, the course of the cubital vein, and in the chitinous spermathecæ of the female. Since the venation of *Mycetobia* has been shown to be directly derivable from that of the Rhyphid genus *Olbiogaster*, it is probable that any resemblances in this respect to the Mycetophilidæ are due to convergent evolution, and not to relationship. The genus *Mycetobia* (and with it *Mesochria*, though not *Ditomyia* or *Symmerus*) must therefore, on grounds of adult as well as larval structure, be transferred from the Mycetophilidæ to the Rhyphidæ.

2. It is at least possible that the characters of the gular plate and of the position of the radial fork will be found on full investigation to divide the Nematocera into two groups, and there is evidence that these groups may coincide with those founded on other characters, notably the tracheal system of the larva ; this evidence, therefore, tends to confirm Knab's recent division of the Nematocera (Ann. Ent. Soc. Amer. vol. viii. p. 93, March 1915) into Oligoneura, with peripneustic larvæ, and Polyneura, with amphipneustic larvæ. The genus *Pachyneura* seems to require special study, owing to the intermediate character of its venation, and *Eupeitenus* is also aberrant.

3. If, as seems probable from many considerations, the higher Diptera have been derived from the Polyneura and the Oligoneura represent an entirely distinct line of evolution,

the primary division of the order should be neither into Orthorrhapha and Cyclorrhapha, nor into Nematocera and Brachycera, but into Polyneura and Oligoneura, the former including, in addition to the Tipulid-Culicid group of the Nematocera, the whole of the Cyclorrhapha and the Orthorrhapha Brachycera.

V.—*Notes on Fossorial Hymenoptera.*—XIX. *On new Species from Australia.* By Rowland E. Turner, F.Z.S., F.E.S.

Family **Mutillidæ.**

Ephutomorpha submetallescens, sp. n.

♀. Cærulescens; abdomine pedibusque cupreo-purpureis; antennis nigris; mandibulis nigris, basi ferrugineis; segmentis dorsalibus 1–5 macula apicali albo-hirta.
Long. 12 mm.

♀. Head distinctly narrower than the thorax, closely and rather coarsely punctured, not much narrowed behind the eyes, rather strongly rounded posteriorly; eyes large, as near to the posterior margin of the head as to the base of the mandibles; antennal tubercles well developed, second joint of the flagellum as long as the first and third combined. Thorax very coarsely reticulate, nearly twice as long as the greatest breadth, a little broader in the middle than on the anterior margin, the apical third rather strongly narrowed. Abdomen closely punctured, the punctures on the second dorsal segment larger than on the others and more or less confluent; first segment oblique from near the apex to the base, slightly constricted at the apex, with a spine on each side at the base beneath and with a small patch of white hairs at the apex; second dorsal segment very long, more than half as long again as the greatest breadth, narrower at the extremities. No pygidial area. The sides of the apical segments clothed with long black hairs. Intermediate and hind tibiæ without spines on the outer margin. Calcaria white, the outer apical angle of the tibiæ produced into two short spines much less than half the length of the calcaria.

Hab. Brisbane (*Hacker*); February.

This is very nearly related to *E. metallica,* Sm., but

differs in the absence of a longitudinal depression on the basal half of the second dorsal segment, in the greater breadth of the thorax, which is more than twice as long as the greatest breadth in *metallica*, and in the greater length of the second dorsal segment. The colour of the thorax is also different. The type of *metallica* is from Adelaide, but the species ranges as far west as Perth.

Ephutomorpha dilecta, sp. n.

♀. Cærulea, abdomine viridi-æneo; antennis mandibulisque nigris; pedibus fuscis, femoribus intermediis posticisque basi, tibiisque posticis supra ferrugineis.
Long. 10 mm.

♀. Head no broader than the thorax, closely and not very finely punctured, not narrowed behind the eyes, the posterior angles very feebly rounded; eyes large, a little nearer to the posterior margin of the head than to the base of the mandibles; antennal tubercles well developed; second joint of the flagellum as long as the first and third combined. Thorax nearly twice as long as the breadth on the almost straight anterior margin, strongly narrowed from behind the middle; coarsely reticulate. Abdomen closely and finely punctured; first segment oblique from near the apex to the base, slightly constricted at the apex, with a spine on each side at the base beneath; second segment about half as long again as the greatest breadth, not much broader in the middle than at the apex, more strongly punctured than the other segments, a small patch of white hairs at the apex of segments 2–5. No pygidial area. The sides of the apical segments clothed with long black hairs. Intermediate and hind tibiæ with one well-developed spine near the middle of the outer margin, the apex of the tibiæ above produced into two spines nearly as long as the calcaria, which are black.

Hab. Brisbane (*Hacker*); June.

In many points this is related to *submetallescens*, but differs in the armature of the tibiæ, in colour, and in the shorter second abdominal segment. It is quite distinct from *amœna*, André, and other metallic species from North Queensland.

Family Thynnidæ.

Zaspilothynnus excavatus, Turn.

Thynnus excavatus, Turn. Proc. Linn. Soc. N.S.W. xxxiii. p. 216 (1908). ♂♀.
Zaspilothynnus excavatus, Turn. Wystman's Gen. Insect. cv. p. 53 (1910).

The typical form is from Kuranda, North Queensland. A pair sent from the Queensland Museum differ in colour from the typical form, the male having the four apical dorsal segments of the abdomen wholly ferruginous red, whereas the Kuranda specimens have the same segments brownish yellow more or less marked with black, the fourth segment being often wholly black. The female has the abdomen more strongly marked with yellow than in the type, but Kuranda specimens vary much in this respect and in one specimen the yellow markings are almost as large as in the Brisbane form. The only structural differences are the slightly shorter hypopygium of the male, and the slightly narrower head of the female in the Brisbane form. These differences may prove to be of subspecific value.

Tmesothynnus ingrediens, sp. n.

♂. Niger; clypeo linea marginali utrinque, mandibulis basi, macula obliqua utrinque inter antennas, pronoto linea transversa utrinque antice, postscutelloque albido-flavis; alis hyalinis, venis nigris.

♀. Bruneo-ferruginea; segmento mediano nigro; segmentis abdominalibus tertio, quarto quintoque plus minus infuscatis; segmento dorsali secundo transverse quadricarinato.

Long., ♂ 9 mm., ♀ 6 mm.

♂. Head and thorax closely and rather finely punctured, abdomen more sparsely punctured, median segment shining, very minutely punctured. Clypeus truncate at the apex; antennæ about as long as the thorax and median segment combined, of even thickness throughout, the prominence between the antennæ almost obsolete. Head very thin and flat. Anterior margin of the pronotum straight and slightly raised, median segment rounded. Abdominal segments strongly constricted at the base, the seventh dorsal segment very broadly rounded at the apex. Hypopygium with parallel sides, broadly and shallowly emarginate at the apex, with a long apical spine. Second abscissa of the radius longer than the third, second recurrent nervure received at about one-tenth from the base of the third cubital cell.

♀. Head broader than long by about one-third, the sides slightly sinuate in the middle; eyes small, oblique, narrowly ovate, nearly touching the base of the mandibles; front sparsely punctured, without a sulcus, vertex almost smooth; mandibles long and falcate, not toothed. Pronotum finely punctured, much broader than long, distinctly narrowed posteriorly, the anterior angles prominent; scutellum broader

than long, broadly rounded at the apex; median segment rather closely punctured, the dorsal surface a little longer than the scutellum and not divided from the oblique posterior slope. Abdomen shining, microscopically punctured, with a few larger punctures near the apex of the third, fourth, and fifth segments; first dorsal segment rather strongly depressed on the apical margin; second with four strong transverse carinæ, including the raised apical margin; pygidium narrowly elongate-ovate, pointed at the base, the sides forming marginal carinæ. Fifth ventral segment closely and deeply punctured at the apex.

Hab. Brisbane (*Hacker*); April and September.

This is near *T. iridipennis*, Sm., but has the clypeus much less strongly convex in the male. According to Smith the female of *iridipennis* has only two transverse carinæ on the second segment, and the male hypopygium is truncate, not emarginate.

Unfortunately the types are lost, having been in the Bakewell collection.

Epactiothynnus multicolor, sp. n.

♂. Rufo-ferrugineus; antennis, fronte ante ocellos, pronoto in medio, mesosterno segmentoque mediano nigris; mandibulis, clypeo, orbitis internis, macula bilobata inter antennis, pronoto margine anteriore et posteriore, tegulis, postscutello, segmento mediano macula magna curvata apicali utrinque, segmentisque dorsalibus quinque basalibus macula parva utrinque flavis; alis hyalinis, venis nigris.

Long. 8 mm.

♂. Clypeus scarcely convex, rather broadly truncate at the apex. Antennæ nearly as long as the head, thorax, and median segment combined, slender, the apical joints a little narrowed; the interantennal prominence almost obsolete. Head and thorax finely and closely punctured; the pronotum short, slightly emarginate anteriorly. Median segment shining and almost smooth; abdomen slender, sparsely and shallowly punctured, the segments constricted at the base. Seventh dorsal segment more coarsely punctured; hypopygium with a long apical spine, narrowed from the base, with a small spine on each side at the base. Second abscissa of the radius a little shorter than the third, second recurrent nervure received at about one-fifth from the base of the third cubital cell.

Hab. Oxley, near Brisbane (*Hacker*); September.

This is the eastern representative of *excellens*, Sm., but is

a more slender species, the first abdominal segment is much narrower and proportionately longer, the scutellum is rather less convex, the third abscissa of the radius is much longer, and the second recurrent nervure is received further from base of the third cubital cell.

Dimorphothynnus bicolor, Westw.

Enteles bicolor, Westw. Arc. Ent. ii. p. 143 (1844). ♀.
Thynnus zingerlei, D. T., Cat. Hym. viii. p. 119 (1897). ♀.
? *Rhagigaster hæmorrhoidalis*, Guér. Mag. de Zool. xii. (1842). ♂.
? *Thynnus lecheri*, D. T., Cat. Hym. viii. p. 110 (1897). ♂.
Enteles hæmorrhoidalis, Turn. Proc. Linn. Soc. N.S.W. xxxii. p. 242 (1907). ♀.

I used the name *hæmorrhoidalis* for this species in my revision of the group, probably correctly. But since that time I have received the male of *Rhagigaster castaneus*, Sm., which would fit Guérin's very brief description equally well. There can therefore be no certainty as to Guérin's species without seeing the type. *D. fimbriatus*, Sm., ♂, is a distinctly larger species.

The pair of *D. bicolor* in the British Museum is from Perth, W.A. There is a series of *D. fimbriatus* from Adelaide, S.A., and Yallingup, W.A.

Dimorphothynnus fimbriatus, Sm.

Thynnus fimbriatus, Sm. Cat. Hym. B.M. vii. p. 42 (1859). ♀.
Rhagigaster apicalis, Sm. Cat. Hym. B.M. vii. p. 63 (1859). ♂.
Thynnus ottonis, D. T., Cat. Hym. viii. p. 112 (1897). ♂.

In my revision of the Thynnidæ (Proc. Linn. Soc. N.S.W. xxxii. p. 242, 1907) I treated this species as a synonym of *D. hæmorrhoidalis*, Guér. Further material has come to hand since and shows that I was mistaken. The female *fimbriatus* differs from *bicolor*, Westw., in the shape of the head, which is shorter and much more strongly rounded posteriorly, the pronotum and scutellum are shorter; the median segment is very short, only half as long as in *bicolor*; the carinæ on the second dorsal segment are somewhat stronger; the pygidium is much narrower, being very broadly oval in *bicolor*, elongate and narrowed to the apex in *fimbriatus*, the striation of the pygidium is much coarser, and there is a tuft of long pale hairs on each side, springing from beneath the dorsal plate of the pygidium, which is absent in *bicolor*. The male *bicolor* has the enclosed triangular space on the clypeus narrower than in *fimbriatus*; the seventh dorsal segment more rounded at the apical angles,

less distinctly truncate; the second transverse cubital nervure much less oblique, which makes the second abscissa of the radius much longer than the third, not shorter as in *fimbriatus*, and the second recurrent nervure is received close to the base of the third cubital cell, distinctly closer than in *fimbriatus*. The extent of difference in these details of neuration varies individually to a certain degree. The type of *fimbriatus* from Adelaide is identical with specimens from Yallingup, W.A.

A form from Brisbane (*Hacker*), taken in March, is probably a subspecies, the male differing in having the triangular space on the clypeus narrower; the female in the form of the sixth dorsal segment, which has the sides almost parallel.

Dimorphothynnus truncicutis, sp. n.

♂. Niger, nitidus, albo-pilosus; alis fusco-cæruleis.
Long. 16 mm.

♂. Clypeus finely punctured, thickly clothed with white pubescence; a narrow triangular area extending from the base to the apex, pointed at the base, with distinct lateral carinæ, the narrow space enclosed by the carina irregularly rugose-striate. Antennæ scarcely longer than the thorax, of even thickness throughout; the interantennal prominence broad, very broadly rounded at the apex and irregularly longitudinally striated, separated from the front by a transverse carina which does not reach the eyes, from this carina an arched carina extends over the anterior ocellus enclosing an almost semicircular space. Vertex shining, finely and rather sparsely punctured. Pronotum scarcely half as long as the mesonotum, finely transversely striate-rugulose, the anterior margin raised and almost straight, the anterior angles of the prothorax acutely produced beneath. Mesonotum and scutellum shining, sparsely punctured, the dorsal surface of the scutellum flat, transverse at the apex and almost vertically truncate posteriorly; mesopleuræ coarsely punctured. Median segment shorter than the scutellum, closely punctured at the sides, sparsely in the middle, almost vertically truncate posteriorly, the dorsal surface separated from the posterior slope by a strong carina. Abdomen closely but not coarsely punctured, the segments slightly constricted at the base; first ventral segment with a strongly raised longitudinal carina which is broken before the apex so as to form an apical and a pre-apical tubercle. Seventh dorsal segment very broadly truncate at the apex, the base

coarsely punctured, the apex longitudinally rugulose. Spine of the hypopygium long and recurved. Third abscissa of the radius distinctly longer than the second, second recurrent nervure received just before one-quarter from the base of the third cubital cell.

Hab. Brisbane (*Hacker*) ; September.

Very nearly allied to *morio*, Westw., but may be distinguished by the colour of the legs, which are ferruginous in *morio*, by the great breadth of the scutellum at the apex, and by the much coarser sculpture of the mesopleuræ. *D. morio* is not uncommon round Sydney and has been taken by Mr. Hacker on Stradbroke Island.

Eirone subpetiolata, sp. n.

♂. Niger; mandibulis, antennis, fronte, vertice, pronoto fascia arcuata, mesonoto, scutello tegulisque pallide ferrugineis ; clypeo, orbitis internis late, pronoto postscutelloque flavis ; alis hyalinis, venis nigris.

Long. 8 mm.

♂. Clypeus slightly convex, truncate at the apex, without a flat triangular area ; the whole head finely punctured. Antennæ rather slender, scarcely as long as the thorax and median segment combined, the apical joints feebly arcuate beneath. Ocelli in an equilateral triangle, the posterior pair more than twice as far from the eyes as from each other. Pronotum about half as long as the mesonotum ; scutellum broadly rounded at the apex, the whole thorax finely punctured. Median segment rounded, very minutely punctured, almost smooth at the base, with short white pubescence on the sides and apex. Abdomen fusiform ; dorsal segments 2–4 slightly depressed at the base, first segment very narrow at the base ; the whole abdomen shining, minutely punctured, more coarsely on the seventh segment. Hypopygium broadly rounded and ciliated. Third abscissa of the radius half as long again as the second, first recurrent nervure received just beyond the middle of the second cubital cell, second just beyond one-third from the base of the third cubital cell.

Hab. Brisbane (*Hacker*) ; April.

Allied to *E. rufodorsata*, Turn., from Herberton, but differs in the colour of the head and antennæ, in the slenderer antennæ, and in the slenderer first abdominal segment, also in the shorter second abscissa of the radius.

Family Psammocharidæ.

Batozonus tricolor, Sm.

Pompilus tricolor, Sm. Trans. Ent. Soc. London, p. 242 (1868). ♂.
Pompilus trichrous, D. T., Cat. Hym. viii. p. 327 (1897). ♂.

♀. Nigra; capite, antennis, segmentis abdominis quatuor analibus, segmento dorsali secundo vel toto vel dimidio basali, femoribus anticis, tibiis tarsisque aurantiacis; alis aurantiacis, apice infumatis, venis testaceis.
Long. 20–24 mm.

♀. Clypeus transverse at the apex, closely and minutely punctured, with a few larger punctures intermingled, the apex of the labrum exposed. Second joint of the flagellum nearly half as long again as the third; eyes separated on the vertex by a distance equal to the length of the third joint of the flagellum. Pronotum broadly arched posteriorly, not angulate; scutellum strongly convex. Median segment longer than the apical breadth, without sulcus or striæ, clothed with short fuscous hairs. Sixth dorsal segment punctured, sparsely clothed with long black hairs. Basal joint of fore tarsus with three spines; ungues of the fore tarsi bifid, of the intermediate and hind tarsi unidentate. Second abscissa of the radius nearly half as long again as the third, the first recurrent nervure received beyond three-quarters from the base of the second cubital cell, second a little beyond the middle of the third cubital cell. Cubitus of the hind wing originating at a distance before the transverse median nervure equal to about three-quarters of the length of the third abscissa of the radius. The fuscous apical margin of the wing does not extend to the third transverse cubital nervure.

Hab. Adelaide, S.A. (*Smith*), ♂; Mackay, Q. (*Turner*), ♀; Townsville, Q. (*Dodd*), ♀.

The sexes are exceedingly different, as is usual in this genus, but the neuration is similar. This is the Australian representative of the Indian *B. unifasciatus*, Sm., from which it differs in the colour of the thorax and abdomen, and in the slenderer median segment of both sexes, also in the longer second joint of the flagellum in the male. The group, which includes *B. fuliginosus* Klug, and *B. madecassus*, Sauss., is distinguished from other species of the genus by the great distance between the cubitus and transverse median nervure of the hind wing.

Batozonus vespoides, Sm.

Pompilus vespoides, Sm. Trans. Ent. Soc. London, p. 244 (1868). ♀.

♂. Niger; clypeo, orbitis internis lato, pronoto, tegulis, scutello macula quadrata, postscutello macula, segmento dorsali primo macula parva utrinque, segmentis dorsalibus 2–7 fascia lata transversa utrinque pallide flavis; antennis basi et subtus pedibusque ferrugineis, tibiis tarsisque posticis nigris; alis hyalinis, apice extremo pallido infumatis, venis nigris.
Long. 11–15 mm.

♂. Clypeus transverse at the apex, the labrum exserted. Antennæ stout, the joints moderately arcuate beneath, but less strongly so than in *tricolor*, second joint of the flagellum distinctly shorter than the third. Pronotum strongly rounded at the anterior angles, the posterior margin widely arched. Median segment broader than long, clothed with thin white pubescence. Seventh dorsal segment narrowly truncate at the apex. Second abscissa of the radius twice as long as the third, first recurrent nervure received at two-thirds from the base of the second cubital cell, second close to the middle of the third cubital cell. Cubitus of the hind wing originating just before the transverse median nervure. All the tarsal ungues bifid.

Hab. Mackay and Cairns, Q. (*Turner*); Brisbane, Q. (*Hacker*); Victoria (*French*).

This is the Australian representative of the group of the European *B. quadripunctatus*, Fabr., and is nearest to the Asiatic *B. orientalis*, Cam., the female of which has been described by Bingham under the name *bioculatus*. In the Oriental region a dark-winged form of the female occurs, named by Bingham *bracatus*, but I do not believe that any corresponding aberration occurs in Australia. The species is common in Queensland, but I never guessed the connection of the sexes during my residence there. *B. tricolor* seems to be a rare species. As far as I know these are the only two Australian species of *Batozonus*.

Aporoideus ultimus, sp. n.

♀. Nigra; clypeo linea transversa subapicali, fronteque macula parva utrinque flavidulis; mandibulis basi, femoribus, tibiis, tarsisque subtus ferrugineis; pronoto marginibus indistincte albidis; alis sordide hyalinis, venis nigris.
Long. 5 mm.

♀. Clypeus shallowly emarginate at the apex, the labrum not exposed; second joint of the flagellum half as long again

as the third; eyes converging a little towards the vertex; head finely and closely punctured, front with a distinct longitudinal sulcus. Pronotum short and broad; parapsidal furrows very indistinct; scutellum longer than broad. Median segment shorter than the pronotum, obliquely sloped posteriorly, with an almost obsolete median sulcus. Thorax and median segment subopaque; abdomen shining, almost smooth. Hind tibiæ with three or four fairly long spines on the outer margin; fore tarsi without a comb, with only a few very minute spines beneath the first joint; tarsal ungues with a small tooth near the middle. Second abscissa of the radius about equal to the third; first recurrent nervure received just beyond two-thirds from the base of the second cubital cell, second at the middle of the third cubital cell. Submedian cell a little longer than the median; cubitus of the hind wing originating distinctly beyond the transverse median nervure.

♂. Without the whitish band on the clypeus, the spots on the inner margin of the eyes very minute, the apical dorsal segment and a spot at the base of the hind tibiæ white. Pronotum entirely black.

Clypeus subtruncate at the apex; first recurrent nervure received close to the middle of the second cubital cell; fore tarsi smooth. Antennæ stout, the joints not arcuate beneath, the second joint of the flagellum no longer than the third.

Length 4 mm.

Hab. Eaglehawk Neck; February, 1 ♀. Mt. Wellington, 2200 ft.; January, 1 ♂.

The ♀ is the type.

This is very nearly allied to the European *A. cinctellus*, Lind., from which it differs in the longer second joint of the flagellum, the less distinct sulcus on the median segment, the longer third abscissa of the radius, the absence of the yellowish spots on the hind margin of the pronotum, and the very slightly longer submedian cell of the fore wing. The male *cinctellus* has the legs without ferruginous colour.

A colour-variety taken by me at Yallingup, S.W. Australia, has the clypeus of the female black, the frontal spots almost obsolete, and the pronotum entirely black. A male taken in the same locality is black, with the middle of the hind femora ferruginous and a white spot at the base of the hind tibiæ.

Aporus hilli, sp. n.

♀. Nigra; clypeo, fronte sub antennis, genis, postscutello, segmento mediano fascia transversa basali et apicali, segmento

dorsali primo macula magna basali, segmentis dorsalibus basalibusque 1–5 fascia lata apicali, segmento dorsali sexto lateribus, mesopleuris fascia, coxis, trochanteribus, femoribus subtus, tibiis supra tarsisque supra dense albido-pilosis; orbitis internis supra antennas late, capite margine posteriore, pronoto utrinque nigro-maculato, mesonoto maculis duabus margine posteriore scutelloque macula dense aureo-pilosis; alis fusco-hyalinis, apice late infumatis.

Long. 11 mm.

♀. Clypeus broad, truncate at the apex. Eyes almost parallel on the inner margin, separated on the vertex by a distance about equal to the length of the second joint of the flagellum; posterior ocelli as far from each other as from the eyes. Front rather flat; second joint of the flagellum as long as the first and third combined. Pronotum in the middle a little shorter than the mesonotum; the posterior margin arched, not angulate. Median segment much broader than long, the posterior slope oblique, a longitudinal sulcus on the dorsal surface. Fore tarsi with a long comb, the spines more or less spatulate, the basal joint with four spines. Tarsal ungues with one tooth near the middle; hind tibiæ spinose. Second abscissa of the radius a little shorter than the first; second cubital cell receiving both recurrent nervures, the first a little before the middle, the second just before the apex. Cubitus of the hind wing interstitial with the transverse median nervure.

Hab. Port Darwin, N.T. (*Hill*); May.

The markings consist of short hairs laid very flat and close, much as in "*Pompilus*" *labilis*, Sm., from which the neuration differs conspicuously, through the absence of a third cubital cell. The structure is very similar to that of *A. cingulatus*, Fabr., also the shape of the second cubital cell.

Family Crabronidæ.

Zoyphium flavofasciatum, sp. n.

♂. Niger, opacus; mandibulis, labro, clypeo apice, flagello, pronoto, tegulis, scutello, postscutello, segmentis abdominalibus primo, quinto, sexto septimoque, femoribus apice, tibiis tarsisque bruneo-ferrugineis; mesopleuris segmentoque mediano apice obscure ferrugineis; clypeo, apice excepto, scapo, pronoto fascia utrinque, segmentoque dorsali primo fascia undulata utrinque flavis; segmentis dorsalibus quinto sextoque fascia utrinque obscure flavidula; alis hyalinis, venis fuscis, costa stigmateque ferrugineis.

Long. 7·5 mm.

♂. Mandibles deeply notched on the lower margin; clypeus flattened, truncate at the apex, the apical margin narrowly depressed, more broadly in the middle than at the sides, a small tooth on each side of the depressed apical margin. Face clothed with golden pubescence; antennæ twelve-jointed, the joints gradually thickened towards the apex, joints 8–11 broader than long, apical joint very large and stout, blunt at the apex. Posterior ocelli twice as far from each other as from the eyes. Median segment clothed with fine pale golden pubescence on the sides and apex, the dorsal surface with a rather broad longitudinal sulcus. Abdomen fusiform, the second segment the broadest, apical segment produced into a blunt point with a small spine on each side. The whole insect very closely microscopically punctured. Third abscissa of the radius distinctly shorter than the second transverse cubital nervure, first recurrent nervure received very distinctly before the apex of the first cubital cell, second beyond the middle of the second cubital cell.

Hab. Brisbane (*Hacker*); November.

Very distinct in colouring from any other species of the genus; the club of the antennæ is much stouter than in *rufonigrum* and *erythrosoma*, but apparently more conical than in *crassicorne*, Ckll.

Pison (*Parapison*) *exclusum*, sp. n.

♂. Niger, opacus; antennis articulis quinque basalibus, tegulis pedibusque ferrugineis; segmentis dorsalibus, secundo excepto, apice pallide bruneis et pallide aureo-sericeis; alis sordide hyalinis, venis nigris.

Long. 8 mm.

♂. Clypeus feebly bilobed at the apex, covered with pale golden pubescence which extends on to the front. Antennæ short and stout, the second joint of the flagellum a little longer than the third, joints 6–11 broader than long. The whole insect closely microscopically punctured, a distinct frontal longitudinal groove reaching the anterior ocellus; posterior ocelli farther from each other than from the anterior ocellus and a little farther from each other than from the eyes. Median segment with a distinct longitudinal groove, in which lies a low carina, a transverse groove at the base of the segment, the remainder of the dorsal surface very finely granulate. Abdomen subsessile, short and broad; seventh dorsal segment truncate at the apex. Second abscissa of the radius a little more than half as long as

the first, second recurrent nervure received just beyond one-fourth from the base of the second cubital cell, a little further from the first transverse cubital nervure than is the first recurrent nervure.

Hab. Brisbane (*Hacker*): November.

Apart from the neuration this strongly resembles the male of *Pison vestitum*, Sm., but the clypeus is quite different and the abdomen more sessile, the antennæ shorter with the joints differently proportioned, the punctures less distinct, and the distance between the eyes on the vertex greater.

Key to the Genera of Australian Pemphredoninæ.

♀♀.

1.	Three cubital cells; antennæ inserted on the front far above the base of the clypeus	*Neofoxia.*
	Two cubital cells; antennæ inserted low down, on the sides of or at the base of the clypeus ..	2.
2.	Two recurrent nervures.....	*Passalœcus.*
	One recurrent nervure	3.
3.	Abdomen petiolate; hind tibiæ with short spines on the outer margin	*Paracrabro.*
	Abdomen not petiolate; hind tibiæ without spines	4.
4.	Ventral plate of the apical segment produced into a stout spine-like process; abdomen ferruginous.	*Harpactophilus.*
	Ventral plate of the apical segment not produced.....	5.
5.	Pronotum with a distinct transverse dorsal surface	*Austrostigmus.*
	Pronotum oblique, without a distinct dorsal surface	*Spilomena.*

Key to the Australian Species of Neofoxia.

1.	Thorax yellow, with a quadrate black spot on the mesonotum; abdomen pale testaceous brown; head black	*N. interstitialis*, Cam.
	Black; scutellum and postscutellum marked with yellow	*N. scutellatus*, Turn.

These species were described as *Psenulus*. *Psen lutescens*, Turn., is a synonym of *interstitialis*, Cam., which was described from a New Guinea specimen. Both the Australian species are from North Queensland.

Genus Passalœcus.

I do not think that *Polemistus*, Sauss., can be separated from this genus. The only Australian species is *P. exul*, Turn., which occurs on the whole eastern coast of Queensland.

Genus Paracrabro.

The only representative of this genus is *P. froggatti*, Turn., a Victorian species. The genus is nearly allied to the wide-ranging genus *Stigmus*.

Key to the Species of Harpactophilus.

♀♀.

1.	Pronotum with a distinct transverse dorsal surface, the angles sharply produced; front yellow	*H. tricolor*, Turn.
	Pronotum without a distinct dorsal surface; front black	2.
2.	The carina between the antennæ produced at the apex in the form of a ploughshare, overhanging the base of the clypeus; recurrent nervure received distinctly before the first transverse cubital nervure	*H. arator*, Turn.
	The frontal carina low, not produced at the apex; recurrent nervure interstitial, or very nearly so, with the first transverse cubital nervure	3.
3.	Eyes separated from the posterior margin of the head by a space exceeding twice the distance between the posterior ocelli	4.
	Eyes separated from the posterior margin of the head by a distance scarcely exceeding the distance between the posterior ocelli	5.
4.	Vertex rugose, mesonotum punctured; wings hyaline, second cubital cell pointed on the radius	*H. kohlii*, Turn.
	Vertex and mesonotum longitudinally striated; wings fusco-hyaline, second cubital cell not pointed	*H. sulcatus*, Turn.
5.	Wings dark fusco-hyaline, second abscissa of the radius half as long as the first	*H. bicolor*, Sm.
	Wings hyaline, first abscissa of the radius about three times as long as the second	*H. steindachneri*, Kohl.

The genus *Harpactophilus* is confined to the Australian and Austro-Malay region, all the known species being from the Queensland coast, except *H. bicolor*, the type of the genus, which is from Mysol. *H. steindachneri* seems to be the Australian representative of *bicolor*, probably a geographical race.

Key to the Australian Species of Spilomena.

1.	Testaceous brown, the head black	*S. australis*, Turn.
	Black; legs, antennæ, mandibles, and tegulæ testaceous brown	2.

2. Recurrent nervure interstitial with the first transverse cubital nervure; wings strongly iridescent	*S. iridescens*, Turn.
Recurrent nervure received before the first transverse cubital nervure; wings only slightly iridescent	3.
3. Second abscissa of the radius longer than the first transverse cubital nervure; head almost smooth	4.
Second abscissa of the radius much shorter than the first transverse cubital nervure; head longitudinally striated	*S. longiceps*, Turn.
4. Length 5 mm. Distance between recurrent nervure and first transverse cubital nervure equal to half the length of the latter nervure	*S. hobartia*, Turn.
Length 2 mm. Recurrent nervure received very close to the apex of the first cubital cell	*S. elegantula*, Turn.

Spilomena is very near *Austrostigmus* in some of the species, especially in *S. longiceps*. The absence of the groove in front of the mesopleuræ for the reception of the anterior femora does not seem to be a very satisfactory generic distinction in the group, the degree of development showing much variation in the different species. The genus has a wide range in Australia, being recorded from N. Queensland, Tasmania, and S.W. Australia.

Key to the Species of Austrostigmus.

1. Pronotum ferruginous red	*A. ruficollis*, Turn.
Pronotum black	2.
2. Mesonotum almost smooth	3.
Mesonotum rugose or coarsely reticulate	5.
3. Second cubital cell pointed on the radius	*A. queenslandensis*, Turn.
Second cubital cell not pointed on the radius	4.
4. Second abscissa of the radius as long as the second transverse cubital nervure; stigma fuscous	*A. glabrellus*, Turn.
Second abscissa of the radius scarcely more than half as long as the second transverse cubital nervure; stigma pale testaceous	*A. approximatus*, Turn.
5. Mesonotum coarsely reticulate	*A. reticulatus*, Turn.
Mesonotum rather finely rugose	*A. dubius*, Turn.

The genus has a wide range, being recorded from North Queensland and S.W. Australia; I have also seen specimens of *A. reticulatus* from Port Darwin, N.T. The species utilise small deserted beetle-holes in dead trees for nesting-purposes.

Austrostigmus dubius, sp. n.

♀. Nigra; mandibulis, antennis, tegulis pedibusque brunneo-testaceis; alis hyalinis, venis testaceis; mesonoto rugoso.
Long. 4 mm.

♀. Head longer than broad, with a carina from the anterior ocellus to the base of the clypeus, the carinæ round the eyes strongly developed, the front between the carinæ punctured-rugulose. Eyes divergent toward the clypeus; posterior ocelli as near to the eyes as to each other. Antennæ inserted on each side of the clypeus, nearer to the base than to the apex, farther from each other than from the eyes, as long as the head, the flagellum more than twice as long as the scape. Pronotum transverse, pointed at the angles; mesonotum rugulose; scutellum smooth, opaque; mesopleuræ opaque, with a few scattered punctures. Enclosed area of the median segment well defined, almost triangular, the marginal carinæ not quite meeting at the apex, with two longitudinal carinæ near the middle, the space between the carinæ transversely striated; the surface of the posterior truncation indistinctly transversely striated, with a fovea at the base. Abdomen smooth and shining, the sixth segment without a pygidial area. Second cubital cell very small, the second abscissa of the radius less than half as long as the first, second cubital cell less than half as long on the radius as on the cubitus, the length on the cubitus equal to about half the length of the first transverse cubital nervure; the recurrent nervure received at a distance before the apex of the first cubital cell slightly exceeding the length of the cubital margin of the second cubital cell.

Hab. Kuranda, N. Queensland (*Turner*); June.

This is very near *A. queenslandensis*, Turn., but differs in the much coarser sculpture of the mesonotum, being intermediate in this respect between *queenslandensis* and *reticulatus*. The second cubital cell in *queenslandensis* is triangular.

Austrostigmus approximatus, sp. n.

♀. Nigra; antennis, tegulis pedibusque brunneo-testaceis; mandibulis basi flavis, apice ferrugineis; alis pallide flavo-hyalinis, venis pallide testaceis.
Long. 4 mm.

♀. Head longer than the greatest breadth, finely shagreened, with a carina reaching from the anterior ocellus to the base of the clypeus, and continued to the apex of the clypeus in a gradually broadening form. Mandibles acutely

bidentate at the apex. Antennæ inserted as far from each other as from the eyes, shorter than the head, the flagellum a little more than twice as long as the scape. Eyes elongate-ovate, not quite reaching the base of the mandibles, distinctly divergent towards the clypeus, the carina round the margin of the eyes rather indistinct. Posterior ocelli farther from the eyes than from each other, and about twice as far from the posterior margin of the head as from the eyes. Pronotum short, transverse, the anterior margin raised, the angles sharply pointed; the tubercles of the prothorax reaching the tegulæ. Mesonotum opaque, closely and microscopically punctured; scutellum subopaque, with a transverse groove at the base. Dorsal surface of the median segment almost entirely occupied by the enclosed area, which is strongly reticulate, with two or three distinct longitudinal carinæ, the segment abruptly truncate posteriorly, the surface of the truncation opaque, with a longitudinal carina near the apex. Abdomen subpetiolate, fusiform, smooth and shining; the sixth dorsal segment finely punctured, without a pygidial area. Second cubital cell twice as long on the cubitus as on the radius; first abscissa of the radius a little longer than the second; recurrent nervure received by the first cubital cell at a distance before the apex equal to the length of the second abscissa of the radius; stigma more than twice as long as the greatest breadth.

Hab. Kuranda, N. Queensland (*Turner*); May.

Differs from *A. reticulatus*, Turn., conspicuously in the sculpture of the mesonotum, in the much longer head, the shape of the second cubital cell, and in the finer sculpture of the head and median segment. From *queenslandensis*, Turn., it differs markedly in the sculpture of the head, the greater length of the head behind the eyes, and in the much larger second cubital cell. The legs in this genus are unarmed as in *Spilomena*, from which it differs in the structure of the pronotum.

Austrostigmus glabrellus, sp. n.

♀. Nigra; mandibulis, antennis, tegulis pedibusque testaceis; alis hyalinis, venis fusco-ferrugineis.
Long. 3 mm.

♀. Head a little longer than the greatest breadth, opaque and almost smooth, the orbital carinæ developed on the outer margin of the eye only; the frontal carina almost obsolete and not reaching the anterior ocellus. Eyes diverging towards the clypeus, almost touching the base of the mandibles.

Antennæ inserted on the sides of the clypeus, a little nearer to the base than to the apex, shorter than the head, the flagellum more than twice as long as the scape. Posterior ocelli much nearer to each other than to the eyes. Pronotum very short, transverse, the angles acute; mesonotum opaque, the parapsidal furrows distinct, but very shallow; scutellum subopaque, with a transverse groove at the base; pleuræ almost smooth. Median segment rather coarsely reticulate, the enclosed area well marked, with two rather low longitudinal carinæ near the middle. Abdomen smooth and shining. Second abscissa of the radius a little shorter than the first, equal to the second transverse cubital nervure; second cubital cell less than half as long again on the cubitus as on the radius; recurrent nervure received at a distance before the apex of the first cubital cell equal to about half the length of the first abscissa of the radius.

Hab. Kalamunda, Darling Ranges, S.W. Australia (*Turner*); March.

This species is nearest to *A. approximatus* in the sculpture, but is a smaller species, with the head less massive, the nervures darker, and the second cubital cell much longer.

Austrostigmus ruficollis, sp. n.

♀. Nigra; scapo tegulisque bruneo-testaceis; prothorace rufo-ferrugineo; femoribus apice, tibiis basi, tarsisque luteis; alis hyalinis, venis pallidis, stigmate fusco.

Long. 3 mm.

♀. Head scarcely longer than the greatest breadth; the front obliquely striated, with a carina from the base of the clypeus not quite reaching the anterior ocellus. Eyes strongly divergent towards the clypeus, not quite reaching to the base of the mandibles, or to the posterior margin of the head. Posterior ocelli as near to the eyes as to each other; the carina round the eyes well marked. Antennæ inserted nearer to the eyes than to each other, a little longer than the head, the scape about half as long as the flagellum. Pronotum transverse, crenulate, the anterior angles pointed; mesonotum granulate. Median segment very long, much longer than broad, reticulate, the enclosed area triangular, with a median longitudinal carina. Abdomen subpetiolate, elongate, smooth and shining, the sixth segment without a pygidial area. Second cubital cell rather more than half as long on the radius as on the cubitus; the first transverse cubital nervure a little longer than the second abscissa of the radius, about equal in length to the first abscissa of the radius: stigma about twice as long as the greatest breadth.

Hab. Kuranda, N. Queensland (*Turner*); June 26, 1913.

Easily distinguished from other species of the genus by the colour of the pronotum and legs and by the sculpture of the front. As in other species of the genus, there is a transverse crenulate groove at the base of the scutellum.

Spilomena longiceps, sp. n.

♀. Nigra; mandibulis, antennis pedibusque bruneo-testaceis; alis hyalinis, venis tegulisque testaceis.
Long. 4 mm.

♀. Head very long, about one-third longer than the greatest breadth; eyes slightly divergent towards the clypeus, very long, elongate-ovate, not quite reaching to the base of the mandibles; the whole head rather finely longitudinally striate, with a low carina from the anterior ocellus to the base of the clypeus and continued on the clypeus to the apex. Antennæ shorter than the head, the scape about half as long as the flagellum. Posterior ocelli nearly twice as far from the eyes as from each other, farther from the posterior margin of the head than from the eyes. Pronotum very small, sunk far below the mesonotum and almost vertical, the dorsal surface not developed and without sharp angles. The tubercles of the prothorax reach the tegulæ. Mesonotum opaque, closely and minutely punctured, nearly twice as broad as long; scutellum smooth, opaque, with a depressed, crenulate, transverse line at the base. Basal area of the median segment well defined, large, broadly rounded at the apex, longitudinally striated, the striæ diverging towards the apex, with small transverse striæ giving a reticulate appearance; outside the enclosed space are rather indistinct oblique striæ. Abdomen subpetiolate, smooth and shining. Fore tarsi without a comb, tibiæ without spines on the outer margin. Two cubital cells, the second more than half as broad on the radius as on the cubitus; first abscissa of the radius nearly half as long again as the second, the recurrent nervure received just before the apex of the first cubital cell. Stigma more than twice as long as the greatest breadth.

Hab. Kuranda, N. Queensland (*Turner*); May.

This species is very near the genus *Austrostigmus*, differing chiefly in the strongly depressed pronotum, which shows no transverse dorsal surface, as in that genus. The characters of the head are nearer to *Austrostigmus* than to *Spilomena*.

Spilomena iridescens, sp. n.

♀. Nigra; mandibulis tegulisque flavo-luteis; antennis pedibusque bruneo-ferrugineis; alis hyalinis, valde iridescentibus, venis fusco-ferrugineis.
Long. 3 mm.

♀. Head much broader than long, broadly rounded behind the eyes; subopaque, microscopically punctured, the frontal carina very short, only extending a short distance from the base of the clypeus; antennæ inserted very low down, on each side of the clypeus near the apex, nearer to the eyes than to each other, the flagellum about twice as long as the scape. Posterior ocelli nearly twice as far from the eyes as from each other; very little farther from the posterior margin of the head than from each other. Pronotum very small, depressed below the mesonotum, obliquely sloped, the tubercles of the prothorax touching the tegulæ. Mesonotum and scutellum subopaque, minutely punctured, a transverse crenulate groove at the base of the scutellum. Median segment about as long as the mesonotum, slightly narrowed to the apex, the enclosed area well defined, with two longitudinal carinæ near the middle, the space between the carinæ and the space between them and the marginal carinæ transversely striated. Mesopleuræ minutely punctured, sides of the median segment rugose. Abdomen shining, minutely punctured, sixth dorsal segment without a pygidial area. First abscissa of the radius very short; second cubital cell much longer than broad, almost as long on the radius as on the cubitus, the recurrent nervure interstitial with the first transverse cubital nervure.

Hab. Yallingup, S.W. Australia (*Turner*); October.

This species has the inner margin of the eyes almost parallel, only slightly divergent towards the clypeus. The head is shorter and broader than in other Australian species of the genus, and the position of the recurrent nervure is different.

Spilomena elegantula, sp. n.

♀. Nigra; mandibulis, antennis, tegulis pedibusque bruneo-testaceis; alis hyalinis, venis pallide testaceis, stigmate infumato.
Long. 2 mm.

♀. Head distinctly longer than the greatest breadth, smooth and subopaque. Eyes almost parallel on the inner margin, touching the base of the mandibles; posterior ocelli far apart, farther from each other than from the eyes, as far

from the posterior margin of the head as from each other. Antennæ much shorter than the head, inserted low down close to the apex of the clypeus. A short, almost obsolete, longitudinal sulcus below the anterior ocellus. Pronotum narrow, depressed, and obliquely sloped; mesonotum narrower than the head, opaque; scutellum subopaque, with a transverse groove at the base. Median segment almost as broad as long, reticulate; the enclosed area not clearly defined, the marginal carinæ being very far apart and merging into the margin of the segment before the apex, two short carinæ from the base not reaching the middle, about twice as far from the marginal carinæ as from each other. Abdomen smooth and shining. Second abscissa of the radius more than twice as long as the first, and about twice as long as the first transverse cubital nervure, a little shorter than the cubital margin of the second cubital cell; recurrent nervure received close to the apex of the first cubital cell. Stigma less than twice as long as broad.

Hab. Kuranda, N. Queensland (*Turner*); May.

This is the smallest Australian fossorial wasp which I have seen. I took it from the calyx of a blossom of *Eugenia*. The second cubital cell is much longer than in other species of the genus.

All the types of the species described in this paper are in the British Museum. For the Brisbane species collected by Mr. Hacker I am indebted to Dr. Hamlyn-Harris, of the Queensland Museum.

VI.—*The Porcupine of Tenasserim and Southern Siam.*

By Oldfield Thomas.

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The National Museum owes to Mr. C. Boden Kloss a first typical set of the fine collection of mammals from S.E. Siam, of which he has been giving an account to the Zoological Society. Among these there is a Porcupine, which for want of material for comparison he has asked me to work out for him, and I have at the same time examined the other specimens that the Museum contains from the same region.

Porcupines from the Burma-Siam area have been some-

times referred to *Acanthion brachyurus* *, Linn., and sometimes to *A. bengalensis*, Blyth, the latter being unfortunately an animal of which no one seems to have modern specimens available for comparison.

In his original account Blyth says of it "general colour as in *A. hodgsoni*; the quills generally having the basal half white, the rest black, most of them with a white tip more or less developed." This description no one would apply to the more southern animals under notice, for in them the black ring on the quills is in length only from one-third to one-fifth of the white tip, whereas Blyth's account obviously suggests that the greater part of the terminal half of the quill is black, and only just the tip white. This latter condition is found in *A. hodgsoni*, and would fulfil his statement as to the general colour. Possibly, indeed, *bengalensis* is not distinct from *hodgsoni*, but this must be settled later.

A. bengalensis being thus eliminated, all the porcupines in question—those of Burma, Siam, and the Malay Peninsula—are practically identical externally, with a small brown and white crest, greater than in *hodgsoni*, far smaller than in *leucurus*, and have the main body-spines buffy white, with a median blackish ring. The nuchal crest is rather less developed in the Malay animal, but the difference is not great.

In the skulls, however, I find that two forms are readily distinguishable—the one from the Malay Peninsula (true *brachyurus*) and the other from Tenasserim and Siam. These may be diagnosed as follows:—

Acanthion brachyurus, Linn.

Syn. *A. grotei*, Gray †.

Size smaller, condylo-incisive length less than 130 mm. (see table of measurements on p. 138). Nasals comparatively small and frontals correspondingly large, the length of the frontal suture over 55 per cent. of that of the nasals. Supraorbital edges tending to the development of a fairly definite postorbital process. Size of teeth and other proportions as indicated by the measurements.

A good figure of the skull of this porcupine has been given by Bonhote ‡.

* There is a curiously widespread idea that every word ending in *-on* is neuter; but the majority of Greek substantives ending in *-ων* are masculine, and it is only the adjectival ending *-όν* which is necessarily neuter.

† It is useless to try and allocate Gray's names *flemingi* and *bartletti*, based on specimens of doubtful locality and asserted to be menagerie hybrids.

‡ Fascic. Malay. i. pl. iii. (1903).

Cranial Measurements.

	Upper length.	Condylo-incisive length.	Nasals, length.	Nasals, breadth.	Frontal suture.	Percentage of frontal to nasal length.	Interorbital breadth.	Upper tooth-row.
A. brachyurus.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Mabek, Malay Peninsula. ♂	141	129	60	26	40	67	48	24
,, ,, ,, ♀	137	128	62	32	35	56	48	27
Prov. Wellesley. ♂	130	123	60	25·5	35	58	44	..
Singapore	128	121	..	31	36	..	48	26·5
A. klossi.								
Tenasserim. Type, ♂	147	140	74	40	34	46	54	31
,,	141	136	78	42	30	38	54	30
S.E. Siam. ♂	139	130	71	36	30	42	49	29·5
S. Siam	132	132	71	37·5	28	40	49	28·5

Hab. Malay Peninsula. Type-locality and also that of *A. grotei*, Gray—Malacca. Good skulls examined from Mabek, Jalor (*Robinson and Annandale*), Malacca (*Cantor*), and Singapore (*Ridley*).

Acanthion klossi, sp. n.

Size larger, well-developed skulls attaining a condylo-incisive length of 140 mm. Nasals large, their length more than twice that of the comparatively short frontal suture. Interorbital region broad, swollen, convex, with scarcely any indication of a postorbital projection.

Skull-measurements in table on p. 138.

Hab. Southern Tenasserim and Southern Siam. Type from Tenasserim Town, other specimens from Bankachon, Tenasserim (*Shortridge*), S. Siam, 12° N., 99° 50′ E. (*K. G. Gairdner*), and Klong-Yai, S.E. Siam (*C. Boden Kloss*).

Type. Adult male. B.M. no. 14. 12. 8. 223. Original number 4905. Collected by G. C. Shortridge. Presented to the National Collection by the Bombay Natural History Society.

This species is distinguished from *A. brachyurus* by its shorter frontals and longer nasals and the lesser development of postorbital processes.

I have named the species in honour of Mr. Kloss, who noticed and drew my attention to its difference from *A. brachyurus*, and himself collected the specimen from S.E. Siam.

Anderson's *Hystrix yunnanensis* has markedly shorter nasals than any of the porcupines here referred to.

The Chinese porcupine, *Acanthion subcristatus*, Swinh., has a skull very like that of *A. klossi*, but its coloration appears to be more as in *A. bengalensis* and *hodgsoni*.

VII.—*On the Grouping of the South-American* Muridæ *that have been referred to* Phyllotis, Euneomys, *and* Eligmodontia.

By Oldfield Thomas.

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The South-American Muridæ which have been referred at various times by various authors to the genera mentioned in the title, as also to *Reithrodon* and *Hesperomys*, have hitherto formed a very confused group, and I have thought it useful to go over the Museum series of them, which includes types

of most of the species, and to make an attempt to classify them more satisfactorily.

Recently * Mr. Osgood has proposed the subgeneric name *Auliscomys* for a group of species some of which had been referred to *Reithrodon* and others to *Phyllotis*, and which I had placed in *Euneomys* when last writing on the subject †. This subgenus I am prepared to recognize, though I still consider it more nearly allied to *Euneomys* than to *Phyllotis*, to which Mr. Osgood assigns it.

The position of the whole group among S.-American Muridæ may be seen in Winge's synopsis ‡ of Lagoa Santa Muridæ, where they would all fall under what he calls "*Hesperomys*," though he did not have occasion to deal with the more hypsodont *Euneomys* series, none of which occur at the locality he was writing about.

The group divides broadly into two—the slenderly built, slender-footed, and more brachyodont *Phyllotis* and *Eligmodontia* series, and the stoutly built, Microtine-looking, thick-footed, and more hypsodont *Euneomys* set.

In working out these animals I have largely used the external characters of build (ears, feet, and mammæ), as the characters of the skull and dentition do not suffice to indicate all the natural groups.

Eligmodontia, F. Cuv., 1837.

Size small. Form delicate. Tail medium, about as long as or rather longer than the head and body, well-haired, slightly pencilled terminally. Feet characteristic; palms and soles hairy; in the former the outer part is occupied by two large hairy cushions, the anterior of which bears the two outer digital pads and the posterior the outer carpal pad as quite inconspicuous smooth places on the otherwise hairy surface; of the two cushions the posterior is by far the largest and most conspicuous. Soles also with hairy cushions, the posterior sole-pad obsolete. Mammæ 2—2=8.

Skull small, delicate, unridged, without special characteristics.

Type. *E. typus*, F. Cuv. (syn. *Mus elegans*, Waterh.).

* Publ. Field Mus. x. p. 190 (1915).

† Ann. & Mag. Nat. Hist. (7) viii. p. 254 (1901).

‡ Gnavere fra Lagoa Santa, p. 12 (1887). Winge's synopsis is, as usual, an admirable presentation of the natural relations of the genera, but to bring its nomenclature up to date *Holochilus* must be read for *Sigmodon*, *Akodon* for *Habrothrix*, and *Oryzomys* for *Calomys*.

The following are also referable to the genus:—

Eligmodontia hirtipes, Thos. (described as *Phyllotis hirtipes*).
,, *moreni*, Thos. (*Eligmodon moreni*).
,, *morgani*, All.
,, *morgani pamparum*, Thos.

Hesperomys, Waterh., 1839.

Syn. *Calomys*, Waterh., 1837, nec *Callomys*, d'Orb. & Geoff., 1830.

Size small or medium. Form delicate. Ears short. Tail short, rarely attaining the length of the head and body. Feet normal, slender, the pads 5–6, not covered by hair; surface of palms and soles generally naked, but occasionally hairy. Mammæ variable, ranging from 2—2 = 8 or 3—2 = 10 to a continuous series attaining a total of 14, different numbers often occurring in the same species.

Skull delicate, lightly built, the supraorbital edges square in old specimens, divergent and slightly ridged in the larger species; zygomatic plate not cut back anteriorly.

Molars small, brachyodont.

Type. *H. bimaculatus* (*Mus bimaculatus*, Waterh.).

Other species:—

Hesperomys callosus, Rengg. (*Mus callosus*).
,, ,, *boliviæ*, Thos. (*Eligmodontia c. boliviæ*).
,, *carilla*, Thos. (*Eligmodontia carilla*).
,, *ducilla*, Thos. (*E. ducilla*).
,, *expulsus*, Lund (*Mus expulsus*).
,, *gracilipes*, Waterh. (*Mus gracilipes*).
,, *laucha*, Desm. (*Mus laucha*).
,, ,, *musculinus*, Thos. (*Eligmodontia l. musculina*).
,, *lepidus*, Thos. (*Hesperomys bimaculatus lepidus*).
,, *sorella*, Thos. (*Eligmodontia sorella*).
,, *tener*, Winge.
,, *venustus*, Thos. (*Oryzomys* (?) *venustus*).

Graomys, gen. nov.

Size comparatively large. General appearance graceful, with long ears and long fine fur. Tail longer than head and body, thickly hairy, pencilled terminally, prominently bicolor. Feet normal, with the usual pads small and well defined, the space between them coarsely granulated. Mammæ 2—2 = 8.

Skull in general form like that of *Phyllotis*, but the supra-orbital edges ridged and divergent as in the larger species of *Hesperomys*. Anterior edge of zygomatic plate undercut, concave. Bullæ generally large.

Type. *Graomys griseo-flavus* (*Mus griseo-flavus*, Waterh.).

Other members of the genus:—

Graomys chacoensis, All. (described as *Phyllotis chacoensis*).
„ *cachinus*, All. (*Phyllotis cachinus*).
„ *domorum*, Thos. (*Eligmodontia domorum*).
„ *griseoflavus centralis*, Thos. (*E. g. centralis*).

Phyllotis, Waterh., 1837.

Size various. Form slender, graceful. Ears long. Tail about as long as or (generally) longer than head and body, thinly haired, not pencilled. Feet normal, slender, with the usual pads small and well defined. Mammæ 2—2=8.

Skull, compared with that of the *Euneomys* group, long and narrow, the zygomata not widely expanded. Interorbital region more or less parallel-sided, its edges, at least in the larger forms, not broadly divergent posteriorly and not ridged. Anterior edge of zygomatic plate straight or occasionally slightly concave, but never distinctly undercut. Bullæ generally small, though larger than in *Hesperomys*.

Teeth brachyodont.

Type. *Phyllotis darwini* (*Mus darwini*, Waterh.).

About a score of other species appear rightly referable to *Phyllotis*.

Euneomys, Coues, 1874.

Size various. Form comparatively stout, more or less Microtine. Tail medium or short, well-haired, especially at tip. Feet stout, dumpy, generally heavily fringed; pads large, low, more or less filling up the surface of the palms and soles. Mammæ 2—2=8.

Skull comparatively short, stout, rounded, the zygomata widely expanded.

Incisors grooved or smooth. Molars more hypsodont than in *Phyllotis* and the other allied genera.

Type. *Euneomys chinchilloides* (*Reithrodon chinchilloides*, Waterh.).

Three subgenera, as follows:—

Euneomys, s. s.

Tail of medium length. Palms and soles completely naked.

Incisors strongly and clearly grooved. Premaxillo-maxillary suture bowed forwards below.

Type as above.

Other species :—

Euneomys fossor, Thos. (*Reithrodon fossor*).
„ *mordax*, Thos.
„ *petersoni*, All.

Auliscomys, Osgood, 1915.

Tail medium or rather short. Palms and soles naked.

Incisors faintly or not grooved. Premaxillo-maxillary suture mainly vertical.

Type. *E.* (*Auliscomys*) *pictus* (*Reithrodon pictus*, Thos.).

Other species :—

Euneomys (*Auliscomys*) *boliviensis*, Waterh. (*Phyllotis boliviensis*).
„ „ „ *flavidior*, Thos. (*Phyllotis b. flavidior*).
„ „ *decoloratus*, Osgood.
„ „ *micropus*, Waterh. (*Mus micropus*).
„ „ *sublimis*, Thos. (*Phyllotis sublimis*).
„ „ *xanthopygus*, Waterh. (*Mus xanthopygus*).

Galenomys, subgen. nov.

Tail very short, barely 1½ times the length of the hind foot ; palms and soles partially hairy.

Zygomata especially widely expanded anteriorly. Naso-frontal region flattened. Zygomatic plate slanting, not projected forward above.

Incisors narrow, much thrown forward, not grooved.

Type. *Euneomys* (*Galenomys*) *garleppi* (*Phyllotis garleppi*, Thos.).

The striking external appearance of "*Phyllotis*" *garleppi*, recalling that of *Onychomys*, always appeared to indicate more than merely specific distinction from other members of the group ; but upon only a single specimen with imperfect skull I have not hitherto ventured to separate it. It is, no doubt, most nearly related to *E.* (*Auliscomys*) *boliviensis*, but may be distinguished by the characters above noted.

VIII.—*On* Crassicauda crassicauda (*Crepl.*) [*Nematoda*] *and its Hosts.* By H. A. Baylis, B.A.

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On July 18th, 1915, an example of the rare Cuvier's whale (*Ziphius cavirostris*) was found stranded on the coast of Ireland near the entrance to Bannow Bay, Co. Wexford. This whale has recently been reported upon by Dr. S. F. Harmer *. During its dissection by members of the staff of the British Museum, a portion of a Nematode worm was found in the neighbourhood of the kidneys, having evidently been pulled out of the renal tubules. This fragmentary specimen was handed to me for examination, and proves to be of interest on grounds which will be mentioned in this paper.

Although the specimen is incomplete, and I have been unable to decide to which sex it belongs, it seems almost certainly to be an example of the curious *Filaria*-like form originally described by Creplin † in 1829, under the name of *Filaria crassicauda*, and lately redescribed in part by Leiper and Atkinson ‡, who have created for it the new genus *Crassicauda*.

There seems to be some doubt as to the species of whale from which Creplin's original material was obtained. This was a whale stranded on the island of Rügen, in the Baltic, in 1825. According to the opinion of Rosenthal and Hornschuch §, who described the whale, it was of the same species as the "*Balæna minima seu rostrata*" of Fabricius ‖. This, according to True ¶, is in all probability the species now more correctly known as *Balænoptera acuto-rostrata*, Lacép. Münter **, however, who examined the skeleton of the same specimen, refers it to the blue whale, *Balænoptera musculus*, L. [= *B. sibbaldii*, auctt., nec *B. musculus*, auctt.]. Dr. S. F. Harmer, who has kindly given me the benefit of his know-

* Abstr. of Proceedings Zool. Soc. 1915, no. 148, p. 42.

† Verh. d. K. Leop.-Carol. Ak. d. Naturf. xiv. 2 Abth. 1829, p. 873.

‡ 'Terra Nova' Report, Zoology, vol. ii. no. 3, Parasitic Worms (1915), p. 29.

§ 'Epistola de *Balænopteris* quibusdam ventre sulcato distinctis &c.,' Gryphiæ, 1825.

‖ O. Fabricius, 'Fauna Groenlandica,' 1780, p. 40.

¶ F. W. True, "On the Nomenclature of the Whalebone Whales of the Tenth Edition of Linnæus' 'Systema Naturæ.'" Proc. U.S. Nat. Mus. xxi. (1898) pp. 617-635.

** Mitth. naturwiss. Ver. Neu-Vorpommern u. Rügen, ix. Jahrg. 1877 (Berlin), p. 1.

ledge of the Cetacea, and has, at my request, examined the description of Rosenthal and Hornschuch and that of Münter, informs me that, in his opinion, the facts point to the conclusion that the whale in question was a common rorqual (*Balænoptera physalus*, L. = *B. musculus*, auctt.) and not a blue whale. The main reasons for this conclusion, stated briefly, are :—(1) The general coloration of the body —black above, white beneath ; (2) the colour (white) of the first ninety baleen-plates on the right side (this asymmetrical condition is highly characteristic of the common rorqual) ; (3) the comparatively small breadth of the baleen-plates : (4) the number of vertebræ (61) and of pairs of ribs (15) ; (5) the number of finger-bones ; (6) the figures representing the external appearance of the animal, reproduced by Münter from drawings made in 1825 (these, in Dr. Harmer's opinion, "indicate the common rorqual rather than the blue whale") ; (7) the month (April) in which the 1825 whale was stranded. The blue whale seldom appears off the Norwegian coasts before the end of May or beginning of June.

It is somewhat remarkable that Diesing* has recorded the host of Creplin's original material as "*Balæna borealis*," while von Linstow† has included the parasite (the reference being to Creplin's material) among those of *Balæna mysticetus*, L. It may be supposed that both these records are erroneous ; they were doubtless due to the uncertainty existing as to the determination of the 1825 whale.

In the case of the 'Terra Nova' material the host was another baleen whale, *Megaptera nodosa*, taken off New Zealand. Mr. J. E. Hamilton, who has been investigating various questions connected with whales at the Belmullet Whaling Station, states in his report for 1914‡ that he found "Nematode worms of some size" in the urinary vessels of twenty-one finners (*B. physalus*), in one blue whale (*B. musculus*), and in the sejhval (*B. borealis*, Lesson). These worms, Mr. Hamilton considers, are very closely allied to, if not identical with, *Crassicauda crassicauda*. It is of especial interest to note that they occurred most commonly in *B. physalus*, a fact which lends great probability to the view that the host of the types belonged to that species.

The parasite evidently has its normal habitat in the urino-genital system of its host. In Creplin's original case the worms were discovered in the corpora cavernosa of the male

* 'Systema Helminthum,' 1851, p. 264.

† 'Compendium der Helminthologie,' 1878, p. 61.

‡ British Association Report, 1915, "Report on Belmullet Whaling Station."

copulatory organ, while in the 'Terra Nova' case, and probably in that now recorded, they were inhabiting the renal tubules. In the 'Terra Nova' whale some specimens are also said to have occurred in the stomach (wall ?).

Mr. Hamilton has given * some interesting details as to the disposition of the worms in the kidneys of *B. physalus*, which I take the liberty of quoting:—"The worms are found partly in the urinary tube system, partly in the interlobular tissue. The point at which the worm passes into the urinary system is usually, if not always, situated in the wall of a calyx. The extralobular part of the parasite is embedded in a mass of connective tissue, in which it has a very tortuous course. It is probable that the presence of the nematode is responsible for the growth of the tissue in the regions where it occurs, since the connective tissue masses may be taken as indicative of the presence of the parasites which they invariably contain."

Assuming that the worms observed in all cases were *C. crassicauda*, we are now in a position to enumerate three genera and five species of whales as tolerably well authenticated hosts for this species, viz.:—

1. *Balænoptera physalus*, L. (=*B. musculus*, auctt.). (Common rorqual or finner.)
2. *B. musculus*, L. (Blue whale or Sibbald's rorqual.)
3. *B. borealis*, Lesson. (Northern rorqual, Rudolphi's whale, or Sejhval.)
4. *Megaptera nodosa*, Bonn. (=*M. boops*=*M. longimana*). (Humpback.)
5. *Ziphius cavirostris*. (Cuvier's whale.)

It is a point of some importance that the last-mentioned species is a toothed whale, all the others being baleen whales. It would be premature at present to speculate on the probable intermediate host (if any) of the worm; but in considering this question the fact that the parasite occurs in both groups of whales would have considerable weight, since the nature of their food differs widely.

I am unable to find any definite reference to the possible occurrence of this worm in a toothed whale, previously to the present case. I am, however, again indebted to Dr. Harmer for bringing to my notice the following interesting passage from the writings of P. J. Van Beneden † concerning the parasites of *Ziphius cavirostris*:—

"On ne connait jusqu'à présent qu'un Cestode et un ver

* *Loc. cit.*

† "Histoire Naturelle des *Balénoptères*," Mémoires Couronnés, Ac. Roy. de Belgique, xli. (1888) p. 93.

rond qui peut être un Nématode ou un Échinorhynque : le premier est un *Phyllobothrium* agame, que le professeur Haeckel a trouvé dans l'épaisseur de la peau. Le second est un ver très long, logé dans l'estomac d'un *Ziphius* échoué sur les côtes de Suède en avril 1867 (Malm). Le professeur Sir Turner suppose que c'est un Échinorhynque : un nouvel examen est indispensable. Nous ne savons si cet animal a été conservé." It is, of course, impossible to be certain of the point from this brief notice, but it is not unreasonable to suspect that this latter worm was another example of *Crassicauda*. Its occurrence in the stomach finds a parallel in the case of the 'Terra Nova' material.

Van Beneden also states that *Filaria crassicauda* occurs in "*Balænoptera rostrata*." He does not mention his authority for this statement, and it is not improbable that the reference is again to the 1825 whale, which, as has been seen, has appeared in the literature under a variety of names.

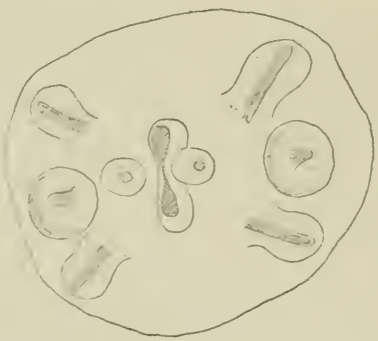
The present specimen from *Ziphius* (1915) consists of an anterior end only, the tail, which might have served as a guide to the sex of the individual, having unfortunately been lost. The fragment is twisted in a spiral fashion, and measures, when stretched as far as the twisting will permit, about 30 cm. The anterior part of the body is thick, but tapers off rather suddenly in the first quarter of an inch to the very narrow oral extremity. I have been unable, on clearing in creosote, to make out any genital organs.

The 'Terra Nova' specimens did not include any heads, the material consisting entirely of posterior portions. No description of the anterior end, therefore, was possible. Creplin's original material did include complete individuals, and a figure of the oral extremity of one of them is given by that author *, but the features of the head are very vaguely indicated, and the figure does not appear to agree very closely with the description given. Creplin's description of the mouth is as follows :—"*Os* terminale, subrotundum, aut potius subtransversum, subellipticum, minimum, margini insigni, tumido, nodulis experte, cinctum."

Supposing that the determination of the present specimen is correct, I am now able to give what is, I hope, a more precise description of the head of this species, together with a figure. According to my findings, the mouth is a narrow slit-like aperture whose long axis runs not in a transverse but in a dorso-ventral direction. Its margin is certainly conspicuous, but hardly tumid. It is lined with a very thick cuticle, which is an invagination of the external cuticle of

* *L. c.* pl. lii. fig. 5.

the body. The expression "nonnulis experte" would appear to mean that Creplin did not observe any circumoral papillæ. I have, however, satisfied myself that these are present, and have a definite arrangement. On either side of the mouth, situated in the middle of its length and very close to its margin, there is a small rounded papilla. Laterally to this there are, towards each side of the extremity of the head, three more papillæ, considerably larger than those first mentioned. There are thus four pairs of papillæ in all. The six outer papillæ are mastoid in shape and but slightly raised above the general surface of the cuticle. Those of the middle pair project in a forward direction, while the other four



0·1 mm.

Head-end of *Crassicauda crassicauda* (Crepl.).

papillæ, representing, as it were, the corners of a square, are more laterally directed.

It will be seen that the general appearance of the mouth and papillæ is very *Filaria*-like. Except for a difference in the number of the outer papillæ, there is a close resemblance, for example, to the arrangement seen in *Filaria horrida* *. Although, as Leiper and Atkinson have pointed out †, there is reasonable ground for separating this species from the genus *Filaria*, *sensu stricto*, yet the characters of the mouth and papillæ, as exhibited by the present example, seem to indicate a very close relationship to that genus.

* See Schneider, 'Monographie der Nematoden,' pl. v. fig. 17.
† *L. c.* pp. 29-30.

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[EIGHTH SERIES.]

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IX.—*Rhynchotal Notes.*—LVIII. By W. L. Distant.

Homoptera.

Fam. **Membracidæ** (continued from vol. xvi. p. 496).

Basilides, gen. nov.

Pronotum with the anterior area strongly gibbous, centrally perpendicularly raised, the apex developed into a transverse curved process on each side, the posterior process as in *Anchon*, Buckt.

The type of this genus is the *Centrotus bipennis*, Walk., for which that writer has given an unusually complete structural description, which may be used for the generic characters.

Allied to *Beninia*, Dist., from which it differs by the peculiar structure of the posterior pronotal process, which also separates it from the Australian genus *Eutryonia*, Goding. From the latter it is at once separated by the different structure of both the anterior and posterior pronotal processes.

Basilides bipennis.

Centrotus bipennis, Walk. List Hom. ii. p. 606 (1851).
Anchon fuscum, Buckt. Trans. Linn. Soc. Lond. (2) vol. ix. p. 334, pl. xxii. fig. 2 *a* (1906).

Hab. W. Africa; Old Calabar, Cameroons (*Escalera*, Brit. Mus.).

Ibiceps mounseyi, sp. n.

Head and pronotum black; a frontal lateral pronotal fascia on each side, two discal pronotal fasciæ, a central fascia to face, the clypeus, and lateral sternal areas greyishly pubescent; legs testaceous; abdomen beneath black, excluding apical area, greyishly pubescent; tegmina straminous, apical area dark castaneous, base, costal and subcostal areas, and apical margin black; pronotum coarsely punctate, the anterior produced processes almost horizontal, very slightly recurved, their apices acute, disk centrally carinate, posterior process tricarinate and passing the posterior angle of the inner tegminal margin, frontal area strongly centrally carinate.

Long., incl. tegm., 12 mm.; exp. ant. pronot. process. 5 mm.

Hab. Philippine Islands (*J. J. Mounsey*).

Allied to *I. erigens*, Walk., but differing by the much more slender and less curved anterior pronotal processes, &c.

Ibiceps erigens.

Centrotus erigens, Walk. List Hom. ii. p. 614 (1851).
Sertorius erigens, Stål, Öfv. Vet.-Ak. Förh. 1870, p. 727.

Hab. Philippines.

Genus Leptocentrus.

Leptocentrus, Stål, Hem. Afr. iv. pp. 87 & 90 (1866).
Rabduchus, Buckt. Monogr. Membrac. p. 251 (1903).
Bocchar (part.), Jacobi, Sjöstedt, Kilimandj. Exped. xii. p. 120 (1910).

Leptocentrus altifrons.

Centrotus altifrons, Walk. List. Hom. ii. p. 608 (1851).
Centrotus atratus, Walk. *loc. cit.* p. 624 (1851).
Rabduchus gnomon, Buckt. Monogr. Membrac. p. 251, pl. lvii. fig. 4 *a* (1903).
Leptocentrus bos, Melich. Wien. ent. Zeit. xxiv. p. 295 (1905).
Leptocentrus altifrons, Dist. Trans. Ent. Soc. Lond. 1913, p. 516 (pub. 1914).

Hab. Lagos, Calabar, Sierra Leone, Cameroons. Nyasaland; Melange (*S. A. Neave*). Uganda, N. Ruwenzori and Kafu R., near Hoima, Kampala Rd., 3500 ft. (*S. A. Neave*).

The unique type of *C. atratus*, Walk., is a mutilated one, with the posterior pronotal process broken off.

Leptocentrus confusus, sp. n.

Leptocentrus leucaspis, Melich. (nec Walk.), Wien. ent. Zeit. xxiv. p. 295 (1905).

Bocchar montanus, Jacobi (var.), Sjöstedt, Kilimandj. Exped. xii., Hom. p. 120, t. ii. fig. 2 (1910).

Hab. Cameroons (*Escalera*, Brit. Mus.). Brit. East Africa; W. slopes of Kenya on Meru-Nyeri Rd., 6000–8500 ft., and E. foot and slopes Aberdare Mts., 7000–8500 ft. (*S. A. Neave*).

Distinguished from *L. altifrons* by the shorter and more robust lateral pronotal processes.

Leptocentrus ugandensis, sp. n.

Head, pronotum, scutellum, body beneath, and legs black; tegmina bronzy brown, the apical area transversely and fasciately ochraceous, base, costal area, and apical margin black; pronotum thickly coarsely punctate, strongly, centrally, percurrently carinate, the lateral processes moderately convexly recurved, their apices subacute, posterior process somewhat slender, strongly tricarinate, its apex passing the posterior angle of the inner tegminal margin.

Long., incl. tegm., $8\frac{1}{2}$–9 mm.; exp. pronot. lat. process. $4\frac{1}{2}$–5 mm.

Hab. Uganda; Entebbe (*C. C. Gowdey* and *C. A. Wiggins*); Buamba Forest, Semliki Valley; Budongo Forest, Unyoro; Mabira Forest, Southern Toro, Mbarara, S. of L. George (*S. A. Neave*).

This very distinctly marked species is allied to that described and figured by Buckton as *Ibiceps rufipennis* from the Cameroons (Trans. Linn. Soc. Lond., Zool. (2) vol. ix. p. 334, pl. xxii. fig. 8 *a*, 1906). When this species is studied by its short description and the qualifications perused on the "Explanation of the Plate," it can with certainty be ascribed to the genus *Leptocentrus*, and to be separated from the species above described by the much more upwardly raised lateral pronotal processes.

Leptocentrus peracatus, sp. n.

Head, pronotum, scutellum, body beneath, and legs black; tegmina pale brownish ochraceous; pronotum coarsely punctate, the lateral processes long, their expanse equalling the length of the body including tegmina, carinate and roundly curved, the apices acute and recurved, the central

carination less prominent frontally than discally, the posterior process very strongly tricarinate, curved backwardly, the apical area impinging on tegmina at and beyond posterior angle of inner tegminal margin, the apex acute ; tarsi testaceous ; scutellum more or less greyishly pubescent.

Long., incl. tegm., 9 mm. ; exp. lat. pronot. process. 9 mm.

Hab. Somaliland (*E. Lord Phillips*, Brit. Mus.).

Xiphopœus erectus, sp. n.

Pale fuscous brown, more or less greyishly tomentose ; lateral margins of the pronotum distinctly greyish ; femora black, their apices and the whole of the tibiæ and tarsi pale ochraceous ; tegmina dull greyish, the venation and the apical area (more or less) pale fuscous brown ; pronotum with the lateral processes obliquely erect, inwardly coarsely serrate for about half their length, their apices broadened, flattened and bispinous, in other respects resembling *O. phantasma*, Spin., from West Africa, and *O. horridulus*, Walk., from Southern Africa. From the first this species is separated by the less broadened and differently angulated apices of the pronotal processes, and from the second by the same character and the more obliquely erect direction of the processes.

Long., incl. tegm., 6½ mm. ; exp. pronotal process. 5 mm.

Hab. Uganda ; Kafu R., near Hoima, Kampala Road, 3000–5000 ft., and N. of L. Isolt, 3700 ft. (*S. A. Neave*).

In the genus *Kleidos* = *Xiphopœus*, Buckton (Trans. Linn. Soc. Lond. (2) vol. ix. p. 333, 1906) has described a species from Zanzibar under the name of *Kleidos palmatus*. I have not seen the type, and the short description is insufficient.

Eligius, gen. nov.

Elongate, moderately compressed ; pronotum with the lateral processes long, broad, laminate, erect, the posterior margins bicarinate, more flattened anteriorly, and broadly rounded at apices, the posterior apex shortly spinous, posterior process strongly tricarinate, slightly recurved on apical area, moderately broad at base, gradually narrowing to apex, which is subacute, and slightly passing the posterior angle of inner tegminal margin ; tegmina elongate, with five apical cells, their margins straight.

The erect, broadly laminate, pronotal lateral processes, and the gradually narrowing posterior process, are the salient characters of this genus, the first feature separating it from *Centrotypus*, Stål.

Elipius merinjakensis.

Head and pronotum black; body beneath and legs piceous; tegmina bronzy brown, the costal area black; pronotum coarsely punctate, centrally longitudinally carinate, the posterior process very strongly tricarinate, and between the carinations very coarsely punctate; tegmina twice longer than broad.

Long., incl. tegm., 7 mm.

Hab. Borneo; Mt. Merinjak (*J. C. Moulton*).

Genus Eufrenchia.

Eufrenchia, Goding, Proc. Linn. Soc. N.S.W. xxviii. p. 24 (1903).
Sertorius, Stål (part.), Œfv. Vet.-Ak, Förh. 1869, p. 287.

Type, *E. falcata*, Walk.

Stål (*supra*) referred to his genus *Sertorius* (indicated without type in his 'Hem. Africana'), and including his *S. curvicornis* = *Centrotus falcatus*, Walk. This alone would have disqualified *Eufrenchia*, of which *falcatus* is the type. However, previously, in 1866, "Berl. ent. Zeitschr. x. p. 387," Stal had given *Centrotus australis*, Fairm., as the type of his genus *Sertorius*, which disposes of his subsequent determination (1869), and the genus *Eufrenchia* becomes a necessity.

Eufrenchia falcata.

Centrotus falcatus, Walk. List Hom. ii. p. 622 (1851).
Centrotus bicurris, Walk. List Hom., Suppl. p. 164 (1858).
Sertorius curvicornis, Stål, Œfv. Vet.-Ak. Förh. 1869, p. 287.
Eufrenchia falcata, Goding, Proc. Linn. Soc. N.S.W. xxviii. p. 25 (1903).

Hab. Australia; Tasmania.

Walker ascribed the habitat of his *C. bicurris* (supra) as "New Hebrides?" The specimens on which he founded his species were really received from Australia.

Eufrenchia strigata.

Centrotus strigatus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 184 (1868).

Hab. New Guinea.

Otinotus nigrorufus, sp. n.

Head, pronotum, and scutellum black; lateral apices of the scutellum ochraceous; lateral margins of face and lateral

areas of sternum ochraceously tomentose; body beneath and femora blackish, tibiæ and tarsi castaneous; tegmina shining pale castaneous, extreme base black, immediately followed by an obscure transverse ochraceous fascia; pronotum very coarsely punctate, the lateral processes horizontally and a little upwardly produced, centrally carinate, their apices obtuse and very slightly recurved, posterior process somewhat slender, tricarinate, very slightly elevated above the scutellum, after which it impinges more or less on the tegmina, its apex subacute and passing the posterior angle of the inner tegminal margin; tegmina punctate on the black base.

Long. 8–9 mm.; breadth lat. pronot. process. 5–5½ mm.

Hab. Uganda, near Masindi, 3500 ft.; Eastern Mbale Distr., S. of Mt. Elgon, 3700–3900 ft.; Mpanga Forest, Toro, 400–800 ft.; Mabiri Forest, Chagwe, 3500–3800 ft.; Kafu R., near Hoima, Kampala Rd., 3500 ft., between Jinja and Busia, E. Busoga (*S. A. Neave*). Entebbe (*C. C. Gowdey*). Brit. E. Africa, slopes of Mt. Elgon, 5100–5800 ft. (*S. A. Neave*).

Otinotus recurvus, sp. n.

Closely allied to the preceding species in colour and markings, but with the pronotal lateral processes broader, more distinctly recurved, and less obliquely elevated; the posterior pronotal process considerably more elevated above the tegmina, which are also paler and more ochraceous in hue.

Long. 10 mm.; breadth lat. pronot. process. 6 mm.

Hab. Uganda; Entebbe (*C. C. Gowdey*); shores of L. Isolt or Wamala, 3800 ft. (*S. A. Neave*).

Otinotus curvidens, sp. n.

Allied to the preceding species, *O. recurvus*, but with the lateral pronotal processes much more slender, though somewhat similarly recurved, but when viewed from the front appearing much shorter and less obliquely raised; scutellum with a white spot at each basal angle and the apex ochraceous (these markings, however, are inconstant); apical area of posterior pronotal process impinging on tegmina.

Long. 8–9 mm.; breadth lat. pronot. process. 4½–5 mm.

Hab. Cameroons (*Escalera*). Uganda; Entebbe (*Dr. C. A. Wiggins*); between S.E. shore of L. Kioga and Kakindu, 3500 ft. (*S. A. Neave*).

Centrotus marshalli, sp. n.

Ochraceous; tegmina with two dark suffusions, one at

base black, the other (nearly occupying apical area) bronzy brown; face (excluding lateral margins) black; pronotum thickly, rather finely punctate, with the anterior lateral processes broad, somewhat discally flattened, moderately narrowed towards apices, which are somewhat recurved and obliquely truncate, these processes are subhorizontal and very slightly elevated, the disk is distinctly centrally carinate above, but faintly and obsoletely so in front, posterior process moderately undulate, distinctly separate from scutellum, impinging on tegmina beyond scutellum, its apex about reaching the posterior angle of inner tegminal margin, gradually diminishing in breadth from base to apex, which is subacute, centrally rather strongly carinate; tegmina strongly wrinkled, the basal black area finely punctate.

Long. 6½–7 mm.; breadth lat. pronot. process. 4½–5 mm.

Hab. Mashonaland; Salisbury, 5000 ft.; Umfuli River (*G. A. K. Marshall*).

Centrotus laxatus, sp. n.

Allied to the preceding species *C. marshalli*, but differing in the following characters:—the lateral pronotal processes are broader, longer, and less apically recurved, the apices blackly margined, more truncately oblique, and distinctly finely bicarinate on the apical areas; the posterior pronotal process is more robust, its apex more downwardly recurved and passing the posterior angle of the inner tegminal margin; the coloration is generally similar, but on the tegmina the bronzy-brown apical area is much less pronounced and more distinct at its inner margin.

Long. 8½ mm.; breadth lat. pronot. process. 6 mm.

Hab. Natal; Durban (*J. P. Cregoe*).

Centrotus cornutus.

Cicada cornuta, Linn. Syst. Nat. ii. p. 705. 6 (1767).
Centrotus cornutus, Buckt. Monogr. Membrac. p. 245, pl. lvi. figs. 7 *a*, *b* (1903).
Campylocentrus rugosus, Buckt. *loc. cit.* p. 243, pl. lvi. fig. 3 *a* (1903).

Although Buckton's figures are somewhat diverse, I have before me the type of his *C. rugosus* and his identical specimen of typical *cornutus*.

Platybelus sinuosus, sp. n.

Piceous brown, somewhat thickly ochraceously pilose; legs brownish ochraceous, femora piceous brown; face longly

and strongly ochraceously pilose, lateral areas of sternum dull ochraceously tomentose; abdomen beneath blackish; tegmina brownish ochraceous much suffused with piceous brown, especially at base and on costal and subcostal areas; pronotum with the frontal area obliquely convex, the lateral processes somewhat short, moderately recurved, and apically bent downwardly, broad at base, subacute at apices, the posterior process very strongly sinuous, strongly elevated above scutellum, and roundly depressed and touching tegmina near its base, afterwards broadly concave before posterior angle of inner tegminal margin, and again depressed and becoming subacute at apex, which nearly reaches tegminal apex.

Long. 8 mm.; breadth lat. pronot. process. 4½ mm.

Hab. Nyasaland.

A distinctive character of this species is found in the peculiar structure of the pronotal lateral processes.

Barsumas, gen. nov.

Pronotum with the disk a little rounded in front between the lateral processes, which are short, broad, a little upwardly raised, their apices suddenly narrowed, acute, and a little recurved, the posterior process very strongly sinuous, at base strongly convexly raised above the scutellum, at the extremity of which it touches the tegmina, then again convexly raised and broadened but still adjacent to the tegmina, its apex suddenly attenuate and acute and passing the posterior angle of the inner tegminal margin, the whole of its surface shortly spinous above; tegmina closely wrinkled, with the venation very prominent.

This genus is allied to *Platybelus*, Stål.

Barsumas primus, sp. n.

Head, pronotum, body beneath, and legs testaceous or castaneous; tegmina subhyaline, wrinkled, the prominent veins pale ochraceous, the base, some irregular scattered markings, and extreme apical margin castaneous; pronotum with the disk strongly centrally carinate, paler in hue at and near the lateral processes, which have their margins serrate, the acute narrowed apices darker in hue, the posterior sinuated process with its upper surface strongly serrate, its apical area finely tuberculate, its extreme apex flavous, lateral margins behind the bases of the lateral processes greyish white; face strongly pilose.

Long. 5 mm.; breadth lat. pronot. process. 3 mm.

Hab. Mashonaland; Salisbury, 5000 ft. (*G. A. K. Marshall*).

Subrincator, gen. nov.

Pronotum with the disk broad, moderately convex, very prominently, centrally, longitudinally carinate, lateral processes absent, but the lateral margins broadly, obtusely subangulate, the posterior process short, laminately, convexly dilated, its apex shortly subacute, about reaching the posterior angle of the inner tegminal margin; face broader than long, rugose, eyes prominent; tegmina a little more than twice as long as broad, the veins prominent, four apical cells; legs robust, but tibiæ not dilated.

Subrincator tonkinensis, sp. n.

Body and legs black; central carination, lateral margins, and a curved fascia on each lateral area to pronotal disk, central carination, a transverse fascia near middle, and the apical area of posterior pronotal process, apices of femora, and bases and apices of tibiæ sanguineous; tegmina subhyaline, the veins black, basal area black spotted with sanguineous, two black spots on apical margin and some black macular suffusions on central area; pronotum coarsely punctate, the lateral margins somewhat ampliate and reflexed; face moderately shortly pilose; other structural characters as in generic diagnosis.

Long. 9–10 mm.; breadth lat. pronot. angl. 4 mm.

Hab. Upper Tonkin, Lao Kay, near Chapa (*R. Vitalis de Salvaza*, Brit. Mus.).

Genus Hamma.

Hamma, Buckt. Trans. Linn. Soc. Lond., Zool. (2) vol. ix. p. 330, pl. xxi. fig. 3 (1906).

Type, *H. nodosum*, Buckt.

Hamma pattersoni, sp. n.

Body and legs piceous, apices of tibiæ and the tarsi pale ochraceous; tegmina hyaline, wrinkled, reflecting the dark abdomen beneath, extreme base piceous, immediately followed by an obscure transverse pale ochraceous fascia, a costal ochraceous spot beyond middle, and some small discal indeterminate ochraceous suffusions; pronotum with the whole of the frontal margin and the central carination to both the frontal angles and posterior process coarsely serrate, the

whole pronotal surface finely tuberculate, the face darker and more black in hue; the sinuosity of the posterior pronotal process with its pale apex and the upturned apex of the scutellum is perfectly shown in the figure.

Long. 4 mm.

Hab. Gold Coast; Aburi (*W. H. Patterson*).

Hamma pattersoni, sp. n.

Genus Tricentrus.

Tricentrus, Stål, Hem. Afr. iv. p. 89 (1866).
Otaris, Buckt. Monogr. Membrac. p. 249 (1903).
Taloipa, Buckt. Trans. Linn. Soc. Lond., Zool. ix. p. 334 (1905).

Tricentrus auritus.

Otaris auritus, Buckt. Monogr. Membrac. p. 249, pl. lix. fig. 1 *a* (1903).

Hab. Sumatra.

Tricentrus orcus.

Centrotus orcus, Buckt. Monogr. Membrac. p. 247, pl. lx. figs. 7 *a*, *b* (1903).

Hab. Philippine Islands.

Genus Bocchar.

Bocchar (part.), Jacobi, Sjöstedt, Kilimandj. Exped. p. 120 (1910).

Bocchar montanus.

Bocchar montanus, Jacobi (part.), Sjöstedt, Kilimandj. Exped. xii. p. 120, t. ii. figs. 2 *a*, 2 *b* (1910).

Hab. Uganda; Ruanda, Mutanda, Kigesi (*Dr. C. H. Marshall*). Brit. E. Africa; Nairobi (*S. A. Neave*).

Genus Daunus.

Daunas, Stål, Hem. Afr. iv. p. 87 (1866); Perl. ent. Zeitschr. x. p. 386 (1866); Goding, Proc. Linn. Soc. N.S.W. xxviii. p. 30 (1903).

Type, *D. tasmaniæ*, Fairm.

Daunus tasmaniæ.

Centrotus tasmaniæ, Fairm. Ann. Soc. Ent. Fr. (2) iv. p. 51?, pl. iii. fig. 15 (1846).
Daunus tasmaniæ, Goding (part.), Proc. Linn. Soc. N.S.W. xxviii. p. 31 (1903).
Centruchoides tasmaniæ, Buckt. Monogr. Membrac. p. 227, pl. l. fig. 6 (1903).

Hab. Tasmania, Australia.

Daunus vitta.

Centrotus vitta, Walk. List Hom. ii. p. 626 (1851).
Oxyrhachis contorta, Walk. Ins. Saund., Hom. p. 66 (1858).
Centrotus truncaticornis, Walk. *loc. cit.* p. 81.
Daunus tasmaniæ, Goding (part.), Proc. Linn. Soc. N.S.W. xxviii. p. 31 (1903).
Daunus vitta, Goding, *loc. cit.* p. 32 (1903).

Hab. Tasmania, Australia.

Daunus contractus.

Centrotus contractus, Walk. List Hom. ii. p. 622 (1851).
Daunus tasmaniæ, Goding (part.), Proc. Linn. Soc. N.S.W. xxviii. p. 31 (1903).

Hab. Australia.

X.—*Descriptions of new Freshwater Shells from Japan.*

By H. B. Preston, F.Z.S.

[Plate IX.]

The shells described in the present paper were collected recently by Dr. N. Annandale during his dredging-operations in Lake Biwa. Though the collection includes only some seven species, a curiously varied Molluscan fauna is revealed, including as it does the Palæarctic *Pisidium casertanum*, a species which ranges over Northern Europe and Siberia, and the genus *Choanomphalus*, which has hitherto been supposed to be confined to North-eastern Siberia, together with a small shell which the author has been unable to generically separate from *Lithotis*, which has, up to the present time, only been recorded from Central India.

It is greatly to be hoped that further investigations may be carried out in the lake, when, doubtless, further interesting material will be brought to light.

It may also be of interest here to state that specimens of a species undoubtedly belonging to the Indian genus *Camptoceras* were forwarded to the author with the present collection; this interesting form was collected in the Kogamura-Osaka district of Japan, and a specimen had already reached the writer with a request for confirmation of its generic position from Mr. Bryant Walker, of Detroit, Mich., who, he understands, intends to describe it at an early date.

Class *GASTROPODA*.

Order PULMONATA.

Suborder GEOPHILA.

Family Succneidæ.

Lithotis japonica, sp. n.
(Pl. IX. figs. 6, 6 *a*.)

Shell imperforate, small, ovate, reddish brown; whorls $2\frac{1}{2}$, the first small, the last very large, transversely striate and slightly angled above, laterally compressed; columella margin obliquely descending, flattened, broad; labrum continuous, acute; aperture large, slightly dilated.

Alt. 1·5, diam. maj. 4, diam. min. 3 mm.

Aperture: alt. 2·5, diam. 2 mm.

Hab. Lake Biwa, Japan; on the lower surface of stones at the edge of the lake (*Dr. N. Annandale*).

The shell in general form recalls, in miniature, the genus *Septaria*.

Suborder HYGROPHILA.

Family Limnæidæ.

Choanomphalus japonicus, sp. n.
(Pl. IX. figs. 2, 2 *a*, 2 *b*, 2 *c*.)

Shell rather small, subovate, with swollen spire, thin, pale yellowish brown; whorls 3, rapidly increasing, the last descending in front, tricarinate, the middle carina being situated at the periphery, the upper and lower about equidistant from it; between the carinæ appear somewhat distant, microscopic, spiral striæ, while the whole shell is transversely obliquely striate; suture impressed; umbilicus moderately wide and deep, occupying about one-fifth of the total diameter of the shell; columella margin very obliquely descending, extending above into a fine, polished, restricted,

parietal callus; labrum acute, projecting in front, rapidly receding below, sharply angled at each carinal point of termination; aperture irregularly quadrate.

Alt. 1·25, diam. maj. 3·25, diam. min. 2·75 mm.

Aperture: alt. 1, diam. ·75 mm.

Hab. Lake Biwa, Japan; on the lower surface of stones near the edge of the lake (*Dr. N. Annandale*).

Choanomphalus japonicus perstriatulus, subsp. n.
(Pl. IX. figs. 1, 1 *a*, 1 *b*, 1 *c*.)

Shell differing from the typical form in its less swollen spire, strong intercarinal, spiral striation, and less angular labrum, the only marked angle being at its base.

Alt. 1·5, diam. maj. 3·5, diam. min. 2·75 mm.

Aperture: alt. 1·25, diam. 1 mm.

Hab. Lake Biwa, Japan; on the lower surface of stones near the edge of the lake, in company with the typical form (*Dr. N. Annandale*).

Planorbis (*Gyraulus*) *biwaënsis*, sp. n.
(Pl. IX. figs. 3, 3 *a*, 3 *b*, 3 *c*.)

Shell subovate, somewhat planulate above, with sunken first whorl, gently rounded at the periphery, pale yellowish brown, thin; whorls 3, rapidly increasing, rather distantly and coarsely spirally, and closely, finely, and indistinctly transversely striate, the last whorl large and rather rapidly descending in front; suture well impressed; base of shell angled in the median region; umbilicus wide open, occupying about one-fourth of the total diameter of the shell; columella margin very obliquely descending, slightly curved, diffused above into a restricted parietal callus; labrum receding below, acute; aperture ovate.

Alt. 1·5, diam. maj. 4·75, diam. min. 3·75 mm.

Aperture: alt. 1·75, diam. 1·75 mm.

Hab. Lake Biwa, Japan; on the lower surface of stones near the edge of the lake (*Dr. N. Annandale*).

Order PROSOBRANCHIA.

Suborder PECTINIBRANCHIATA.

Family Valvatidæ.

Valvata biwaënsis, sp. n.
(Pl. IX. figs. 4, 4 *a*.)

Shell turbinate, somewhat flattened above, pale yellowish;

whorls 3, the first flattened, *microscopically spirally* striate, the last two carinate above and subplanulate above the carination, rather finely and closely obliquely costulate, the last rounded at the periphery ; suture impressed ; umbilicus deep, occupying in breadth about one-seventh of the total diameter of the shell ; base of shell convex ; columella margin descending in a vertical curve, extending above into a restricted, but rather thick, parietal callus, which joins it with the upper margin of the labrum, and gives to this last a continuous appearance ; labrum acute ; aperture subcircular ; operculum whitish, thin, multispiral, with central nucleus.

Alt. 3·75, diam. maj. 5, diam. min. 3·5 mm.

Aperture : alt. 2·25, diam. 2·25 mm.

Hab. Lake Biwa, Japan ; on a muddy bottom at depths greater than 40 metres (*Dr. N. Annandale*).

Valvata annandalei, sp. n.
(Pl. IX. figs. 5, 5 *a*, 5 *b*.)

Shell allied to *V. biwaënsis*, but rather larger, with exserted first whorl, coarser and more distant transverse costulæ, proportionately narrower umbilicus, which, in the present species, occupies about one-eighth of the total diameter of the shell, and in possessing a basal carina situated near the circum-umbilical region ; moreover, the aperture is more oval and proportionately much larger than in *V. biwaënsis*.

Alt. 5, diam. maj. 5·25, diam. min. 4 mm.

Aperture : alt. 3, diam. 2 mm.

Hab. Lake Biwa, Japan ; on a muddy bottom at depths greater than 40 metres (*Dr. N. Annandale*).

Class *PELECYPODA*.

Order TETRABRANCHIA.

Suborder CONCHACEA.

Family Cyrenidæ.

Pisidium casertanum (Poli), forma *lacustris*.

Hab. Abundant on a muddy bottom in Lake Biwa at depths greater than 40 metres, and not found in shallower water.

The author must here tender his thanks to Mr. B. B. Woodward, the well-known expert in the Palæarctic *Pisidia*, for his kind assistance in the above determination, and who remarks that the specimens submitted to him are "rather more oval than usual."

EXPLANATION OF PLATE IX.

Figs. 1, 1 *a*, 1 *b*. *Choanomphalus japonicus perstriatulus*, subsp. n., × 8.
Fig. 1 *c*. Sculpture of same, × 16.
Figs. 2, 2 *a*, 2 *b*. *Choanomphalus japonicus*, sp. n., × 6.
Fig. 2 *c*. Sculpture of same, × 9.
Figs. 3, 3 *a*, 3 *b*. *Planorbis* (*Gyraulus*) *biwaënsis*, sp. n., × 4.
Fig. 3 *c*. Sculpture of same, × 8.
Fig. 4. *Valvata biwaënsis*, sp. n., × 4.
Fig. 4 *a*. Sculpture of same, × 8.
Figs. 5, 5 *a*. *Valvata annandalei*, sp. n., × 4.
Fig. 5 *b*. Sculpture of same, × 8.
Figs. 6, 6 *a*. *Lithotis japonica*, sp. n., × 6.

XI.—*On the Nomenclature and Identity of some little-known British Spiders.* By A. Randell Jackson, M.D., D.Sc.

During the last two years the Rev. O. Pickard-Cambridge has kindly allowed me to examine the actual types of a number of little-known British spiders. For the most part these were described many years ago, when microscopes were new or little-known instruments. Many of these spiders had never been recorded since; but there was no doubt that several of them had been redescribed under other names when the use of microscopes became more general.

I here publish the result of these investigations as far as I have gone. I had hoped to have examined all the species on the British list which were unknown to me, but circumstances will not now permit this. I hope, however, to finish this investigation at some future date.

For half a century Mr. Pickard-Cambridge has laboured in the field of arachnology, and his collection contains nearly all the species hitherto recorded as British. Hence the great kindness he has shown me in allowing me to examine these types has put me in possession of many facts otherwise inaccessible. I here thank him for this and for all the innumerable other kindnesses he has done me.

In my previous papers on the genera *Micronetа* and *Porrhomma* I accounted for many of these half-forgotten species. I here continue the work, and have now, save for about a dozen species, finished the great family Argiopidæ, which contains considerably more than half of the British spider-fauna.

I may say that I have not gone into any ancient questions of nomenclature, but have started from the basis of Mr. Pickard-Cambridge's 'List of British and Irish Spiders,' published in 1900.

Bolyphantes subnigripes, Camb.

Linyphia subnigripes, Camb., Ann. & Mag. Nat. Hist. ser. 5, vol. iv. 1879, p. 204 (no figure); Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. vii. 1886, p. 73, pl. iv. figs. 2 *a*, 2 *b*, 2 *c*; Camb., List of British & Irish Spiders, 1900.

I have examined this example, which is still unique and rather the worse for wear.

In size, general facies, and ocular relations it is indistinguishable from the female of *B. luteolus*, Bl. The vulva almost exactly resembles that of that species; if any differences are present, they are so slight as to render necessary a series of examples in order to guard against variation within the species. As a matter of fact, the vulva of this specimen does seem rather broader than that of *B. luteolus*.

The pigmentation of the legs is, however, very striking, and has faded very little, although the example was taken in 1878.

First leg: tibia and metatarsus very black, contrasting strongly with the other articles, which are very pale brown.

Second leg: distal two-thirds of tibia and proximal half of metatarsus very black; the rest of the leg pale brown.

Third leg: distal two-fifths of metatarsus very black; the rest of the leg pale brown.

Fourth leg: patella and tibia deep black, proximal half of metatarsus brown; the rest of the limb pale brown.

Abdomen at present quite devoid of markings.

In no case are two legs of the same pair present.

This leg-pigmentation is very extraordinary, and the colour remains, after thirty-seven years' immersion in spirit, deep inky black.

With the vulva not quite typical and this curious pigmentation present I should certainly hesitate to remove this species from the British list. It is, however, very closely related to *B. luteolus*.

The specimen was found near Belfast by Mr. F. Workman.

Linyphia impigra, Camb.

Linyphia impigra, Camb., Trans. Linn. Soc. Lond., vol. xxvii., 1870, p. 422, pl. lv., no. 18.

Leptyphantes culta, Camb., Proc. Dorset Nat. Hist. & Antiq Field Club, vol. xiv., 1893, p. 152, pl., figs. 8, 8 *a*, 8 *b*.

Leptyphantes cultus, Camb., List of British & Irish Spiders, 1900.

The examination of the type of *L. culta* showed clearly that it was a female of *L. impigra*.

Leptyphantes ericæus, Bl.

Leptyphantes beatula, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxxii., 1911, pp. 52, 53, pl., figs. 8–11.

There is no doubt that *L. beatula*, of which I have examined the single male that forms the type, is identical with *L. ericæus*, Bl.

Mr. Pickard-Cambridge's figure of the palpus is taken from below as well as from the outer side. The specimen is not well pigmented.

Leptyphantes insignis, Camb.

Leptyphantes insignis, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxxiv., 1913, pp. 131–132, pl. A, figs. 4–6.

I have had the pleasure of examining the sole existing specimen of this distinct species, which is an adult male.

Mr. Cambridge's figure of the palpus shows the tibia and patella in outer profile, but the tarsus and palpal organs from the outside and below. The tarsus is considerably rotated upon the tibia in the specimen.

It is an extraordinary thing that this distinct and striking species should be found at Bloxworth after so many years of close work there.

Since writing the above, I have received both sexes of this species from Mr. H. Britten, who found them in a mole's nest in the neighbourhood of Oxford. The female is a very distinct animal, with the epigyne situated at the end of a long process directed almost vertically downwards.

I hope to publish figures of this and of the male in course of time.

Pœciloneta globosa, Wid.

Bathyphantes variegatus, Bl., Camb., List of British & Irish Spiders, 1900.
Linyphia finitima, Camb., Trans. Linn. Soc. Lond., vol. xxvii., 1870, pp. 426–427.
Linyphia contrita, Camb., Trans. Linn. Soc. Lond., vol. xxviii., 1873, p. 537, pl. xlvi., fig. 7.
Tmeticus finitimus, Camb., List of British & Irish Spiders, 1900.
Tmeticus contritus, Camb., List of British & Irish Spiders, 1900.

I have followed Professor Kulczynski in sinking Blackwall's *Bathyphantes variegatus* under *Pœciloneta globosa*.

I examined the two males which are the types of *L. contrita* and *L. finitima* respectively. The former was taken on

the Cheviot Hills and the latter near London, both many years ago.

Both specimens are very much bleached, but the palpal structure can be made out, and there is no doubt that both are examples of *P. globosa*, Wid. Both appear to have been rather abnormally pigmented when alive.

Centromerus subacuta, Camb.

Opistoxys subacuta, Camb., List of British & Irish Spiders, 1900; id., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xii., 1891, p. 92, pl., fig. 3.

Leptyphantes patens, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxviii., 1907, pp. 139–140, pl. A, figs. 20–25 (male, not female).

Opistoxys subacuta, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxxv., 1914, p. 128, pl. A, figs. 19–20.

I have examined the types of *O. subacuta*, Camb., and *L. patens*, Camb., male, and find that they are identical. Mr. Cambridge has confirmed this, and his remarks will be found in the last reference given above.

The drawings on plate A, figs. 19 & 20, are quite rough ones by myself. The type of *O. subacuta* is now unfortunately destroyed, and the male described as *L. patens* is at present the only example extant. The female of *L. patens* turned out to be *Leptyphantes pallidus*, Camb. (see Proc. Dorset Nat. Hist. & Antiq. Field Club, 1910, vol. xxxi., p. 51).

This species is a typical *Centromerus*, and there seems to be no reason for considering *Opistoxys* as a British genus.

The following is the chætotaxy of the species :—

Falces.—Anterior border bears three large teeth. Posterior border bears four or five very small teeth very closely grouped.

Legs.—Femur i.: a spine on dorsum about the middle; a spine on anterior border near the apex.

Femur ii.: a spine on dorsum near middle.

Femur iii. & iv.: unarmed.

Patellæ: one spine above on each.

Tibiæ: two spines above on each. The first tibia bears, in addition, an extra spine on the anterior border nearer the apex than the middle.

Metatarsi: unarmed in the type of *O. subacuta*. In that of *L. patens* the first two each bore a very fine erect spine near the middle.

These may have been broken off in the other example, but I saw this specimen first and did not look for their bases.

Palpi very characteristic and quite similar in the two specimens.

Centromerus sylvaticus, Bl.

Tmeticus sylvaticus, Bl., Camb., List of British & Irish Spiders, 1900.
Tmeticus serratus, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxviii., 1907, pp. 143–144, pl. B, figs. 45–48 (female only).

Centromerus prudens, Camb.

Tmeticus prudens, Camb., List of British & Irish Spiders, 1900.
Tmeticus serratus, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxviii., 1907, pp. 143–144, pl. B, figs. 45–48 (male only).

I have examined the British examples of the supposed *C. serratus*, Camb. The male is *C. prudens* and the female *C. sylvaticus*. They differ markedly from the true *C. serratus*, of which I possess French examples, and which, among other things, is a very much smaller spider.

Centromerus similis, Kulcz.

Tmeticus similis, Kulcz., Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxvi., 1905, pp. 62–63, pl. A, figs. 12–13.

I have examined this small female, which is unknown to me, though certainly a *Centromerus*. It is not, I believe, *C. similis*, Kulcz., and more closely resembles *C. incilium*, L. Koch; but, since it has not been compared with that species, I do not advise altering the name under which it stands on the British list at present.

Micryphantes rurestris, C. L. Koch.

Micronetа rurestris, C. L. Koch, Camb., List of British & Irish Spiders, 1900.
Eupolis excavata, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxi., 1900, pp. 26–27, pl., figs. 7 *a*, *b*, *c*, *d*.

I examined the type-female of *E. excavata*. In my opinion this is certainly a decolourized female of *M. rurestris*, C. L. K. The depression at the occiput is, I believe, due to trauma.

Micryphantes beatus, Camb.

Micronetа beata, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxvii., 1906, pp. 90–91, pl. A, figs. 27–31.
Bathyphantes explicata, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxxiii., 1912, p. 75, pl. A, figs. 14 & 15.

The type of *B. explicata* exactly resembles *M. beatus* in

every respect, including the unusual structure and shape of the lamella characteristica. I have no hesitation in sinking the former name amongst the synonyms of *M. beatus*. I have, of course, examined the types.

Phaulothrix hardii, Bl.

Tmeticus hardii, Bl., Camb., List of British & Irish Spiders, 1900.
Tmeticus carpenteri, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xv., 1894, pp. 108 & 109 (female only).

The female of *Tmeticus carpenteri*, Camb., is a rather large example of *P. hardii*. The specimen is curiously piebald—due, I think, to the uneven solution of the abdominal pigment in spirit. No mention is made of this in the description, and it has probably taken place during the long period in which the specimen has been in this fluid; otherwise the specimen is typical enough.

Macrargus carpenterii, Camb.

Tmeticus carpenterii, Camb. *loc. cit.* (male only).

The male of this species is a very puzzling animal. I believe it to be an abnormal specimen of the common *M. rufus*, Wid., but cannot deny that there are differences difficult to account for by any theory of maldevelopment. If these prove constant, the species might be considered good, though nearly related to *M. rufus*. No further examples have yet occurred.

There are a number of little differences, and sooner or later I hope to publish figures illustrating them.

Small or stunted-looking examples of *M. rufus* should be carefully preserved for reference by collectors. The best differences are in the palpal organs. These are the same on both sides in the type, but a series of the species should be obtained before more can be said. Meanwhile, the name is best left on the British list. It can only, however, be considered as a doubtful species.

Lophomma stativum, Sim.

Lophomma statirum, Sim., Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxvi., 1905, pp. 64 & 65.
Neriene lucida, Camb., Trans. Linn. Soc. Lond., vol. xxviii., 1871, p. 452, pl. xxxv., no. 27 (male only).
Cornicularia lucida, Camb., List of British & Irish Spiders, 1900.

I examined a pair of accredited *C. lucida*, Camb., kindly sent me by Mr. Cambridge which I believe to be the types, but about which there seems to be some ambiguity. The

male is, I think, without doubt *L. stativum*, Sim., the very characteristic palpi corresponding exactly with the description and figures of those of that species. The female is quite another species—*Diplocephalus cristatus*, Bl., in fact. Some day I hope to take the matter up more thoroughly; meanwhile, I have little doubt that my present statement is correct.

Minyriolus pusillus, Wid.

Minyriolus pusillus, Wid., Camb., List of British & Irish Spiders, 1900.
Sintula pygmæa, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xiv., 1893, p. 155, pl., figs. 3 *a*, *b*, & *c*.

The type of *S. pygmæa* has lost all its pigment, but is, I think, clearly a female of *M. pusillus*, Wid.

Tmeticus graminicolus, Bl.

Gongylidium graminicolum, Bl., Camb., List of British & Irish Spiders, 1900.
Tmeticus adeptus, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxvii, 1906, pp. 85–86, pl. A, figs. 8–11.

The types of *T. adeptus* consist of two females. These are undoubtedly young examples of *T. graminicolus*, Bl. The chitin covering the vulva is very transparent, and the sexual apertures are visible through it. This does not seem to be the case with *all* young *T. graminicolus*; but in a series of these juveniles several individuals showing exactly this condition can generally be found.

Trichoncus saxicolus, Camb.

Tigellinus saxicolus, Camb., List of British & Irish Spiders, 1900.
Sintula nigrotibialis, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxi., 1900, pp. 29–30, pl., figs. 6, 6 *a*, 6 *b*.

The type of *S. nigrotibialis*, which is a female, turned out on examination to be *T. saxicolus*, Camb.

Widería melanocephala, Camb.

Widería melanocephala, Camb., List of British & Irish Spiders, 1900.
Walckenaera atrotibialis, Camb., Ann. & Mag. Nat. Hist., ser. 5, vol. i., 1878, pp. 116–117, pl. xi., figs. 3, *a*, *b*, *c*, *d*.
Prosopotheca atrotibialis, Camb., List of British & Irish Spiders, 1900.

I examined the type of *P. atrotibialis*, which is a female. All the tibiæ are said in the description to be deeply pigmented, but nearly all trace of this pigment has now gone. The whole spider is much bleached.

In *W. melanocephala*, as a rule, only the first four tibiæ are

pigmented, but occasionally, as in a specimen of my own from the New Forest, all eight may be very dark. The epigyne and general structure of *P. atrotibialis* are quite typical of *W. melanocephala*.

Wideria cucullata, C. L. Koch.

Wideria cucullata, C. L. K., Camb., List of British & Irish Spiders, 1900.
Wideria incerta, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxiii., 1902, pp. 35-36, pl., figs. 9, *a*, *b*, *c*, *d*.

The type of *W. incerta* is an immature male of *W. cucullata*. The tibial apophysis is not really continued transversely across the dorsum of the tarsus, although some long hairs in this position give something of this appearance with poor illumination. This apophysis is quite developed and typical of *W. cucullata*. The palpal organs are, however, enveloped in membrane. The caput, too, is quite undeveloped, and, as certainly as one can be certain of immature spiders, this is an example of *W. cucullata*.

Wideria fugax, Camb.

Wideria fugax, Camb., List of British & Irish Spiders, 1900.
Wideria warburtonii, Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxiii., 1902, pp. 34-35, pl., figs. 8, *a*, *b*, *c*, *d*.

I can detect no difference between the type of *W. warburtonii* and typical males of *W. fugax*.

Prosopotheca incisa, Camb.

Prosopotheca incisa, Camb., List of British & Irish Spiders, 1900.

This is a fine distinct species which I had not seen before. The epigyne is curiously like that of *Cornicularia cuspidata*, Bl., but in other respects the spider is very different.

Walckenaera capito, Westr.

Walckenaera capito, Westr., Camb., List of British & Irish Spiders, 1900.
Walckenaera capito, Westr., Camb., Proc. Dorset Nat. Hist. & Antiq. Field Club, vol. xxvi., 1905, p. 53, pl. B, fig. 24.
Cornicularia pudens, Camb., List of British & Irish Spiders, 1900.
Neriene pudens, Camb., Trans. Linn. Soc. Lond., vol. xxviii., 1873, p. 544, pl. xlvi., fig. 15.

There is no doubt at all that the type of *C. pudens*, which is a female, is identical with what is supposed to be the female of *W. capito*. This female has, however, never been

found accompanying an adult male, and there is some doubt whether it really is the female of *W. capito*. However, until more evidence is forthcoming, it is best considered as such.

Cornicularia karpinskii, Camb.

Cornicularia pavitans, Camb., List of British & Irish Spiders, 1900.
Neriene pavitans, Camb., Trans. Linn. Soc. Lond., vol. xxviii., 1873, p. 543, pl. xlvi., fig. 13.

Cornicularia pavitans, of which the type is a female, is a very striking species, and is identical with *C. karpinskii*, which has priority. Mr. Cambridge will shortly publish a note on this subject, which I will not anticipate. I obtained a pair of *C. karpinskii* on Helvellyn on August 28th, 1900. They were taken together under one stone, and the association of the male with the female is thus established.

XII.—*Note on the Thorax in Anoplura and in the Genus* Nesiotinus *of the Mallophaga*. By Bruce F. Cummings (British Museum of Natural History).

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Thorax in Anoplura.

The three segments of the thorax are fused together *. On the dorsal surface in most species may be seen certain transverse bars or rafters of thick chitin, which serve to support the thoracic nota, to provide on the extreme lateral margin a point for the attachment of the coxæ on each side, and may roughly represent the original delimiting lines between pro-, meso-, and metanotum. No epimeral or episternal pieces can be traced at the sides. The fused thoracic notum fits down as a kind of "lid" upon the sternal surface, which shows no sign of segmentation at all, and in many species carries a single sternal plate of various sizes and shapes.

These notal rafters—or, if we use the cautious phraseology of the systematist, "bands"—are important elements in the exoskeleton, and are frequently made use of by descriptive writers, and certainly afford useful, if superficial, characters.

The Anopluran thorax to the comparative anatomist is of

* My friend Mr. Harrison points out that the prothorax is distinct in *Hæmatomyzus*, which I have not seen.

some interest, inasmuch as it affords us with an example—I imagine, rare in the Insecta—of the attachment of the coxæ to the margin of the dorsal or notal surface. The coxæ, roughly cup-shaped, are applied by their concave surfaces to the ventro-lateral region of the thorax on each side. The lower (or inner) half of the edge of each cup is attached to the sternal surface, while the upper (or outer) half reaches to the depressed margin of the notum, which on each side has a clearly marked rim, and is usually strengthened by a dark longitudinal bar connecting up each transverse rafter. Just where the upper half of each coxal cup establishes a point of contact with the notal rim the chitin of the latter becomes thickened, and often runs out into a dark depressed promontory or jetty—one for each coxa. A rafter runs in from each jetty.

It is unnecessary to summarize here the form and course of these exoskeletal rafters ; suffice it to say that, with the exception of the meso-metanotal one in many Hæmatopini for example, they rarely run right across the upper surface, but disappear before halfway into the thinner chitin of the middle area.

I believe I have discovered in *Hæmatopinus asini* a pair of clavicles within the prothorax, very much as they occur in some Mallophaga ; while in many, if not all, Hæmatopini there is present in the middle of the metanotal region a structure of some interest, not hitherto described. It shows on the surface as a small circular depression, but in specimens passed through caustic potash the depression is seen to be the mouth of a small chitinous funnel, which does not descend into the thorax perpendicularly, but is directed backwards as well as downwards, so as to lie beneath, and in many cases to project behind, the posterior margin of the metanotum. The funnel is graduated, and ends blindly in a point, like a dunce's cap. It should be regarded presumably as a thoracic apodeme for the attachment of muscles, and a more careful examination of it by the method of sections might produce results of interest. In one form or another all the members of the genus *Hæmatopinus*, I believe, possess this funnel, and it occurs also in *Antarctophthirus ogmorhini*, End., and in a less funnel-shaped condition in *A. tricheci* (Boh.), and *Pediculus capitis*, De Geer.

Thorax in *Nesiotinus* (Mallophaga).

The much more complicated thorax of the Mallophaga presents a very interesting study in comparative anatomy;

but as a memoir which, I believe, will include this subject in its scope is in course of preparation by my friend Mr. Launcelot Harrison, B.Sc., of the University of Sydney, I intend to do no more here than to correct an error extant concerning the thorax of the remarkable species *Nesiotinus demersus*, Kellogg. For our knowledge of this parasite we are indebted to Prof. Vernon Lyman Kellogg, of the Leland Stanford Junior University, California, who, so long ago as in 1903, published a short description in the 'Biological Bulletin of the Marine Laboratory at Woods Hole, Mass.' (vol. v. p. 89, 1903), of a single female specimen received from Dr. Günther Enderlein, and taken on a Kerguelen penguin, *Aptenodytes longirostris*.

No other specimen, according to my knowledge, has since been recorded, and therefore the capture of another female in November 1913 on a king penguin (*Aptenodytes* sp. ? *pennanti*) in the Bay of Isles, S. Georgia, by Mr. P. Stammwitz (who accompanied the late Major Gerald Barrett-Hamilton on his whaling expedition) is worthy of being placed on record.

Kellogg remarks that one of the distinguishing features of the genus and species is "the complete distinctness of the pro-, meso-, and metathorax in a degree unequalled elsewhere among the known Mallophaga, unless it be in *Trinoton*." Further on he remarks that the meta-segment is "nearly as wide as the first (widest) abdominal segment," and so *resembles* an abdominal segment.

No particular reasons are adduced in favour of this singular interpretation, and all Mallophagan morphology is against it. A comparative study of the thorax of Mallophaga makes it certain that the thorax of *Nesiotinus* consists of pro- and metathorax, the mesothorax being quite absent, and that Kellogg has mistaken the first segment of the abdomen for the metathorax. The thorax of *Nesiotinus* is short, and consequently on the sternal surface but little space is left for the articulation of the legs, which are relatively large appendages. There is therefore a good reason why the acetabular bars should be prolonged backwards, so that the hind legs are suspended from the base of the abdomen.

A similar state of affairs occurs in *Menopon antennatum*, Kell. & Paine, where the short thorax has involved a lengthening of the acetabular bars of both the second and third pairs of legs, so that the second pair appears to come from under the metathorax and the third pair from as low down as the second abdominal segment.

Kellogg's interpretation allows only seven segments in the abdomen and only five pairs of spiracles. In all Mallophaga

except *Gliricola* and possibly *Trimenopon* there are six pairs of abdominal spiracles, and they open upon either the third to the eighth or upon the second to the seventh segments—never upon the first segment *.

Finally, neither the chætotaxy nor the coloration lend any support to Kellogg's interpretation.

XIII.—*Two new Genera of African Muscoidea.* By Charles H. T. Townsend, Bureau of Entomology, Washington, D.C.

Congochrysosoma, gen. nov.

Genotype, *Congochrysosoma snyderi*, sp. n.

Differs from *Chrysomasicera* as follows:—Female only: Eyes bare. Vertex about three-fourths width of one eye. Ocellar bristles very small, but distinct, short. Outer verticals scarcely developed. Second antennal joint elongate, the third only one and one-half times second. Arista shorter. Face rather flattened, epistoma quite prominent, vibrissæ well above oral margin. Parafacials bristly in middle. Four lateral pairs of scutellar macrochætæ; a short median pair on first abdominal segment, no discals on intermediate segments. Hind tibiæ short-ciliate, with a longer bristle below middle.

Congochrysosoma snyderi, sp. n.

Length of body 11·5 mm., of wing 9·5 mm.

One female, Luebo, Congo (*D. W. Snyder*).

Face dull silvery, the parafacials with a faint greenish lustre. Checks silvery, with a bronze lustre. Parafrontals greenish bronze. Frontalia and antennæ blackish, the second antennal joint brown. Palpi fulvous, infuscate at base. Mesoscutum and arcuate area on base of scutellum greenish bronze; five vittæ showing, widening and narrowing with the incidence of light, the middle one disappearing in front of suture in some lights. Pleuræ, humeri, and outer aspect of front femora rather silvery. Abdomen and very broad margin of scutellum bright frosted green, the first segment and rather irregular hind borders of others black.

* See Launcelot Harrison, 'Parasitology,' vol. viii. no. 1, June 25th, 1915, p. 101.

Venter pale brownish. Legs blackish brown. Wings faintly infuscated, tegulæ nearly white.

Holotype, no. 19976 U.S. N. M.

Named in honour of Mr. D. W. Snyder.

Ocypteromima, gen. nov.

Genotype, *Ocypteromima polita*, sp. n.

Related to the *Aphria-Eriothrix* series of groups, from the genera of which it may be distinguished by the following characters:—Female only: Front anteriorly about width of eye, gently narrowing to vertex; face widening therefrom at same angle. Parafacials rather narrow, not as wide as third antennal joint. Frontalia occupying nearly one-third of frontal width posteriorly. No ocellars. Inner verticals strong, reclinate, not decussate; no outer verticals. Two proclinate and two reclinate fronto-orbitals. Only one frontal below base of antennæ. Second antennal joint only slightly elongate; third narrow, of even width, about three times as long as second. Arista slender, finely pubescent, a little thickened on basal half, rather tapered, basal joints very short. Epistoma produced, but vibrissæ very close to oral margin. Cheeks narrow, the eyes descending as low as vibrissæ. Eyes practically bare, only very faintly and sparsely short-hairy. Proboscis rather short, but corneous, part below geniculation hardly as long as lower border of head; palpi slender, short, subfiliform. Two sterno-pleurals and three postsuturals. Scutellum without apical or discal bristles, but with one long postero-lateral and one very short antero-lateral. No discals on abdomen, first two segments with median marginal pair, last two with marginal row. Abdomen subcylindrical, but swollen in middle, thence tapering both ways. Legs slender, not very elongate. Apical cell open, constricted apically, ending a little before wing-tip. Cubitus abruptly rounded; hind cross-vein nearer same, straight. Third vein bristly nearly to small cross-vein. No costal spine.

Ocypteromima polita, sp. n.

Length of body 8·5 mm., of wing 6·5 mm.

One female, Lorenzo Marques, March 1, 1910 (*C. W. Howard*).

Black, silvery-white pollinose. Antennæ blackish, frontalia dark brown. Palpi appearing black, but in reality deep rufous, with many short black bristly hairs. Head all

silvery white, except that parafrontals show through blackish on vertical half. Thorax showing two very wide heavy black vittæ. Scutellum with faint sheen of silvery. Abdomen with bases of segments 2 to 4 silvery white, more broadly so on sides and venter, the rest shining black, but with faint sheen of silvery continuation in places as seen in very oblique lights. Legs black, tibiæ more or less reddish; bases of legs and pleuræ silvery. Wings lightly smoky yellowish, tegulæ pearly white.

Holotype, no. 1997 U.S. N. M.

XIV.—*A new Genus of African Mongooses, with a Note on* Galeriscus. By R. I. Pocock, F.R.S.

Cynictis selousi was described by Mr. de Winton * on the evidence of a skull picked up by Mr. Selous near Bulawayo; and since the cranial and dental characters agreed tolerably closely with those of *C. penicillata*, the type of the genus *Cynictis*, no alternative generic reference was open to the describer.

Subsequently Mr. P. C. Reid sent to the British Museum a complete specimen caught on the Linyanti River, and Mr. de Winton published an illustrated description † of its colour, pointing out that the blackness of the legs and the absence of the rufous tint on the body confirm the skull-characters in differentiating *C. selousi* from *C. penicillata*.

In 1906 Mr. C. H. B. Grant secured the species at Woodbush, in the north-eastern Transvaal, as recorded by Messrs. Thomas and Schwann ‡, and in 1909 Mr. E. C. Chubb § gave a list of several examples taken at Bulawayo and Inyamandhlovu, in Matabeleland.

I am not aware of any later records or published particulars relating to the species.

The marked likeness in colour between *Cynictis selousi*, *Ichneumia albicauda*, and some species of *Bdeogale*—e. g., *B. nigripes*—induced me to examine the British Museum's specimens, consisting of the skins procured by Reid and Grant; and since *Cynictis*, *Ichneumia*, and *Bdeogale* can easily be distinguished by the number of the digits, the feet

* Ann. & Mag. Nat. Hist. (6) xviii. p. 469 (1896). See also W. L. Sclater, 'Fauna of South Africa, Mammals,' vol. i. p. 75 (1901).

† Proc. Zool. Soc. 1901, vol. i. pt. 1. pp. 2-3, pl. i.

‡ *Ibid.* 1906, p. 588. § *Ibid.* 1909, p. 118.

naturally claimed attention first. The result was the discovery of the complete absence of all external trace of the first digit of the fore-foot—a feature bringing *C. selousi* into line with *Bdeogale* and severing it from *Cynictis*. It does not appear whether this character was detected by the authors above quoted and dismissed as a taxidermic accident or neglected as unimportant systematically, or not. Possibly the presence of the corresponding digit in *Cynictis penicillata* was for the moment forgotten *.

However that may be, the character is, in my opinion, quite sufficient for generic recognition. I propose, therefore, to place *C. selousi* in a new genus, which may be named and diagnosed as follows:—

PARACYNICTIS, gen. nov.

Related to *Cynictis*, but differing in the suppression of digit 1 of the fore-foot, the digital formula being 4—4 as in *Bdeogale*.

Type, *Cynictis selousi*, de Wint.

Two genera of African mongooses have the same digital formula as *Paracynictis*—namely, *Suricata* and *Bdeogale*; but with neither of the last two can the first be associated. *Suricata* occupies an isolated position in the group, and need not be further considered in this connection; but, as already stated, *Paracynictis selousi* bears such a close superficial resemblance to some species of *Bdeogale*, like *B. nigripes*, that the main reasons for its exclusion from that genus may be briefly given. Apart from the differences mentioned by de Winton in his original diagnosis, the skull of *Paracynictis selousi* is very like that of *Cynictis penicillata*, and shows no special resemblance to the massive skull of *Bdeogale*. The bulla is larger and more inflated than in *Cynictis*, and the partition divides it into two subequal chambers, whereas in *Cynictis* the posterior chamber is smaller than the anterior. In *Bdeogale*, on the contrary, the anterior chamber is smaller than the posterior, in *B. puisa* about half its size. Numerically the teeth of *Paracynictis* are as in *Bdeogale*, but, whereas in the former the injutting portions of pm^4, m^1, and m^2 of the upper jaw are transversely elongated and narrow, in *Bdeogale* they are very noticeably thicker and more rounded. Similar but less well-marked differences occur in the molars of the lower jaw.

* The coloured figure of *C. selousi* published by de Winton shows the feature in question quite plainly.

So far as external characters can be interpreted on dried skins, the feet of *Paracynictis* resemble those of *Bdeogale* not only in the number of the digits, but also in the extension of the hair over the metatarsus nearly or quite down to the plantar pad. But in *Paracynictis* the carpal pad is comparatively small, and, although the feet have been slit down the middle line beneath, it appears to me that the area between this pad and the plantar pad was wholly or mostly overgrown with hair. There may, however, have been a narrow strip of naked skin extending between the two pads. In *Bdeogale*, on the contrary, the carpal pad is large and joined to the plantar pad by a wide and distally widening naked area.

Finally, in *Paracynictis* it seems certain that the digits are longish, slender, and very imperfectly webbed, as in *Cynictis*, but in *Bdeogale* the thick short digits are webbed to approximately the same extent as in *Mungos*—that is to say, up to the base of the digital pads on the admedian side of each.

Although on paper it may appear that *Paracynictis* occupies an intermediate place genetically between *Cynictis* and *Bdeogale*, I do not think that is the true opinion to hold. *Paracynictis* seems to me, on the available evidence, to be nothing but an aberrant form of *Cynictis*, specialized by the loss of the first digit of the fore-foot. Hence it may be inferred that the occurrence of a similar defect in *Bdeogale* is an adaptive resemblance; and, without due consideration of other facts connected with the feet, one would be inclined to associate this defect with the adoption of a digitigrade gait. In the case of *Bdeogale*, which has short, compact, somewhat "canine" feet, this may be so—at least in part,—but the long-clawed feet of *Paracynictis* are fossorial rather than cursorial; and I suspect the suppression of the digit in question is connected with burrowing. Support for this suspicion is supplied by the independent incidence of a precisely similar character in *Suricata*, the fore-feet of which are essentially fossorial. A short weak pollex must be a hindrance rather than a help in digging amongst roots and stones; and the atrophy of the hallux may likewise be explained by the part the hind-feet play in raking backwards the loosened material of the burrow. So far as I am aware, there are no records of the habits of *Bdeogale* helping a decision as to whether the loss of the pollex and hallux is connected with digging or running.

The close resemblance in coloration above alluded to between *Paracynictis*, *Ichneumia*, and some species of *Bdeogale* is curious, since it does not appear to be attributable to mutual affinity. Special attention may be drawn to the

prevalent whiteness of the tail, the effect of which must be to render the animal comparatively visible, especially at night. In view of the existence in all mongooses of an anal sack and foul-smelling secretion of the anal glands, coupled with the known power in the case of *Mungos urva** of ejecting this secretion to a distance, as in the skunk, I suggest that the whiteness of the tail may be a warning attribute; and since *Ichneumia* geographically overlaps *Bdeogale* to the north and *Paracynictis* to the south, the likeness between the three may, perhaps, be Müllerian.

Note on Galeriscus.

In 1894 Mr. F. J. Jackson sent to the British Museum the skin, without the skull, of a Carnivore from Mianzini, in in Masailand. This was described by Mr. Thomas† as a new genus and species, *Galeriscus jacksoni*, which was assigned to the Mustelidæ, and compared more particularly with the South-American genus *Galictis*, now known as *Grison*. Mr. Thomas subsequently came to the conclusion that the specimen must be referred to *Bdeogale*—a view fully confirmed by the structure of the ear, which is like that of *Mungos* rather than of *Grison*. Since I am not aware that this correction has ever been published, I take this occasion to point out that *Galeriscus* falls as a synonym of *Bdeogale*.

XV.—*On the Generic Names of certain Old-World Monkeys.*

By Oldfield Thomas.

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The generic names used for some of the Old-World monkeys have of late years been in a state of continual incertitude, so that for the langurs *Presbytis*, *Pygathrix*, and *Semnopithecus* have been used by different authors for different reasons, for the macaques *Simia*, *Pithecus*, and *Macacus*, and for the guenons *Cercopithecus* and *Lasiopyga*—not to mention the use of such little-known names as *Pan* and *Pongo* for the chimpanzees and orangs.

The question of *Pithecus* has recently been again brought

* Ann. & Mag. Nat. Hist. (8) viii. p. 756 (1911).

† *Ibid.* (6) xiii. p. 522 (1894).

up by Dr. Lyon *, who, for reasons in which I concur, considers valid my selection in 1894 of "*Simia veter*" as the type of that name, and who then quotes my assertion that, *S. veter* being indeterminable, the name *Pithecus* should drop—a conclusion which Dr. Lyon accepts. He would, therefore, abolish the name *Pithecus*, and (failing *Simia*, which he does not mention) use the name *Macaca* for the macaques.

But, in doing this, we are always confronted with the risk that, after zoologists have got accustomed to the resulting names, attempts will later on be made to identify *Simia veter*, and thus embroil the whole question afresh.

It appears to me, therefore, to be better to make this attempt now, while usage is still in an unsettled condition, and so, whatever conclusion may be come to, to introduce a nomenclature which may have some chance of finality—a desideratum which can never be attained while *Pithecus*, the earliest of the names in question, is still "in the air."

That *Simia veter* as a known definite species is indeterminable may be true, but, nevertheless, the consequence does not follow that *Pithecus* as a generic name is untenable; for if the species between which its identity lies are congeneric, its validity is unaffected. A determinable genotype is not a *sine quâ non* for the validity of a generic name, as is evident from the number of recognized genera which have been founded merely by diagnosis, without mention of genotypes.

Under *Simia veter* Linnæus † gives only two references—to Brisson and Ray,—that of the former being, again, simply a reproduction from the latter, whose account ‡ is therefore the essential basis of the name.

Ray's monkey, the "*Simia alba* seu incanis pilis, barba nigrâ promissa, ex Zeylona: ELAWANDUM Zeylanensibus," is clearly the whitish monkey described by Kelaart § as "*Presbytes albinus*," which Blanford considers to have been either an albinistic form of *Semnopithecus cephalopterus* or *ursinus*—these two species being certainly congeneric—or a special white species nearly allied to them. It is to be noted that Ray's native name of "Elawandum" and locality of Ceylon agree very well with Blanford's *Semnopithecus cephalopterus*—"Kalli Wanderu (and Elli Wanderu ?)," with locality Ceylon. Kelaart also gives "Ellee Wanderoo" as

* P. Biol. Soc. Wash. xxviii. p. 179 (1915).
† Syst. Nat. (12) i. p. 36 (1766).
‡ Quadr. p. 158 (1793).
§ Prodr. Faun. Zeyl. p. 7 (1852).

the Singhalese name of the brown langur which he calls *Presbytes thersites*. All these species are langurs, nearly allied to each other, and no macaque comes into the question.

Since, then, the genus of langurs has of late years had several changes of name, it appears to me no great harm if a fresh and far earlier name be attached to it, thus removing (so far as this point is concerned) all question as to the extent and validity of *Pygathrix*, and, in fact, at the cost of one more change after many, by putting its date much further back, rendering the name of the genus far more stable than has hitherto seemed likely ever to be the case.

The result of this would be that the langurs should be called *Pithecus* and the macaques *Macaca*—that is to say, if *Simia* is removed by Fiat from competition with the latter.

If, therefore, as almost everyone on this side of the Atlantic hopes will be the case, the Anthropoid names included in the Fiat list published in 1914* are accepted as there advocated, the generic names of the Anthropoids and chief Old-World monkeys will be as follows :—

Chimpanzees	*Anthropopithecus*, Blainv., 1838 (by Fiat). Synn. *Pan*, Oken, 1816, *et al.*
Gorilla	*Gorilla*, I. Geoff., 1852.
Orangs	*Simia* (by Fiat). Synn. *Pongo*, Lac., *et al.*
Langurs	*Pithecus*, Geoff. & Cuv., 1795. Synn. *Presbytis*, Eschsch., 1821 ; *Semnopithecus*, Desm., 1822 ; *Pygathrix* of Elliot's Primates.
Macaques	*Macaca*, Lac., 1799. Synn. *Simia*, Linn., 1758 ; *Macacus*, Desm. ; *Pithecus* of Elliot.
Guenons.....	*Cercopithecus*, Brünn. (removed from Tamarins by Fiat †). *Lasiopyga* of Elliot.

We thus obtain a set of names which are comparatively familiar, and represent to most people the genera to which they are here applied. The names produced by rigid technicality, without Fiat—as, for example, those used in Elliot's 'Primates,'—do not possess any meaning at all to the minds of the majority of naturalists.

The attachment, apparently technically valid, of the one unfamiliar name in the list—*Pithecus*—to a genus for which no name is now really familiar, appears to me to help greatly to render stable the results at which I arrive.

* Zool. Anz. xliv. p. 284 (1914).

† And in no case properly referable there, as Gronovius was not a binomial writer.

XVI.—*Notes on Argentine, Patagonian, and Cape Horn* Muridæ. By Oldfield Thomas.

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The Mice of the *Hesperomys laucha* Group.

Of the small grey field-mice of the *Hesperomys laucha* group there is happily no doubt about the identification of the original species, Azara's "Laucha," as Mr. Perrens sent from Goya, Corrientes, specimens exactly agreeing with Azara's description.

But I am now convinced that the larger form occurring in the same region—the largest of the genus as now restricted—cannot be identified with Rengger's *Mus callosus*, as I had hitherto supposed, and needs a fresh determination. Rengger's animal has too long a tail and too long ears, and, owing to the extreme insufficiency of the description, it should probably be put aside as unidentifiable. Perhaps it was a common rat—to which Rengger compared it—or possibly a *Reithrodon*, a genus in which the pads of the feet are more conspicuous than in *Hesperomys*. In any case, however, the doubt is so great that a guesswork identification is of no use to anyone.

The Goya *Hesperomys* seems to represent a Parana race of the Cordova *H. venustus*, and may be described as follows:—

Hesperomys venustus callidus, subsp. n.

Fur not so long as in true *venustus*, hairs of back about 9 mm. in length. General colour above greyish, very much the colour of *Mus musculus*, darker "mouse grey" anteriorly, more drabby posteriorly, but not so drab as in true *venustus*. Flanks with a slight wash of buffy, decidedly less marked than in *venustus*. Under surface pale grey, the hairs slaty basally, white or greyish white terminally. Ears large, appearing larger than in true *venustus*, rounded, brown anteriorly, greyish posteriorly, the usual postauricular white patch not very conspicuous. Hands and feet white. Tail shorter than head and body, thinly haired, pale brownish above, greyish white on sides and below. Mammæ usually 3—2=10.

Skull stoutly built, with broadly divergent supraorbital edges, which form well-marked ledges over the orbits, but not upwardly projecting beads; the ledges in continuation with distinct ridges running across the parietals.

Dimensions of the type (measured in flesh) :—

Head and body 115 mm. ; tail 77 ; hind foot 21 ; ear 18.

Skull : greatest length 29·2 ; condylo-incisive length 27 ; zygomatic breadth 16 ; nasals 11·6 ; interorbital breadth 4·5 ; breadth of brain-case 13 ; palatilar length 12·8 ; palatal foramina 6·5 ; upper molar series 4·5.

Hab. Goya, Corrientes. 600′.

Type. Adult male. B.M. no. 98. 12. 3. 12. Original number 106. Collected 10th August, 1896, by R. Perrens. Presented by Oldfield Thomas. Fifteen specimens examined.

This mouse may be distinguished from the true *H. venustus* of Cordova by its darker, less drabby colour, shorter fur, and apparently rather longer ears.

"Common. Killed in maize-field." "Trapped in quinta." —*R. P.*

The Jujuy species, *H. musculinus*, is smaller, paler, with shorter hair, and has six or seven pairs of mammæ.

Of the smaller members of the group, the true *H. laucha*, Desm., is an animal with head and body about 70 mm., tail about 50, and hind foot 14–15 mm., as represented by the Goya specimens. And in the south of the Argentine Waterhouse's *H. gracilipes* is very closely allied to it ; but I have not material for a proper comparison.

Between the two, however, in the Buenos Ayres and La Plata region, there occurs a mouse which I collected in some numbers in 1896 and supposed to be the same as the laucha, the natives even calling it by that very name.

But comparison shows that it has a conspicuously longer tail, which nearly or quite equals the head and body in length. It may be called

Hesperomys murillus, sp. n.

General appearance very much as in *Mus musculus*. Size about as in *H. laucha*, though old individuals may attain a larger size.

Colour mouse-grey above, slightly more drabby posteriorly, an inconspicuous buffy wash along the sides ; under surface greyish white, the bases of the hairs slaty. Ears of medium size, greyish brown, a well-marked postauricular white patch present. Hands and feet white above ; palms and soles naked. Tail about as long as the head and body, sometimes actually longer, but more commonly a few millimetres shorter : grey-brown above, slightly darkening terminally, whitish below.

Skull without marked supraorbital ridges or ledges.

Dimensions of the type (measured in flesh) :—

Head and body 72 mm. ; tail 72 ; hind foot 16·5 ; ear 13·5.

Skull : greatest length 21 ; condylo-incisive length 19·2 ; zygomatic breadth 11·3 ; interorbital breadth 3·3 ; palatilar length 8·8 ; palatal foramina 4·3 ; upper molar series 3·4.

An older specimen measures :—Head and body 91 mm. ; tail 85 ; hind foot 18 ; ear 15. Skull : greatest length 23·6 ; condylo-incisive length 22·4.

Hab. Province of Buenos Ayres ; type from La Plata City, other specimens from Las Talas, Ensenada, and Bahia Blanca.

Type. Young adult male. B.M. no. 6. 4. 6. 26. Original number 148. Collected 8th June, 1896, and presented by Oldfield Thomas. Fifteen specimens.

This mouse is readily distinguishable from *H. laucha* by its conspicuously longer tail, but is otherwise closely like that species. It is the only member of the restricted genus *Hesperomys* in which the tail is proportionally so long.

Like the true laucha, this animal is not much of a burrower, but lives about in the grass, and examples may be easily obtained by kicking up loose heaps of hay, thistle-stalks, or other rubbish, under which the mice take refuge. One specimen I have marked as found under a heap of thistle-stalks, in a round nest, the size of a tennis-ball, made of thistle-down. Another was dug up, semi-torpid, in very cold weather, from about 6 inches below the surface of the ground.

There is also a Western form of the same species, which may be named

Hesperomys murillus cordovensis, subsp. n.

General characters as in true *murillus* of La Plata, but the colour paler and less saturate, the back nearly matching "drab" of Ridgway ; sides rather more buffy. Under surface more heavily washed with buffy whitish, the slaty bases of the hairs less evident. Colour of crown especially lighter and more drabby than in true *murillus*.

Skull apparently with a more inflated brain-case than in *murillus*, but the number of fully adult specimens is not sufficient to prove how far this is constant.

Dimensions of type :—

Head and body 85 mm. ; tail 74 ; hind foot 16 ; ear 14. Another specimen measures :—Head and body 80 mm. ; tail 84 ; hind foot 17 ; ear 15.

Skull : greatest length 23·2 ; condylo-incisive length 21·5 ; breadth of brain-case 10 8 ; upper molar series 3·3.

Hab. Near Villa Dolores, Cordova. Type from Yacanto, 900 m.; other specimens from El Carrizal, 1000 m.

Type. Adult male. B.M. no. 16. 1. 6. 24. Original number 2537. Collected 17th Nov., 1915, by Robin Kemp. Presented by Oldfield Thomas. Eight specimens.

The Cape Horn *Euneomys*.

Euneomys ultimus, sp. n.

Allied to *E. chinchilloides*, but larger.

General appearance about as in *E. chinchilloides*. Fur long and soft, hairs of back about 12–13 mm. in length. Colour apparently of the same dull greyish fawn as in *chinchilloides*, but all the available specimens are or have been in spirit, by which the colour may have been affected. Under surface drab, the bases of the hairs slaty. Ears of medium length, greyish brown. Hands and feet thick and clumsy, with large palm and sole-pads which nearly touch one another; edges of feet heavily fringed and the back of the soles hairy except along the centre; upper side of both hands and feet white. Claws of normal size, not enlarged as in *E. fossor*. Tail short, thick and fleshy, closely haired, markedly bicolor, brown above and white below.

Skull and teeth quite like those of *E. chinchilloides*, but larger and heavier in all dimensions. On the other hand, they are both smaller and lighter than in *E. mordax* and *fossor*. Upper incisors clearly and distinctly grooved.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 129 mm.; tail 90; hind foot 30; ear 19.

Skull: upper molar series 6.

Dimensions of adult skull in the Paris Museum:—

Greatest length 33 mm.; condylo-incisive length 30·5; zygomatic breadth 20·3; nasals 14 × 4·6; interorbital breadth 3·8; breadth of brain-case 14; zygomatic plate 3·2; diastema 9; palatilar length 15; palatine foramina 8·5; upper molar series 5·6; breadth of m^1 1·7.

Hab. Cape Horn Islands. Type from St. Martin's Cove, Hermite Island. Other specimens from Orange Bay, Hardy Peninsula, Hoste Island.

Type. Adult male. B.M. no. 43. 11. 16. 26. Collected in 1842 by Sir James Ross's Antarctic Expedition.

This far southern species may be readily distinguished from the Magellan *E. chinchilloides* by its greater size and heavier teeth.

It was first obtained by the Antarctic Expedition of 1841–2 under Sir James Ross, and, later on, by the French Cape Horn Mission, in whose Zoology (Muridæ written by myself) it is referred to as "*Reithrodon chinchilloides*." I owe to the kindness of Prof. Trouessart the loan again of the adult specimen I determined in 1890, and the transference by exchange of an immature example from the same locality.

The original specimen was, unfortunately, put in some peculiar preserving fluid, which has caused the skull, after extraction, to shrink in drying. Its size, however, before drying was quite the same as in the French specimen, and its teeth are still unaffected.

The *Oryzomys* of the Extreme South of South America.

When in 1881 I described "*Hesperomys* (*Calomys*) *coppingeri*" no assertion as to the position of the type-localities Cockle Cove and Tom Bay was made, but the statement on the labels that these places were in the Straits of Magellan was generally accepted, and influenced later determinations. Now, however, on finding that all other *Oryzomys* from the Straits region are referable to *O. magellanicus*, Benn., including those from Orange Bay, Cape Horn, I have thought it probable that some mistake has been made. On examining Dr. R. W. Coppinger's book, the "Cruise of the 'Alert,'" 1883, it at once appears that Cockle Cove and Tom Bay are not in what is commonly called the Straits of Magellan at all, but are in Trinidad Channel, at the north end of Madre de Dios Island, West Patagonia, in 50° S. lat.

Since *O. coppingeri* is so closely allied to *O. magellanicus* as practically to differ from it in nothing but its greater size, this location is far more natural than in the Straits, near the centre of the range of *O. magellanicus*.

The specimens obtained by the French Transit of Venus Expedition of 1882–3, named by me *Hesperomys coppingeri*, prove on re-examination to be typical *O. magellanicus*, which is evidently common throughout this region.

But a series from further north, in middle Patagonia, equally referable specifically to *O. magellanicus*, prove to have such uniformly longer tails as to deserve subspecific distinction, as follows :—

Oryzomys magellanicus mizurus, subsp. n.

Size and other characters quite as in true *magellanicus*, but the tail averaging about 130 mm. in length, in adults, as compared with about 110–115 in the more southern form.

Colour above olivaceous lined with black, the rump with a dull suffusion of fulvous; under surface dull greyish buffy. In true *magellanicus* the colour is more rufous; but as both of the only two available skins have formerly been in spirit, I believe that they are discoloured, and that no real difference exists.

Dimensions of the type (measured in flesh):—

Head and body 100 mm.: tail 131; hind foot 29; ear 16.

Skull: greatest length 27·5; condylo-incisive length 24·5; interorbital breadth 3 3; upper molar series 3·8.

Hab. Southern Patagonia. Type from Koslowsky Valley, 46° S., 71° W., Central Patagonia.

Type. Adult male. B.M. no. 14. 4. 4. 17. Collected 17th October, 1903, by J. Koslowsky. Presented by the Buenos Ayres Museum. Other specimens received in 1903 direct from Mr. Koslowski.

Specimens from the Rio Chica, Upper Santa Cruz, measured by Dr. Allen, would appear to be intermediates between the two forms; but I am inclined to think that, if only the fully adult specimens were included, the tail-length would be as in the Koslowsky form, which is but little further north in the same faunal area.

On the other hand, aged specimens of true *magellanicus*, from Orange Bay in the far south, have the tail at most 115 mm. in length.

The Cape Horn Akodon.

As I have thus revised the determination of the Orange Bay *Euneomys* and *Oryzomys*, I have thought it worth while to re-examine the Akodon from the same locality, recorded as "*Hesperomys* (*Habrothrix*) *olivaceus*" in my paper of 1890*.

As might be expected, this proves to be different from the *Akodon olivaceus* of Chili, and is clearly referable to *A. xanthorhinus*, Waterh., of which it is, in fact, a topotype, Orange Bay being in the Hardy Peninsula, where Darwin caught the original example. A confusion in the labelling of Darwin's specimens, recently corrected by Dr. Allen, and a consequent misapprehension as to the size of adult *xanthorhinus*, was a contributory cause of the wrong determination.

* Thomas, in Milne-Edwards, Miss. Scient. Cap Horn, vi., Zool., Mamm. p. 28 (1890). The Muridæ part of this work was written by me, and merely translated in Paris. Its misdeterminations, some of which I have now rectified, are therefore not to be credited to my respected and friendly ally, Prof. Alphonse Milne-Edwards.

XVII.—*On the African Shrews belonging to the Genus* Crocidura.—VII. By Guy Dollman.

[Concluded from vol. xvi. p. 514.]

Group 19 (*bicolor*).

Size very small. Colour above greyish, greyish brown, or cinnamon; below silvery grey or whitish. Skulls rather flattened. Fur very short. Second and third upper unicuspids about equal in size.

(104) *Crocidura bicolor*, Boc.

Crocidura bicolor, Bocage, Jorn. Sc. Lisb. p. 29 (1889).

A small, short-haired, greyish-brown species, with silvery-grey underparts and a rather flat skull.

General dimensions a trifle less than in *allex*. Fur, as in all the members of this group, very short; hairs of back only about 2–3 mm. in length.

Colour above greyish brown (between "hair-brown" and "fuscous" speckled with pale greyish buff), greyer than in *allex* or *alpina*. Flanks a trifle paler, the colour passing fairly abruptly into the silvery greyish white of the ventral surface, the underparts being lighter than in any of the preceding small species. Backs of hands and feet white. Tail finely haired, distinctly bicoloured, dark brown above, white below; bristle-hairs numerous, greyish in colour.

Skull small, equal in size to that of *b. cuninghamei*; brain-case flatter than in *alpina*. Teeth small, especially the second and third upper unicuspids, which are about equal in size, the third slightly overlapping the second.

Dimensions of the type (as given by Bocage):—

Head and body 53 mm.; tail 42; hind foot 10 (s. u.).

In the Museum Collection there is a series of specimens of *bicolor* from Caconda; the following are the flesh-dimensions of two of these individuals:—

	Head and body. mm.	Tail. mm.	Hind foot. mm.	Ear. mm.
♂. Caconda ..	55	38	10	7
♀. „ ..	60	42	10	7

Skull-dimensions of two Caconda specimens:—

Condylo-incisive length 17·5, 17·2; greatest breadth 7·8, 7·8; least interorbital breadth 3·7, 3·6; length of palate 6·9, 6·7;

postpalatal length 8·2, 7·8 ; greatest maxillary breadth 5·4, 5·3 ; median depth of brain-case 4·2, 3·7 ; length of upper tooth-row 7·3, 7·3.

Hab. Gambos, Mossamedes, Angola.

Type in the Lisbon Museum.

The short fur, greyer colour, lighter underparts, and flatter skull distinguish this Angolan shrew from the East-African *allex* and *alpina*.

(105) *Crocidura bicolor woosnami*, subsp. n.

A cinnamon-coloured race of *bicolor*.

General proportions as in the Angolan form. Fur equally short.

Colour of dorsal surface cinnamon-brown speckled with grey ; flanks cinnamon-brown, the transition to the light colour of the ventral surface quite sharp. Underparts slate-grey washed with white. Backs of hands and feet white. Tail dull brown above, white below ; bristle-hairs white and rather inconspicuous.

Skull of the same semi-flattened type as that of *bicolor*, but rather smaller. Teeth all a little smaller, but similar in shape ; second and third upper unicuspids about equal in size, cingula small.

Dimensions of the type (preserved in spirit) :—

Head and body 53 mm. ; tail 40 ; hind foot 10 ; ear 6·5.

Skull: condylo-incisive length 17 ; greatest breadth 7·8 ; least interorbital breadth 3·4 ; length of palate 7 ; post-palatal length 7·8 ; greatest maxillary breadth 5·3 ; median depth of brain-case 3·8 ; length of upper tooth-row 7·3.

Hab. Lake Ngami.

Type. Adult female. B.M. no. 10. 6. 3. 80. Collected by R. B. Woosnam, Esq.

The rather lighter underparts, more sharply marked off from the cinnamon-brown flanks, and smaller skull distinguish this Ngami race from true *bicolor*.

(106) *Crocidura bicolor hendersoni*, subsp. n.

Closely allied to *bicolor*, but rather larger in size and much richer in colour.

Hind foot a little larger, measuring 11 mm. in length. Fur equally short. Colour of upper parts brownish buff ("sepia" mixed with "fuscous," sprinkled with "neutral

grey"), very different from the slaty colour of the Angolan species. Patches of the old worn coat, which are still retained in this Nyasa specimen, are very much more orange in colour, about as in "tawny olive." Underparts greyish white, as in *bicolor*, not as white as in *woosnami*. Backs of hands and feet rather darker, especially on their outer sides. Tail about equal in length and similar in colouring.

Skull badly broken, only the muzzle remaining intact. Upper unicuspids rather larger than in *bicolor*, the third rather longer than the second.

Dimensions of the type (taken from dry skin) :—

Head and body (stretched) 67 mm.; tail 43; hind foot 11.

Skull: length from front of upper incisors to back of large premolar 5 mm.

Hab. Nyasaland. Altitude 4040 feet.

Type. Adult. B.M. no. 0. 7. 31. 1. Original number 4. Collected on May 18th, 1900, by J. Henderson, Esq., and presented by him to the National Collection.

(107) *Crocidura bicolor cuninghamei*, Thos.

Crocidura cuninghamei, Thomas, Ann. & Mag. Nat. Hist. (7) vol. xiv. p. 240 (1904).

A slate-brown coloured race of *bicolor*, with duller underparts and a rather flatter skull.

Size as in *bicolor*. Fur quite short, hairs on back 2–3 mm. in length.

Colour dark slaty grey washed over with brown, the general effect as in "sepia" speckled with "neutral grey," considerably less brown than in *allex* or *alpina*. Belly dull grey, not sharply marked off from the browner upper parts. Backs of hands and feet whitish. Tail finely haired, brown above, dull white below; bristle-hairs numerous, but very inconspicuous.

Skull small, brain-case rather flatter than *bicolor* and considerably more so than in *allex* or *alpina*, and more parallel-sided. Teeth much as in *bicolor*, the third upper unicuspid overlapping the second to a rather greater extent.

Dimensions of the type and two other specimens :—

	Head and body. mm.	Tail. mm.	Hind foot. mm.	Ear. mm.
♀ (type)	60	40	11	7
♂. Kama I.....	55	38	10	5
♂. Kampala	56	43	10·5	7·5

Skull of type: condylo-incisive length 17·6 mm.; greatest breadth 7·8; least interorbital breadth 3·9; length of palate 7·4; postpalatal length 7·9; greatest maxillary breadth 5·4; median depth of brain-case 4; length of upper tooth-row 7·7.

Hab. "Small uninhabited island one mile north of Sajitu Island, Victoria Nyanza."

Type. Adult female. B.M. no. 2. 7. 5. 6.

In addition to the type there are two further specimens of *cuninghamei* in the collection, one from Kama Island, Victoria Nyanza, and the other from Kampala.

(108) *Crocidura bicolor elgonius*, Osg.

Crocidura bicolor elgonius, Osgood, Ann. & Mag. Nat. Hist. (8) vol. v. p. 369 (1910).

Rather smaller than *cuninghamei*, greyer in colour and with smaller skull.

Size rather less than in either *bicolor* or *cuninghamei*, hind foot only 9 mm. in length. Fur as short as in the allied forms. Colour of dorsal surface much greyer, general effect between "fuscous" and "*Chætura* drab," considerably less brown than *cuninghamei*. Colour on sides gradually paling and passing imperceptibly into the lighter grey of the belly. Lateral gland very small, marked by short white hairs. Backs of hands and feet darker, dirty brownish grey. Tail finely haired, dark sooty brown above, slightly paler below; bristle-hairs more conspicuous, grey throughout, not darker at their bases as in the Victoria Nyanza form.

Skull smaller, equally flat, brain-case rather narrower. Teeth as in *cuninghamei*, second and third upper unicuspids slightly smaller.

Dimensions of type and topotype (♂) (measured in the flesh):—

Head and body 52, 55 mm.; tail 38, 44; hind foot 9, 9; ear 8, 6.

Skull of type: condylo-incisive length 16·7; greatest breadth 7·3; least interorbital breadth 3·2; length of palate 6·8; postpalatal length 8; greatest maxillary breadth 4·8; depth of brain-case 4; length of upper tooth-row 7·2.

Hab. Kirui, Mt. Elgon. Altitude 6000 feet.

Type. Adult female. B.M. no. 10. 4. 1. 47.

The much more sooty coloration and smaller skull distinguish this Elgon race from the Lake form.

Group 20 (*cinderella*).

Size fairly small. Colour above cinnamon, below whitish. Skulls rather flat. Second and third upper unicuspids about equal in size.

(109) *Crocidura cinderella*, Thos.

Crocidura cinderella, Thomas, Ann. & Mag. Nat. Hist. (8) vol. viii. p. 119 (1911).

Size of body about as in *floweri* described below, but tail shorter and hind foot smaller. Fur rather short, but not as short as in the *bicolor* group, hairs of back 3–4 mm. in length.

Colour above pale cinnamon-grey, near "wood-brown" mixed with "drab" and speckled with "neutral grey," the cinnamon tint passing rather abruptly into the light greyish white of the ventral surface; hairs of belly slate-grey, with whitish tips. Backs of hands and feet white. Tail of medium length, rather thick at base, thinly clad with short hairs, drab-grey above, paler below; bristle-hairs numerous, evenly distributed throughout nearly the whole length of the tail.

Skull rather larger than in *floweri* and more heavily built, brain-case narrow and fairly flat. Teeth about as in the Egyptian species, the two small upper unicuspids equal in size.

Dimensions of the type (measured in the flesh) :—

Head and body 62 mm.; tail 48; hind foot 11.

Skull: condylo-incisive length 19·7; greatest breadth 8·2; least interorbital breadth 3·8; length of palate 8; postpalatal length 8·8; greatest maxillary breadth 5·9; median depth of brain-case 4·3; length of upper tooth-row 8·3.

Hab. Gemenjulla, French Gambia.

Type. Adult female. B.M. no. 11. 6. 10. 13.

The shorter and less hairy tail and smaller feet distinguish this species from the Egyptian *floweri*, to which it would appear to be most nearly allied.

(110) *Crocidura floweri*, sp. n.

Larger than in the *bicolor* or *nana* groups, tail considerably longer, skull as flat as in *bicolor*.

Size greater than in *bicolor* or *nana*, the hind foot measuring from 12–13 mm. in length. Fur long, hairs of back

from 4–5 mm. in length, considerably longer than in *bicolor*.

Colour (from spirit-specimens) of dorsal surface light cinnamon-brown, changing abruptly on the flanks into the white of the ventral surface; hairs of belly with pale slate-grey bases and whitish tips. Backs of hands and feet dirty white. Tail very long, thinly clad with short hairs, cinnamon-colour above, white below, distinctly bicoloured; bristle-hairs not numerous, entirely confined to the basal half, greyish white in colour, and rather inconspicuous.

Skull much larger than in the other small Egyptian species, *religiosa*, but somewhat of the same flattened type, not so markedly however, the roof of the brain-case slightly convex, about as in *bicolor*. In size the skull is larger than in any of the members of the *bicolor* or *nana* groups, nearly equalling in length that of *cinderella* from the French Gambia. Teeth much larger than in *religiosa*, more as in the Gambia species; second and third upper unicuspids almost equal in size, third slightly overlapping second.

Dimensions of the type (in spirit) :—

Head and body 57 mm.; tail 58; hind foot 13; ear 8.

Skulls of type and three topotypes :—

	♂ (type). mm.	♂. mm.	♂. mm.	♀. mm.
Condylo-incisive length	19·2	18·5	18	18
Greatest breadth	8·4	8	7·8	7·8
Least interorbital breadth	4	3·8	3·7	3·8
Length of palate	7·5	7·4	7·3	7·3
Postpalatal length	8·9	8·4	8·3	8·3
Greatest maxillary breadth	5·6	5·3	5·2	5·4
Median depth of brain-case....	4·3	4·2	4·2	4·1
Length of upper tooth-row	8·1	8	7·8	7·6

Hab. Giza, Egypt.

Type. Adult male. B.M. no. 10. 6. 18. 3. Collected by Captain S. S. Flower, and presented to the National Collection by the Egyptian Government Zoological Service.

This species would appear to be most nearly allied to *cinderella*, from which it is distinguished by its longer and more bicoloured tail, larger hind feet, and rather shorter skull with larger brain-case; further, in *cinderella* the bristle-hairs are distributed over nearly the entire length of the tail, while in *floweri* they are strictly confined to the basal half. All the members of the *bicolor* and *nana* groups are considerably smaller in size and have shorter fur.

Group 21 (*nana*).

Size small or very small. Colour above greyish or cinnamon, below greyish or white. Fur very short. Skulls exceptionally flat. Second and third upper unicuspids about equal in size.

(111) *Crocidura nana*, Dobs.

Crocidura nana, Dobson, Ann. & Mag. Nat. Hist. (6) vol. v. p. 225 (1890).

A very small slaty-brown coloured species, with a very flat skull.

Size considerably less than in the *bicolor* group. Fur fairly short, hairs of back measuring 3–4 mm. in length.

Colour of dorsal surface slaty brown ("neutral grey" washed with "Prout's brown"), flanks equally dark, the brownish-grey tint passing fairly abruptly into the greyish white of the ventral surface; belly rather whiter than in the following race. Backs of hands and feet white. Tail finely haired, dull brown above, white below; bristle-hairs numerous, whitish in colour.

Skull very small and with the brain-case markedly flattened, much more so than in any of the *bicolor* group; maxillary region rather narrow. Teeth very small, third upper unicuspid a little broader than second.

Dimensions of the type (from dried skin):—

Head and body 40 mm.; tail 30; hind foot 8·5.

Skull of specimen from Eyk, Somaliland (the type-skull is too badly broken to be of any use for measuring purposes):—

Condylo-incisive length 16; greatest breadth 7; least interorbital breadth 3·2; length of palate 6·7; postpalatal length 7·4; greatest maxillary breadth 4·6; median depth of brain-case 3·2; length of upper tooth-row 6·8.

Hab. Dollo, Somaliland.

Type. Adult. B.M. no. 90. 3. 6. 1.

In the Collection there are two further specimens of this minute Somali shrew, both exactly like the type in general colour and dimensions.

The small size, greyish-brown upper parts, whitish belly, and very small flat skull readily distinguish *nana* from all the preceding species.

(112) *Crocidura nanilla*, Thos.

Crocidura nanilla, Thomas, Ann. & Mag. Nat. Hist. (8) vol. iv. p. 99 (1909).

Smaller and greyer than *nana*.

Fur shorter, hairs of back only 2–3 mm. in length. Colour of dorsal surface slate-grey (rather paler than "*Chætura* drab"); transition from slate-coloured flanks to whitish underparts well defined; belly rather greyer than in *nana*. Backs of hands and feet white. Tail finely haired, slaty brown above, white below; bristle-hairs numerous, grey in colour.

Skull smaller and with shorter brain-case than in *nana*, equally flat. Teeth rather smaller, second and third upper unicuspids about equal in size.

Dimensions of the type (taken from spirit-specimen):—

Head and body 41 mm.; tail 31; hind foot 8·2; ear 6·3.

Skull: condylo-incisive length 15·1; greatest breadth 6·8; least interorbital breadth 3; length of palate 6·1; post-palatal length 7; greatest maxillary breadth 46; median depth of brain-case 3·2; length of upper tooth-row 6·5.

Hab. Uganda (probably Entebbe).

Type. Adult female (skinned from spirit). B.M. no. 9. 7. 14. 1.

This Uganda pygmy shrew is distinguished from the Somali *nana* by its smaller skull and more slaty colouring.

(113) *Crocidura pasha*, sp. n.

A very small cinnamon-coloured species, with a smaller skull than either *nana* or *nanilla*.

Size of head and body measured as rather larger than in *nana*; hind foot 9 mm. in length. Fur quite short, hairs of back only about 2·5 mm. in length.

Colour of upper parts pale cinnamon mottled with grey, the resulting effect between "wood-brown" and "drab," much browner and less slate-coloured than in *nana* or *nanilla*, more as in the larger *whitakeri* from Morocco. Flanks as brightly coloured as back, sharply contrasting with the pure white belly; hairs of belly almost uniformly white, only the extreme bases being greyish, the general effect much whiter than in *nana* or *nanilla*. Backs of hands and feet whitish buff. Tail finely haired, cinnamon-brown

above, whitish below; bristle-hairs long and numerous, white in colour.

Skull smaller than in *nanilla*, of the same exceptionally flattened type, sides of brain-case rather less parallel, more convex. Teeth smaller, second upper unicuspid a trifle smaller in horizontal section than the third, which slightly overlaps it.

Dimensions of the type (measured in the flesh):—

Head and body 50 mm.; tail 38; hind foot 9; ear 8.

Skull of type and of a female specimen from Khartoum:—Condylo-incisive length 14·4, 14·2; greatest breadth 6·6, 6·6; least interorbital breadth 3·1, 3; length of palate 5·7, 5·5; postpalatal length 6·7, 6·8; greatest maxillary breadth 4·3, 4; median depth of brain-case 2·9, 2·9; length of upper tooth-row 5·9, 5·9.

Hab. Atbara River, Sudan.

Type. Adult female. B.M. no. 8. 9. 22. 1. Collected on July 10th, 1908, by W. G. Percival, Esq., and presented by him to the British Museum.

In the Collection there are two specimens, preserved in spirit, from Khartoum which undoubtedly represent this species; the skull-dimensions of one of these individuals are given above.

The pale cinnamon-coloured dorsal surface, sharply contrasting with the almost pure white of the underparts, and smaller skull and teeth distinguish this handsome little shrew from *nana*, *nanilla*, and *religiosa*.

(114) *Crocidura glebula*, sp. n.

Closely allied to *pasha*, but rather darker in colour.

Size about as in *pasha*; fur equally short.

Colour of dorsal surface considerably darker and duller, between "hair-brown" and "snuff-brown," speckled with "neutral grey"; flanks a little greyer, the brownish tint passing fairly abruptly into the greyish white of the ventral surface, but not nearly so sharply contrasted as in *pasha*. Underparts greyish white, basal halves of hairs slate-grey, apical portions whitish, the general effect much duller and greyer than in the Sudan species. Backs of hands and feet white. Tail finely haired, light drab-brown above, white below; bristle-hairs slender and inconspicuous, but fairly numerous.

Skull missing.

Dimensions of the type (measured in the flesh) :—
Head and body 56 mm. ; tail 32 ; hind foot 9 ; ear 8.
Hab. Zungeru, Northern Nigeria.
Type. Female. B.M. no. 4.7.9.14. Original number 16. Collected and presented to the British Museum by Capt. H. Cock, R.A.

In spite of the absence of the skull, there can be little doubt regarding the affinities of this shrew. The darker and duller-coloured upper parts and distinctly greyer belly distinguish it at once from *pasha*. The only other West-African species at all similar in general colour is *cinderella*, from the French Gambia, which may be easily distinguished by its larger size, longer tail, and much longer fur.

(115) *Crocidura religiosa*, Is. Geoff.

Sorex religiosus, Is. Geoffroy, Mém. Mus. xv. p. 128 (1827).

In size about as in *nana*, but greyer in colour.
Fur shorter than in *nana*, about like that of *nanilla*.
Colour of upper parts dull drab-grey faintly washed with brownish, the general effect much as in "hair-brown," considerably greyer than in *nana*, but not so slaty as in *nanilla*. Flanks rather paler, the tint gradually fading and passing imperceptibly into the light grey of the underparts ; hairs of belly with grey bases and greyish-white tips, on chin and throat rather lighter. Backs of hands and feet white. Tail drab-colour above, whitish below ; bristle-hairs numerous, greyish in colour.
Skull about equal in length to that of *nana*, quite as flat, the brain-case a trifle broader. Teeth similar.
Dimensions (taken from spirit-specimens) :—

	Head and body. mm.	Tail. mm.	Hind foot. mm.
Giza	45	36	9
„	49	40	9·5
Cairo	52	37	9·2
„	47	34	8·5
„	50	34	9
„	47	34	8·7

Skulls of two adults : condylo-incisive length 15·8, 15·8 ; greatest breadth 7, 7 ; least interorbital breadth 3·2, 3·1 ; length of palate 6·2, 6·2 ; postpalatal length 7·4, 7·4 ; greatest maxillary breadth 4·9, 4·7 ; median depth of brain-case 3, 3 ; length of upper tooth-row 6·8, 6·8.

Hab. Egypt.

This Egyptian shrew is distinguished from *nana* by its shorter fur, rather duller and greyer dorsal surface, and much greyer underparts. The Sudan species, *pasha*, is separated from *religiosa* by its much smaller skull, brighter colouring, and white ventral surface. The smaller size and more slaty colour at once distinguish *nanilla* from this species.

(116) *Crocidura lusitania*, sp. n.

Allied to *nana*, larger in size and with larger skull and teeth.

Body and hind foot larger than in *nana*; tail rather longer. Fur very short, hairs of back about 2·5 mm. in length.

Colour (taken from spirit-specimens) of dorsal surface rather darker than in *glebula*, dull greyish cinnamon-brown, changing fairly abruptly on the flanks into the greyish white of the underparts. Chin and throat, backs of hands and feet, and lateral gland white. Tail long; light brown above, whitish below; bristle-hairs numerous and long, distributed over nearly the whole length of the tail, white in colour.

Skull of the same flattened shape as in *nana*, brain-case broader, muzzle less slender. Teeth larger and heavier; third upper unicuspid rather broader than second, but not markedly so.

Dimensions of the type and topotype (spirit-specimens):—

Head and body 53, 53 mm.; tail 43, 42; hind foot 10·6, 10·5; ear 8, 7.

Skulls: condylo-incisive length 16·9, 17; greatest breadth 7·5, 7·4; least interorbital breadth 3·6, 3·2; length of palate 7, 7; postpalatal length 7·8, 8; greatest maxillary breadth 5·2, 5; median depth of brain-case 3·7, 3·6; length of upper tooth-row 7·2, 7·4.

Hab. Trarza Country, Mauritania.

Type. Adult male. B.M. no. 13. 3. 7. 2. Collected by M. Audan.

The larger size distinguishes this species from all the other members of the *nana* group.

The Nigerian *glebula* would appear to be its nearest relation; it is probably also related to the Gambian *cinderella*, which species possesses a larger and less flattened skull and more incrassated tail.

Grounp 22 (*dolichura*).

Size medium or very small. Colour above dark brownish red, greyish, or blackish. Caudal bristle-hairs almost entirely absent.

(117) *Crocidura dolichura*, Pet.

Crocidura dolichura, Peters, MB. Akad. Berlin, p. 475 (1876).

A fairly small species with very long tail, caudal bristle-hairs almost entirely absent.

Size of body small; tail exceptionally long, about 80 mm. in length.

Colour slate-grey above, gradually fading on the flanks to the greyish tint of the belly, which is only a shade lighter than on the back. Backs of hands and feet dirty white or brownish; claws of fore and hind feet about equal. Tail very long, cylindrical, and appearing almost naked, but covered with very short brown hairs, rather darker above than below; caudal bristles almost absent, a few situated at the extreme root of the tail.

Dimensions of the type (as given by Peters) :—

Head and body 63 mm.; tail 80; hind foot 14 (c. u.); ear 9.

Skull: length of upper tooth-row 7·9.

Hab. Bonjongo, Cameroons.

In the Museum Collection there are two spirit-specimens from the Cameroons which may be referred to this species; the following are the flesh-dimensions of these specimens :— Head and body 59, 60 mm.; tail 84, 78; hind foot 13, 13·2 (s. u.); ear 8, 8.

The skull of one specimen having been taken out, it is possible to give the following dimensions :—

Condylo-incisive length 20; greatest breadth 8·6; least interorbital breadth 4·2; length of palate 7·8; postpalatal length 9·2; greatest width across maxillary region 5·7; median depth of brain-case 5 1; length of upper tooth-row 8·6.

The skull is smaller than that of the following species; brain-case narrow and high, muzzle not tapering so suddenly. Teeth small, second and third upper unicuspids about equal in size and roughly circular in section, much broader than those of *maurisca*; cingula exceptionally prominent.

Externally this shrew may be at once recognised by its extremely long and apparently hairless tail. The great length of the tail readily separates it from the other members of this group.

(118) *Crocidura maurisca*, Thos.

Crocidura maurisca, Thomas, Ann. & Mag. Nat. Hist. (7) vol. xiv. p. 239 (1904).

A medium-sized species, chocolate-brown in colour, possessing the cylindrical hairless tail so characteristic of this group; skull small and tapering, unicuspids very narrow.

General body-proportions much as in *dolichura*, tail markedly shorter.

Colour above dull chocolate-brown, flanks slightly lighter, the brown tint gradually passing into the brownish of the ventral surface, which is slightly paler than the upper parts. Backs of hands and feet same colour as back; the fore and hind claws subequal. Tail slender and cylindrical, long hairs present only at the extreme base; brownish above and below.

Skull small and narrow in front, tapering anteriorly more markedly than in any other member of this group; brain-case fairly broad and high, maxillary region narrow, muzzle slender and tapering to a sharp point. Teeth small, upper incisors very narrow, small unicuspids longer than broad, oval in section, third slightly longer than second; cingula prominent.

Dimensions of the type (taken from spirit-specimen before skinning) :—

Head and body 75 mm.; tail 60; hind foot 14·4; ear 10.

Skull : condylo-incisive length 20·7; greatest breadth 9·2; least interorbital breadth 4·3; length of palate 8·3; post-palatal length 9·2; greatest width across maxillary region 6·2; median depth of brain-case 5·4; length of upper tooth-row 9·1.

Hab. Entebbe, Uganda.

Type. Adult female. B.M. no. 1. 8. 9. 99.

This species is known only from the type-specimen, and, as this was for a short period preserved in spirit, it is impossible to accept the general coloration of this individual as strictly normal. There can be no doubt, however, that it is a very dark-coloured species, both above and below.

The narrow tapering muzzle of the skull and small very narrow unicuspids serve to separate *maurisca* from all the other members of this naked-tail group.

(119) *Crocidura niobe*, Thos.

Crocidura niobe, Thomas, Ann. & Mag. Nat. Hist. (7) vol. xviii. p. 138 (1906).

Slightly smaller than *maurisca*; agrees in the almost entire absence of long bristles on the tail, but considerably greyer in colour, and possesses a shorter stouter skull with broader unicuspids.

Size of body and hind feet rather less than in the Entebbe species.

General colour dark slaty grey (varies from "blackish brown (2)" to "blackish brown (2)" mixed with "clove-brown"), indistinctly mottled with silvery grey. Under-parts slate-grey, rather lighter than in *maurisca*, only the extreme tips of the hairs tinted with light brown. Backs of hands and feet slate-brown, fore claws rather smaller than hind. Tail long, slender, and cylindrical, long hairs present only on the basal portion; uniformly blackish brown above and below.

Skull less delicately built than that of *maurisca*, stouter and slightly flatter; muzzle blunter and less tapering, maxillary region rather broader. Teeth rather smaller, unicuspids broader, nearly circular in section, second rather smaller than and overlapped by third; cingula well developed. The broad almost circular second and third unicuspids are very different from the narrow oval-shaped teeth of *maurisca*. Cheek-teeth square-shaped.

Dimensions of the type (measured in the flesh) :—

Head and body 61 mm.; tail 63; hind foot 13; ear 10.

Skull: condylo-incisive length 20; greatest breadth 9·1; least interorbital breadth 4·5; length of palate 7·8; post-palatal length 9; greatest maxillary breadth 6·3; depth of brain-case 5·4; length of upper tooth-row 8·2.

Hab. Ruwenzori East. Altitude 6000 feet.

Type. Adult female. B.M. no. 6. 7. 1. 32.

There are three specimens of this shrew in the collection, all from Ruwenzori, collected at altitudes between 6000 and 7000 feet.

The much broader and less tapering skull and broader unicuspids distinguish this species from *maurisca*.

(120) *Crocidura bottegi*, Thos.

Crocidura bottegi, Thomas, Ann. Mus. St. Nat. Genova, (2) vol. xviii. (xxxviii.) p. 677 (1898).

Much smaller than *niobe*, but possessing the same domed-shaped skull and bristleless tail.

In general dimensions more as in the *nana* group, body very small. Fur long, hairs on back from 5 to 6 mm. in length.

Colour (from spirit-specimen) dark brown above and below, the belly scarcely paler. Hands and feet equally dark. Tail long and slender, finely haired, dark brown above, a shade paler below; bristle-hairs almost entirely absent, a few very short ones near the base.

Skull in general build like that of *niobe*, but very much smaller; brain-case very high and rounded, the junction of the lambdoidal and sagittal sutures situated fairly far forward, as in *niobe* and the flatter skull of *fumosa*. Interorbital region very broad behind, narrowing in front rather abruptly. Maxillary region narrow. Teeth small, anterior upper incisors directed forwards in such a manner that they do not project downwards below the level of the second incisors; second and third upper unicuspids small, third a little broader than second. Cheek-teeth of the same square shape as in *niobe*, the last upper molar exhibiting the same characteristic form, the main grinding-area square-shaped, abruptly narrowing externally into a small lateral point. In length this skull is more as is found in the *nana* group, but its build is so different from the exceedingly flat skulls of *nana* and its allies that it is impossible to consider it in any way closely related.

Dimensions of co-type (in spirit) :—

Head and body 44 mm.; tail 41; hind foot 10·7; ear 7·3.

Skull: condylo-incisive length 15·3; greatest breadth 7·3; least interorbital breadth 3·4; greatest posterior interorbital breadth 4·2; length of palate 6; postpalatal length 7; greatest maxillary breadth 4·3; depth of brain-case 4·4; length of upper tooth-row 6·3.

Hab. Between Badditu and Dimè, near Lake Margharita, N.E. of Lake Rudolf.

The co-type in the British Museum (B.M. no. 98. 2. 5. 6) is an adult male.

The minute size of this species immediately distinguishes it from all the other members of this group. The only points which it has in common with *nana* and its allies are the small size of the body and skull; the high brain-case, square-shaped cheek-teeth, great posterior breadth of the interorbital region, and almost entire absence of caudal bristles show beyond doubt that it is most nearly related to *niobe*.

(121) *Crocidura monax*, Thos.

Crocidura monax, Thomas, Ann. & Mag. Nat. Hist. (8) vol. vi. p. 310 (1910).

Larger than *maurisca* with very much heavier and stouter skull.

Size medium, hind foot between 15·5 and 17 mm. in length.

General colour dark slaty, like that of *niobe*, but rather darker and without the mottled appearance (between "fuscous" and "fuscous black"). Flanks rather paler than back, the colour gradually passing into that of the ventral surface, which is a shade greyer and paler than the upper parts. Backs of hands and feet brownish, fore and hind claws about equal in size. Tail slender and cylindrical, long caudal bristles almost entirely absent, a few only at the base; colour blackish brown above and below.

Skull considerably larger than that of *maurisca*, brain-case rather flat; maxillary region narrow, muzzle blunt. Teeth large, unicuspids with well-formed cingula, broad and roughly circular in section, very different from the narrow oval-shaped teeth of *maurisca*; third unicuspid slightly larger than and overlapping second.

Dimensions of the type (measured in the flesh) :—

Head and body 88 mm.; tail 66; hind foot 16·2; ear 10.

Skull: condylo-incisive length 24·1; greatest breadth 10·7; least interorbital breadth 5·3; length of palate 9·7; postpalatal length 10·8; greatest maxillary width 7·5; median depth of brain-case 6·1; length of upper tooth-row 11.

Hab. Rombo, Kilimanjaro. Altitude 5000 feet.

Type. Old female. B.M. no. 10. 7. 2. 58.

In addition to the type there are in the Museum Collection seven further specimens from Rombo, all remarkably uniform in general colour. The following are the collector's measurements of six of these specimens :—

		Head and body. mm.	Tail. mm.	Hind foot. mm.
♂.	Rombo	87	62	16·2
♂.	„	88	61	15·5
♂♀.	„	91	65	17
♀.	„	81	62	16
♀.	„	88	62	16·5
♀.	„	83	64	15·5

In general colour this species is slightly darker than

niobe ; it may be distinguished at once by its larger size and very much larger and stouter skull.

(122) *Crocidura littoralis*, Hell.

Crocidura littoralis, Heller, Smith. Misc. Coll. vol. lv. no. 15, p. 5 (1910).

Allied to *monax*, darker and browner in colour.

Size of body and hind foot rather larger than in the Kilimanjaro species.

Colour of dorsal surface rich sepia, considerably browner than the dark slaty pelage of *monax* ; underparts vandyke-brown, the chin and throat suffused with grey. Hair everywhere plumbeous at base. Backs of hands and feet rather lighter than back. Tail as in *monax*.

Skull about equal to that of *monax*, rather narrower and with a slightly shorter tooth-row.

Dimensions of the type (measured in the flesh, excepting the hind foot) :—

Head and body 96 mm. ; tail 67 ; hind foot 17.

Skull : condylo-incisive length 24 ; greatest breadth 10 ; length of upper tooth-row 10.

Hab. Butiaba, east shore of Albert Nyanza, Uganda.

Type. Adult male. U.S. Nat. Mus. no. 164642.

This species is evidently very closely allied to *monax*, from which it may be distinguished by its browner and darker colour.

(123) *Crocidura ultima*, sp. n.

Allied to *monax*, distinguished by its paler and browner colour and the large size of third upper unicuspid, as compared with the second.

Size of body much as in *monax*.

General colour reddish brown mottled with grey, effect very much as in "clove-brown" sprinkled with greyish buff, very different from the dark blackish-brown coloration of *monax*. Underparts rather greyer than upper, not distinctly differentiated from the brownish tint of the flanks. Backs of hands and feet pale brownish buff ; claws of hind feet slightly larger than those of fore feet. Tail fairly long, covered with very short brownish hairs, the general effect as in *monax* ; colour reddish brown above and below, paler than in the other members of this group ; caudal bristles almost entirely absent, a few near the base on the ventral surface.

Skull slightly smaller than that of *monax*, of a very similar

build, broad with blunt muzzle. Teeth slightly smaller; second unicuspid conspicuously smaller than and overlapped by third, circular in section with well-developed cingula.

Dimensions of the type (measured in the flesh) :—

Head and body 90 mm.; tail 62; hind foot 16; ear 13.

Skull: condylo-incisive length 22·9; greatest breadth 10·2; least interorbital breadth 5·3; length of palate 9·3; postpalatal length 10; greatest maxillary breadth 6·8; length of upper tooth-row 10·2.

Hab. Jombeni Range, Nyeri District, British East Africa. Altitude 5000 feet.

Type. Adult. B.M. no. 12. 7. 1. 60. Original number 868. Collected and presented by A. Blayney Percival, Esq.

This Jombeni form may be distinguished at once from *monax* by the great difference in size between the second and third upper unicuspids, the third being very much larger and considerably overlapping the second, while in *monax* the third unicuspid is only slightly larger than the second.

(124) *Crocidura neavei*, Wrought.

Crocidura neavei, Wroughton, Manchester Memoirs, vol. li. no. 5, p. 7 (1907).

In size rather larger than *maurisca*, but much blacker in colour and possessing a flatter skull with rather broader teeth.

Size of body and hind foot a little larger than in *maurisca*.

General colour very dark seal-brown (dark "fuscous black" finely speckled with "cinnamon-brown"), fading gradually on the flanks into the brownish grey of the ventral surface. Backs of hands and feet brownish; fore claws rather smaller than hind. Tail long and clothed with short blackish hairs above and below, general appearance as naked as in the foregoing species; long caudal bristles only present on the basal portion.

Skull about equal in size to that of *maurisca*, with flatter brain-case; maxillary region more expanded, muzzle not tapering so markedly. Tooth-row equal in size to that of *maurisca*, second and third upper unicuspids rather broader, but not so broad as in *dolichura*; cingula well developed.

Dimensions of the type (measured in the flesh) :—

Head and body 78 mm.; tail 60; hind foot 16; ear 9.

Skull: condylo-incisive length 20·7; greatest breadth 8·8; least interorbital breadth 4·7; length of palate 8·2;

postpalatal length 9·5; greatest maxillary breadth 6·4; median depth of brain-case 4·9; length of upper tooth-row 9·1.

Hab. Kafue River, Northern Rhodesia. Altitude 4000 feet.

Type. Adult female. B.M. no. 7. 1. 11. 12.

Since this species was described Mr. Neave has collected a second specimen of this interesting shrew on the Kalungwisi River, east of Lake Mweru. It agrees very closely with the type in the general colour and the caudal characters described above.

The very dark blackish colour readily separates this form from all the more northern species; it would seem to be more nearly allied to the following species than to any of the other members of this group.

(125) *Crocidura sylvia*, Thos. & Schw.

Crocidura sylvia, Thomas & Schwann, P. Z. S. xxxix. p. 587 (1906).

A very dark-coloured species with rather more long hairs on the basal portion of the tail than in the other members of this group.

Size of body and hind foot as in *maurisca*; tail usually rather shorter.

General colour dark seal-brown ("fuscous black" and "black" sprinkled with golden buff), as dark as in *neavei*; underparts slightly paler. Backs of hands and feet brownish; claws of fore and hind feet about equal in size. Tail shorter than in *neavei* or *maurisca* and more hairy, the entire tail covered with fairly conspicuous black hairs, not, as in the other members of this group, appearing almost naked; caudal bristles very slender, but fairly numerous on the basal portion of the tail, more conspicuous than in any of the allied species. As regards the length of the tail it will be seen from the figures given below that, while the usual length is between 53 and 60 mm., there is one rather larger specimen from Inhambane in which the tail is fully 67 mm. in length; it is interesting to note that in this individual the tail is less hairy than in the Zoutpansberg series and the caudal bristles less numerous—the general effect much more that of *neavei*.

Skull rather longer than that of *maurisca*, with broader muzzle, the nasal region about as in *neavei*; brain-case proportionally narrower and rather high, the general shape

of the skull rather like a larger edition of *dolichura*. Maxillary breadth as great as in *neavei*. Teeth larger and broader than in *maurisca*, unicuspids roughly circular in shape, slightly broader than those of *neavei*; cingula fairly prominent.

Dimensions of the type (measured in the flesh) :—

Head and body 81 mm. ; tail 53 ; hind foot 15 ; ear 8·5.

The following are the skin-dimensions of the other specimens of *sylvia* in the collection :—

	Head and body. mm.	Tail. mm.	Hind foot. mm.	Ear. mm.
♀. Zoutpansberg....	84	50	14·5	8
♀. „	78	51	14·7	8
♂. „	76	49	14	8
♂. „	74	54	14·7	8
♂. „	82	50	15	9
♂. „	81	60	17	8
♂. „	78	54	15	8
♀. Zululand.....	91	58	14	6
♂. Inhambane.....	90	67	16	9

Skull-dimensions of the type and two other specimens from the type-locality :—

	♂ (type). mm.	♂. mm.	♂. mm.
Condylo-incisive length.....	21·5	22	21·3
Greatest breadth.....	9·1	9·2	9·2
Least interorbital breadth	4·3	4·5	4·6
Length of palate.....	8·6	9	8·7
Postpalatal length	9·9	9·9	9·5
Greatest maxillary breadth	6·7	6·7	6·3
Length of upper tooth-row	9·1	9·4	9·2

Hab. Woodbush, Zoutpansberg District, N.E. Transvaal. Altitude 4500 feet.

Type. Adult male. B.M. no. 6. 4. 3. 10.

This species may be distinguished from the other members of this group by its more hairy and rather shorter tail ; its very dark colour separates it from all the equatorial forms, *neavei* from the Kafue River being the only species as dark as *sylvia*.

The following forms I have been unable to determine :—

(a) *Crocidura ferruginea*, Heug.

Crocidura ferruginea, Heuglin, Nov. Act. Ac. Cæs. Leop.-Carol. part i. p. 36 (1865).

Length of head and body 5″ 3‴ ; tail $2\frac{1}{2}$″.

Hab. "Lande der Ridj-Neger," Bahr-el-Ghazal.

The description is extremely vague, the author not being quite certain as to whether there are three or more upper unicuspids. If the specimen was really a *Crocidura* it is possible that *ferruginea* is a member of the *nyansæ* or *doriana* groups.

(b) *Crocidura fusco-murina*, Heug.

Sorex fusco-murinus, Heuglin, Nov. Act. Ac. Cæs. Leop.-Carol. part i. p. 36 (1865).

Smaller than *sericea*, but not as small as in the *nana* group; length of head and body 2″ 2‴; tail 1″ 9½‴.

"Supra nitide fusco-murinus, subtus pallidior, magis cinerascens; mento labiisque obsolete albis; auriculis majusculis, latis, rotundatis . . ."

Hab. Meshra el Req, Bahr-el-Ghazal.

This species is probably allied to *butleri*, from which it is easily distinguished by its general dimensions.

(c) *Crocidura viarius*, Is. Geoff.

Sorex viarius, Is. Geoffroy, Voy. Bél., Zool. p. 127 (1834).

A small species; the only Senegalese shrew of similar size in the Museum Collection is a *Pachyura*.

"Pelage d'un roux grisâtre en dessus, d'un cendré clair en dessous. Oreilles grandes, non cachées dans les poils. Queue un peu comprimée dans sa première portion, arrondie vers son extrémité, garnie de longues soies clair-semées, dirigées en arrière. Longueur du corps et de la tête, un peu plus de 3 pouces; longueur de la queue, 2 pouces."

Hab. Senegal.

(d) *Crocidura infumata*, Wag.

Sorex infumatus, Wagner, Schreb. Säug. Suppl. ii. p. 76 (1841).

From the dimensions and colour it seems most probable that *infumata* is related to the *hirta* group, possibly to *flavidula* or *pondoensis*.

Length of head and body 3″ 1‴; tail 1″ 9½‴.

Hab. Cape.

(e) *Crocidura fulvaster*, Sund.

Sorex fulvaster, Sundevall, Vet. Akad. Handl. Stock. pp. 172 & 178 (1842).

This form is described as "palide grisco-fulvescens, subtus cinereo-albus, dentibus intermediis supra 3; secundo tertioque æqualibus."

Dimensions of the type (as given by Sundevall) :—
Head and body 90 mm. ; tail 44 ; hind foot (c. u.) 13.
Hab. Bahr el Abiad.

It seems probable that *fulvaster* is only a colour-phase of Sundevall's *sericea* ; if this should be the case, the name *fulvaster* must stand owing to page priority, *sericea* and *strauchii* then being placed as synonyms of *fulvaster*.

(f) *Crocidura macrodon*, Dobs.

Crocidura macrodon, Dobson, Ann. & Mag. Nat. Hist. (6) vol. v. p. 226 (1890).

A medium-sized species.
Colour not described.
Skull with long anterior incisors, third upper unicuspid broader than second.
Dimensions of the type (as given by Dobson) :—
Head and body 68 mm. ; tail 46 ; hind foot 14 ; ear 8·5.
Skull : "distance of the tip of first incisor from apex of principal cusp of the last premolar $5\frac{1}{2}$."
Hab. "Sudan?"
Type (in spirit). No. 1968. Zoological Museum, Petrograd.
It is probable that this shrew is allied to the *fumosa* group, but from the description alone it is impossible to arrive at any true idea of the affinities of the species.

BIBLIOGRAPHICAL NOTICE.

Manual of the New Zealand Mollusca. Atlas of Plates. By H. Suter. Published by the Authority of the Government of New Zealand. 72 Plates, with Explanations.

When reviewing the text of this work in our number for July 1914 we expressed the hope that the plates, when they arrived, would prove superior to the text in "get up."
This we are now glad to be able to state is the case. Not that the whole of the seventy-two plates composing this Atlas are of equal merit—some are decidedly poor, and the figures based on photographs leave much to be desired. On the other hand, the reproductions of the author's own careful drawings of the Endodonts are excellent. In all cases, however—and this is the important point,—the species delineated are clearly recognizable, which, alas! is often not the case in some quite beautifully executed plates where artistic licence has been taken with the subjects.

With this Atlas before us we are more than ever sure, as we said, that the work will be of immense value, not only to students of the New Zealand Mollusca, but to all malacologists. Would that other governing bodies, including some not far removed from home, could be induced to undertake similar works of scientific utility!

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 17th, 1915.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

Mr. John Parkinson gave an account (illustrated by specimens and lantern-slides) of some observations on the Structure of the Northern Frontier District and Jubaland Provinces of the East Africa Protectorate, made by him while conducting a water-supply survey for the Government of the Protectorate. A floor of gneisses and schists, among which the Turoka Series of metamorphosed sediments was found at several places, is overlain on the western side by lavas, including those arising from the volcanoes Kulal, Assi ('Esie' of the maps), Hurri, Marsabit, etc., and by probably older lava-fields which together extend as far as long. 39° E. On the south, it was found that the lavas north of Kenya reached the Guaso Nyiro, leaving 'inselberge' of the crystalline rocks in their midst, but that a high gneiss country extended north-westwards from lat. 1° N. and long. 38° E. to within a short distance of Lake Rudolf. Eastwards the Coastal Belt of sediments proved to be of Upper Oxfordian age and to extend to long. 40½° E. (west of Eil Wak), and these were lost southwards under the great alluvial plain of Jubaland.

At intervals throughout the alluvial plain and lying in hollows in the Jurassic rocks, disconnected exposures were found of soft calcareous sandstones or limestones (Wajhir, Eil Wak), the age of which cannot now be definitely fixed.

Evidences of the desiccation of the country were, it was thought, shown (1) by the Laks or water-channels characteristic of Jubaland, which contained surface-water only during the rainy season and then extremely rarely, if ever, throughout their length; (2) by the presence of freshwater molluscs in the scarcely consolidated beds of such Laks and at other places where now no surface-water is present (Buna and near the Abyssinian frontier); and (3) by the presence of wells along fault-lines and in other places where, but for the previous presence of springs, it appears improbable that the natives would have begun sinking.

The region between Lake Rudolf and Marsabit was pointed out

as one of exceptional interest, which the speaker had so far not been able to investigate.

The depression between the Mathews and associated ranges and the Abyssinian frontier on which the Marsabit and Hurri volcanoes were situated, and the origin of the Kuroli Desert (Elgess), were the outstanding features of the district that required further elucidation.

Mr. G. C. Crick stated that the Cephalopoda submitted to him by the Lecturer consisted chiefly of crushed ammonites from dark-grey shales at Kukatta on the Juba River (lat. 2° 8′ N.), there being also a belemnite preserved in a yellowish-brown rock-fragment from Serenli on the same river and somewhat north of Kukatta. He regarded all the ammonites as referable to *Perisphinctes* and its section *Virgatosphinctes*, and to species which had previously been described from the neighbourhood of Mombasa. From this assemblage of forms he concluded that the shales at Kukatta were of Upper Oxfordian (Sequanian) age. He stated that the belemnite from Serenli indicated the presence there of a slender sulcate form, similar to those previously recorded from British Somaliland on the north and from the neighbourhood of Mombasa on the south; but, although of Jurassic age, it was too imperfectly shown in the rock-fragment for accurate determination.

Mr. R. Bullen Newton said that he had examined a small series of non-marine Kainozoic molluscan remains belonging to recent species, and associated with hard and soft limestones, calcareous sandstones, and conglomerates, which had been collected by the Lecturer, and had determined them as follows:—

Ampullaria ovata (?) Olivier. Locality.—Lak Buna.

Distribution.—Recent: Victoria Nyanza, Tanganyika, Nile; Post-Pliocene: Egypt; Miocene: Victoria Nyanza.

Melania tuberculata (Müller) (= *curvicosta* Deshayes). Localities.—Archer's Post; Lak Buna; Chikali Khofu.

Distribution.—Recent: Nile, Rudolf, Nyasa, Tanganyika, India, etc.; Post-Pliocene: Egypt and Sahara; Pliocene: Lake Assal, French Somaliland (formerly regarded as Abyssinia); Miocene: Rudolf (Omo River), Greece, North Italy, etc.

Cleopatra bulimoides (Olivier). Localities.—Lak Buna; Chikali Khofu.

Distribution.—Recent: Nile, Rudolf, French Somaliland, Zanzibar; Post-Pliocene: Egypt; Pliocene: French Somaliland; Miocene: Victoria Nyanza.

Bythinia and Planorbis spp. Locality.—Waihir.

Limicolaria rectistrigata E. A. Smith. Locality.—Archer's Post.

Distribution.—Recent: Rudolf and Tanganyika regions.

Rhachis rhodotænia Martens. Locality.—Chukali Ghofu.

Distribution.—Recent: Victoria Nyanza and Mount Kenya plateau.

Leptospatha spathuliformis (Bourguignat). Localities.—Turbi and Lak Buna.

Distribution.—Recent: Rudolf and Zanzibar.

Corbicula fluminalis (Müller) (= *saharica* Fischer). Localities.—Turbi; Lak Buna and Chukali Ghofu.

Distribution.—Recent: Nile, Rudolf, Marguerite, and Abyssinia; Post-Pliocene: Egypt and Sahara; Pliocene: French Somaliland; Miocene: Rudolf (Omo-River beds).

Corbicula radiata (=*pusilla*?) Philippi. Locality.—Chukali Ghofu.

Distribution.—Recent: Nile, Rudolf, Victoria Nyanza, Albert Edward, Nyasa, Tanganyika; Post-Pliocene: Egypt; Pliocene: French Somaliland; Miocene: Rudolf (Omo-River beds).

No vertebrates occurred with these shells, hence their age would probably be younger than the Omo-River deposits north of Lake Rudolf, that have yielded a somewhat similar molluscan fauna, but with the addition of *Dinotherium* and other vertebrate remains. The presence of that genus, as pointed out by Dr. Haug ('Traité de Géologie' 1908–11, vol. ii, p. 1727), was indicative of the Pontian or Upper Miocene Period. There are, however, some lacustrine beds near Lake Assal, in French Somaliland (formerly regarded as Abyssinia), which contain shells also bearing a resemblance to those collected by Mr. Parkinson in British East Africa, especially *Melania tuberculata*, *Cleopatra bulimoides*, *Corbicula fluminalis*, and *C. radiata*, which are common to both sets of deposits. These Lake Assal beds, which are also without vertebrate remains, have been identified by Aubry (Bull. Soc. Géol. France, ser. 3, vol. xiv, 1885, pp. 206–209), and Pantanelli (Atti Soc. Toscana Sci. Nat. Proc.-verb. vol. v, 1887, pp. 204–206, and *ibid.* vol. vi, 1888, p. 169) as of Pliocene age. If, from these facts, such widely distant beds can be recognized as contemporaneous, then the suggestion may be made that the northern half of British East Africa was probably an extensive freshwater region during Pliocene times, limited on the north by Lake Assal, on the east by Suddidima, on the south by Archer's Post and the Mount Kenya plateau, and on the west by Lakes Rudolf, Stefanie, and Marguerite.

Assistance in the determination of these shells had been kindly rendered by Mr. E. A. Smith, I.S.O.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 99. MARCH 1916.

XVIII.—*Brief Descriptions of new Thysanoptera.*—VII.
By Richard S. Bagnall, F.L.S.

Suborder Terebrantia.

Family **Thripidæ**.

Heliothrips frontalis, sp. n.

H. hæmorrhoidalis group.

♀.—Length about 1·15 mm.

Head, prothorax, pterothorax, and apex of abdomen golden-brown, shaded to brown laterally; frons brown; legs yellow, femora slightly deeper in coloration than the tibiæ, especially the intermediate pair. Body, excepting apex, chestnut-brown, with a sublateral pair of black rings or "eye-spots" on tergites 3 to 7. Antennæ broken in the unique specimen except the first two joints, which are light yellow. Fore-wing clouded with yellowish-brown at base and with the veins in the third sixth (or more) and the fifth sixth dark brown; veins otherwise except at extreme apex (distal sixth), where they are colourless, yellowish to light yellowish-brown.

Head subquadrate, strongly reticulated, about 0·8 as long as broad across eyes; cheeks very slightly arched behind eyes, and then as faintly sinuate or convergent posteriorly. Eyes small, only occupying about one-third the length of the head, and the space between them at least 2·5 times the width of one of them. Antennæ . . . . Vertex produced

into an exceptionally prominent hump, with anterior ocellus facing forwards at summit and the posterior pair evidently flanking the sides.

Prothorax only about 0·7 the length of the head, transverse, with angles rounded ; widest near posterior angles, where it is twice as wide as long ; surface with network reticulation as in head, except a belt across disc. Pterothorax widest at junction of meso- and metathorax. Legs much as in allies, hind-tibiæ long, slender basally. Wings reaching to sixth abdominal segment, fore-wings slightly upturned distally, with veins (including marginal) strong ; upper vein fused with costa ; lower vein joining the hind-margin at or just before the distal sixth. Costal fringe of about fifteen curved setæ; lower cilia also sparse, fumate, rather long, slender, and wavy.

Abdomen comparatively heavy, elongate-ovate, and about 1·4 times as broad as the pterothorax at broadest. Tenth abdominal segment long, more than twice as long as broad near base, divided above. Apical setæ vestigial, a pair on 9, at hind angles, only about 0·3 the length of segment 10.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Australia, Healesville, Victoria ; on *Senecio dayardeus*, 1 ♀ only (*R. Kelly*).

Genus Australothrips, nov.

Strong network reticulation. Antennæ 8-segmented, style normal, not setiform ; joint 2 quadrate, cup-shaped, hollow at apex for reception of 3. Head transverse, hind-angles prominent ; eyes prominent ; maxillary and labial palpi 3- (?) and 2-jointed respectively.

Prothorax without any prominent setæ, transverse, with lateral, explanate, wing-like margins. Wings straight, not reticulated ; fore-wing with strong ring-vein, upper vein merged in costa, and lower vein appearing as a median vein ; no cilia or setæ on costa, no setæ on veins, and lower margin with cilia fine. Hind-wing with strong median vein ; a series of slender setæ or cilia on upper margin and a long slightly wavy fringe on lower margin.

Tenth abdominal segment short, broad, cylindrical.

Pterothorax and abdomen much as in *Rhipiphorothrips*.

Type. *Australothrips bicolor*, mihi.

Differs from *Dinurothrips*, the only other genus with

explanate lateral margins of the prothorax, in the simple antennal style and the structure of fore-wings, which are without setæ and cilia on the costa.

Australothrips bicolor, sp. n.

♀.—Length about 1·1 mm.

Orange-yellow; head, prothorax, mesothorax, scutular area, and sides of metathorax dark chestnut-brown; fore and intermediate femora dark brown; hind-femora and fore and intermediate tibiæ lightly tinged with brown. Antennæ with joint 6 apically and style brown; first joint lightly tinged with brown. Scale of fore-wing, small patch adjoining, and mid-vein and cilia of hind-wing brown.

Head about 1·8 times as broad as long, cheeks slightly converging, and hind angles prominent; network reticulation of surface strong, especially below an arcuate raised line behind eyes. Eyes prominent, space between them about twice the width of an eye. Vertex sinuate on each side of raised part, having the antennæ, which are twice as long as the head, seated in the sinuations. First antennal joint short; second quadrate, with distal cup-shaped hollow for reception of 3; 3 long, claviform, constricted at apex; 4 and 5 cylindrical, with minute stem, and 4 also narrowly constricted at apex; 6 broadest basally; 7 and 8 together styliform, and the relative lengths and breadths as follows:—

$$\frac{16 : 34 : 48 : 28 : 24 : 22 : 8 : 13}{20 : 30 : 16 : 17 : 17 : 14 : 7 : 5}.$$

Prothorax as long as or only slightly longer than the head, and (excluding the lateral explanate margins) as broad as the head. Legs comparatively short and stout.

Posterior margins of abdominal tergites with more or less regularly placed, minute, blunt projections; setæ on segment 9 short and those on 10 very short, colourless.

♂.—Smaller, more slender. Lemon-yellow where orange-yellow in ♀. Tergite 8 set with four long and rather stout spines set on an arcuate series of tubercles.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. AUSTRALIA, Healesville, Victoria; on *Eucalyptus viminalis* (R. Kelly).

Tæniothrips major, sp. n.

♀.—Length about 2·0 mm.

Colour dark chestnut-brown ; fore-tibiæ, hind-tibiæ basally, all tarsi, and third antennal joint not quite so dark. Fore-wings brown, slightly lighter distally.

General form as in *T. inconsequens* (Uz.).

Head almost as long as broad ; eyes bulging, coarsely facetted, pilose ; cheeks swelling out from behind eyes as in *T. primulæ* and *inconsequens*. A series of dorsal and lateral setæ on a line behind eyes. Ocelli large ; a pair of very long and strong inter-ocellar bristles situated between the posterior ocelli ; a shorter pair on vertex close to inner margins of eyes and beyond the anterior ocellus, which is directed forwards. Dorsal surface transversely striate in basal half or thereabouts. Antennæ long and slender, about 2·3 times the length of head ; joints 3 and 4 fusiform ; relative lengths of joints:—16 : 22 : 40 (with stem) : 36 : 25 : 32 : 4 : 5 ; forked trichomes on 3 and 4 long and slender.

Prothorax transverse, not quite as long as the head ; broadest at posterior angles ; bristles at posterior angles long and slender ; a line demarcating posterior margin ; a pair of longish mid-dorso-lateral setæ, and several short setæ, curved and chiefly lateral. Pterothorax large. Wings long, strong, pointed at apex, reaching to ninth abdominal segment ; setæ slender. Fore-wings with three or four setæ on distal half of upper vein, namely, one just within the distal half and 1+0+1 or 1+1+1 in the distal fifth or thereabouts.

Abdomen elongate, pointed at apex from base of segment 8 ; apical bristles long, especially those on 9, which is also furnished with a pair of shorter dorsal bristles.

This is a true *Tæniothrips*, coming nearest *inconsequens* (*pyri*), from which it differs chiefly in the much larger size and darker coloration, the chætotaxy, and in the slender antennæ.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. India, Kulhara, Garhwal, 11,700 feet altitude ; in flowers of rhododendron, 5. vi. 10, together with *Physothrips longiceps*, sp. n. (*A. D. Imms*).

Tæniothrips inconsequens, Uzel.

1895. *Physopus inconsequens*, Uzel (and others).
1904. *Euthrips pyri*, Daniels (and others).

For some time I have considered that the well-known

pear-thrips, *P. pyri*, was synonymous with the earlier-described *P. inconsequens* of Uzel, a conclusion that Mr. C. B. Williams had also come to. On going into the question together recently, comparing material from North America, Central Europe, and England, we confirmed this opinion.

It is interesting to note that in the Czech account of the habitat of *P. inconsequens* in Uzel's monograph the food-plant *Prunus cerasus* is mentioned.

For a pest of such importance the trivial name *inconsequens* is unfortunate.

Odontothrips fasciatipennis, sp. n.

♀.—Length 1·3 mm.

Dark brown, pterothorax rather lighter; fore-tibiæ light yellow, shaded to grey-brown basally; apices of intermediate and hind tibiæ and all tarsi light yellow; antennal joints 3 and 4 yellow.

Fore-wing with basal third clear, then a band or patch of brown, and the distal two-fifths with but the slightest tinge of grey; cilia grey-brown. Posterior ocelli on a line drawn behind eyes and contiguous to their inner angles. Fore-tibial teeth small, sharp, the larger sharply bent; fore-tarsus apparently without tooth.

This species differs from both *phaleratus* (Hal.) and *intermedius* (Uz.) in the coloration of the wings.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. S. Australia, Outer Harbour, Adelaide; collected by Prof. Poulton in the flowers of *Mesonbryanthemum*, Aug. 28th, 1914.

Genus Physothrips.

a. *Sjostedti-usitatus* group.

Physothrips usitatus, Bagn., var. *cinctipennis*, nov.

Fore-wings with the middle third and extreme tip greyish-brown. Relative lengths of antennal joints as follows:—12 : 16 : 25 : 25 : 16 : 23 : 7 : 8.

Distinguished from the type-form (only known from India) by the distinct clear band near distal end of fore-wing. This band is weakly suggested in the Indian specimens.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. N. Queensland, Brandon; on small flowers (pea), 16. x. 14 (*R. Kelly*).

Physothrips brunneicornis, sp. n.

♀.—Length 1·4 to 1·5 mm.

Colour brown, the antennæ, head, prothorax, intermediate and hind femora and tibiæ, and apical abdominal segments inclined to be darker. Antennæ unicolorous, fore-tibiæ yellow, shaded with greyish brown along margins; all tarsi yellow. Fore-wings faintly clouded with light grey-brown near base; basal third or thereabouts clear, thence smoky-brown to tip excepting for an ill-defined clear patch at about the commencement of the distal fifth; setæ and cilia dark.

Head about 0·7 as long as broad and not quite as long as the prothorax; a defined area of the dorsal surface behind transversely striated. Eyes coarsely facetted, minutely pilose; cheeks not arched, tending to widen posteriorly; ocelli large, posterior pair above a line drawn across hind margins of eyes; interocellar bristles long and strong, placed between the anterior ocellus and the posterior pair. Antennæ seated below vertex, about 2·5 times as long as the head; relative lengths of joints 3 to 8 as follows:—22 : 22 : 14 : 20 : 5 : 6. Joints 5 and 6 somewhat broadly united and distinctly more slender than the preceding; forked trichomes on 3 and 4 long and stout.

Prothorax much as in *P. usitatus*.

Fore-wing and arrangement of setæ as in *P. usitatus*.

Abdomen about 1·15 times as broad as the pterothorax, segments 9 and 10 obconical; apical bristles long and stout; 9 with a rather short dorsal pair widely separated.

This species very closely approaches *P. usitatus*, Bagn., but is at once separated from it (as well as from *sjostedti*, Trybom, and *variabilis*, Bagn.) by the unicolorous antennæ. The antennal joints 3 and 4 would appear to be stouter and 6 shorter than in *usitatus*, whilst the fore-femora are concolorous with the prothorax.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Japan, Kobe, April 1914 (*J. E. A. Lewis*). Reg. no. 144.

Physothrips seticollis (Bagnall).

Tæniothrips seticollis, Bagnall, 1915, Ann. & Mag. Nat. Hist. ser. 8, xv. p. 591.

This species cannot be referred to the genus *Tæniothrips* as exemplified by *inconsequens*, *primulæ*, and *major*, sp. n.

b. *Funtumiæ* group.

Physothrips kellyanus, sp. n.

♀.—Length 1·6 to 1·8 mm.

Very like *P. funtumiæ*, Bagn.

Dark chestnut-brown, antennæ with the distal constricted parts of joints 3 and 4 colourless; fore-tibiæ and all tarsi yellow. Fore-wings yellowish-brown, basally lighter; hind-wings also fumate, with ciliæ and median vein dark.

Head a little broader than long, eyes setose; interocellar setæ long. Relative lengths of antennal joints 3 to 8 as follows:—27 : 27 : 17 : 26 : 4 : 6.

Prothorax as long as or very slightly longer than head; setæ at hind angles long, but not stout, and one rather long pair in the postero-marginal series. Setæ on fore-wing long, upper vein with two in distal half near extreme end and 3 + 3 near base.

Apical abdominal bristles long.

♂.—Length about 1·2 mm., slender.

Each of the sternites 3 to 7 with numerous minute, roundish, irregular, pale depressions, those at angles, especially the anterior, slightly larger. Tergite 9 with a series of short spines in a line near posterior margin.

Colour of antennæ as in ♀; joint 6 abnormally long; relative lengths of joints 3 to 8 as follows:—26 : 25 : 13 : 36 : 3 : 4·5.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. N. Queensland, Brandon, ♂ and ♀ on a composite flower (? *Helianthus* sp.), 16. x. 14; Brisbane, numerous ♀ ♀ and 1 ♂ on *Acokeanthera spectabilis* (a South-African plant), in the Botanic Gardens, 23. x. 14.

Victoria, Ballarat, 1 ♂ on *Hypochæris radicata*, 18. i. 15.

One of the many interesting species discovered by Mr. Reg. Kelly, after whom I find pleasure in naming it.

The ♂ is easily separated from ♂ *Ph. funtumiæ* by the nature of the depressions in sternites 3 to 7, the line of spines in ninth tergite, the unicolorous antennæ, and the exceptionally long sixth joint.

c. *Pallipennis* group.

Physothrips brevicornis, sp. n.

♀.—Length 1·2 to 1·3 mm.

Colour dark brown, fore-tibiæ, apices of fore-femora and of hind and intermediate tibiæ and all tarsi yellowish; fore-wings wholly greyish yellow-brown, hind-wings greyish at base. Antennæ with first joint and style grey to grey-brown, second dark brown, 3 to 5 yellowish, the latter very lightly tinted with grey; 6 yellow, with distal half grey-brown.

Head transverse, about 0·65 as long as broad, cheeks apparently converging posteriorly; eyes large, not bulging, coarsely facetted and very minutely setose; interocellar bristles moderately long. Antennæ short and rather stout, a little more than twice as long as the head; relative lengths and breadths of joints 3 to 8 as follows:—

$$\frac{32 : 29 : 26 : 36 : 6 : 11}{18 : 18 : 14 : 15 : 6 : 4}$$

3 to 4 broadly claviform.

Prothorax transverse, about 1·25 times longer than the head; bristles at posterior angles rather short, the inner one of each pair longer than the outer, and about 0·4 as long as the prothorax. Upper vein of fore-wing with 3 or 4 setæ (1+0 (or 1)+1+1) in the distal half; in one specimen 4 are placed in the distal third; lower vein with 11 to 15 setæ.

Abdomen only slightly broader than the pterothorax, elongate-ovate.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. AUSTRALIA, Ballarat, Victoria; 3 ♀♀ on *Hypochæris radicata*, 28. i. 15 (*R. Kelly*).

Physothrips longiceps, sp. n.

♀.—Length 1·5 mm.

Colour chestnut-brown; fore tibiæ yellowish distally, margins dark; tarsi yellowish. Antennæ brown, joint 2

distally and 3 rather lighter, the latter inclined to yellowish basally. Fore-wings and cilia yellowish-brown.

Head long, about 0·85 as long as broad and as long as the prothorax; widened just behind eyes, cheeks subparallel; surface transversely striate, and vertex similarly striate. Eyes occupying about 0·5 the length of the head, coarsely facetted; postocular bristles absent; interocellar setæ situated just behind anterior ocellus, minute. Antennæ twice as long as the head; joints 3 and 4 fusiform, 5 and 6 broadly united, and 4 and 5 shortly constricted near base; style short; relative lengths of joints as follows:—11 : 17 : 26 (including stem) : 22 : 18 : 23 : 3 : 3. Forked trichomes on 3 and 4 moderately long.

Prothorax about 0·7 as long as broad; bristles at hind angles about 0·4 the length of prothorax.

Pterothorax large. Legs somewhat stout. Wings reaching to ninth abdominal segment, pointed; setæ moderately long, slender. Fore-wing with three setæ in distal half, viz., one just beyond the second third, and two in distal fifth; lower vein with 14–17 setæ.

Abdomen elongate-ovate, pointed at apex. Bristles on segments 9 and 10 long, slender; 9 with a pair of widely separated dorsal bristles.

♂.—Smaller and more slender.

Tergite 9 with a series of four closely set long setæ disposed practically in a straight line. Sternites 3–7 each with a small depression, gradually diminishing in size; 3 and 4 the largest, elliptical, 5–7 rounded, and 7 the smallest, minute.

Separated from *pallipennis*, Uz., by the long head, the coloration of antennæ and wings, the small depressions in sternites, and the length and disposition of setæ on the ninth tergite in the ♂.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. India, Kulhara, Garhwal, 11,700 feet altitude; in flowers of rhododendron, 5. vi. 10 (*A. D. Imms*).

Physothrips calcaratus, sp. n.

♀.—Size and form much as in *P. vulgatissimus* (*pallipennis*). Colour evidently dark brown, with the fore-tibiæ and ends of the intermediate and hind-tibiæ lighter, and all

tarsi yellowish. Antennæ brown, end of joint 2 and whole of 3 yellowish.

Head transverse, rather long; eyes coarsely facetted, sparsely and minutely setose; ocelli large, interocellar bristles long, placed between the posterior ocelli. Antennæ about 2·3 times as long as the head; joints 1 and 2 broader than any of the succeeding; relative lengths of joints as follows:— 10 : 12 : 19 (including stem, which is rather long) : 16 : 12 : 17 : 2·5 : 3. 3 (excluding stem) and 4 subequal, fusiform; 5 narrower than 4 or 6, apex truncate.

Prothorax about 1·4 times as broad as long, and scarcely noticeably longer than head; bristles at hind angles very long, about 0·7 the length of the prothorax, slender. Legs somewhat stout; *fore tarsus with a sharp stout tooth near apex.* Wings longish, pointed apically; fore-wings uniform grey-brown; setæ long and slender, 3 to 5 in distal half of upper vein, namely, 1 just beyond middle of wing and 2 to 4 (1+1, 1+1+1, 2+1, or 2+2) in the distal fifth. Costa with about 25 and lower vein 17 longish setæ.

Abdomen elongate-ovate; apical bristles fairly long, a dorsal pair on 9; tergite 8 with a moderately long close fringe.

At once recognized by the fore-tarsal claw (analogous with *Thrips calcaratus,* Uz.) and the setæ of the upper vein of the fore-wing.

Hab. Bohemia; in coll. Uzel mixed with *Odontothrips phaleratus.*

Pseudothrips parvus, sp. n.

♀.—Length about 1·0 mm.

General colour yellow-brown to brown, abdominal segments 9 and 10 darker. Antennæ with first joint greyish, second and fifth to eighth grey-brown, 3, 4, and extreme base of 5 yellow, 4 tinged lightly with grey. Fore-wings wholly light yellowish-brown. Legs yellowish, more or less shaded with grey to brown, especially the femora and outer margins.

Head transverse, about 1·3 times as broad as long, and nearly as long as the prothorax; eyes coarsely facetted. Sixth antennal joint not divided. One prominent prothoracic bristle at each posterior angle and a shorter one just above. Both veins of fore-wing regularly set with setæ, 11 or 12 in each.

Abdomen elongate-ovate, sharply narrowed at apex; posterior margin of eighth tergite sparsely fringed. Apical

bristles of both ninth and tenth segments long; a dorsal series of minor setæ on 9 and a dorsal pair on 10; the latter segment divided above.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. N. Queensland, Brandon; on a composite flower (? *Helianthus* sp.), 16. x. 14 (*R. Kelly*).

Near *P. glaucus*, Bagn. (a South-African species), from which it may be separated, apart from coloration, by the fewer setæ on veins of fore-wings and the chætotaxy of the apical abdominal segments.

XIX.—*The Nematode Genus* Tanqua, *R. Blanchard.*

By H. A. Baylis, B.A.

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Up to the present time only a single species of this remarkable genus appears to have been recognized, viz. the interesting form *Tanqua tiara* (v. Linst.). This is a nematode of medium size, somewhat resembling an *Ascaris* in general build, and inhabiting the stomach and intestines of reptiles of more or less aquatic habits. It was first recorded, under the name of *Ascaris tiara*, by von Linstow (1879), from "*Varanus ornatus*" (? *V. albigularis* *) in Natal. The other hosts and localities from which it has been recorded in published papers are:—*Varanus salvator*, Sumatra (Parona, 1898); *V. gouldii*, Australia or New Guinea—precise locality unknown (Parona, 1898); *V. bengalensis*, Ceylon (von Linstow, 1904); and *V. niloticus*, White Nile (Leiper, 1908). Leiper also mentions the occurrence of a very similar form in *Hydrosaurus bivittatus* from the Federated Malay States.

I have now to add that I have examined specimens, which I believe to belong to this species, (1) from a lizard (probably *Varanus niloticus*, though I have no information regarding its determination), from Accra, Gold Coast Colony; (2) from *Tropidonotus quincunciatus* (*T. asperrimus*, Blgr.†), from Ceylon; and (3) from *Varanus exanthematicus*, Northern

* Dr. G. A. Boulenger informs me that *V. albigularis* is the form most nearly related to *V. ornatus*, occurring in Natal.

† Dr. Boulenger regards the Ceylon form of *T. quincunciatus* as a distinct species.

Nigeria. The last-mentioned specimens were kindly given to me, for the purpose of comparison, by Dr. J. H. Ashworth, of Edinburgh, who informed me that they had been determined as *T. tiara* by Dr. R. T. Leiper *.

It would appear, from this list of hosts, that *T. tiara* is not confined to the monitors (*Varanus*), but may also infect snakes of semi-aquatic habits. That the genus, at all events, certainly does so is shown by some specimens which recently came to light in the British Museum collection. Having occasion to examine the types of Baird's species *Ascaris obconica*, from the Brazilian fresh-water snake *Helicops* [*Uranops*] *angulatus*, I was struck by the fact that some of the specimens so labelled were distinctly smaller than others, and of a different shape, especially in the region of the tail. A closer examination soon showed that these smaller specimens undoubtedly represented a species of *Tanqua*. They have a very close resemblance in all respects to the type-species, but differ sufficiently from it, especially when the geographical distribution is taken into account, to be regarded as representing a distinct species.

The genus *Tanqua*, as has been pointed out by Leiper (1908), possesses certain features which indicate a close relationship with *Gnathostoma*, Owen. He places it provisionally in the family Gnathostomidæ, and there seems to be no objection at present to this classification.

1. *Tanqua tiara* † (v. Linst.).

Ascaris tiara, von Linstow, 1879, p. 320; Parona, 1898, p. 114.
Ctenocephalus tiara, von Linstow, 1904, p. 102; Pl. ii. figs. 23–27.
Tanqua tiara, R. Blanchard, 1904, p. 478; Leiper, 1908, p. 189.

Von Linstow has given (1904) a fairly complete and accurate account of this species; his figures, however, are somewhat too diagrammatic, and calculated to be misleading. There are one or two points in which, after examining a number of specimens, I must differ from him. He states (1904, p. 102) that the dorsal lip has three rounded projections, while the ventral lip has four similar processes, interdigitating. In a cleared specimen, viewed in horizontal optical section, it might quite easily be imagined that this was a correct interpretation of the structure. By rolling the specimen over, however, under a cover-glass, in such a way that first one lip and then the other can be focussed separately,

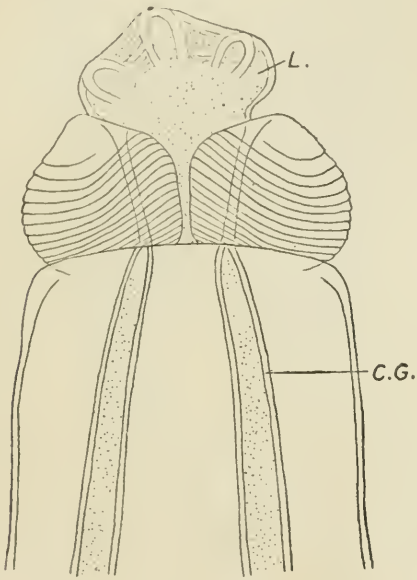
* Since writing this paper, I have received several further examples of *T. tiara* from a species of *Varanus* in Zanzibar.

† For generic and specific diagnoses see below (p. 230).

it becomes apparent that each lip has in reality only three "teeth" on its anterior border. The anterior lobe of each lip (fig. 1, *L.*), which carries the teeth, is twisted slightly to one side, in such a way that its teeth can interlock with those of the other lip. The teeth of each lip are, in fact, asymmetrically disposed with regard to the longitudinal axis of the animal. The "teeth" are, in reality, folds of thickened cuticle, and are shown in optical section in fig. 1.

Von Linstow is, I think, in error in stating that the two

Fig. 1.



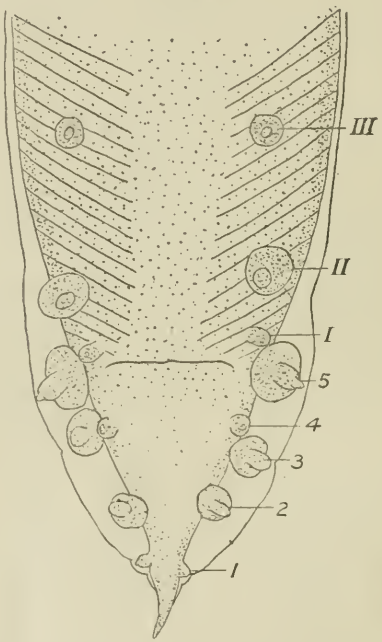
Tanqua tiara. Head of an example from *Varanus exanthematicus.* *C.G.*, cervical gland; *L.*, lip.

cervical glands on either side unite anteriorly to form a common duct; the duct of each gland appears to open separately upon the anterior surface of one of the four striated swellings at the base of the lips.

Another point in which von Linstow's account seems inaccurate is the number of papillæ on the tail of the male. He mentions and figures (1904) two preanal, one large paranal, and three postanal pairs of papillæ. In the specimens which I have examined there are two additional pairs

of smaller papillæ—one (fig. 2, *I*) just in front of, and slightly ventral to, the large paranal pair, and another (fig. 2, *4*) in a similar position on the body, between the paranals and the most anterior of the large postanals. There are thus, in all, eight pairs of papillæ, four pairs being postanal, one paranal, and three preanal. The first postanal papillæ (nearest to the tip of the tail) are very small, laterally

Fig. 2.



Tanqua tiara. Ventral view of posterior end of a male from *Tropidonotus asperrimus*.

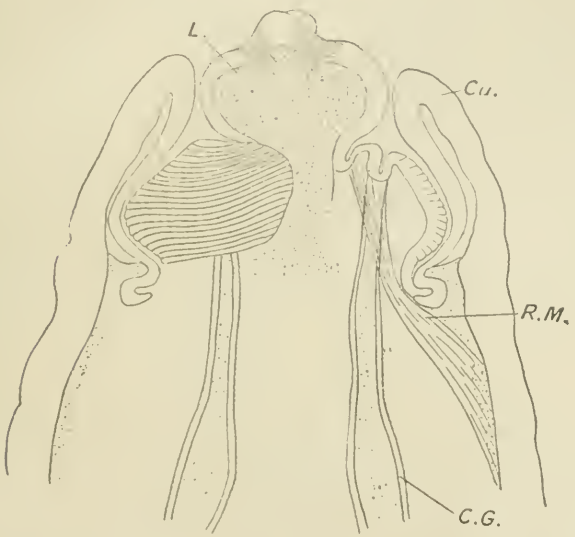
1-4, postanal papillæ; *5*, paranal; *I–III*, preanal papillæ.

placed, and simple in structure. The second and third postanal, the paranal, and the second and third preanal papillæ on each side are very laterally placed, and are of a peculiar and characteristic shape. They are elongate, finger-like papillæ, having a large swelling at about the middle of their length, beyond which they again suddenly become narrow and tapering, before coming to the surface of the cuticle.

The spicules of the male are characterized by a peculiar rasp-like covering of minute points or spinelets throughout their length—a fact which the previous observers have omitted to mention.

In other respects the specimens which I assign to this species agree well with von Linstow's account (1904). A table, showing in parallel series the measurements of certain parts of the body in the various sets of specimens studied and, for comparison, the measurements given by von Linstow, will be found on p. 231.

Fig. 3.



Tanqua diadema. Head of an example from *Helicops angulatus.* The right half is shown partly in optical section.

C.G., cervical gland; *Cu.*, fold of cuticle; *L.*, lip; *R.M.*, retractor muscles of head.

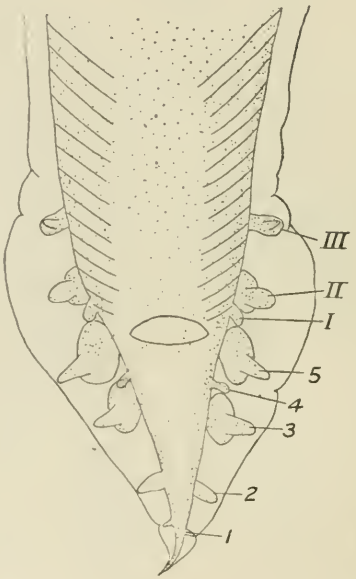
2. *Tanqua diadema*, sp. n.

The following is an account of the second form, which, as mentioned above, was discovered among the type-specimens of *Ascaris obconica*, Baird, from the intestines of the South-American fresh-water snake *Helicops angulatus*.

The male measures about 20 mm. in length and 0·6 mm. in thickness. The female is larger, 28–30 mm. long and

0·8–1 mm. thick. The head (fig. 3) is similar in shape to that of *T. tiara*, but appears to be retractile within a protective sheath of loose cuticle, and to be provided with special retractor muscles for that purpose. The swollen basal portions of the head are transversely striated, as in the type-species, and the two lips (*L.*) are closely similar to those of *T. tiara*, each being provided with three blunt teeth, and twisted sideways in such a way that the teeth of the opposite lips interlock. The head measures in length (from base of

Fig. 4.



Tanqua diadema. Ventral view of posterior end of a male from *Helicops angulatus.*

Papillæ numbered as in fig. 2.

striated portion to end of middle tooth) 0·22 mm.; the maximum width of the basal portion is 0·25 mm., and that of the lips 0·18 mm.

Four elongate cervical glands (fig. 3, *C.G.*) are present, opening on to the basal portion of the head, as in *T. tiara*. The length of the œsophagus is only 2·2 mm. (male)–2·4 mm. (female). It thus varies between about $\frac{1}{11}$ and $\frac{1}{9}$ of the total length. This is an important point of difference from the

type-species, in which the œsophagus is about twice as long, being sometimes as much as $\frac{1}{4}$ (or even more, according to von Linstow), and never less than $\frac{1}{7}$, of the total length.

The tail of the male (fig. 4) is 0·6 mm. long, or about $\frac{1}{33}$ of the total length. There is a considerable lateral expansion of the cuticle, forming a bursal ala on either side, so that the outline of the tail is somewhat like an arrow-head with rounded barbs. The two spicules measure 1·4 mm. in length (or 1·1 mm. in a straight line from base to tip). They are covered with minute spinelets, as in the preceding species. The papillæ are arranged precisely as in *T. tiara*, and are present to the same number (eight pairs). The only important difference observed is that the second postanal pair (*i. e.*, the second from the extremity of the tail) lack the large swelling, or exhibit it in a much less conspicuous degree.

In the female the tail measures 0·65 mm. in length, or about $\frac{1}{43}$ of the total length. It tapers rapidly from the anus, and ends in a sharp point. The vulva is situated considerably further forward than in the type-species, and is within the middle third of the body; in a mature example it opens at 11·5 mm. from the posterior end, thus dividing the body in the proportion of 33 : 23. The vagina is short. One branch of the uterus, with its ovary, lies anteriorly to it, the other posteriorly. The eggs are similar to those of *T. tiara* in shape, measuring 60 μ in length and 42·5 μ in breadth.

3. *Tanqua anomala* (v. Linst.).

Heterakis anomala, von Linstow, 1904, p. 97; Pl. i. figs. 10, 11.

Under this name, in the same paper with *T.* [*Ctenocephalus*] *tiara*, von Linstow has described a form from the stomach of *Tropidonotus piscator* in Ceylon, which appears almost certainly to belong to the genus under consideration, and not to *Heterakis*. There are certain apparent discrepancies, which might, perhaps, be removed or explained by a re-examination of the material. Thus the lips are described as being three, instead of two, in number, and there is said to be a peculiar preanal sucker-like organ in the male, "beset with eight roundish projections, of which the cuticle shows pore canals." But in all other respects the species seems to agree very well with the two forms already considered in this paper. The figures given by von Linstow at once suggest *Tanqua*, on account of (1) the general shape of the head, and the presence of striated cuticular swellings at its base; (2) the characteristic shape of some of the caudal papillæ of the male; and (3) the equal length and spiny or

granulated appearance of the spicules. These points are all borne out by the description ; from its larger size, however, and certain differences in the arrangement of the papillæ, and in the proportions of various parts of the body, it is evident that the species is distinct from both *T. tiara* and *T. diadema*.

From the features of the type-species, *T. tiara*, and that now described as *T. diadema*, it is possible to extract some characters which may be regarded as being of generic value, and a revised definition of the genus may be given, somewhat as follows:—

TANQUA, R. Blanchard, 1904.
[= *Ctenocephalus*, v. Linst., 1904.]

Gnathostomidæ: of medium size, moderately stout in proportion to the length of the body. Head provided with two lips, dorsal and ventral, each bearing on its inner side three rounded tooth-like projections. At the base of the head there are four rounded submedian cuticular swellings, marked with distinct transverse striations. Anteriorly the lips are twisted slightly out of the middle line, towards opposite sides, in such a way that the teeth of one lip can be interlocked with those of the other lip. Cuticle thick, with irregular transverse wrinkles and exceedingly fine transverse striations. The cuticle of the anterior end may be loose and form a protective sheath, within which the head can be retracted. Œsophagus rather long, simple in structure, increasing gradually in diameter from before backwards. No œsophageal bulb, œsophageal or intestinal diverticula. Four elongate cervical glands present, opening to the exterior on the basal portion of the head. Tail of male provided with more or less pronounced lateral alæ near the tip, giving it a lancet-shaped outline, and having eight pairs of elongate papillæ of different sizes, some of which have a characteristic swelling near the middle. Copulatory spicules curved, cylindrical, and armed throughout with minute spines. Posterior end of the body, in the male, provided with a series of oblique muscle-bands on either side of the ventral surface, extending for some distance in front of the anus. Tail of female short, tapering and pointed. Vulva in the posterior half of the body. Vagina rather short, with a coat of circular muscles; giving off two wide uterine branches, one of which, with its ovary, lies anteriorly, the other posteriorly, to the vagina. Eggs oval, with thin shells, ornamented with fine granulations.

Type-species, *T. tiara* (v. Linst.), 1879.

Comparative Table of Measurements in Tanqua tiara, T. diadema, *and* T. anomala (*v. Linst.*).
(All measurements in millimetres.)

	Tanqua tiara.				*T. diadema.*	*T. anomala.*
	Host :— *Varanus bengalensis* (von Linstow, 1904).	*Varanus* sp.? (Gold Coast).	*Varanus exanthematicus* *.	*Tropidonotus asperrimus.*	*Helicops angulatus.*	*Tropidonotus piscator.*
Length, ♂	18–20	20	20	25	20	34
„ ♀	25–28	27	26	35	28–30	33
Thickness, ♂	0·63–1	0·7	0·55–0·6	0·65	0·6	1·14
„ ♀	1·2–1·3	0·95	0·9–1	1·1	0·8–1	1·14
Head—length	....	0·27–0·33	0·18–0·28	0·22–0·3	0·22	....
„ width, base	....	0·4–0·5	0·25–0·41	0·3–0·39	0·25	....
Lips, width	....	0·21–0·26	0·15–0·22	0·17	0·18	....
Œsophagus—length	....	4–5	4·3–5	3·65–4·86	2·2–2·4	....
„ fraction of total length	$\frac{1}{4}$–$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{7}$	$\frac{1}{11}$	$\frac{1}{9}$–$\frac{1}{8}$
Tail, ♂—length	....	0·55	0·4	0·6	0·6	....
„ „ fraction of total length (approximate)	$\frac{1}{35}$	$\frac{1}{35}$	$\frac{1}{50}$	$\frac{1}{41}$	$\frac{1}{33}$	$\frac{1}{43}$
„ ♀—length	....	0·6	0·6	0·8	0·65	....
„ „ fraction of total length (approximate)	$\frac{1}{46}$	$\frac{1}{45}$	$\frac{1}{43}$	$\frac{1}{44}$	$\frac{1}{43}$	$\frac{1}{66}$
Vulva—distance from post. end.	....	5·9	5–5·4	4·6	11·5	....
„ divides body in proportion of	50 : 11	7 : 2	21 : 5	4 : 1	33 : 23	2 : 1
Egg—measurements	0·065×0·042	0·064×0·0375	....	0·062×0·045	0·060×0·0425	0·055×0·036

* These examples were not fully mature, and the females contained no fully-formed eggs.

The two species which can at present be assigned definitely to this genus may be distinguished thus :—

1. Head not retractile within a cuticular sheath. Œsophagus long (one-seventh to one-fourth of the total length). Vulva situated within the last quarter of the total length. Parasitic in *Varanus* and other semi-aquatic reptiles in Africa, the East Indies, and Australasia .... *T. tiara* (v. Linst.).
2. Head retractile within a loose cuticular sheath. Œsophagus comparatively short (about one-eleventh of the total length). Vulva in the middle third of the body. Parasitic in semi-aquatic reptiles in South America ..... *T. diadema.*

A table of measurements is given on p. 231, including, for the sake of completeness, these two species and the more doubtful *T. anomala*. The measurements given by von Linstow (1904) for *T. tiara* are placed beside my own for comparison. A certain amount of variation was found to exist, and for this reason measurements derived from the three sets of specimens studied are given side by side.

References.

Blanchard, R. 1904. "*Tanqua*, n. g., remplaçant *Ctenocephalus* von Linstow." Arch. Parasitol. viii. p. 478.

Leiper, R. T. 1908. "Helminthes contained in Dr. C. M. Wenyon's Collection from the Sudan." Rep. Wellcome Res. Lab. Khartoum, iii. p. 187 (published 1909).

Linstow, O. von. 1879. "Helminthologische Untersuchungen." Württemb. Naturw. Jahresh. xxxv. p. 313.

——. 1904. "Nematoda in the Collection of the Colombo Museum." Spolia Zeylanica, i. p. 91.

Parona, C. 1898. "Elminti raccolti dal Dott. Elio Modigliani alle isole Mentawei, Engano e Sumatra." Ann. Mus. Genova, (2) xix. p. 102.

XX.—*Preliminary Notice of some Irish Sponges.—The Monaxonellida (Suborder Sigmatomonaxonellida) obtained by the Fisheries Branch of the Department of Agriculture and Technical Instruction, Ireland.*

By Jane Stephens, B.A., B.Sc., Irish National Museum.

The following list of sponges belonging to the suborder Sigmatomonaxonellida, Dendy, contains ninety-five species. Fifty-one of the species are now recorded for the first time within the Irish area, and of these thirty-one have not been taken previously off any part of the British Isles.

Thirteen species are described as new.

Nearly all the sponges in this collection which are new to the British Isles were dredged in deep water off the west and south-west coasts of Ireland.

A report on the collection is in preparation for publication in the "Scientific Investigations" of the Irish Fisheries Branch.

List of Species.

Grade MONAXONELLIDA.

Suborder SIGMATOMONAXONELLIDA.

Family **Haplosclerida**.

Subfamily *Gellinæ*.

Gellius flagellifer, *R. & D.*
Oceanapia robusta (*Bowerbank*).

Subfamily *Reniering*.

Reniera cinerea (*Grant*).
—— peachi (*Bowerbank*).
—— simulans (*Johnston*).
—— fistulosa (*Bowerbank*).
—— indistincta (*Bowerbank*).
Metschnikowia spinispiculum (*Carter*).
Halichondria panicea (*Pallas*).
—— fibrosa (*Fristedt*).
Phlœodictyon elongatum (*Topsent*).

Subfamily *Chalininæ*.

Pachychalina limbata (*Montagu*).
Chalina oculata (*Pallas*).

Subfamily *Desmacellinæ*.

Biemna inornata (*Bowerbank*).
Tylodesma annexa (*Schmidt*).
—— informis, sp. n.
Hamacantha johnsoni (*Bowerbank*).
—— falcula (*Bowerbank*).

Family **Desmacidonidæ**.

Subfamily *Mycalinæ*.

Esperiopsis fucorum (*Johnston*).
—— villosa (*Carter*).
—— incognita, sp. n.
—— macrosigma, sp. n.
Mycale ægagropila (*Johnston*).
—— macilenta (*Bowerbank*).
—— placoides (*Carter*), *Lundbeck*.
—— rotalis (*Bowerbank*).
—— fascifibula (*Topsent*).
—— littoralis (*Topsent*).
Rhaphidotheca marshall-halli. *Kent*.
Asbestopluma pennatula (*Schmidt*).
Cladorhiza abyssicola, *Sars*.
Myxilla rosacea (*Lieberkühn*).
—— incrustans (*Johnston*).
—— fimbriata (*Bowerbank*).
Lissodendoryx diversichela, *Lundbeck*.
Iophon nigricans (*Bowerbank*).
Iotrochota acanthostylifera, sp. n.
Forcepia forcipis (*Bowerbank*).
Histoderma physa (*Schmidt*).
Histodermella ingolfi, *Lundbeck*.
Grayella pyrula (*Carter*).

Subfamily *Ectyoninæ*.

Hymedesmia zetlandica, *Bowerbank*.
—— truncata, *Lundbeck*.
—— koehleri (*Topsent*).
—— curvichela, *Lundbeck*.
—— paupertas (*Bowerbank*).
—— pansa, *Bowerbank*.
—— occulta, *Bowerbank*.
—— baculifera (*Topsent*).
—— mutabilis (*Topsent*).
—— crux (*Schmidt*).
—— digitata, *Lundbeck*.
—— mucronata (*Topsent*).
—— tenuisigma, *Lundbeck*.
—— dujardini (*Bowerbank*).
—— helgæ, sp. n.
—— spinosa, sp. n.
—— hibernica, sp. n.
Ectyodoryx atlanticus, sp. n.
Anchinoë fictitius (*Bowerbank*).
Stylostichon plumosum (*Montagu*).
—— dendyi, *Topsent*.
Pocillon hyndmani (*Bowerbank*).
Eurypon clavatum (*Bowerbank*).
—— hispidulum (*Topsent*).
—— affine (*Topsent*).
—— acanthotoxa, sp. n.
—— ditoxa, sp. n.
—— tenuissimum, sp. n.
—— microchela, sp. n.
—— lacazei (*Topsent*).
—— viride (*Topsent*).
Microciona armata, *Bowerbank*.
Clathria dichotoma (*Esper*).
(?) —— anchorata (*Carter*).
Echinoclathria foliata (*Bowerbank*).
Ophlitaspongia seriata (*Grant*).
Plocamia microcionides (*Carter*).
Suberotelites demonstrans, *Topsent*.
Raspailia pumila (*Bowerbank*).
—— howsei (*Bowerbank*).
Cyamon spinispinosum (*Topsent*).
Rhabderemia guernei, *Topsent*.
Spanioplon armaturum (*Bowerbank*).
Leptosastra constellata, *Topsent*.

Family **Axinellidæ**.

Axinella pyramidata, sp. n.
Phakellia ventilabrum (*Johnston*).
—— robusta, *Bowerbank*.
—— rugosa (*Bowerbank*).
Bubaris vermiculata (*Bowerbank*).
Tragosia infundibuliformis (*Johnston*).
Tragosia arctica (*Vosmaer*).
Higginsia thielei, *Topsent*.
Hymeniacidon caruncula, *Bowerbank*.
Halichemia verticillata (*Bowerbank*).

Preliminary Description of the New Species.

Tylodesma informis, sp. n.

The sponge is growing in a thick encrustation on coral.

The main skeleton is an irregular reticulation of tylostyli. In places the spicules are collected into bundles or short fibres. The dermal skeleton consists of broad strands of tylostyli closely packed together and lying tangentially to the surface.

Spicules.—(1) Tylostyli. The shaft is slightly curved and fusiform ; the head is well-defined, oval or rounded. The size varies from about 0·37 mm. by 0·008 mm. to 1·3 mm. by 0·027 mm. (2) Sigmata. These are contort and their longer axis is 0·035–0·045 mm. in length.

The species was dredged at three stations off the south-west coast of Ireland, at depths varying from 250 to 560 fathoms.

Esperiopsis incognita, sp. n.

The sponge is growing in a very thin encrustation on coral.

The skeleton consists of short fibres made up of multiserially arranged styli, which run obliquely through the sponge from base to surface. In addition to these fibres there are thick, well-defined, branching fibres running more or less parallel to the surface of the sponge.

Spicules.—(1) Styli, straight and slender, 0·4–0·45 mm. in length by 0·006–0·008 mm. (2) Isochelæ palmatæ of two forms—(*a*) straight isochelæ with rather long, narrow alæ leaving only a short part of the shaft free. Length 0·035–0·07 mm.; (*b*) very small, slender isochelæ, with slightly curved shaft, 0·013 mm. in length. (3) Sigmata of two forms—(*a*) sigmata lying in one plane and varying a good deal in size. The longer axis is from 0·1–0·32 mm. in length. The maximum thickness of the spicule is about 0·013 mm.; (*b*) slender, contort sigmata with a longer axis of 0·04–0·075 mm.

This sponge is identical with the specimen referred to by Carter as "an unknown sponge," and partly described and figured by him under that name (Journ. Roy. Micr. Soc. ii. 1879).

The sponge was dredged off the west coast of Ireland in 388 fathoms.

Esperiopsis macrosigma, sp. n.

The sponge is growing in a very thin encrustation on coral.

The skeleton consists of bundles of spicules, or of short fibres containing multiserially arranged spicules. In places longer, rather ill-defined fibres run more or less parallel to the surface. There are also single spicules or groups of two or three spicules scattered through the sponge.

Spicules.—(1) Styli slender, straight, tapering to a rather short point. Length 0·37–0·42 mm. by 0·006–0·008 mm. (2) Isochelæ palmatæ of three forms—(*a*) the largest are 0·11–0·125 mm. in length, the shaft is straight and is about 0·006 mm. in thickness. The tooth measures 0·024 mm. across; (*b*) isochelæ with rather long narrow alæ leaving only a short part of the shaft free. Length 0·06 mm.;

(*c*) isochelæ with a slightly curved shaft, 0·015–0·024 mm. in length. (3) Sigmata of two forms—(*a*) sigmata lying in one plane and of very different sizes. The longer axis varies from about 0·1–0·4 mm. in length. The maximum thickness of the spicule is 0·02 mm.; (*b*) slender, contort sigmata with a longer axis of 0·04–0·075 mm.

Specimens of this species were obtained at two stations off the south-west coast of Ireland at depths varying from 250 to 728 fathoms.

Iotrochota acanthostylifera, sp. n.

The sponge is coating a piece of coral; it is a good deal injured.

As far as can be seen, the main skeleton is an irregular reticulation of acanthostyli. Here and there ill-defined fibres are formed. The dermal skeleton consists of flat bundles of spicules, or, in places, of longer fibres.

Spicules.—(1) Acanthostyli, which are straight or slightly curved. The head is a little swollen and is thickly set with strong blunt spines. A few small spines are scattered along the shaft. Length 0·32–0·35 mm. by 0·008 mm. (2) The dermal spicules are tylota. The shaft is straight and the ends are unequal, one end being more rounded than the other. Length 0·3–0·33 mm. by 0·005 mm. (3) Isanchoræ, 0·045–0·5 mm. in length, with about 8–10 teeth at either end. (4) Birotulæ, 0·015 mm. in length.

The species was dredged off the south-west coast of Ireland at a depth of 627–728 fathoms.

Hymedesmia helgæ, sp. n.

The sponge is growing in a thin encrustation on coral and on a piece of *R. tepora*.

The main skeleton consists of acanthostyli, set vertically with their heads on the substratum. The dermal skeleton is made up of thick bundles of spicules, which are arranged more or less vertically in the sponge. Beneath the surface they spread out, and are continued as strong fibres running parallel to the surface of the sponge. The dermal membrane is crowded with isochelæ arcuatæ.

Spicules.—(1) The longer acanthostyli have a slightly curved shaft and a head which is, at the most, very slightly marked. The lower part of the shaft is thickly covered with rather small spines; the remainder of the shaft is set with very small spines, so small that the shaft looks merely roughened. Length 0·25–0·35 mm. by 0·01 mm. The

small acanthostyli have a slightly curved shaft, which is covered with small recurved spines along its whole length. These spicules are about 0·125–0·15 mm. in length by 0·005–0·008 mm. (2) The dermal spicules are strongyla, which are straight and polytylote. They measure 0·35–0·5 mm. in length by 0·006–0·008 mm. (3) The isochelæ arcuatæ have a strongly curved shaft which is very broad in front view. They are 0·035–0·04 mm. in length.

This species was dredged off the west and south-west coasts of Ireland at depths of 388 and 468 fathoms.

Hymedesmia spinosa, sp. n.

The sponge is growing in a very thin encrustation on coral. The main skeleton consists of acanthostyli which are placed very close together and are set vertically with their heads on the substratum. The dermal spicules are in bundles which lie more or less horizontally to the surface.

Spicules.—(1) The acanthostyli measure from 0·09 to 0·22 mm. in length, with a maximum diameter of 0·013 mm. above the head. They cannot be separated into two groups. The shaft is straight or very slightly curved. The head is fairly well marked and is thickly covered with long, stout, blunt spines; the remainder of the shaft is set with recurved spines. The longer spicules are more sparingly spined along the shaft than are the shorter ones, and the spines are smaller. (2) The dermal spicules are straight, slightly fusiform tornota, measuring 0·18–0·26 mm. by 0·005 mm. (3) The isochelæ arcuatæ are very numerous. They have a thick, usually very strongly curved shaft, with short teeth. They measure 0·03–0·038 mm. in length. The species is nearly allied to *Hymedesmia procumbens*, Lundbeck.

The sponge was dredged at two stations off the south-west coast of Ireland at depths varying from 500 to 728 fathoms.

Hymedesmia hibernica, sp. n.

The sponge forms a thin encrustation on two specimens of *Caryophyllia clavus*.

The main skeleton consists of acanthostyli which stand vertically with their heads on the substratum. The slender dermal spicules are united into bundles which are placed more or less vertically in the sponge; they bend round beneath the dermis and are continued as fibres running parallel to the surface.

Spicules.—(1) The acanthostyli fall into two groups: the longer measure from 0·25 to 0·325 mm. in length by 0·008 mm.

They have a slightly curved shaft and a head which is thickly covered with short blunt spines. A few small recurved spines are scattered along the shaft, sometimes to nearly half its length. The shorter acanthostyli are 0·11–0·13 mm. in length by 0·006 mm. The shaft is straight, and the head is, at the most, very slightly marked, and is covered with rather long blunt spines. The shaft is spined throughout its length. (2) The dermal spicules are slender strongyla measuring 0·22–0·25 mm. in length by 0·0025 mm.

Microscleres are absent from the sponge.

The species was dredged in 37 fathoms off Reenacry Head, Co. Kerry.

Ectyodoryx atlanticus, sp. n.

The sponge is coating a piece of coral.

The main skeleton consists of a network of large acanthostyli, lying usually three or four together, sparingly echinated by small acanthostyli. A small quantity of spongin is present. The dermal spicules form thick fibres, but the exact arrangement cannot be made out owing to the injured surface of the only specimen available.

Spicules.—(1) The large acanthostyli have a slightly curved shaft. The head is swollen and is covered with short blunt spines. A few spines are sometimes scattered along the shaft for a short distance. On the other hand, some of the spicules are almost quite smooth. These spicules measure about 0·66–0·95 mm. in length by 0·015–0·02 mm. in diameter above the head. (2) The echinating acanthostyli are small and few in number. The shaft is straight; the head is a little swollen and is covered with rather long spines. The shaft is thickly set with small recurved spines. The length is 0·1–0·14 mm. by 0·01 mm. above the head. (2) The dermal spicules are strongyla with rather unequal ends, one end being slightly thicker than the other. The shaft is often a little crooked. Length 0·4–0·5 mm. by 0·006 mm. (3) Isochelæ arcuatæ. The shaft is rather strongly curved. Length 0·045–0·06 mm.

The species was dredged off the south-west coast of Ireland in 468 fathoms.

Eurypon acanthotoxa, sp. n.

The sponge is growing in a small, thin encrustation on coral.

The main skeleton consists of acanthostyli which stand vertically with their heads on the substratum. The dermal

spicules are in bundles which apparently lie more or less obliquely to the surface, the ends of the spicules projecting beyond the dermis.

Spicules.—(1) Acanthostyli. These vary in size from about 0·16–0·9 mm. in length by 0·008–0·025 mm. The longer of these spicules have a slightly curved shaft. The head is thickly covered with short, stout, blunt spines, the remaining part of the spicule being smooth. The shorter acanthostyli have a curved shaft. The head is covered with short, stout, blunt spines. Similar spines extend a little way along the shaft. The rest of the shaft is set with recurved spines. These two extremes in the acanthostyli are linked together by other acanthostyli of varying lengths and of varying degrees of spination, so that it is not possible to divide the spicules into two groups. (2) The dermal spicules are long straight styli, minutely spined on the head. Length 0·5–0·75 mm. by 0·008 mm. (3) Isochelæ palmatæ, 0·019 mm. in length. (4) Toxa. These have a well-rounded bend in the middle of the shaft and very slightly recurved ends, which are spined. The size varies from very minute to about 0·35 mm. in length, with a maximum thickness of 0·003 mm.

The sponge was dredged off the south-west coast of Ireland in 250–542 fathoms.

Eurypon ditoxa, sp. n.

The sponge is growing in a very thin encrustation on a piece of *Retepora*.

The main skeleton consists of acanthostyli, which are placed vertically with their heads on the substratum. The dermal spicules are in bundles set more or less obliquely to the surface.

Spicules.—(1) Acanthostyli. The largest of these spicules are slightly curved. The shaft is smooth except at the base, which is thickly covered with short blunt spines. Length about 0·3–0·6 mm., with a maximum diameter of 0·02 mm. The small acanthostyli are straight or slightly curved ; the head is covered with rather strong blunt spines and the shaft is thickly set along its whole length with small recurved spines. Length 0·125–0·2 mm., with a maximum diameter of 0·01 mm. (2) The dermal spicules are styli which are often a little crooked. The head is very minutely spined. Length 0·4–0·5 mm. by 0·005 mm. (3) Isochelæ palmatæ, 0·015 mm. in length. (4) Toxa of two kinds—(*a*) with a wide even curve and short arms ending in sharp, slightly

recurved points. Length 0·08–0·13 mm., with a maximum thickness of about 0·0025 mm. ; (*b*) with very long and very slender straight arms, and with rather an abrupt curve in the middle of the spicule. The maximum length is about 0·8 mm.

The sponge was dredged off the west coast of Ireland in 388 fathoms.

Eurypon tenuissimum, sp. n.

The sponge is growing in a small, very thin encrustation on coral.

The main skeleton consists of acanthostyli which are set vertically with their heads on the substratum. The dermal skeleton consists of styli, apparently arranged in bundles, set vertically to, and projecting above, the surface, but their exact arrangement could not be made out owing to the scanty material available for examination.

Spicules.—(1) Acanthostyli. The largest of these spicules are from 1 to 1·5 mm. in length, with a maximum diameter of 0·021 mm. The slightly curved shaft tapers to a rather short point at the apex. The base is covered, sometimes very sparingly, with rather short blunt spines. Smaller acanthostyli, spined to some distance along the shaft, are intermediate both in size and in amount of spination between the foregoing and the smallest acanthostyli, which are about 0·12–0·14 mm. in length. These latter are thickly spined along their whole length. The head is covered with short blunt spines, the shaft with recurved spines. (2) The dermal styli are minutely spined on the head; they are 0·45–0·7 mm. by 0·006 mm. (3) Isochelæ palmatæ, 0·021 mm. in length. (4) Toxa, very slender, with long straight arms. Maximum length about 0·55 mm.

The sponge was dredged off the west coast of Ireland in 388 fathoms.

Eurypon microchela, sp. n.

The sponge is growing in a very thin encrustation on coral.

The main skeleton consists of acanthostyli, which are placed very close together and are set vertically with their heads on the substratum. The long acanthostyli project far above the surface of the sponge. The dermal spicules are in small bundles and project more or less obliquely above the surface.

Spicules.—(1) Acanthostyli. The long acanthostyli are very slightly curved and taper to a rather long point. The head is well marked and is rounded; it is thickly covered with short, stout, blunt spines. A few small spines are scattered along the shaft. These spicules measure about 0·5–0·8 mm. in length by 0·013 mm. above the head. The short acanthostyli are straight and taper to a long fine point. The head is fairly well marked and is covered with rather strong blunt spines. The shaft is thickly set with small recurved spines. The length varies from 0·12–0·17 mm. by 0·008 mm. (2) The dermal spicules are slender subtylostyli, very minutely spined on the head. The shaft is often rather curved. The length is about 0·3–0·4 mm. by 0·003 mm. (3) Isochelæ palmatæ, very minute, measuring only 0·008 mm. in length.

The species was dredged off the south-west coast of Ireland in 250–542 fathoms.

Axinella pyramidata, sp. n.

The sponge, which is cut off from its support, is 15 mm. in height and 17 mm. in diameter at its summit. In shape it is somewhat like a three-sided pyramid standing on its apex, except that the sides are deeply cut vertically into a series of flattened lobes. The upper surface is flat, but here and there it rises into small knob-like elevations.

The skeleton consists of closely-set plumose columns of spicules which run upwards through the sponge, and then bend out towards the surface, where they end in brushes of styli which project for part of their length beyond the dermis. A considerable amount of spongin is present, cementing the spicules together.

Spicules.—(1) Styli varying from about 0·23 mm. to 1 mm. in length by 0·01–0·016 mm. In the shorter styli the shaft is rather sharply bent at a little distance above the head. The longer styli are usually slightly curved. There is sometimes a slight swelling on the shaft a little distance above the head. (2) Oxea about 0·3–0·6 mm. in length by 0·01–0·013 mm. They are sharply and irregularly bent, and taper at either end to a rather short point. Many of the oxea have a slight swelling about the middle of the spicule.

The only specimen in the collection was dredged off the Kerry coast in 37 fathoms.

Notes on some of the Species.

Hamacantha johnsoni (Bowerbank) and *H. falcula* (Bowerbank).

A great deal of confusion exists with regard to these two species. An examination of the type-slides showed that *Hamacantha johnsoni* possesses the following kinds of spicules—oxea, diancistra of two forms, and sigmata,—while *Hamacantha falcula* possesses styli, diancistra of three forms, and toxa. The former species, in fact, has in recent years been called *Hamacantha schmidti* (Carter) and the latter has usually been referred to as *Hamacantha johnsoni* (Bowerbank).

Rhaphidotheca marshall-halli, Kent.

Two specimens of *Rhaphidotheca* are in the collection—one with exotyles of the shape characteristic of *R. marshall-halli*, Kent, and the other with exotyles shaped like those of *R. affinis*, Carter. From an examination of the two specimens it has been decided to regard the latter name as a synonym of *R. marshall-halli*. The union of these two species has been suggested from time to time by various authors.

(?) *Clathria anchorata* (Carter).

This sponge, which is doubtfully referred to the genus *Clathria*, was described by Carter under the name *Dictyocylindrus anchorata*.

Anchinoë fictitius (Bowerbank).

The sponge called by Bowerbank *Microciona fictitia* was found to have the same arrangement of the skeleton and the same kinds of spicules as *Hymeniacidon perarmatus*, Bowerbank, which is the type-species of Gray's genus *Anchinoë*. This genus may be defined as follows :—Ectyoninæ with a skeleton composed of branching fibres which consist of multiserially arranged smooth diactinals echinated by acanthostyli. No special dermal skeleton. Microscleres isochelæ arcuatæ solely, or perhaps with other forms.

Plumohalichondria, Carter, must be regarded as a synonym of *Anchinoë*, Gray.

XXI.—*Description of a new Snake of the Genus* Coluber *from Northern China.* By G. A. Boulenger, F.R.S.

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Two years ago I described in these 'Annals' (xiii. 1914, p. 576) a new and very distinct species of *Coluber* discovered by Mr. A. L. Hall at Chihfeng, N.E. Chihli Province, which I named *C. halli*. Mr. Hall has since been so kind as to send a second series of snakes from the same locality, and this includes, in addition to five further specimens of *C. halli*, a single specimen of another species which I regard as new and of which I here offer a description.

The additional specimens of *C. halli* show the following variation in the number of scales and shields :—

♂	23 scales.	172 ventrals.	69 subcaudals.
♀	25 „	181 „	63 „
„	23 „	179 „	64 „
Yg.....	23 „	171 „	65 „
„	23 „	171 „	69 „

The formula for the seven known specimens is therefore—

Sc. 23–25. V. 171–181. A. 2. C. 58–69.

Coluber anomalus.

Snout rounded, scarcely prominent ; canthus rostralis very obtuse, loreal region slightly concave ; eye rather small, one-third length of snout. Rostral much broader than deep, just visible from above ; internasals as long as broad, as long as the præfrontals ; frontal as long as broad, two-thirds its distance from the end of the snout, three-fifths the length of the parietals ; loreal longer than deep ; præocular single, no subocular below it ; two postoculars ; temporals 2 + 3 or 4 ; seven upper labials, third and fourth entering the eye ; four lower labials in contact with the anterior chin-shields, which are a little longer than the posterior. Scales in 22 rows, dorsals feebly but very distinctly keeled, laterals smooth. Ventrals not angulate laterally, 212 ; anal divided ; subcaudals mostly single, 65. Dark brown above ; a large blotch on the neck and a streak behind the eye black ; hinder part of body and tail with rather irregular black cross-bars ; lower parts white, with greyish spots anteriorly ; subcaudals edged with brown.

Total length 1770 mm. ; tail 250.

A single male specimen.

This snake can only be compared with *C. schrenckii*, Strauch, from Corea and Eastern Siberia, but it differs in the number of upper labial shields, the mostly single subcaudals, and in other points of minor importance.

XXII.—*Descriptions of Three new Cyprinid Fishes from East Africa.* By G. A. Boulenger, F.R.S.

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Labeo gracilis.

Body strongly compressed, its depth $4\frac{1}{2}$ to $4\frac{2}{3}$ times in total length. Head $4\frac{1}{2}$ times in total length ; snout rounded, as long as postocular part of head ; eye perfectly lateral, $3\frac{1}{4}$ times in length of head ; interorbital width $\frac{1}{2}$ length of head ; width of mouth, with lips, $3\frac{1}{2}$ times in length of head ; lips rather feebly developed, without transverse plicæ, with a fringe of conical papillæ ; edge of rostral flap entire ; a small barbel. Dorsal III 10–11, equally distant from nostril and from caudal, upper edge concave, longest ray as long as head. Anal III 5, not reaching caudal. Pectoral slightly shorter than head, not reaching ventral, which is inserted below middle of dorsal. Caudal deeply notched, crescentic. Caudal peduncle once and a half as long as deep. Scales 40–42 $\frac{6\frac{1}{2}}{6\frac{1}{2}}$, 4 between lateral line and ventral, 16 round caudal peduncle. Dark brown above, whitish beneath.

Total length 120 mm.

Three specimens from the Juba River near Gobwen, collected by Mr. A. Blayney Percival. Types in the British Museum and in the Nairobi Museum.

Allied to *L. mesops*, Gthr., but body more elongate, eye larger, and mouth smaller.

Barbus procatopus.

Depth of body equal to length of head, $3\frac{2}{3}$ to 4 times in total length. Snout rounded, 3 to $3\frac{1}{2}$ times in length of head ; eye $3\frac{1}{3}$ to $3\frac{1}{2}$ times in length of head, interorbital width $3\frac{1}{3}$ times ; mouth inferior, its width 4 times in length of head ; lips moderately developed, lower uninterrupted ; two barbels on each side, posterior a little longer than anterior and as

long as eye or a little shorter. Dorsal III 8, equally distant from gill-opening and from caudal, border slightly concave; last simple ray very strong, bony, not serrated, as long as head or a little shorter. Anal III 5, reaching caudal or not quite so far. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, not reaching ventral, the base of which is entirely in front of the vertical of the dorsal. Caudal peduncle twice as long as deep. Scales longitudinally striated, 31–34 $\frac{5\frac{1}{2}}{5\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Brown above, silvery white beneath, scales darker at the base.

Total length 115 mm.

Three specimens from the Amala River, entering the east side of Lake Baringo; collected by Mr. A. Blayney Percival. Types in British Museum and in Nairobi Museum.

Distinguished from *B. gregorii*, Gthr., which occurs also in the Baringo watershed, by the shorter barbels and the more posterior position of the dorsal fin, which originates behind the vertical of the base of the ventral.

Barbus loveridgii.

Depth of body $3\frac{1}{2}$ to 4 times in total length, length of head 4 times. Snout rounded, as long as or slightly shorter than eye, which is $3\frac{1}{4}$ to $3\frac{1}{2}$ times in length of head; interorbital width $2\frac{1}{2}$ to 3 times in length of head; mouth small, subinferior; lips feeble, two barbels on each side, anterior very short, sometimes rudimentary, posterior $\frac{2}{3}$ to $\frac{3}{5}$ diameter of eye. Dorsal III 7, equally distant from occiput and from caudal, border straight; last simple ray strong, bony, very strongly serrated, the stiff part $\frac{3}{4}$ to $\frac{4}{5}$ length of head. Anal III 5, not reaching caudal. Pectoral as long as head, reaching or nearly reaching ventral; base of latter entirely in front of vertical of dorsal. Caudal peduncle twice as long as deep. Scales radiately striated, 26–30 $\frac{4\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Brownish above, silvery white beneath, some of the scales black at the base; a narrow black lateral streak.

Total length 70 mm.

Several specimens from the Amala River, entering the east side of Lake Baringo; collected by Mr. A. Blayney Percival. Types in British Museum and in Nairobi Museum.

This species, named after Mr. A. Loveridge, Curator of the Nairobi Museum, is most nearly related to *B. lumiensis*, Blgr., also found in the Amala River, differing chiefly in the larger eye and the shorter barbels.

XXIII.—*Two new Species of the Hymenopterous Genus* Megalyra, *Westw.* By Rowland E. Turner, F.Z.S., F.E.S.

Family **Megalyridæ**.

Megalyra testaceipes, sp. n.

♀. Nigra; pedibus testaceis, palpis pallide testaceis; antennis terebraque brunneo-testaceis; alis hyalinis, iridescentibus, area cubitali leviter infumata.
Long. 3 mm.; terebræ, long. 9 mm.
♂. Feminæ similis, alis omnino hyalinis.
Long. 2·5 mm.

♀. Antennæ 14-jointed, second joint of the flagellum twice as long as the first, the third joint a little shorter than the second and scarcely longer than the fourth. A strong transverse carina reaching to the eyes just above the base of the antennæ. Head and thorax coarsely and evenly punctured-reticulate. Anterior ocellus separated from the eyes by a distance slightly greater than that separating the posterior ocelli from each other; the posterior ocelli farther from each other than from the eyes. Clypeus rugulose, rounded at the apex. Anterior angles of the mesonotum produced into blunt tubercles; scutellum large, as long as the mesonotum; pleuræ more finely punctured than the mesonotum; median segment coarsely reticulate on the dorsal surface, finely rugulose on the sides, shorter than the scutellum. Abdomen shining, almost smooth, the punctures microscopic. The whole insect without any patches of pubescence. Legs, especially the tibiæ, with sparse whitish hairs; wholly testaceous, except the coxæ, which are fusco-ferruginous.

The male is similar to the female in all points of sculpture, but the faint fuscous cloud on the cubital area of the fore wing is absent in the male.

Hab. Kuranda, N. Queensland, June 29–July 16, 1913. Two females and one male. Taken on dead *Eucalyptus*-wood, in which small beetle-holes were numerous.

Easily distinguished from other species of the genus by the straight transverse carina above the antennæ, by the much shorter third joint of the flagellum, and by the very small size. Even *M. minuta*, Frogg., is considerably larger.

Megalyra lilliputiana, sp. n.

♀. Nigra; tibiis anticis apice tarsisque testaceis; terebra antennisque dimidio basali fusco-ferrugineis; alis hyalinis, iridescentibus, areis cubitali discoidalique infuscatis.
Long. 2–4 mm.; terebræ, long. 7–14 mm.

♀. Third joint of the flagellum a little longer than the second and equal in length to the fourth. Eyes converging towards the clypeus, very narrowly separated from the posterior margin of the head; anterior ocellus separated from the eyes by a distance distinctly greater than that separating the posterior ocelli from each other, the posterior pair a little farther from each other than from the eyes. Head and thorax coarsely punctured-reticulate; pleuræ rugose, less coarsely sculptured than the mesonotum. Anterior angles of the mesonotum produced into short acute tubercles; scutellum large, nearly as long as the mesonotum and distinctly longer than the median segment, the latter rugose-reticulate. First abdominal segment smooth and shining; the remaining segments very finely and closely punctured, subopaque. Legs and pleuræ very sparsely clothed with whitish hairs, the whole insect without any patches of white pubescence.

Hab. Kuranda, N. Queensland, June 9–24, 1913. Four females. On dead *Eucalyptus*-wood.

The third joint of the flagellum, though somewhat longer than in *testaceipes*, is much less elongate than in *fasciipennis*. In both this species and in *testaceipes* the eyes are more elongate and reach much nearer to the posterior margin of the head, and also converge more towards the clypeus than in the larger species of genus which I have seen (*fasciipennis*, *shuckardi*, *melanoptera*, *mutilis*); the terebra is three-and-a-half times as long as the insect, not four times as long, as in *minuta*, which also differs in the colour of the legs.

In *Megalyra mutilis*, Westw., the second joint of the flagellum is nearly twice as long as the third, which is only twice as long as the first. The only specimen I have seen is a male.

Both *testaceipes* and *lilliputiana* were taken by me on a recent expedition to Australia. The types are in the British Museum.

XXIV.—*Notes on Fossorial Hymenoptera.*—XX. *On some* Larrinæ *in the British Museum.* By Rowland E. Turner, F.Z.S., F.E.S.

Key to the Australian Species of Liris.

♀♀.

Wings yellow, with a pale fuscous margin; legs ferruginous; the whole dorsal surface clothed with golden pubescence ..	[subsp. *magnifica*, Kohl. *L. hæmorrhoidalis*, Fabr.,
Wings pale fuscous; legs black; without golden pubescence	*L. melania*, Turn.

Liris melania, sp. n.

♀. Nigra, subopaca; segmento mediano opaco, delicatissime transverse striato; area pygidiali setosa, aureo-pilosa; alis fusco-hyalinis, venis fuscis.
Long. 17 mm.

♀. Clypeus finely and closely punctured, with a deep depression in the middle of the apical margin. Second joint of the flagellum equal to the third, twice as long as the first. Eyes touching the posterior margin of the head, separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Cheeks and the base of the mandibles clothed with fine silver pubescence. Pronotum not reaching the level of the mesonotum, higher in the middle than at the sides. Thorax subopaque, minutely punctured; median segment about equal in length to the mesonotum, very finely and closely transversely striated, with a longitudinal sulcus from the base to the apex, the sides of the dorsal surface and of the posterior truncation more coarsely striated. Abdomen subopaque, microscopically punctured; obscure apical bands of fine whitish pubescence, broadly interrupted in the middle on the three basal dorsal segments. Pygidial area subtriangular, narrowly rounded at the apex, shaped as in *L. gibbosa*, Kohl, clothed with fine golden pubescence, and with numerous black setæ. Second ventral segment swollen near the base as in *Notogonia*, with a carina from the base to the middle. Second abscissa of the radius as long as the third, the two recurrent nervures received very close to each other.

Hab. Cairns district, Q. (*collected by F. P. Dodd and presented by Dr. Perkins*).

This was recorded by me as *L. ducalis*, Sm. (Trans. Ent.

Soc. London, p. 425, 1910), to which it is nearly allied ; but in that species the eyes are very distinctly separated from the hind margin of the head, as in all the other species of the group known to me, the median segment is longer and has the median sulcus much more obscure, and the pubescence on the head is golden.

Liris cowani, Kirby.

Larrada cowani, W. F. Kirby, Trans. Ent. Soc. London, p. 200 (1883). ♀.

Liris pedestris, Saussure, Grandidier, Hist. Madagascar, xx. p. 517 (1892). ♀ ♂.

Key to the Australian Species of Larra.

♀ ♀.

1. Fore tibiæ with a row of spines on the outer margin	*L. melanocnemis*, Turn.
Fore tibiæ without spines on the outer margin	2.
2. Legs ferruginous	*L. femorata*, Sauss.
Legs black, shading into fusco-ferruginous on the tibiæ and tarsi in some specimens.	*L. scelesta*, Turn.

♂ ♂.

1. Eyes separated on the vertex by a distance at least equal to the length of the three basal joints of the flagellum	*L. melanocnemis*, Turn.
Eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum	2.
2. Legs ferruginous	*L. femorata*, Sauss.
Legs black, the apical half of the tarsi fusco-ferruginous	*L. scelesta*, Turn.

Larra melanocnemis, sp. n.

♀. Nigra, opaca, abdomine nitido, segmentis dorsalibus 1–5 fascia interrupta, albo-pilosa ; tegulis pallide testaceis ; alis fusco-hyalinis, venis fuscis.

Long. 15–17 mm.

♀. Clypeus opaque, very finely and closely punctured, the extreme apex smooth and shining, the apical margin transverse. Head subopaque, finely and closely punctured, the front above the base of the antennæ shining and very sparsely punctured. Second joint of the flagellum twice as long as the first and half as long again as the third, the antennæ quite as stout in proportion as in *L. anathema*. Eyes separated on the vertex by a distance equal to the

combined length of the second and third joints of the flagellum. Pronotum sunk a little below the mesonotum, no higher in the middle than at the sides, the dorsal surface almost linear, very sharply sloped anteriorly. Thorax very closely punctured, the pleuræ covered with short silver-white pubescence. Median segment longer than the mesonotum, granulate, without any distinct median sulcus or carina, the apical slope finely and closely punctured. Abdomen smooth and shining, the first to fifth dorsal segments with a broadly interrupted apical band of white pubescence; pygidial area elongate, pointed at the apex, finely and very sparsely punctured. Anterior tibiæ with a row of spines on the outer margin. Third abscissa of the radius equal to the second, the recurrent nervures separated from each other on the cubitus by a distance equal to nearly two-thirds of the distance between the first recurrent nervure and the first transverse cubital nervure.

Hab. Mackay, Q., November to May (*ex coll. G. Turner*); Adelaide River, N.T. (*J. J. Walker*); Adelaide, S.A.

This is the Australian representative of *L. mansueta*, Sm., a New Guinea species.

In a former paper (Proc. Zool. Soc. London, p. 473, 1908) I identified this species erroneously as *Larrada nigripes*, Sauss., and treated *Larra psilocera*, Kohl, as a synonym. Schulz (Zool. Ann. p. 191, 1911), having consulted Saussure's collection, applies the name *nigripes* to quite a different insect, which now bears the type-label. Saussure's description, however, seems to have been taken from a headless female, whereas the specimen mentioned by Schulz is a male and not headless. But Saussure's description is insufficient for any certainty. With regard to *L. psilocera*, Kohl, the description of the antennæ does not agree either in colour or form with the present species, the clypeus also is more polished. The locality given is Australia, but I suspect that the specimen may have come from one of the Austro-Malayan or Melanesian islands.

Larra femorata, Sauss.

Tachytes femoratus, Sauss. Mém. soc. phys. & hist. nat. Genève, xiv. p. 20 (1854).
Larrada femorata, Sauss. Mélang. Hymen. i. p. 69 (1854).
Larra femorata, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 243 (1884).

Hab. Sydney (*Froggatt*); Mackay, Q., November to April (*ex coll. G. Turner*); Kuranda, Q., January to June (*Turner*).

Larra scelesta, Turn.

Larra scelesta, Turn. Proc. Zool. Soc. London, p. 474 (1908). ♀.

I doubt if this is more than a variety of *L. femorata*. I can find no good structural distinction, and the colour of the legs seems to vary, intermediate forms occurring.

Larra erythropyga, sp. n.

♀. Nigra; segmentis abdominalibus lateribus albo-pilosis; segmento sexto, plerumque etiam in parte quinto, rufis; tegulis testaceis; alis fuscis.
Long. 17–20 mm.

♀. Clypeus opaque, finely and closely punctured, the apical margin transverse; front above the base of the antennæ shining and concave, the marginal grooves very distinct, the upper part of the front and the vertex opaque, finely and closely punctured. Second joint of the flagellum twice as long as the first and about half as long again as the third; eyes separated on the vertex by a distance slightly exceeding the combined length of the two basal joints of the flagellum. Thorax finely and closely punctured, opaque, the mesopleuræ shining and less closely punctured. Median segment longer than the mesonotum, granulate, with a low median carina not reaching the apex, the posterior slope finely rugulose and divided by a longitudinal sulcus. Abdomen shining, almost smooth; pygidial area triangular, almost smooth, the sides nearly half as long again as the basal breadth. Fore tibiæ with a row of spines on the outer margin. Third abscissa of the radius a little longer than the second, which is equal to the first; the second recurrent nervure received close to the middle of the cubital margin of the second cubital cell, very narrowly separated from the first recurrent nervure.

Hab. Nyasaland, S.W. of Lake Chilwa; January 1914 (*S. A. Neave*).

Superficially this species strongly resembles the North-American *L. analis*, Fabr., but has the pronotum raised much higher than in that insect.

Notogonia australis, Sauss.

Tachytes australis, Sauss. Mém. soc. phys. & hist. nat. Genève, xiv. p. 19 (1854).
Larrada australis, Sauss. Mélang. Hymen. i. p. 69 (1854).
Larra australis, Turn. Proc. Zool. Soc. London, p. 474 (1908).

This species should be placed in *Notogonia*, having the

second ventral segment formed as in that genus; the pronotum sunk below the mesonotum, distinctly higher in the middle than on the sides; and a small tooth on the inner side of the mandibles at about one-third from the base. On the other hand, it approaches *Larra* in the short tarsal ungues and in the very sparse pubescence of the pygidial area.

Hab. Adelaide, S.A.; Eaglehawk Neck, S.E. Tasmania.

Tachytes australis, Sauss., Reise d. Novara, Zool. ii. p. 68 (1867), is quite a different insect, but has been confused in Dalla Torre's catalogue. It is probably a *Tachysphex*.

Notogonia pilosifrons, sp. n.

♀. Nigra, fronte aureo-pilosa, segmentis dorsalibus 1–3 fascia apicali obscura albida; alis fuscis.
Long. 17 mm.

♀. Clypeus subopaque, very minutely and closely punctured, with a transverse row of large punctures near the apex, the apical margin straight. Second joint of the flagellum equal to the third, twice as long as the first. Eyes separated on the vertex by a distance equal to nearly two-thirds of the length of the second joint of the flagellum. Front clothed with bright golden pubescence. Pronotum sunk much below the mesonotum, much higher in the middle than at the sides; mesonotum strongly depressed in the middle of the anterior margin, subopaque. Median segment opaque, longer than broad, obscurely transversely striated, the striæ more distinct on the apical angles and on the posterior truncation; a very obscure median carina from the base not reaching the apex. Abdomen subopaque; the pygidial area triangular, the sides a little longer than the base, covered densely with coarse black setæ. First ventral segment finely obliquely striated at the apex; second ventral segment swollen towards the base, as is usual in the genus, and with a carina from the base not reaching the middle. Basal joint of the fore tarsus with four spines on the outer margin. Second abscissa of the radius a little shorter than the third, in some specimens equal to the third; the two recurrent nervures very near together on the cubitus.

Hab. Mlanje, Nyasaland, from 2300 ft.; May to January (*S. A. Neave*).

The wings are paler than in *N. gowdeyi*, Turn., and have no blue effulgence. It is also distinguished from that species by the golden pubescence on the front, the sculpture of the median segment, the lesser distance between the eyes on the vertex, and other details.

Key to the African Species of Motes.

♀♀.

1.	Wings hyaline, clouded with fuscous.....	2.
	Wings golden yellow, with a broad fuscous margin	3.
2.	Abdomen wholly red.....	*M. cyphonomyx*, Kohl.
	Two or three apical segments of the abdomen only red	*M. odontophora*, Kohl.
3.	Abdominal segments with a broad reddish-brown apical band above and beneath ..	*M. deceptor*, Turn.
	Abdominal segments without a reddish apical band	*M. liroides*, Turn.

Motes cyphonomyx, Kohl.

The type is from West Africa. Specimens in the British Museum are from Mwera, Uganda, August (*C. G. Gowdey*); Chagwe, Mabira Forest, Uganda, 3500 feet, July (*S. A. Neave*); Mlanje, Nyasaland, January (*S. A. Neave*); Upper Luangwa River, N.E. Rhodesia, August (*S. A. Neave*).

Motes deceptor, sp. n.

♀. Nigra; capite, pronoto, mesonoto, scutello, segmento mediano supra, abdomine supra tibiisque anticis intermediisque subtus dense aureo-pilosis; scapo subtus, tegulis, segmentis dorsalibus et ventralibus 2–5 fascia lata apicali, segmento dorsali sexto, femoribus apice, tibiis tarsisque brunneo-ferrugineis; alis aurantiacis, fascia lata apicali fusca.

Long. 20 mm.

♀. The whole dorsal surface of the insect covered with dense golden pubescence, concealing the sculpture. Mandibles incised on the outer margin; clypeus narrowly and shallowly emarginate on the middle of the apical margin; second joint of the flagellum equal to the third, rather more than twice as long as the first. Eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum. Pronotum sunk below the level of the mesonotum, higher in the middle than at the sides; pleuræ smooth, opaque. Sides of the median segment smooth, opaque, with a few striæ near the apex; dorsal surface and posterior slope strongly transversely striated at the sides, the striæ very short. First ventral segment with irregular oblique striæ on the apical third, second ventral segment shaped as in *Notogonia*. Pygidial area in the form of a triangle rather broadly truncated at the apex, clothed with short setæ, a row of very stout setæ forming a comb at the

apex. The basal joint of the fore tarsi has four long spines on the outer margin ; the tooth near the middle of the tarsal ungues is small. The dark apical border of the fore wing reaches the first transverse cubital nervure. First abscissa of the radius as long as the second and third combined, the two recurrent nervures very near to each other on the cubitus.

Hab. Offi, N. Nigeria (*Hiscock*).

This species is very near *liroides*, Turn., and may prove to be a western subspecies of that insect. It differs in the broader pygidial area, in the shape of the anterior margin of the clypeus, in the reddish-brown margins of the abdominal segments, and in the darker and somewhat broader marginal band of the fore wing.

The superficial resemblance to *Liris hæmorrhoidalis* is very striking.

Key to the Australian Species of Tachysphex.

♀♀.

1. Two basal segments of abdomen red	*T. truncatifrons*, Turn.
Abdomen wholly black	2.
2. Tibiæ, tarsi, and apex at least of the femora ferruginous or testaceous brown.	3.
Tibiæ and femora wholly black, tarsi usually black, sometimes testaceous brown towards the apex	4.
3. Legs ferruginous, hind and intermediate femora wholly ferruginous	*T. adelaidæ*, Turn.
Legs testaceous brown, hind and intermediate femora black except at the apex .	*T. imbellis*, Turn.
4. Wings fuscous or dark fusco-hyaline	5.
Wings hyaline	7.
5. Pygidial area distinctly though not very closely punctured ; comb of the fore tarsi black and long	*T. stimulator*, Turn.
Pygidial area smooth and shining ; comb of the fore tarsi shorter and fusco-ferruginous.....	6.
6. Wings dark fuscous; mesonotum, scutellum, and abdomen highly polished..	*T. persistans*, Turn.
Wings dark fusco-hyaline; mesonotum, scutellum, and abdomen subopaque ..	*T. hypoleius*, Sm.
7. Dorsal surface of median segment rugose-reticulate or longitudinally striated ..	8.
Dorsal surface of median segment smooth or minutely punctured	9.
8. Median segment longitudinally striated; third abscissa of the radius longer than the second	*T. walkeri*, Turn.
Median segment rugose-reticulate ; second abscissa of the radius at least twice as long as the third	*T. rugidorsatus*, Turn.

9. Thorax and median segment covered with long pubescence; abdominal fasciæ tinged with pale gold ..... *T. pilosulus*, Turn.
   Thorax and median segment not strongly pubescent; abdominal fasciæ white or absent ..... 10.
10. The whole insect, especially the abdomen, much flattened, dorsal surface of abdomen flat ..... *T. depressiventris*, Turn.
    Normal, not flattened ..... 11.
11. Mesonotum and scutellum shining, highly polished ..... 12.
    Mesonotum and scutellum opaque or subopaque ..... 14.
12. Second joint of the flagellum longer than the third ..... *T. pacificus*, Turn.
    Second joint of the flagellum equal to or shorter than the third ..... 13.
13. Second joint of the flagellum equal to the third, pygidium compressed laterally, the pygidial area long and narrow .... *T. pugnator*, Turn.
    Second joint of the flagellum shorter than the third, pygidium not compressed, the pygidial area fairly broad ..... *T. discrepans*, Turn.
14. Median segment a little longer than the mesonotum ..... 15.
    Median segment distinctly shorter than the mesonotum ..... 16.
15. Mesonotum distinctly and very closely punctured; apical joints of the antennæ black; second abscissa of the radius fully as long as the first or third. *T. mackayensis*, Turn.
    Mesonotum only microscopically punctured; apical joints of the antennæ fusco-ferruginous; second abscissa of the radius shorter than the first or third ..... *T. tenuis*, Turn.
16. Apical tarsal joint light ferruginous; posterior slope of the median segment finely punctured ..... *T. fortior*, Turn.
    Apical tarsal joint black; posterior slope of the median segment transversely striated ..... *T. subopacus*, Turn.
    [(= *T. debilis*, Turn., nec Perez).

Tachytes australis, Sauss., 1867 (nec Saussure, 1854), is almost certainly a *Tachysphex*, but I am unable to identify it. In dealing with Australian *Tachysphex* in a former paper (Proc. Zool. Soc. p. 491, 1908), I mentioned a doubtful record of the New Zealand species *T. nigerrimus*, Sm., from Victoria; this is certainly a case of mistaken locality. I have seen no specimens of *T. truncatifrons* in recent collections, and it is possible that the locality on the type at Oxford is erroneous.

Tachysphex depressiventris, sp. n.

♀. Nigra; mandibulis apice ferrugineis; tarsis anticis spinis albidis; alis hyalinis, venis nigris; mesonoto scutelloque nitidis; abdomine depresso, nitido.
Long. 9–10 mm.

♀. Clypeus shining and sparsely punctured, convex, the apical margin strongly depressed, transverse. Front finely and closely punctured, an oblique undulating carina on each side from above the base of the antennæ not quite reaching the eyes. Second joint of the flagellum equal to the third, a little more than twice as long as the first. The front is not strongly convex, and the convex area on which the posterior ocelli are placed is less developed than is usual in the genus. Eyes separated on the vertex by a distance not quite equal to twice the length of the second joint of the flagellum. Pronotum depressed much below the mesonotum, the middle a little higher than the sides; mesonotum and scutellum shining, microscopically punctured; pleuræ opaque, minutely punctured. Median segment broader than long, a little narrowed to the apex, opaque, shagreened, with a distinct impressed line from the base to the apex, the surface of the apical truncation very finely transversely striated. Abdomen strongly depressed, the dorsal surface flat, shining, with a broadly interrupted apical band of white pubescence on segments 1–3; pygidial area lanceolate, very narrow, shining, with a few small punctures. Second abscissa of the radius distinctly longer than the third; the first recurrent nervure nearer to the first transverse cubital nervure than to the second recurrent nervure. Comb of the fore tarsus well developed, the spines whitish, tinged with ferruginous.

Hab. Yallingup, S.W. Australia, January; Mundaring Weir, S.W. Australia, March 18, 1914 (*Turner*).

This species may be distinguished by the strongly flattened abdomen.

Tachysphex persistans, sp. n.

♀. Nigra, nitida, segmento mediano opaco; segmentis dorsalibus 1–3 macula transversa laterali albo-pilosa; alis fuscis.
Long. 18 mm.

♀. Clypeus shining, sparsely punctured, transverse at the apex; labrum bilobed. Front finely and closely punctured, not convex, depressed and convex round the base of the

antennæ. Second joint of the flagellum equal to the third, at least three times as long as the first. Eyes separated on the vertex by a distance slightly greater than the length of the second joint of the flagellum. Pronotum depressed below the mesonotum, a little higher in the middle than at the sides, very sharply sloped. Mesonotum and scutellum shining and smooth; pleuræ opaque, almost smooth. Median segment smooth, opaque, without a median line, as long as broad, the posterior slope transversely striated. Abdomen smooth and shining; pygidial area very long and narrow, with a few minute punctures, the sixth segment as long as the fourth and fifth combined. Fore tarsi stout, the comb short as compared with most species of the genus. The three abscissæ of the radius about equal in length; first recurrent nervure distinctly nearer to the second than to the first transverse cubital nervure. The tegulæ are brown at the apex.

Hab. Yallingup, S.W. Australia, December (*Turner*).

This may be distinguished from other Australian species by the larger size and highly polished appearance. The eyes are closer to each other on the vertex than in *hypoleius*, Sm.

Tachysphex stimulator, sp. n.

♀. Nigra; segmentis dorsalibus 1–4 fascia apicali argenteo-pilosa; segmento mediano transverse ruguloso-striato; alis fuscis.

♂. Feminæ similis.

Long., ♀ 17 mm., ♂ 15 mm.

♀. Clypeus shining, irregularly and rather coarsely punctured, convex at the base, the apical half depressed and flattened; apical margin transverse, with two indistinct teeth on each side close to the angles. Front subopaque, minutely punctured, with an indistinct longitudinal sulcus reaching the anterior ocellus. Eyes separated on the vertex by a distance slightly exceeding the combined length of the two basal joints of the flagellum; the second joint of the flagellum equal to the third and nearly three times as long as the first. Pronotum oblique, depressed below the mesonotum, somewhat higher in the middle than at the sides. Pleuræ and mesonotum subopaque, microscopically punctured; median segment opaque, as long as the mesonotum, transversely rugulose-striate, with a shallow longitudinal sulcus from base to apex, the face of the posterior truncation more strongly transversely striated, with a deep sulcus from the base not reaching the apex. Abdomen subopaque above, smooth and

shining beneath, the four basal dorsal segments with an apical band of silver pubescence. Pygidial area shining, strongly and rather closely punctured, without pubescence, elongate, pointed at the apex. Comb of the fore tarsi long and well developed; tarsal ungues long as in the genus *Notogonia*. Third abscissa of the radius distinctly longer than the second, the distance between the two recurrent nervures on the cubitus scarcely more than half as great as that between the first recurrent and the first transverse cubital nervures.

The male has the seventh dorsal segment closely but not coarsely punctured, the punctures more or less confluent longitudinally, and the median segment is granulate on the dorsal surface.

Hab. Yallingup, S.W. Australia, December (*Turner*).

May be distinguished from *hypoleius*, Sm., by the sculpture of the median segment and pygidial area, the longer tarsal ungues, and the lesser distance between the recurrent nervures. But there seems to be considerable variation in the development of the sculpture of the median segment, which in some specimens is almost as smooth as in *hypoleius*.

Genus Paralellopsis, Maidl.

Paralellopsis, Maidl, Boll. Lab. Zool. Portici, ix. p. 147 (1914).

To this genus must be assigned *Gastrosericus neavei*, Turn. (Trans. Ent. Soc. London, 1912 [1913]), which, however, is quite distinct from the typical species *P. africana*. The generic distinctions given seem to me rather slight in view of the aberrant structure of some species of *Gastrosericus*.

Gastrosericus swalei, sp. n.

♀. Nigra, pallide aureo-pilosa; tegulis macula basali, femoribus apice tibiisque extus flavis; tegulis apice testaceis; tarsis fuscis; mandibulis fusco-ferrugineis; alis hyalinis, venis fuscis; prosterno utrinque acute cornuto.

Long. 7 mm.

♀. Eyes moderately convergent towards the vertex, separated on the vertex by a distance equal to about twice the length of the scape; front very broad, clypeus and lower part of the face covered with short silver pubescence. Eyes separated from the posterior margin of the head by a distance

equal to about half the length of the scape. Prosternum produced on each side into a stout, acute, curved horn, plainly visible from above. Median segment shorter than the mesonotum, strongly narrowed to the apex. The whole insect opaque, with pale golden pubescence thinly distributed, becoming denser on the pronotum, median segment, and behind the eyes, and forming apical bands on the dorsal segments of the abdomen. Pygidial area triangular, punctured and bare. Second abscissa of the radius very short; the two recurrent nervures meeting before joining the cubitus.

Hab. Lonely Mine, Rhodesia (*H. Swale*); January.

Easily distinguished by the extraordinary horns of the prosternum; otherwise it superficially resembles the West-African *G. attenuatus*, Turn., but has the median segment shorter and the eyes much farther apart on the vertex, in the latter feature resembling *G. lamellatus*, Turn., and forming a link between the usual strongly convergent eyes of *Gastrosericus* and the parallel eyes of *Paralellopsis*.

XXV.—*Descriptions of a new Species and Subspecies of* Ennea *from Northern Nigeria, and a Correction in the Original Description of* E. reesi, *Preston.* By H. B. Preston, F.Z.S.

The species and subspecies described below were received through the kindness of Colonel A. G. Peile, and were obtained by Mr. H. Cadman, of the Colonial Civil Service, at Idah village, at an altitude of 1300 feet, 25 miles north of Abuja, Zaria Province, Northern Provinces, Nigeria. The author has much pleasure in dedicating the new species, a most interesting form, to the collector.

It may, perhaps, not be out of place to here make a small correction in a former paper by the author, also dealing with Enneidæ from Nigeria *. In this paper the words placed in square brackets in the quotation below should be added to the last lines of the diagnosis of *Ennea reesi*, thus:—"Aperture obliquely subtriangular, armed with a projecting, parietal, lamella-like tooth, two denticles on the inner margin of the [labrum and two on the inner margin of the] columella lip, the lower in each case being the stronger."

* Proc. Malac. Soc. xi. 1914, pp. 134–136.

Ennea (*Gulella*) *cadmani*, sp. n.

Shell cylindrical, yellowish white, polished, shining; whorls 6, the first three regularly increasing, the last three increasing in length but not in breadth ; suture rather slightly impressed, narrowly margined below, the margin minutely crenulated ; perforation narrow, deep ; labrum thick, white, reflexed, the margins joined by an opaque, white, parietal callus ; aperture irregularly subquadrate, armed with a coarse, erect, vertical, parietal lamella which is slightly twisted

Ennea (*Gulella*) *cadmani*, × 4.

below, a protuberance on the upper portion of the outer lip which partly fills the space between it and the parietal lamella, while below this occurs a coarse downwardly curved lamella ; at the base of the aperture and very interiorly situate is an oblique nodular denticle, while in addition, projecting from the broad columella margin, occurs a horizontal lamella-like tooth.

Alt. 5·75, diam. maj. 2 mm.

Aperture : alt. 1·25, diam. 1 mm.

Hab. Idah, at an altitude of about 1300 feet, Zaria Province, Northern Nigeria (*H. Cadman*).

Ennea (*Paucidentata*) *monodon zariaënsis*, subsp. n.

Shell differing from the typical form from Gaboon * in its larger size, much more cylindrical shape, and more oblique columella lip.

Alt. 10, diam. maj. 4 mm.

Aperture : alt. 2·75, diam. 1·5 diam.

Hab. Idah, at an altitude of about 1300 feet, Zaria Province, Northern Nigeria (*H. Cadman*).

* J. de Conchyliol. 1873, p. 330.

XXVI.—*On the Course of the Internal Carotid Artery and the Foramina connected therewith in the Skulls of the* Felidæ *and* Viverridæ. By R. I. Pocock, F.R.S., Superintendent of the Zoological Society's Gardens.

[Plates X. & XI.]

The skulls upon which the observations made in this paper are based belong mainly to the Zoological Society's collection; but I am indebted to Mr. H. C. Beck, F.Z.S., for the kind loan of the skull of the rare Madagascan genus *Cryptoprocta*, and to Mr. E. Gerrard for that of a species of *Galidictis*. The facts recorded have been checked as far as possible upon the skulls in the British Museum placed at my disposal by Mr. Oldfield Thomas; but in these examples I was unable to lift the bullæ or cut away the parts concerned for the purpose of laying bare the foramina.

For classifying the Æluroid Carnivora both Flower and Mivart made use of the foramina in the base of the skull connected with the course of the internal carotid artery. The former * wrote:—"In the Felidæ the carotid canal is very minute. In the Viverridæ it is distinct as a groove on the side of the bulla." According to Mivart †, "in the Felidæ there is no carotid foramen anywhere visible on the surface of the basis cranii, and no carotid foramen perforates or notches the sphenoid, whereas in the Viverridæ there is a carotid foramen, or two carotid foramina, visible on each side of the basis cranii, and there may be a conspicuous carotid foramen (deeply notching the sphenoid) in the basis cranii for the entrance of the carotid into the cranial cavity."

No excuse need be sought for restating the facts, since neither of the quoted authors, who have inspired subsequent writers on the subject, seems to have investigated them very carefully, judging from certain inaccuracies and defects contained in their statements.

The Viverridæ, as understood by Flower and Mivart, are a heterogeneous group including all the Æluroids which are not obviously cats or hyænas. They may be considered first.

It may be recalled that in *Canis* the canal for the internal carotid begins by an orifice on the inner side and in front of the space that leads to the *foramen lacerum posticum*—the

* 'Mammalia,' pp. 502 & 525 (1891).
† P. Z. S. 1882, pp. 144-145, 197-198.

posterior orifice between the periotic and the basioccipital. Posteriorly the canal lies between the tympanic bulla and the periotic. Anteriorly it is a tube in the tympanic itself, and its anterior orifice opens at the antero-internal angle of the bulla on the admedian side of the adjacent orifice of the eustachian tube, and just above the *foramen lacerum medium*, the anterior space between the periotic and the basisphenoid, through which the artery, after leaving the canal, enters the cranium.

Except that the posterior orifice of the canal is always situated further forwards and that the anterior orifice, even when the canal is complete, opens into a space beneath the bulla common to it and the eustachian tube, the arrangement found in the Viverridæ does not differ much from that of the Canidæ. But within the Viverridæ there are some interesting variations in detail worth putting on record.

The facts observed in most of the dominant types may be described before a general summary is attempted.

In an example of the African civet (*Civettictis civetta*) the posterior orifice of the carotid canal is situated about halfway along the inner wall of the bulla further in advance of the *foramen lacerum posticum* than in the Felidæ and Canidæ. Throughout its length it is an open channel, and not a closed tube. It passes nearly vertically between the tympanic and the adjacent edge of the basioccipital. It then turns, and ceases at the edge of the inturned tympanic. Thence the artery runs forwards beneath the anterior part of the tympanic, and enters the *foramen lacerum medium*, which forms a small semicircular notch in the basisphenoid and is just visible at the antero-internal angle of the bulla when the skull is viewed from below, although it is partially overlapped by a small bridge of bone jutting inwards from the bulla to the antero-lateral angle of the basioccipital. Behind this bridge the periotic appears for a small space on the surface of the skull between the bulla and the basioccipital.

In examples of the Oriental civets (*Viverra zibetha, V. tangalunga*, and *Viverricula malaccensis*) the arrangement is similar in all essential respects, except that the periotic does not reach the surface of the basis cranii, the *foramen lacerum posticum* is usually narrow, and the *foramen lacerum medium* much deeper and more apparent on the base of the skull *.

* In properly cleaned skulls a bristle can be passed through the carotid canal from back to front when the canal is tolerably straight; but where it makes a sharp bend, as in the African civet examined, this cannot be done.

In examples of *Genetta pardina* and *felina*, on the contrary, the posterior orifice of the canal lies much further in advance of the *foramen lacerum posticum*—that is to say, about one-fourth of the distance from the anterior end of the posterior chamber of the bulla. It is formed by two juxtaposed grooves, one on the bulla, the other on the periotic, a narrow strip of which reaches the surface at this point between the basioccipital and the bulla; but the deeper, anterior half of the groove is a complete bony tube formed by the bulla alone. The anterior end of this tube opens just above the *foramen lacerum medium*, which deeply notches the sphenoid and is almost concealed from view superficially.

In an adult skull of *Paguma larvata* the canal begins as a groove on the anterior half of the inner side of the bulla, and becomes a definite tube quite at the anterior end of the posterior chamber of the bulla up against the basioccipital; and as in *Genetta felina* the concealed anterior part of the canal is a short but completely bony tube formed by the bulla alone. The *foramen lacerum medium*, notching the basisphenoid, is just visible at the ante o-internal angle of the bulla. The two bones forming the bulla are not fused together.

In an adult skull of *Paradoxurus niger* the canal resembles that of *Paguma larvata*, except that the concealed anterior portion is not a complete bony tube in the tympanic. Here also the two bones of the bulla are not co-ossified.

In an example of *Arctictis binturong* the posterior orifice of the canal is about halfway along the wall of the bulla, and therefore much closer to the *foramen lacerum posticum* than to the *foramen lacerum medium*. The canal is a deep groove on the tympanic. It descends nearly vertically at first, where it passes alongside the basioccipital. The artery thereafter turns forwards and completes its course on the underside of the tympanic. In the specimen examined the canal is nowhere a complete tube, although just above the point where it ceases the bones of the tympanic almost meet and close it in. Since this specimen is immature, as shown by the persistence of the occipito-sphenoidal fissure, although the permanent dentition is just in place, it is possible that in the adult the tube is closed at the place above indicated. The *foramen lacerum medium* deeply notches the sphenoid, the anterior part of the notch being almost cut off from the posterior by bony growths.

In a skull of Hose's palm-civet (*Diplogale hosei*) the carotid canal is set close to the *foramen lacerum medium*, and is a very short and simple passage lying between adjacent

portions of the tympanic, periotic, and basioccipital; and the *foramen lacerum medium* is a rather short constricted notch in the basisphenoid, and is visible to a great extent upon the surface of the skull. It may be added that the two bones composing the tympanic bulla are completely separated in the adult skull, as they are in the examples of *Paguma larvata* and *Paradoxurus niger* examined.

In a subadult skull of *Arctogalidia* with the tooth-change just completed, but with the basisphenoidal suture still visible, the posterior orifice of the carotid canal lies approximately midway between the *foramen lacerum posticum* and the *foramen lacerum medium*. It leads into a groove in the tympanic, which is bordered on the admedian side by the basioccipital; but anteriorly it is continued by a complete bony tube formed by the tympanic, as in *Genetta felina* and *Paguma larvata*. But, unlike the other species hitherto discussed, the orifice by which the carotid artery enters the skull is entirely cut off from the periotic, and pierces the sphenoid as a round hole, which is exposed on the base of the skull just in front of the antero-internal angle of the tympanic bulla. The two bones of the bulla are completely fused together, as in *Arctictis*, *Genetta*, *Virerra*, *Viverricula*, and *Civettictis*.

In *Cynogale* the course of the carotid canal is peculiar. It runs from a notch-like orifice in the wall of the bulla obliquely across the posterior chamber as a very distinct crest to the septum and periotic, and itself forms a low partition to that chamber. The *foramen lacerum medium* simply notches the basisphenoid.

In *Cryptoprocta ferox* the features presented by the carotid canal combine those of *Genetta* and *Arctogalidia*. The canal slants as a groove on the tympanic near the middle of the inner wall of the bulla; but where it dips beneath the surface it is converted into a complete cylindrical tube formed by the tympanic alone, and is thus cut off from the basioccipital and the periotic. It terminates in front beside the eustachian aperture. The artery enters the brain by a hole, not a notch, in the basisphenoid, and this hole, as in *Arctogalidia*, is visible on the base of the skull in front of the antero-internal angle of the bulla, and is completely severed from all connection with the periotic.

Approximately the same condition appears to obtain in *Eupleres* and *Fossa*—at all events, so far as the distinctness of the carotid foramen in the sphenoid is concerned.

In the skulls of mongooses (*Mungos*) the posterior orifice of the canal is a small round hole, not a long groove, perfo-

rating the wall of the bulla above the basioccipital bone. The canal itself throughout its length is a narrow cylindrical bony tube formed by the tympanic, so that the artery is nowhere in contact with the basioccipital or the periotic. The artery issues from this tube alongside the eustachian aperture, and enters the skull by a conspicuous foramen on the base of the skull, piercing the basisphenoid in advance of the antero-internal angle of the bulla, as in *Cryptoprocta*.

Within the limits of the genus *Mungos* the position of the posterior orifice of the canal varies. In a skull of *Mungos ichneumon* it lies about midway between the *foramen lacerum posticum* and the anterior termination of the canal; but in a skull of *Mungos smithii* the posterior orifice is only a short distance in front of the *foramen lacerum posticum*, so that the canal in this example is relatively much longer than in the other.

Judging from a superficial examination of the skulls of mongooses of other genera, the structure of the carotid canal is the same as that described above. The position of the posterior orifice, which always apparently pierces the bulla just behind the inner portion of the partition of the bulla, varies in accordance with the length of the two chambers. In *Cynictis*, for example, where the posterior chamber is very short and the anterior very long, the orifice in question is only a little way in front of the *foramen lacerum posticum* and the canal is long, whereas in *Ichneumia albicauda*, where the anterior chamber is small and the posterior large, the posterior orifice of the canal is set far forwards, and the canal itself is short.

In *Galidictis* and related genera the structure of the carotid canal appears to be the same as in the mongooses.

The condition of the canal in the mongooses and Galidictinæ may be derived from that seen in *Cryptoprocta* by the growth and subsequent union of the upper and lower margins of the carotid groove on the bulla, to form a cylindrical tube continuous with the osseous tube, which forms the anterior portion of the canal in that animal.

In the African palm-civet (*Nandinia binotata*) the bulla, as is well known, has the wall of the posterior chamber permanently cartilaginous. In a fresh example of this species I found the carotid artery entering the cartilaginous bulla a little way in front of the *foramen lacerum posticum*, and running over a groove on the periotic close to the basioccipital and entering the small *foramen lacerum medium*, which lies deep down and is entirely concealed by the bony tympanic bone, when the latter is left in place. This

foramen, moreover, is cut off from the periotic by bone, a short straight suture alone indicating its original continuity with the space between the periotic and the basisphenoid.

In her paper upon *Nandinia* Miss Albertina Carlsson marks the carotid groove as running between the antero-internal portion of the tympanic bone and the basioccipital. This must, I think, be a mistaken inference. At all events, the artery did not take that course in the fresh example of *Nandinia* that I examined (see Zool. Jahrb. Syst. xiii. pp. 509–528, pl. xxxvi. fig. 1, 1900).

It may be added that there is no partition, either cartilaginous, membranous, or osseous, in the bulla of *Nandinia*. When the tympanic membrane is cut away, a probe can be passed in the uncleaned skull through the external auditory meatus to the posterior wall of the cartilaginous portion of the bulla.

In the Felidæ, in conformity with the homogeneity of the family, the carotid canal is much less variable than in the Viverridæ *. The canal is almost always apparent as a short shallow groove notching the tympanic bulla close to the basioccipital, and not infrequently set so far back that it lies within the depression which leads to the *foramen lacerum posticum*. Occasionally, however, the notch or groove lies just in front of that depression, as in a skull of *Felis jaguarondi* I possess ; but it is never set nearly so far forward as the middle of the inner surface of the bulla. Only quite exceptionally, and as an individual peculiarity, is the notch converted into a bony tube, with a rounded orifice, by the extension and fusion of its edges, so that the basioccipital forms no part of the carotid canal. This is the case on one side, but not on the other, in a skull of *Felis uncia*, in which the posterior orifice of the canal is, as in *Mungos*, a round hole in the bulla. In this skull, as in that of *F. jaguarondi*, the canal is placed in front of the *foramen lacerum posticum*.

In all cases the canal descends † to the edge of the concealed inturned portion of the tympanic above the periotic, where it ceases. From that point the artery apparently runs along the periotic close to the basioccipital and the adjacent portion of the tympanic, and in some cases this portion of the tympanic is longitudinally grooved ‡ ; but I

* In this paper the significance applied to the term Viverridæ by Mivart and Flower is, without prejudice, adopted.

† From the point of view of the spectator, when the skull is examined with its base uppermost.

‡ I have not, however, traced the course of the artery within the bulla of any of the Felidæ.

do not know whether or not this groove marks the course of the artery, although the similarity of this groove to that of the Viverridæ suggests that it does so. The canal frequently shows on the inside of the bulla as an upstanding ridge resembling, but relatively smaller than, that of *Cynogale*.

The artery enters the skull by a small narrow foramen, notching the basisphenoid where it touches the periotic. This orifice, visible in all the skulls of Felidæ examined, is the *foramen lacerum medium*, and it corresponds exactly with that of *Viverra* and *Genetta*; but to discover it the bulla has to be removed, because it lies deep beneath the anterior end of the bulla, which at that point is immovably fused to the basisphenoid, and the only orifice at the antero-internal angle of the bulla is the internal orifice of the eustachian tube.

In this connection it may be recalled that Mivart ('The Cat,' p. 208, 1881) said that the minute internal carotid artery enters the *foramen lacerum posticum*, and passes along a slender canal between the basioccipital, basisphenoid, and the periotic, and enters the cranial cavity at the inner side of the anterior end of the periotic. This appears to be perfectly correct, but it is difficult to reconcile with his subsequent statement (P. Z. S. 1882, p. 145) that it is distinctive of the Felidæ as compared with the Viverridæ to have no carotid foramen perforating or notching the sphenoid. Nevertheless, as has been shown above, the basisphenoid is penetrated by a notch by which the carotid enters the skull close to the periotic in the Felidæ and all the typical Viverridæ. In fact, there does not appear to be any material difference between *Felis* and *Nandinia* with respect to the course of this artery and the foramina connected therewith.

Conclusion.

The above-mentioned facts have been described in some detail to show, first, the variation in the structure of the carotid canal and in the situation of the foramina connected with the artery in the genera referred by Mivart, Flower, and others to the Viverridæ, and, second, the impossibility of logically drawing a line, based upon the characters under notice, between the Viverridæ, as understood by those authors, and the Felidæ. The facts may be briefly summarized as follows:—

(1) In the Viverridæ the posterior orifice of the canal may be far forwards and only a short distance behind the *foramen lacerum medium* (*Paguma*, *Diplogale*), or near the

middle of the inner wall of the bulla (most of the genera), or set far back only a little way in advance of the *foramen lacerum posticum* (*Cynictis*). In some Felidæ (*e. g.*, a skull of *F. jaguarondi*) it is only a little closer to the *foramen lacerum posticum* than in *Cynictis*. In others it lies back so as to open within that fossa.

(2) In the Viverridæ the canal itself may be a long completely bony tube traversing the wall of the bulla (*Mungos* and allied genera), or it may be a complete bony tube only at its anterior end and an open channel in the bulla posteriorly (*Genetta*, *Paguma*), or it may be an incomplete tube or an open channel throughout its length in the bulla (*Civettictis*, *Viverricula*, *Viverra*), or it may form a very distinct ridge running obliquely across the cavity of the bulla (*Cynogale*). In the Felidæ it is, as a rule, an open channel, only exceptionally being a closed bony tube in its posterior half.

(3) In the Viverridæ the orifice by which the artery enters the base of the skull after leaving the tympanic canal may be entirely cut off from the rest of the *foramen lacerum medium* and fully exposed on the basisphenoid (*Mungos*, *Cryptoprocta*, *Fossa*, *Galidictis*, *Arctogalidia*), or it may be continuous with the *foramen lacerum medium* behind and form a deeper or shallower notch in the basisphenoid, the anterior end of this notch being sometimes plainly visible in front of the bulla (*Arctictis*, *Diplogale*, *Paradoxurus*), sometimes overlapped by it and only visible by looking beneath the bulla (*Genetta*, *Viverricula*, *Nandinia*). In the Felidæ the orifice always notches the basisphenoid, as in the genera just mentioned, but it is never visible from the surface, because the overlying portion of the bulla forms here a bony contact or fusion with the basisphenoid.

The combination of these characters—namely, the fusion of the bulla to the basisphenoid and the consequent complete concealment of the *foramen lacerum medium* by which the internal carotid enters the skull after leaving the bulla—is apparently the only positive feature that can be substantiated between the Viverridæ and the Felidæ so far as the structures under notice are concerned.

EXPLANATION OF THE PLATES.

Plate X.

Fig. 1. Base of cranium of *Viverricula malaccensis*, with bulla of left side removed and bristles passed through the eustachian tube and the carotid canal of the right side. *ov.*, foramen ovale; *gl.*, glenoid foramen; *fm.*, foramen lacerum medium running from the periotic and deeply notching the basisphenoid; *st.*, stylomastoid foramen with the fenestra rotunda on its inner side and the fenestra ovalis just in front; *per.*, periotic pierced by these two

fenestræ and on the inner side abutting against the basioccipital; *fp.*, foramen lacerum posticum with the condyloid foramen just behind it; *pocc.*, paroccipital; *tb.*, tympanic bulla, the position of the partition shown by a dotted line.

Fig. 2. Base of cranium of *Cryptoprocta ferox* with the two bullæ in place. Lettering and arrows as in fig. 1; *fm.*, the foramen lacerum medium piercing the sphenoid as a round hole entirely separated from the periotic.

Fig. 3. Base of cranium of *Mungos ichneumon* with the antero-internal portion of the bulla of the left side cut away to show the bony carotid canal (*cc.*) running alongside the basioccipital and terminating in front a little behind the part of the foramen lacerum medium (*fm.*) which is separated from the periotic (*per.*), the rest of it being represented by the smaller, more external orifice behind; *co.*, the posterior orifice of the carotid canal. Other lettering and arrows as in figs. 1 and 2.

Fig. 4. Base of cranium of *Nandinia binotata* with the cartilaginous portion of the bullæ missing from both sides and the osseous anterior portion, marked *tb.* on the left side, removed from the right. The stylomastoid foramen (*st.*) is remote from the margin of the prominent mastoid (*m.*) and the fenestra rotunda on the periotic (*per.*) is on its inner side; the foramen lacerum medium (*fm.*) is a small orifice in the basisphenoid lying deeply beneath the tympanic (*tb.*) and touching the periotic by a very narrow cleft. Other lettering as in preceding figures.

Plate XI.

Fig. 1. Left auditory bulla of *Civettictis civetta*, and seen obliquely from the underside to show the course of the carotid canal (*car.*), represented by a dotted groove. The canal comes to an end at the edge of the inturned portion of the tympanic bulla; *ea.*, external auditory meatus formed by tympanic ring.

Fig. 2. Left auditory bulla of *Arctictis binturong* from the same aspect. The carotid groove is almost converted into a bony tube inferiorly; *eu.*, eustachian tube. The large groove behind the carotid groove leads to the foramen lacerum posticum.

Fig. 3. Anterior portion of the left bulla of *Paguma larvata*, to show the carotid groove passing anteriorly into a bony tube, the arrow indicating a bristle traversing the canal.

Fig. 4. The same in *Genetta felina*.

Fig. 5. Right bulla of *Felis uncia* from the same aspect as represented in the foregoing figures. The arrow indicates a bristle passed through the carotid canal (*car.*), part of which is a complete bony tube. In all Felidæ the canal apparently takes the same course, which is practically the same as that of *Civettictis* and *Arctictis*, but the canal is almost always an open groove, and not a bony tube.

Fig. 6. Right bulla of *Viverricula malaccensis*, with arrow indicating the course of the carotid artery anteriorly beneath the triangular flange of bone, which is not united beneath the artery to the adjacent bone of the tympanic ring to form a tube such as is seen in *Genetta*.

Fig. 7. Left half of base of skull of *Diplogale hosei*, showing the very short carotid canal beginning at *car.*; *fm.* and *fp.*, foramen lacerum medium and posticum; *st.*, stylomastoid foramen; *tb.*, tympanic bulla, with the line showing the separation between the two portions.

XXVII.—*A new Binturong from Siam.*

By Oldfield Thomas.

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Among a collection of mammals from South-western Siam presented last year to the National Museum by Mr. K. G. Gairdner there occurs a fine binturong's skull, so conspicuously larger than any other known that it evidently represents a distinct species. I have, however, not been able to describe it before, owing to a doubt as to what sexual variation there might be in the genus and the fact that all our adult skulls appeared to be those of females. Now, however, thanks to the kindness of Mr. H. C. Robinson, I have before me a fine male skull from Bukit Gantang, Perak, and am thus able to make a proper comparison with the Siamese animal. This latter may be called

Arctictis gairdneri, sp. n.

Size conspicuously greater than in the other species. Skull broader, more vaulted. Nasals very broad, parallel-sided to the point where they join the frontals laterally, instead of evenly narrowing from front to back. Frontal region broad, much swollen upwards and laterally, then abruptly narrowed at the fronto-parietal suture. Sagittal and lambdoid crests greatly developed. Posterior palate broad, much produced backwards. Bullæ narrow, far overlapped by the heavy paroccipital processes. Teeth much worn down in the type, their proportions apparently about as in the Perak skull.

Dimensions of the type (those of the Perak male in brackets):—

Greatest length 153 mm. (136); condylo-basal length 152 (136); zygomatic breadth 98 (84·5); nasals, mesial length 28 (21), breadth at middle 19 (12); interorbital breadth 41 (33); tip to tip of postorbital processes 59 (47·5); breadth immediately behind the latter 51·5 (40); breadth at fronto-parietal suture 41 (39); greatest posterior breadth on ridges 73·5 (59); height of crown from posterior palate 54·5 (47); palatal length 84·5 (73); breadth of posterior palate 24·5 (19·7).

Hab. Sai Yoke, S.W. Siam, near Tenasserim boundary.

Type. Adult skull (no doubt male) without skin. B.M. no. 15. 12. 1. 26. Original number 207. Collected and presented by Mr. K. G. Gairdner.

This binturong differs so immensely in size from the ordinary *Arctictis* that no detailed comparison is needed in describing it as new. It affords a curious parallel to the giant *Arctonyx* of the same region—*A. dictator*—discovered by Mr. Robinson, which was also obtained by Mr. Gairdner at Sai Yoke.

I have much pleasure in connecting this fine species with the name of its discoverer, who has been making great efforts to improve our knowledge of the Siamese mammal fauna. It is to be hoped that he may presently be able to obtain a complete specimen of *Arctictis gairdneri*.

XXVIII.—*A new Genus for* Sciurus poensis *and its Allies.*

By Oldfield Thomas.

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When writing a revision of the genera of African squirrels in 1909 *, I included, with much hesitation, three African species in the genus *Sciurus*, otherwise Holarctic only. Since then, however, the important characters which may be drawn from the structure of the penis-bone, or baculum †, have been discovered, and it is now evident that these three species should not be included in *Sciurus* (which has a peculiar and characteristic hand-like baculum), but need distinction as a new genus.

For *Sciurus poensis*, one of the three species referred to, has a minute, perfectly simple baculum about 2 mm. in length, conspicuously different from that of *Sciurus*, but similar to that found in several other African squirrels, among whom no complicated bacula like those of *Sciurus* occur, still less any compound ones such as have been described in *Callosciurus* and *Tomeutes*.

For the new genus I would suggest the name *Æthosciurus*, with genotype *Æ. poensis* (*Sciurus poensis*, A. Smith), and would include in it also *Æ. lucifer* and *ruwenzorii*.

* Ann. & Mag. Nat. Hist. (8) iii. p. 467 (1909).

† See Ann. & Mag. Nat. Hist. (8) xv. p. 383 (1915).

Æthosciurus would appear to be most nearly allied to *Heliosciurus*, but may be distinguished by its possession of two upper premolars. As already explained in my previous paper, its basin-shaped lower molars separate it from *Paraxerus* and *Funisciurus*, and its more normal skull from the peculiar genus *Myrsilus*.

XXIX.—*Notes on Bats of the Genus* Histiotus.

By Oldfield Thomas.

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The members of the genus *Histiotus* are all extremely closely allied to each other, their respective sizes, skulls, and teeth being almost identical, and the only distinguishing characters lying in the colour and the size and shape of the ears. Even these latter are both somewhat variable and very difficult to use for discrimination owing to the effect on them of shrinkage, whether in spirit or dry.

In 1875 * Peters wrote an account of the genus which was wonderfully good, considering the comparatively few specimens he had available. He gave excellent figures of the ears of certain of the forms, these figures being referred to below. In the case of the extreme southern species, however, *H. magellanicus*, the ears are drawn much too small, owing to their having been drawn from dried specimens.

As Peters pointed out, the Brazilian species, *H. velatus*, Geoff., is readily distinguishable from all the others by its more triangular ear, which has a prominent rounded lobe in front projecting forwards, as shown in his plate, figure 1, and is connected with its fellow of the opposite side by a transverse band about 3 mm. in height.

In colour *H. velatus* is very dark brown, with comparatively dark ears and membranes. Its skull is a little narrower than in other species, with narrower interorbital regions and palate, but the difference is really very slight, considering the essential difference in the shape of the ears.

* MB. Ak. Berl. 1875, p. 785, plate.

The type-locality of *H. velatus* is Curityba, Parana, and we have three examples from Palmeira (*Coll. Grillo*), close by in the same province. Other specimens before me come from Lagoa Santa (*Reinhardt*) and San Lorenzo, Rio Grande do Sul (*Ihering*).

But in the highlands of Matto Grosso M. Alphonse Robert collected a specimen, which, though with typically *H. velatus* ears, appears to be subspecifically distinguishable, as follows :—

Histiotus velatus miotis, subsp. n.

Ears shaped as in true *velatus*, but considerably smaller, measuring (when thoroughly re-damped) only 25 × 17 mm., as compared with 30 × 23 in typical *velatus*. Fur blackish brown at base, broadly washed terminally with lighter brown (between cinnamon-brown and Prout's brown).

Skull smaller than in true *velatus*.

Dimensions of type :—

Forearm 46 mm.

Head and body 55 ; tail 50 ; ear 25 × 17.

Skull : greatest length 17·2 ; basi-sinual length 13·2 ; zygomatic breadth 10·5 ; interorbital breadth 5·6 ; maxillary tooth row 6.

Hab. Chapada, Matto Grosso. Alt. 800 m.

Type. Adult female. B.M. no. 3. 7. 7. 17. Original number 1186. Collected 29th October, 1902, by A. Robert and presented by Mrs. Percy Sladen.

The other members of the genus all have broadly rounded ears as in Peters's plate, figs. 2 to 5.

H. magellanicus, Phil., the most southern species, is represented in the Museum by examples from Tierra del Fuego (*Crawshay*), Last Hope Inlet (*Wolffsohn*), and Temuco, S. Chili (*Bullock*). That from the first-named locality, certainly Philippi's species, has ears 25 × 16·5 mm., thus showing that the small size of the ears in Peters's figs. 4 *a* and 5 is due to the specimens having been dried. The body-colour of *H. magellanicus* is a uniform dark brown (mummy-brown). Ears not connected across the crown.

Next northwards follows *H. macrotus*, Poepp., described from Antuco, in the Andes of Southern Chili. This bat was said by its describer to have ears three times the length of its head, which would make them something like 60 mm. long—

no doubt an exaggeration. Peters identifies a specimen from Chili with ears 37 × 24 mm. with *H. macrotus*, while we have none that I can assign to it, unless a very large skull, without skin, sent by Mr. Wolffsohn from near Santiago, may be referable to it.

Then follows the commonest and most widely-spread species of all, *H. montanus*, Phil. & Landb. (syn. *H. segethii*, Peters)—described from Chili (Cordillera of Santiago), whence Mr. Wolffsohn has sent specimens,—which ranges northwards through Peru to Ecuador and eastwards over the Andes to Cordova (*Kemp*), Neuquen (Buenos Ayres Museum), Buenos Ayres itself, and Uruguay (*Aplin*). The ears are of medium size, about 26–28 mm. long by 17–19 in breadth in spirit-specimens. The cross-band on the crown not developed in the middle line*. The colour is a light greyish brown (wood-brown), very different from the dark of *H. magellanicus*.

North of this again there occurs, at Bogota, the following species:—

Histiotus colombiæ, sp. n.

Most closely allied to *H. montanus*. Ears about as in that species. General body-colour dark brown, almost as dark as in the far southern species *H. magellanicus*, the hairs blackish brown basally, washed terminally with pale cinnamon-brown. Hairs of under surface brown basally, dull buffy (near "pinkish-buff") terminally. Ears of rather a narrow-oval shape, those of the type, when thoroughly relaxed, 30 × 19·5 mm. No median connecting-band perceptible. Ears and membranes dark brown.

Skull rather stoutly built, with broad interorbital region. Upper premolar with an unusual development of the antero-external angle, this forming a marked projection outside the hinder basal point of the canine; many of the other forms of *Histiotus* have this angle slightly projected forwards, but none so much as in the present one.

* I am aware of Lataste's observation that on the fresh specimen the connecting cross-band can be simulated by holding up the specimen by the ears, a fold of skin then becoming visible across the crown (Act. Soc. Sci. Chili, i. p. 89, 1892). But he only had before him examples of *H. montanus*, and had probably never seen the species in which a complete connecting-band is present. Had he done so, he would not have thrown doubt on what is certainly a genuine differential character between the various species, as may be readily seen by examining good series of spirit-specimens.

Dimensions of type (measured on skin) :—

Forearm 49 mm.

Ear 30 × 19·5. Tragus on inner edge 12. Third finger, metacarpus 44, first phalanx 16, second phalanx 15 ; lower leg and hind foot (c. u.) 31.

Skull : interorbital breadth 6·6 ; intertemporal breadth 4·6; maxillary tooth-row 6·6.

Hab. Choachi, near Bogotá.

Type. Adult female skin and skull. B.M. no. 99. 11. 4. 1. Collected 20th August, 1895, by G. D. Child. Presented by Oldfield Thomas.

This bat is closely allied to *H. montanus*, of the mountain regions further south, but differs by its darker colour and the great development of the anterior angle of the upper premolar. Should this latter characteristic prove inconstant, it may later be advisable to consider *colombiæ* as a dark subspecies of *montanus*.

In the lowlands east of the Andes, besides *H. montanus* to the south, we have in Bolivia the following :—

Histiotus læphotis, sp. n.

Ears very large, as compared with those of *H. montanus*, about 32 or 33 mm. in length by 23 to 24 in breadth ; transverse connecting-band well developed in middle, where it is about 3 mm. in height. General body-colour, of a specimen skinned out of spirit, rather dark brown (mummy-brown), the extreme tips only of the hairs washed inconspicuously with lighter brown. Hairs of under surface brown basally, dull whitish terminally. On the other hand, while the colour of the fur is dark, much darker than in *H. montanus*, the ears and wing-membranes are comparatively light, pale and more or less translucent grey.

Dimensions of type (measured on spirit-specimen) :—

Forearm 46 mm. (other specimens up to 51).

Head and body 54 ; tail 50; ear 33 × 24 ; tragus 11 ; third finger, metacarpus 42, first phalanx 14, second phalanx 14·5 ; lower leg and hind foot 29.

Skull : greatest length 18·2 ; condylo-basal length 16·8 ; zygomatic breadth 10·8 ; interorbital breadth 5·4 ; maxillary tooth-row 5·8.

Hab. Southern Bolivia. Type from Caiza.

Type. Male in spirit. B.M. no. 97. 2. 25. 1. Collected by Dr. Borelli and presented by the Turin Museum. Four specimens.

This species differs decidedly from *H. montanus* by its much larger ears and their definite connection by a transverse band. In describing it as new the only question is with regard to the South Chilian *H. macrotus*, Pöpp., which we do not possess. But the ears of the Bolivian bat, although large, are so very far less than three times the length of the head, and the respective habitats have such different faunas, that I do not think it possible the two should be the same.

How far it extends southwards I do not know, but of some specimens from Tucuman some appear referable to this species and others to *H. montanus*, as though that were the meeting-place of the two forms.

Finally, we have the somewhat surprising presence, right in the heart of the range of the triangular-eared *velatus* group, of the following member of the oval-eared group :—

Histiotus alienus, sp. n.

Ears like those of *H. læphotis*, but shorter (29 × 20 mm.), joined together on the forehead by a connecting-band about 2 mm. high. General colour dark throughout, the body dark brown, the membranes and ears dark grey. Under surface apparently little lighter than upper.

Dimensions of type (measured on spirit-specimen) :—

Forearm 45 mm.

Head and body 54; tail 45; ear 29 × 20; tragus 10·5; third finger, metacarpus 40, first phalanx 13·5, second phalanx 14; lower leg and hind foot 27.

Skull: greatest length 18·3; condylo-basal length 17; zygomatic breadth 11·4; interorbital breadth 6·5; maxillary tooth-row 6·4.

Hab. Joinville, Santa Catherina.

Type. Adult female. B.M. no. 9. 11. 19. 1. Collected by W. Ehrhardt.

The presence of this bat in the region otherwise exclusively occupied by *H. velatus* is very peculiar, but there can be no doubt of the correctness of the locality, as the specimen came direct from a resident there, who could not well have obtained it from anywhere else.

H. alienus is dark-coloured, like the other Brazilian species, and its ears are larger than those of *H. montanus*, smaller than those of *H. læphotis*, the latter being probably its nearest ally.

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XXX.—*Descriptions and Records of Bees.*—LXXI.

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

Megachile tasmanica, sp. n.

♂.—Length about 7·6 mm.

Black with white hair, long on face, cheeks, and under side of thorax; on front the very long hairs are stained with brownish, and the scanty hair on disc of mesothorax is somewhat brownish; head large, facial quadrangle much longer than broad; mandibles black; clypeus with a dense beard of pure white hair, but upper part exposed, very densely punctured, but with a smooth shining spot; antennæ slender, black; mesothorax closely and minutely punctured, without hair-spots, except that there is a small tuft of white hair behind each tegula; tegulæ piceous. Wings dusky greyish, stigma and nervures black; anterior coxæ covered with white hair and without spines; anterior tarsi formed essentially as in *M. leeuwinensis*, M.-Waldo, the lobe on second joint large, oval, with a large black spot on a white ground. Abdomen short and broad, densely punctured, the first segment with a tuft of white hair on each side, segments 2 to 4 with thin apical hair-bands, weak in middle; fifth segment with thin glittering white hair; sixth briefly bidentate, the teeth not far apart. The anterior tarsi, and anterior tibiæ at apex, are ferruginous.

Hab. George Town, Tasmania, Nov. 19, 1914 (*F. M. Littler*, 2248).

Allied to *M. keenrinensis*, but easily separated by the wholly black abdomen. It cannot be the male of *M. ordinaria*, Sm., as that has hyaline wings with ferruginous nervures.

Megachile pugnata pomonæ, sp. n.

♀.—Length 15 mm.

Like *M. pugnata*, Say, but the pale hair of thorax, legs, and abdomen reddish yellow, the dorsal surface of sixth abdominal segment densely covered with clear ochreous hair, without any dark hairs intermixed. Median apical lobe of clypeus entire.

Hab. Mts. near Claremont, Calif. (*Baker*; Pomona coll., 183).

Andrena macrocephala, sp. n.

♂.—Length about 9 mm.

Black, with an extremely large and broad quadrate head, much broader than the small thorax; eyes diverging below; clypeus very broad and low, sparsely punctured, pale yellow with two pale greyish-brown spots; process of labrum emarginate; mandibles very long, bent in middle, red at tip; cheeks very broad, but rounded behind; flagellum very obscurely reddish beneath; occiput and middle of face with red hair, sides of face with black hair; thorax dull, minutely granular, with long fox-red hair; legs slender, reddish black; tegulæ very small, dark brownish. Wings moderately dusky, stigma dull ferruginous, nervures fuscous. Abdomen shining black, without bands, hair at apex soot-colour.

Var. *a*. Head not so large, though still very large and broad; thorax with pale fulvous hair.

Hab. Claremont, Calif. (*Baker*; Pomona coll., 200; var. *a*., 199).

A remarkable species, suggestive of *A. berberidis*, Ckll., both having a broad head, yellow clypeus, and well-developed malar space. The clypeus is much broader and lower than that of *berberidis*, and there are many other differences.

Panurginus neomexicanus, Ckll.

P. nigrinus, Viereck, is the female of *P. neomexicanus*. I have numerous females from Beulah, August (one at flowers of *Polemonium*; *W. Porter*), Rio Ruidoso, prox.

6700 ft., at flowers of *Verbascum thapsus*, July 22 (*Townsend*), South Fork, Eagle Creek, prox. 8000 ft., at flowers of *Erigeron macranthus*, Aug. 18 (*Townsend*); all in New Mexico.

Panurginus piercei, Crawford.

The range is greatly extended by females from Las Vegas, N. M., at fls. of *Sphæralcea cuspidata*, Aug. 1 (*W. Porter*), and Tularosa, N. M. (*Cockerell*).

Panurginus didirupa, Ckll.

Male from Las Vegas, N. M., at fls. of *Verbesina exauriculata*, July 31 (*Cockerell*).

Panurginus atricornis (Cresson).

Male from Beulah, N. M., Aug. 18 (*W. Porter*).

Panurginus nebrascensis, Crawford.

A male from Lincoln, Nebr., Aug. (*Bruner*), certainly belongs here, but it has an impressed line down middle of clypeus.

Panurginus bakeri, Ckll.

Female from Copeland Park, Boulder Co., Colo., Sept. 6 (*S. A. Rohwer*).

Panurginus flavotinctus (Ckll.).

Female from Florissant, Colo., at fls. of *Cleome serrulata*, Aug. 23 (*S. A. Rohwer*). This has the tegulæ pale testaceous; in *P. bakeri* they are partly dark. *P. flavotinctus* occurs as far south as the Organ Mts., N. M., where Townsend took it in company with *P. pectiphilus*, Ckll., at flowers of *Pectis papposa*. It was also collected by Townsend on the Rio Ruidoso, N. M., prox. 6500 ft., Aug. 4.

Panurginus picipes (Cresson).

Males from Pecos, N. M., at fls. of *Rudbeckia ampla*, Aug. 4 (*T. & W. Ckll.*). This is quite distinct from *P. inmptus*, but is very close to *P. albitarsis* (which visits *Rudbeckia* at Santa Fé), yet I think distinct.

Panurginus boylei, Ckll.

Beulah, N. M., July (*Ckll.*); San Ignacio, N. M., Sept. 1 (*Porter & Ckll.*).

Panurginus armaticeps, sp. n.

♀.—Length about 6 mm.

Black, the head and thorax with scanty long grey hair; head enormous, the face extremely broad, without any light markings; face shining, front dull, except at extreme sides; cheeks swollen, very broad, polished, armed beneath with a very large tooth; mandibles extremely long, falciform; labrum broadly rounded, depressed in middle, with a boss-like elevation on each side of base; clypeus very broad and low; antennæ very long and slender, black; thorax small; mesothorax and scutellum polished; area of metathorax dull; legs piceous, thinly hairy; tegulæ rufo-piceous. Wings moderately dusky; b. n. falling short of t.-m.; first r. n. meeting t.-c.; second s.m. greatly narrowed above; marginal cell broadly obliquely truncate; abdomen shining, without bands.

Hab. Claremont, Calif. (*Baker*; Pomona coll., 228).

This extraordinary species might have been referred to a new genus, but it is evidently related to *P. atriceps* (Cress.), from which it differs by the large head with toothed cheeks.

Perdita fedorensis, sp. n.

♀.—Length nearly 5 mm.

Like *P. vespertilio*, Ckll., except that the flagellum is longer and darker, and conspicuously hooked at end; and the clypeus is dark brown with a white cuneiform mark on each side. The lateral face-marks are between triangular and quadrate, notched above; tubercles with a small white spot. Wings clear, with hyaline nervures and stigma. Abdomen dark brown, without markings. Legs dark brown, the tarsi pallid. The apical two-thirds of the flagellum is rather narrowly testaceous beneath.

Hab. Fedor, Texas, April 29, 1898 (*Birkmann*, 87).

Very close to *P. vespertilio*, but apparently distinct. Mr. Birkmann has also taken *P. ignota*, Ckll. (Lee Co., Texas, Oct.), and *P. crawfordi*, Ckll. (male, Fedor, May 7).

Perdita verbesinæ collaris, subsp. n.

♂.—Head, mesothorax, and scutellum yellowish green, the mesothorax with slight coppery tints; metathorax blue-green; upper part of front wholly dull, lower part shining; flagellum bright orange, marked with black above at base; sides of clypeus, lower border rather broadly, and a median band yellow; lateral face-marks transverse; upper border of prothorax, and large spots on tubercles, light yellow; middle and hind tarsi dark brown; second and following abdominal segments with orange bands, deeply incised sublaterally, the middle portion of band on second segment almost obsolete.

Hab. Rito de los Frijoles, New Mexico, August (*Cockerell*).

This resembles *P. lepachidis*, Ckll., in the colour of the thorax, and seems intermediate between *lepachidis* and *verbesinæ*. It may prove to be a distinct species. *P. verbesinæ*, var. *maculata*, Ckll., has (♂) yellow middle and hind tarsi, the small joints more or less ferruginous.

Perdita heliophila, sp. n.

♀.—Length 8–8·5 mm.

Like *P. albipennis*, but head, thorax, and abdomen without light markings; front dull. Very like *P. verbesinæ*, var. *nigrior*, with which I had confused it, but larger, hair of head and thorax above ochreous, stigma pale orange. The mesothorax is shining yellowish green.

Hab. Mesilla, New Mexico, three, all at flowers of *Helianthus lenticularis*, Aug. 11 and 15 (*Cockerell*).

Perhaps a variety of *P. albipennis*, but the specimens are all alike, and the appearance is very distinctive.

Perdita crotonis undecimalis, subsp. n,

♀.—No supraclypeal mark; clypeus with two very broad black bars, forming a figure 11; lateral marks very short, not reaching level of top of clypeus, squarely notched on inner side above; metallic colour of head and thorax green.

Hab. Between Rowe and the Old Pecos Pueblo, New Mexico, at flowers of *Croton*, Sept. 4 (*W. P. Cockerell*).

Perdita numerata, Cockerell.

This was described from a female. A male, which I refer here with confidence, is from Mesilla Park, New Mexico,

May 12, by sweeping herbage (*Cockerell*). It runs in my table of *Perdita* (Proc. Acad. Nat. Sci. Philad. 1896) to *P. maculipes*, from which it is easily known by the dark brown stigma, the pleura with only an oblique yellow band, and the abdominal bands not united at sides. The dark mark on anterior tibia is small, and if the dark markings on anterior and middle legs were absent it would run to the vicinity of *salicis*, *nitidella*, and *exclamans*, where it would readily be known by the dark stigma. The face is pale yellow, and the upward extension of lateral marks is like a closed hand with a very short index-finger pointed; there is a yellow band along lower half of posterior orbits. The second s.m. is not so greatly narrowed above as in the type female. The ventral surface of the abdomen is yellow without markings.

Perdita birkmanni, sp. n.

♀.—Length 4 mm. or slightly over.

Head and thorax dark bluish green, dullish, only slightly hairy; head ordinary; clypeus (except the usual dots and a pair of brownish bars), a very small transverse supraclypeal mark (sometimes having the form of a letter C), lateral marks (broad below, narrowed above, ending obtusely on orbital margin at level of antennæ), labrum, and mandibles (except the rufescent apices), all yellow; cheeks without yellow; antennæ rather long, flagellum pale fulvous beneath; tubercles with a pale yellow mark; tegulæ testaceous. Wings strongly dusky, outer r. n. and t.-c. pallid and weak. Legs dark brown, with the knees, and anterior and middle tibiæ in front yellow. Abdomen with a yellow mark at each side of first four segments, those on first small, the others pointed mesad, not or hardly oblique; venter brown. The stigma is sepia, without a hyaline centre.

Hab. Fedor, Texas, June 1 (*Birkmann*, 89). Two specimens.

In my tables of *Perdita* this runs to *P. affinis*, var., but it is known by its small size and other characters. It is much smaller than *P. octomaculata*, Say, and has the lateral face-marks differently shaped, without the strong inner angular notch. Among the Texas species it falls close to *P. jonesi*, Ckll., but differs by being smaller, with the yellow marks on third and fourth abdominal segments transverse (not oblique), supraclypeal mark present, anterior tibiæ entirely yellow in front.

Perdita bruneri, Ckll. (*cockerelli*, Crawf.).

The range is greatly extended by a male taken at flowers of *Solidago*, Denver, Colorado, Aug. 24, 1908 (*Mrs. C. Bennett*).

Emphoropsis tristissima (Ckll.).

Claremont, Calif. (*Baker*; Pomona coll. 142). A female *E. murihirta*, Ckll., comes with the same data.

Anthophora crotchii, Cresson.

Claremont, Calif. (*Baker*; Pomona coll. 143).

Anthophora infernalis, Dalla Torre.

Claremont, Calif. (*Baker*; Pomona coll. 153).

Anthophora washingtoni, Ckll.

Claremont, Calif. (*Baker*; Pomona coll. 133).

Anthophora urbana, Cresson.

Claremont, Calif. (*Baker*; Pomona coll. 142).

Anthophora anstrutheri, Ckll., variety *a*.

Mts. near Claremont, Calif. (*Baker*; Pomona coll. 142). This female differs from the type in having the triangular hair-patch at apex of fifth abdominal segment very pale tawny instead of black.

Stelis laticincta, Cresson.

Claremont, Calif. (*Baker*; Pomona coll. 186).

Spinoliella euxantha, sp. n.

♀.—Length 9·5 mm.

Robust, black, with very bright yellow markings on face and abdomen; head and thorax with pale ochreous hair; clypeus (except two brown spots), large triangular lateral face-marks, and spot on base of mandibles (followed by a red shade), bright yellow; labrum brownish; flagellum thick and very short, dull red beneath, except basally; vertex shining, with large and small punctures; thorax without yellow markings; mesothorax shining, sparsely punctured, the disc impunctate; area of metathorax shining,

the basal middle roughened, very delicately plicatulate; legs robust, with pale ochreous hair; middle femora very broad; anterior tibiæ broadly, and middle ones more narrowly, yellow at base; tegulæ black with a faint reddish tint. Wings dilute brownish; b. n. falling far short of t.-m.; marginal cell pointed at end and appendiculate. Abdomen shining, without hair-bands, but much ochreous hair at apex; segments 1 to 5 with bright yellow bands, all broad at sides, the first narrowed nearly to a point in middle, the second with more than the median third linear, the third and fourth merely narrower in middle, the fifth with a median wedge-shaped incursion of black; venter dark without bands.

Hab. Claremont, Calif. (*Baker*: Pomona coll. 229).

In the table in Trans. Am. Ent. Soc. xxv. p. 195, this runs out at 10, because the clypeus is yellow and there is no supraclypeal mark except a minute scarcely visible dot. It falls near to *S. zonalis* (Cresson), known only in the male, but is too different to be its female.

Spinoliella comptula, sp. n.

♀.—Length about 8·5 mm.

Black, with ivory-coloured face-markings and dull yellow abdominal bands; hair of head and thorax greyish; face broad; clypeus (except lower margin, and a pair of black marks like triangular flags on poles, their points directed toward the eyes), subcircular supraclypeal mark, triangular lateral face-marks (produced above, ending in a sharp point on orbital margin a little above level of antennæ), lower part of labrum, and large patch on base of mandibles, ivory-colour; flagellum short and thick, dull red beneath except at base; mesothorax shining, sparsely punctured (punctures large and small), impunctate on disc; thorax without light markings; area of metathorax shining, its base broadly dull; anterior knees with a small yellow spot; anterior tibiæ and tarsi in front with ferruginous hair. Abdomen with five yellow bands, the fifth broken into two large patches, the others continuous but narrow in middle, the second with its large lateral expansions broadly excavated on outer side; venter without bands.

Hab. Mountains near Claremont, Calif. (*Baker*; Pomona coll. 224).

In my table cited it runs to 6, but falls out on account of the peculiar face-markings. In Fowler's table ('Psyche,' Sept. 1899) it runs to *S. cincta* (Cress.), but that has the face all dark in the female.

Neolarra alba, sp. n.

♂.—Length about 4 mm.

Robust, covered with white scale-like pubescence; mandibles and labrum ferruginous, the latter with a boss-like elevation on each side; face broad; flagellum thick, ferruginous; legs covered with white pubescence, but tarsi and knees can be seen to be pale ferruginous; tegulæ dark, covered with light hair; second s.m. extremely small and narrow; stigma dark; tegument of abdomen dark, with the hind margins of segments reddish, but the whole densely covered with white hair, that of the hind margins forming chalky-white bands; venter densely covered with white hair.

Hab. Claremont, California (*Baker*; Pomona coll. 1913).

Neolarra vittata, sp. n.

♂.—Length about 4 mm.

Differing from *N. alba* as follows: less robust, flagellum clearer red, tegulæ reddish, legs not so densely tomentose (knees, tibiæ at apex, and tarsi clear red), chalk-white bands of abdomen very distinct, the basal part of segments appearing darker and browner. The distance between the tegulæ is 800 microns; in *N. alba* it is 865.

Hab. At flowers of *Dithyrea wislizeni*, Mesilla Park, New Mexico, 3800 ft., May 7 (*Cockerell*).

The known species of *Neolarra* may be separated thus:—

	Abdomen red	1.
	Abdomen not red	3.
1.	Very small, length 4 mm. or less	*pruinosa*, Ashm.
	Larger, at least 5 mm.	2.
2.	Abdomen very light red, tegulæ pale clear red	*verbesinæ* (Ckll.).
	Abdomen deep red, tegulæ dark	*congregata*, Crawf.
3.	Less robust; abdomen appearing dark brownish plumbeous, with very conspicuous white bands	*vittata*, Ckll.
	More robust; abdomen very white	*alba*, Ckll.

Dioxys aurifuscus (Titus).

The range is greatly extended by a female from Claremont, California (*Baker*; Pomona coll. 194).

Dioxys pomonæ, Cockerell.

Described from the male. The female (Claremont, *Baker*; Pomona coll. 191) is a little over 8 mm. long, flagellum

only very obscure reddish beneath, tegulæ bright ferruginous with a black spot in front, end of abdomen pointed, but forming an angle greater than a right angle.

Dioxys pacificus, sp. n.

♀.—Length a little over 9 mm.

Similar to *D. productus subruber* (Ckll.), but differing thus: mesothorax less coarsely punctured; postscutellar spine smaller; b. n. meeting t.-m.; second s.m. more narrowed above; legs black, the knees obscurely reddish; abdomen much more finely punctured throughout, first three segments terra-cotta red, hair-bands on hind margins of segments thin and white; apex of abdomen broadly rounded, not truncate.

Hab. Claremont, California (Pomona coll. 190).

Xylocopa orpifex, Smith.

Mts. near Claremont (*Baker*; Pomona coll. 175). Lordsburg, Calif., May 11 (*H. H. Nininger*).

These specimens are rather large, but not to be separated. The species extends eastward to Oak Creek Canon, Arizona (*Snow*).

Halictus smithii, Dalla Torre, variety *a*.

♀.—Length 5–5·5 mm.

Black, with scanty, pale, slightly ochreous hair, caudal fimbria concolorous; head ordinary, broad; clypeus shining, with very few scattered punctures; mandibles red in middle; supraclypeal area convex, shining, without evident sculpture; front dull; flagellum ferruginous beneath except at base; mesothorax dullish, extremely minutely punctured, the median impressed line very distinct; area of metathorax semilunar, with very delicate, weak, straight, longitudinal plicæ; posterior truncation not sharply defined above; tegulæ rufo-testaceous. Wings greyish hyaline; stigma large, dull ferruginous; nervures fuscous or reddish fuscous; third s.m. very broad above. Legs black, with pale ochreous hair. Abdomen shining black, without definite hair-bands, but the sides of the segments are thinly beset with long hairs, and the fifth has similar sparse hair all over.

Microscopical characters: clypeus and supraclypeal area very distinctly reticulate, with widely scattered deep punctures; scape well punctured; middle of front rough and

extremely densely punctured; mesothorax minutely reticulate, with rather sparse small punctures; hind spur with only extremely minute saw-like teeth.

Hab. Waipara, New Zealand, Nov. 21, 1915 (*Guy Brittin*).

Mr. Brittin took four females, two with dark tegulæ, two with rufo-testaceous tegulæ. I thought at first that I could distinguish two species, that with darker tegulæ being the true *H. smithii* (*familiaris*, Smith) and the other new. After minute comparisons, in which I am fortunately able to include a co-type of *smithii* from Smith's collection, I conclude that there is only one variable species. The hind margins of the first and second abdominal segments of *H. smithii* are very narrowly vibrissate with white hair, though this is not always very evident. Cameron (Trans. N. Zealand Inst. vol. xxxii. p. 17) separates *smithii* from *sordidus* and *huttoni* by the character of the base of median segment (metathorax), but his statement is unsatisfactory, as the sculpture in *smithii* is very delicate, appearing rugose under a low magnification, but showing fine plicæ under a higher.

Halictus gulosus punctiferus, subsp. n.

♀.—Like *H. gulosus* (*H. arcuatus gulosus*, Ckll.), but mesothorax more closely punctured, especially at sides of middle, where the punctures are hardly separated by a space equal to the width of one; the hind margins of the abdominal segments are very narrowly or often scarcely at all pallid. Wings brownish. Very like *H. craterus*, Lovell, but easily separated by the impunctate hind margin of first abdominal segment and the larger stigma.

Hab. Boulder, Colorado, twenty-six specimens with the following data: March 25 (*Hite*); March 22 (*Hite*); April 11 (*Rohwer*); March 30, fls. *Salix bebbiana* (*Rohwer*); May 22, fls. *Salix luteosericea* (*Rohwer*); April 23, fls. *Taraxacum taraxacum* (*Rohwer*); April 14, fls. *Rulac texanum* (*Hite*); April 14, fls. *Prunus pennsylvanica* (*Hite*); May 20, fls. *Bursa bursa-pastoris* (*Rohwer*); May 13, fls. *Prunus melanocarpa* (*Rohwer*); Aug. 14 (*Rohwer*).

XXXI.—*Some Nemertinea, Free-living Nematoda and Oligochæta from the Falklands.* By H. A. Baylis, B.A.

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The material described in this paper was collected by Mr. Rupert Vallentin in the Falkland Islands during the years 1902, 1910, and 1911. Dr. J. H. Ashworth, of Edinburgh, to whom it was handed over, has kindly entrusted me with the determination of the collection and the description of such new forms as it contains. The species were all collected between tide-marks, and most of them are probably truly littoral forms. The nemertines, however, and some of the nematodes would probably be found to range into water of considerable depth. *Lineus corrugatus* and *Leptosomatum setosum*, for example, are forms both known to occur in deep water.

The following notes by Mr. Vallentin on the nature of the collecting-ground are of considerable interest:—

The worms are from the "N.W. corner of the West Falklands. Roy Cove, where most of the specimens were gathered, is the only protected estuary in that district. It is a mile and a half in length, and the depth of water varies from 8 fathoms to *nil*. The creek is filled with ice during winter, and during a S.E. gale a heavy sea runs up the creek. The seas round this part are terrific."

The collection comprises three species of Nemertinea, seven of Nematoda, and one of Oligochæta. They are the following:—

Nemertinea.

Amphiporus, Ehrenberg.

1. *Amphiporus michaelseni*, Bürger.

A single specimen, probably of this species, was taken at Whale Sound, "in sand near low-water mark, spring tide."

Lineus, Sowerby.

2. *Lineus corrugatus*, M'Intosh.

Ten small examples of this widely-distributed form occur in the collection. I have previously (1915, p. 128) noted its occurrence at South Georgia, and pointed out that its known

range extends in almost a complete circle round the sub-antarctic region, between the latitudes of 50° and 77° S. The fact that it occurs also at the Falklands serves to render this circle still more complete.

There appears to be great variation in the size at which this species attains sexual maturity. In the 'Terra Nova' collection, where the material was dredged from considerable depths of water (45–250 fathoms), the sexually mature individuals were generally of large size (about 50 cm.). Among the present collection, on the other hand, an example not more than 65 mm. in length was found to contain well-advanced female gonads. The examples from South Georgia, to which reference has already been made, were also comparatively small (not more than 145 mm.), and some of these were sexually mature. The material both from South Georgia and from the Falklands was taken in shallow water. It seems not improbable that the depth at which the worms live has some effect upon their growth, so that those which live close to the shore never attain so large a size as those in deep water, but are, nevertheless, capable of becoming mature.

Loc. Roy Cove, etc., at low water; sometimes washed ashore among *Macrocystis* roots.

3. *Lineus* sp.

There is a single female specimen, belonging to a species very distinct from *L. corrugatus*, but taken with it at low water, spring tides, 1902. It is about 30 mm. long and a little less than 2 mm. in diameter. The skin is smooth. The head is rather narrow and provided with elongate cephalic slits. The mouth is indistinct, and is probably very small. The most striking feature is the large size of the ova, which occupy almost the entire space within the body-wall. They measure 0·5–0·6 mm., or even more than this, in diameter.

I do not feel justified in attaching a specific name to this single specimen.

Nematoda.

Stenolaimus, Marion, 1870.

4. *Stenolaimus serialis*, sp. n.

The nematode most abundantly represented in the collection is an interesting form which may be provisionally referred to the genus *Stenolaimus*. Out of twenty-six examples only two are males.

Measurements (in mm.), taken from two males and three mature females:—

	♂.	♀.
Length	5·2–6	5·52–6
Thickness—at crown of hairs	0·033–0·037	0·037
,, at base of œsophagus	0·15–0·16	0·14–0·15
,, at middle of body	0·22–0·24	0·19–0·25
,, at anus	0·09	0·09–0·1
Length of œsophagus	0·8–0·93	0·81–0·9
,, tail	0·33–0·35	0·4–0·5
,, spicules	0·12–0·15	....
Distance from head-end to excretory pore	0·065	0·0625–0·075
Distance from head-end to nerve-ring	0·40–0·44	0·39–0·42
Distance from head-end to vulva	....	1·41–1·65
a	23·6–25	22·2–29
β	6·4–6·5	6·6–6·8
γ	15·7–17	11·1–13·8

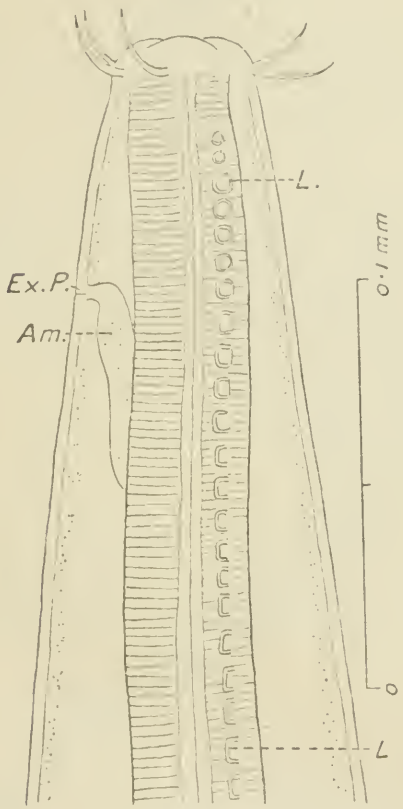
The body tapers considerably both anteriorly and posteriorly, the neck especially being very slender. Posteriorly the tapering begins a little in front of the anus. The cuticle is quite smooth, no transverse striations having been detected. In the *male* only there are a few slender hairs (fig. 2, p. 292) on the ventral surface in front of and behind the anus, and a few shorter and more scattered hairs on the tail. The lateral fields are of a coarsely cellular appearance, and measure 0·025 mm. in width.

The head (fig. 1) is very narrow. Near the extremity there is a crown of six stoutish bristles, which stand out at right angles to the long axis of the body, their tips curving forward. Two of the bristles are lateral, two subdorsal, and two subventral. The chief peculiarity of the species is the fact that instead of the pair of circular or spiral lateral organs near the anterior end, characteristic of the majority of free-living nematodes, there appears to be on either side a longitudinal row of thirty or more very small pits in the cuticle (fig. 1, *L.*), which may possibly be regarded as "lateral organs." They are situated just above the level of the lateral field on either side, and are, therefore, subdorsal in position. De Man (1884, pl. i. figs. 3, 3 *a*, 3 *d*) figures a row of organs in *Deontolaimus papillatus*, which would appear, from the figures, to be of a somewhat similar nature. According to his account of this species, however (1884, p. 32), they are "papillæ" rather than pits, and occur, in the *male only*, in a single median *ventral* row extending throughout the whole

œsophageal region of the body. In the species now under consideration the pits are present in both sexes, and extend in two rows from a little behind the anterior extremity to about the level of the nerve-ring.

The mouth is very small, and is not provided with distinct

Fig. 1.

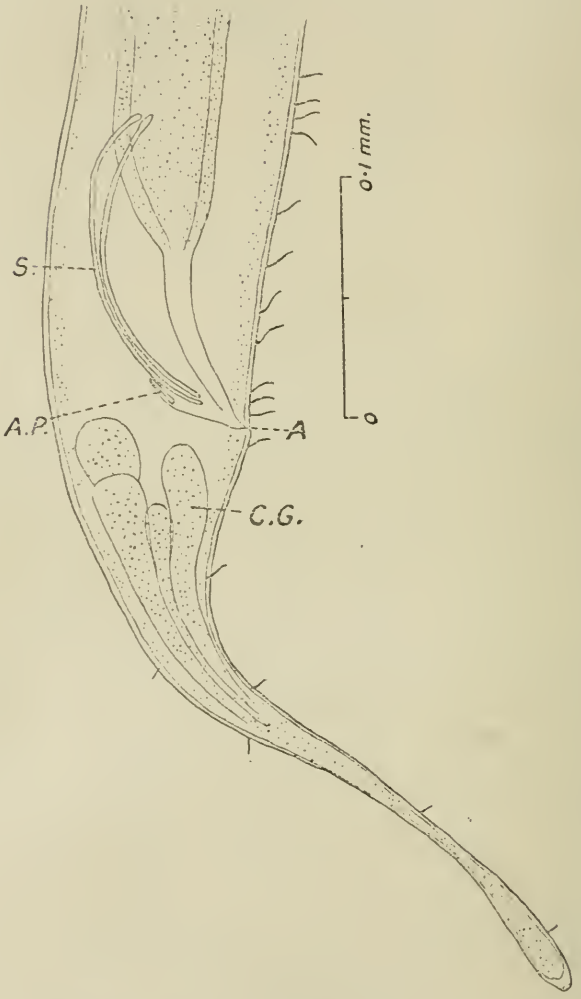


Stenolaimus serialis. Anterior end of female, lateral view.
Am., ampulla of excretory gland; *Ex.P.*, excretory pore; *L.*, "lateral organs" (?).

lips or papillæ. There is no buccal cavity, the mouth leading directly into the œsophagus. The latter is long and slender; it increases gradually in thickness towards its posterior end, but there is no distinct bulb. The nerve-ring

crosses the œsophagus at about the middle. The cells of the chyle-intestine are small, tessellated, and filled with brownish granules.

Fig. 2.



Stenolaimus serialis. Posterior end of male, lateral view.
A., anus; *A.P.*, accessory piece; *C.G.*, caudal glands; *S.*, spicules.

The tail (fig. 2), in both sexes, tapers rapidly at first from the anus for about $\frac{2}{3}$ of its length, becoming more cylindrical

posteriorly. There is a slight bulbous expansion of the cuticle just before the tip. At the extreme tip there is a distinct pore, from which there may sometimes be seen issuing a coagulated stream of the secretion from the caudal glands, which are well developed.

The minute pore of the excretory gland (fig. 1, *Ex.P.*) is situated close behind the head, the duct expanding into a slight ampulla (*Am.*) just before the opening.

The spicules of the male (fig. 2, *S.*) are very slender curved rods; there is apparently a slender accessory piece (*A.P.*) near their distal ends. In the male the posterior end of the body is well provided with diagonal muscle-bands, probably serving to bring about the ventral coiling of the tail.

In the female the genital organs are characteristic. The vulva is anteriorly placed, and the two branches of the uterus are very unequal, the posterior branch being 4½ times as long as the anterior. Both ovaries are doubly reflexed, *i. e.*, bent back upon the uterus and bent back again upon themselves near their blind ends.

This species appears to be common between tide-marks, occurring under stones &c. at Roy Cove. It agrees with *Stenolaimus marioni*, Southern (1914), and differs from the type-species, *S. lepturus*, de Man, in the absence of any hairs on the neck besides the cephalic crown of bristles. It may be remarked that no lateral organs are mentioned in the descriptions of either of these species; it is therefore doubtful whether the rows of pits described above for *S. serialis* are of generic or only of specific importance. It is possible that the species should be regarded as belonging to a new genus, with close relationships to *Stenolaimus* and *Anticoma*.

Dolicholaimus, de Man.

5. *Dolicholaimus vallentini*, sp. n.

The collection includes three examples of a species which is undoubtedly to be referred to *Dolicholaimus*. Of these specimens, one is a male, one a female with ovaries developed, but containing no fully-formed eggs, and the third an immature form of doubtful sex.

The following are the measurements (in mm.) of the two mature individuals:—

	♂.	♀.
Length	3·47	3·40
Thickness—at crown of hairs	0·0275	0·03

	♂.	♀.
Thickness—at end of œsophagus	0·09	0·09
,, at middle of body	0·10	0·11
,, at anus	0·08	0·07
Length of œsophagus (including buccal cavity).	0·53	0·60
,, tail	0·19	0·22
,, spicules	0·07	....
Distance, head to end of buccal cavity	0·125	0·125
,, ,, nerve-ring	0·26	0·31
,, ,, vulva	....	1·9
a	34·7	30·9
β	6·54	5·78
γ	18·26	15·77

This form agrees well in essential points with the type-species, *D. marioni*, de Man (1888). It is, however, slightly larger, and differs in certain other respects. The body is of very even thickness throughout the greater part of its length. Towards the head it tapers rather rapidly, and the posterior end begins to diminish in diameter from a little distance in front of the anus. The tail (fig. 4, p. 296), in both sexes, tapers rapidly for about the first half of its length ; more posteriorly it becomes cylindrical, and, finally, near the tip there is a slight swelling. The tip of the tail is bluntly rounded, and the aperture of the caudal glands is not conspicuous. These glands, however, are well developed (fig. 4, *C.G.*).

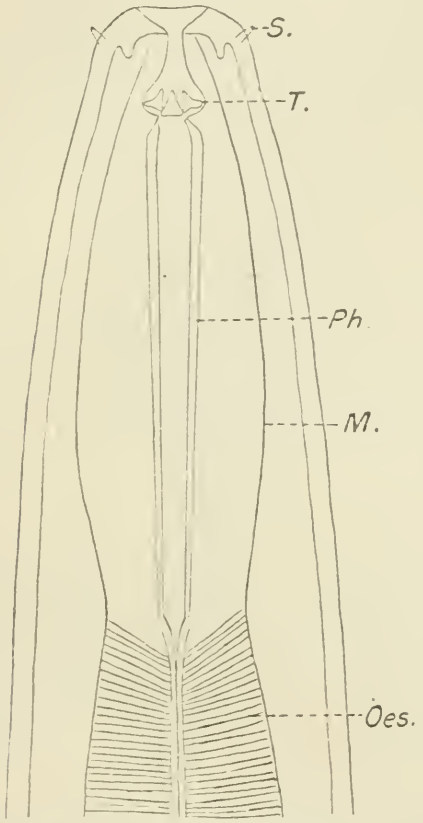
The cuticle is quite smooth, as in the type-species, no transverse striations being visible. No hairs occur on the body, with the exception of four short, stout, submedian bristles situated close to the anterior end (fig. 3, *S.*). The lateral fields have a width of 0·025 mm. No lateral organs have been made out. In the type-species of this genus they are said to be present in the form of grooves ("*sillons*"), but nothing of this kind has been detected in the present form.

The mouth (fig. 3) is a small funnel-shaped depression and is not provided with distinct lips. It leads into a small "vestibule," as in *D. marioni*, at the base of which there are three teeth (fig. 3, *T.*) arranged in a triangle, andeach shaped somewhat like a boot-tree. This vestibule is followed by the buccal cavity proper (fig. 3, *Ph.*), consisting of a greatly elongate, rigid, chitinous tube. This decreases gradually in diameter from before backwards, its walls, comparatively thick in front, becoming also gradually thinner towards the posterior end. The distance from the mouth to the posterior end of this tubular buccal cavity is about a quarter of that from the mouth to the hinder end of the œsophagus. The

chitinous tube is surrounded by a spindle-shaped muscular sheath (fig. 3, *M.*), continuous with the œsophagus behind.

The œsophagus exhibits a slight spindle-shaped thickening near its junction with the buccal cavity. In its middle

Fig. 3.



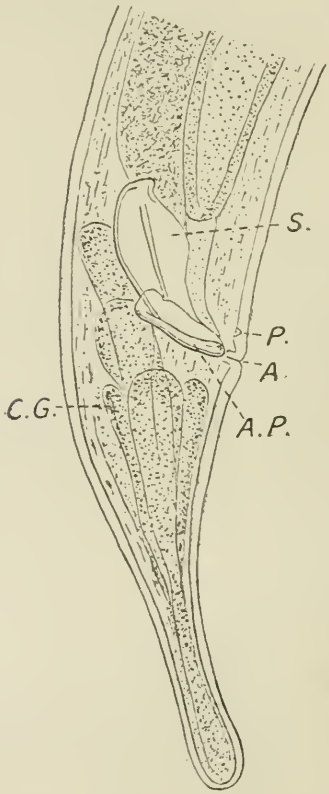
Dolicholaimus vallentini. Anterior end of female, highly magnified.

M., muscular sheath of buccal cavity; *Oes.*, œsophagus; *Ph.*, "pharynx" or tubular portion of buccal cavity; *S.*, cephalic setæ; *T.*, teeth.

portion it becomes narrow again, but posteriorly it is greatly thickened. There is, however, no true œsophageal bulb. The nerve-ring crosses the œsophagus at about the middle of the distance from the mouth to its base. No trace of a

ventral excretory gland has been discovered. In this connection it is noteworthy that, according to de Man, this organ does not exist in the type-species of the genus.

Fig. 4.



Dolicholaimus vallentini. Posterior end of male, lateral view, highly magnified.

A., anus; *A.P.*, accessory piece; *C.G.*, caudal glands; *P.*, preanal papilla of right side; *S.*, spicule of right side.

The posterior end of the male is abundantly provided with diagonal muscles. The spicules (fig. 4, *S.*) are lamellar, their posterior edges having a rib-like thickening. There is also

a fold or thickening running down the middle of the spicule, like a mid-rib. The two spicules slide in a single accessory piece (fig. 4, *A.P.*), situated near their distal ends in the position of repose. This accessory piece is apparently bent so as to form a deep slot in which the posterior ribs of the spicules are lodged. It is nearly half as long as the spicules themselves. There is a single pair of minute papillæ (fig. 4, *P.*) situated just in front of the anal aperture.

In the female the vulva is situated slightly behind the middle of the body. The two ovaries are about equal in length, and are reflexed. No fully-formed eggs were observed in the uterus.

The specimens were taken under stones at Roy Cove, June 20, 1910.

Enoplus, Dujardin.

6. *Enoplus michaelseni*, v. Linst.

Enoplus michaelseni, v. Linstow, 1896, p. 10; figs. 14–16; de Man, 1904, p. 19; pls. iv.–vi., fig. 7.

Of this species two examples occur in the collection, both females. They were taken under stones at Roy Cove, June 20, 1910.

7. *Enoplus* sp.

There is a single example of a second form which is possibly to be referred to this genus. It is a female, measuring about 2 mm. in length, and occurred among other small nematodes and oligochætes, in association with *Marphysa corallina*, July 22, 1910.

It does not seem desirable to found a species upon this unique specimen.

Oncholaimus, Dujardin.

8. *Oncholaimus* sp.

A single female specimen, apparently belonging to this genus, occurred with various other forms among *Marphysa corallina*, July 22, 1910. It measures a little over 5 mm. in length, and is the largest of the nematodes met with, with the exception of *Leptosomatum setosum*.

LEPTOSOMATUM, Bastian.

9. *Leptosomatum setosum*, v. Linst.

Leptosomatum setosum, v. Linstow, 1896, p. 5; figs. 4–7.
Thoracostoma setosum, de Man, 1904, p. 25; pls. vi.–x., fig. 8.
Leptosomatum setosum, Leiper & Atkinson, 1915, p. 23; pl. i., figs. 3, 6, 9.

Two female examples of this form were taken at low water during spring tides, Feb. 21, 1902, together with nemertines. This species appears to occur in any depth of water from low-water mark down to 250 fathoms or more, and is widely distributed in the subantarctic region.

THORACOSTOMA, Marion, 1870.

10. *Thoracostoma* sp.

A single female example occurred among the various other species in association with *Marphysa corallina*, July 22, 1910.

OLIGOCHÆTA.

MARIONINA, Michaelsen.

11. *Marionina georgiana* (Mchlsn.).

Eighteen examples of a small Enchytræid worm, which I refer to this species, were collected at Roy Cove or elsewhere at low water. The collector's labels indicate that they were taken in June and July, 1910, some being found under stones, others, with various nematodes, in association with *Marphysa*.

REFERENCES.

BAYLIS, H. A. 1915. British Antarctic ('Terra Nova') Exp., 1910, Zoology, ii. no. 5, p. 113. Nemertinea.
LEIPER, R. T., and E. L. ATKINSON. 1915. British Antarctic ('Terra Nova') Exp., 1910, Zoology, ii. no. 3, p. 19. Parasitic Worms.
LINSTOW, O. VON. 1896. Hamb. Magalh. Sammelr. Nemathelminthen.
MAN, J. G. DE. 1884. 'Die frei lebenden Nematoden der Niederländischen Fauna.'
——. 1888. "Sur quelques Nématodes libres de la Mer du Nord." Mém. Soc. Zool. France, i. p. 1.
——. 1904. Rés. Voy. S.Y. 'Belgica,' Zoologie. Nématodes Libres.
MARION, A. F. 1870. "Recherches sur les Nématodes non parasites, marins." Ann. Sci. Nat., Zool. (5) xiii.
SOUTHERN, R. 1914. "Clare Island Survey," Part 54. Proc. Roy. Irish Acad. xxxi.

XXXII.—*Notes on Fossorial Hymenoptera.*—XXI. *On the Australian* Larrinæ *of the Genus* Tachytes. By Rowland E. Turner, F.Z.S., F.E.S.

Key to the Australian Species of Tachytes.

♀♀.

1.	Abdomen wholly bright testaceous or ferruginous red	2.
	Abdomen black, at most the apical margins of the segments or the apical segment brown or ferruginous	3.
2.	Abdomen bright testaceous; pubescence of thorax and median segment golden; legs bright testaceous	*T. formosissimus*, Turn.
	Abdomen ferruginous red; pubescence white; legs black, the tarsi more or less ferruginous	*T. rubellus*, Turn.
3.	Pubescence of the abdomen deep or pale golden	4.
	Pubescence of the abdomen silver, that on the pygidial area sometimes golden	6.
4.	Outer margin of the basal joint of the fore tarsus with five spines; second joint of the flagellum scarcely longer than the third	*T. approximatus*, Turn.
	Outer margin of the basal joint of the fore tarsus with six spines; second joint of the flagellum distinctly longer than the third	5.
5.	Legs almost entirely black; median segment nearly half as long again as the scutellum	*T. plutocraticus*, Turn.
	Tibiæ, tarsi, and the apex at least of the femora bright testaceous brown; median segment very little longer than the scutellum	*T. relucens*, Turn.
6.	Tibiæ, tarsi, and sixth dorsal segment ferruginous	*T. mitis*, Turn.
	Legs, except the apical tarsal joints, black; sixth dorsal segment black	7.
7.	Pubescence of the pygidial area golden and dense	8.
	Pubescence of the pygidial area not golden, either silver and dense or fusco-ferruginous and very sparse	9.
8.	Pygidial area very broadly rounded at the apex, almost truncate; basal joint of fore tarsus with six spines on the outer margin.	*T. æstuans*, Turn.
	Pygidial area narrowly rounded at the apex, almost triangular; basal joint of fore tarsus with five spines on the outer margin	*T. fatalis*, Turn

9. Pygidial area almost pointed, densely clothed with silver pubescence ..... *T. dispersus*, Turn.
Pygidial area very coarsely punctured, the punctures confluent longitudinally, sparsely clothed with fusco-ferruginous setæ ..... *T. sulcatus*, Turn.

1. *Tachytes formosissimus*, Turn.

Tachytes formosissimus, Turn. Proc. Zool. Soc. London, p. 482 (1908). ♀.

Hab. Mackay, Q. (*Turner*).
I have only seen the type.

2. *Tachytes rubellus*, Turn.

Tachytes rubellus, Turn. Proc. Zool. Soc. London, p. 482 (1908). ♂.

Hab. Port Darwin, N.T. (*Turner*); Adelaide, S.A. (*ex coll. Perkins*).

♀. The pygidial area is fairly broad, rounded at the apex, clothed with golden pubescence. Basal joint of the fore tarsus with five spines on the outer margin. Second abscissa of the radius equal to the third; the two recurrent nervures separated on the cubitus by a distance greater than that between the first recurrent nervure and the first transverse cubital nervure.

The only female I have seen is from Adelaide; the species appears to be rare, though with a considerable range.

3. *Tachytes approximatus*, Turn.

Tachytes approximatus, Turn. Proc. Zool. Soc. London, p. 483 (1908). ♀♂.

Hab. Mackay and Cairns, Q. (*Turner*).

4. *Tachytes plutocraticus*, Turn.

Tachytes plutocraticus, Turn. Proc. Zool. Soc. London, p. 348 (1910). ♀.

Hab. Townsville, Q. (*Dodd*).
This is the largest Australian species of the genus.

5. *Tachytes relucens*, sp. n.

♀. Nigra; tibiis, tarsis, femoribus apice, posticis fere totis, tegulisque læte brunneo-testaceis; segmentis dorsalibus fascia lata, ventralibus angusta brunneo-ferruginea; segmentis dorsalibus, fascia lata apicali præcipue, aureo-sericeis; capite

thoraceque pallide aureo-pilosis; alis hyalinis, venis fusco-ferrugineis.

♂. Feminæ similis; area pygidiali pallide pilosa.

Long., ♀ 14 mm., ♂ 12 mm.

♀. Clypeus very broadly rounded at the apex. Second joint of the flagellum longer than the third by about one-quarter; eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum. Basal joint of the fore tarsus with six spines on the outer margin. Front, clypeus, sides, and apex of the mesonotum and sides of the median segment clothed with pale pubescence tinged with gold, a spot of rather deeper golden pubescence on each side near the middle of the anterior margin of the mesonotum. Median segment short, scarcely longer than the scutellum, opaque, with a very obscure median sulcus, which becomes well defined on the posterior slope. Abdomen broadly conical; pygidial area rather narrowly rounded at the apex and clothed with deep golden pubescence. Second abscissa of the radius as long as the third; first recurrent nervure received distinctly nearer to the second recurrent than to the first transverse cubital nervure.

Except in the usual sexual characters the male is very similar to the female; there are four small spines on the outer margin of the basal joint of the fore tarsus; the sulcus on the dorsal surface of the median segment is more distinct; the abdomen is more slender, and the third abscissa of the radius is distinctly longer than the second.

Hab. Mackay, Q. (*Turner*).

In the number of spines on the basal joint of the fore tarsus this resembles *plutocraticus*; but this is a smaller insect, with a shorter median segment, the shape of the clypeus is different, also the colour of the legs. It is more stoutly built than *approximatus*, from which it also differs in the shape of the clypeus, in the number of spines on the basal joint of the fore tarsus, and in the broader pygidial area.

6. *Tachytes mitis*, sp. n.

♀. Nigra; mandibulis basi, area pygidiali, tibiis tarsisque ferrugineis; segmentis dorsalibus et ventralibus fascia angusta apicali brunneo-ferruginea; tegulis pallide testaceis; alis hyalinis, venis fusco-ferrugineis; abdomine argenteo-sericeo, segmentis dorsalibus 1–4 fascia lata apicali densius argenteo-sericea; area pygidiali aureo-setosa.

♂. Feminæ similis.

Long., ♀ 10 mm., ♂ 8 mm.

♀. Clypeus with a broadly arched depression on the apical quarter, the margin transverse, the deflexed portion bare and shining, the basal portion densely clothed with silver pubescence, which extends on to the front. Second joint of the flagellum equal to the third, less than twice as long as the first; eyes separated on the vertex by a distance greater by one-third than the length of the second joint of the flagellum; a sulcus reaching from the posterior ocelli to the occiput. Pronotum thick; mesonotum, scutellum, and mesopleuræ closely and minutely punctured, the mesopleuræ and sides of the mesonotum clothed with whitish pubescence. Thorax subopaque; median segment opaque, more strongly punctured than the thorax, with a distinct median sulcus which is more deeply continued on the posterior slope, clothed with short pubescence, silvery on the sides, greyish and sparser in the middle of the dorsal surface, fully half as long again as the scutellum. Abdomen subopaque, pygidial area elongate-triangular, very narrowly rounded at the apex. Basal joint of the fore tarsi with five slender spines on the outer margin. Second abscissa of the radius distinctly longer than the third; first recurrent nervure almost halfway between the second recurrent and first transverse cubital nervures, a little nearer to the former than to the latter.

The male has the joints of the antennæ shorter than in the female, so that the eyes are separated on the vertex by a distance fully equal to the combined length of the two basal joints of the flagellum; there are only four small spines on the outer margin of the basal joint of the fore tarsus, and the seventh dorsal segment is black at the base and clothed with silver pubescence.

Hab. Kalamunda, S.W. Australia (*Turner*); February and March. 3 ♂♂, 1 ♀. A single male apparently of the same species taken at Townsville, Q., by F. P. Dodd.

7. *Tachytes æstuans*, sp. n.

♀. Nigra, albo-pilosa; tarsorum articulo apicali, tibiarum tarsorumque spinis ferrugineis, tegulis pallide brunneis; segmentis dorsalibus 1–4 fascia apicali argenteo-sericea; area pygidiali dense aureo-setosa; alis hyalinis, venis fusco-ferrugineis.
Long. 14 mm.

♀. Clypeus transverse at the apex, deflexed in the middle just before the apex, and clothed with rather long white pubescence which extends on to the front. Second joint of the flagellum equal to the third, more than twice as long as the first; eyes separated on the vertex by a distance equal to

the combined length of the two basal joints of the flagellum; the sulcus from the posterior ocelli shallow and not quite reaching the occiput. Thorax minutely and very closely punctured, thinly clothed with greyish pubescence; median segment more opaque than the thorax, the pubescence denser than on the thorax, without a median sulcus on the dorsal surface, the segment about half as long again as the scutellum. Abdomen fairly stout; pygidial area very broadly rounded at the apex, almost truncate, the sides not very strongly convergent. Basal joint of the fore tarsus with six fairly stout spines on the outer margin. Second abscissa of the radius shorter than the third; first recurrent nervure almost or quite as near to the first transverse cubital as to the second recurrent nervure.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*); Killalpanima, S.A. (*H. J. Hillier*).

This is very near *T. fatalis*, but has the pygidial area much broader at the apex, the sides less convergent; six spines on the basal joint of the fore tarsus as compared with five in *fatalis*; there is also a difference in the form of the clypeus.

8. *Tachytes fatalis*, sp. n.

♀. Nigra, argenteo-pilosa; mandibulis apice, tegulis, unguiculisque tarsalibus brunneis; segmentis dorsalibus 1–4 fascia apicali argenteo-pilosa; area pygidiali aureo-pilosa; alis hyalinis, venis fusco-ferrugineis.

Long. 13 mm.

♀. Clypeus very broadly rounded at the apex, the apical margin transversely depressed and bare, the base of the clypeus and the front clothed with silver pubescence; second joint of the flagellum slightly longer than the third; eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum. Mesonotum minutely and closely punctured; median segment scarcely as long as the scutellum and postscutellum combined, without a median sulcus on the dorsal surface. Abdomen subopaque; the apical bands of silver pubescence broader at the sides than in the middle; pygidial area clothed with golden pubescence, elongate-triangular, narrowly rounded at the apex. Basal joint of the fore tarsus with five spines on the outer margin. Second abscissa of the radius scarcely as long as the third; first recurrent nervure nearer to the second recurrent than to the first transverse cubital nervure.

Hab. Toowoomba, Q.

This is nearest to *dispersus*, from which it may be distinguished by the golden pubescence of the pygidial area, which

is also more distinctly rounded at the apex than in *dispersus* ; also by the shorter median segment and the form of the clypeus. From *æstuans* it is easily distinguished by the much narrower pygidial area and the number of spines on the basal joint of the fore tarsus.

9. *Tachytes dispersus*, sp. n.

♀. Nigra; unguiculis tarsalibus tegulisque brunneis; segmentis dorsalibus 1–4 fascia lata apicali argenteo-pilosa ; area pygidiali argenteo-pilosa ; alis hyalinis, venis nigris.
♂. Feminæ similis.
Long., ♀ 13 mm., ♂ 11 mm.

♀. Clypeus clothed with silver pubescence at the base, a bare, somewhat deflexed triangular area at the apex, the apical margin truncate. Second joint of the flagellum slightly longer than the third, more than twice as long as the first ; eyes separated on the vertex by a distance equal to the length of the third joint of the flagellum. Front, pronotum, mesopleuræ, and the sides of the mesonotum and of the median segment clothed with silver pubescence; mesonotum distinctly depressed in the middle of the anterior margin, minutely and closely punctured ; median segment more opaque than the mesonotum, more than half as long again as the scutellum, with an obscure median sulcus from base to apex, the sulcus becoming broad and deep on the posterior slope. Abdomen subopaque ; the apical fasciæ of pubescence broad, especially on the sides; pygidial area elongate-triangular, almost pointed at the apex. Basal joint of the fore tarsus with five spines on the outer margin. Second abscissa of the radius a little longer than the third ; first recurrent nervure a little nearer to the second recurrent than to the first transverse cubital nervure.

Hab. Baudin Island, N.W. Australia (*J. J. Walker*) ; Townsville, Q. (*Dodd*) ; Mackay, Q. (*Turner*) ; Perth, W.A. (*Turner*) ; Port Essington, N.T. (*Gould*).

This seems to be the commonest Australian species of the genus, and ranges over almost the whole continent. The silver pubescence of the pygidial area and the narrower and more pointed shape of the same area distinguish it from other Australian species.

10. *Tachytes sulcatus*, sp. n.

♀. Nigra ; tarsorum articulis duobus apicalibus fusco-ferrugineis ;

tibiarum tarsorumque spinis albidis; tegulis fuscis macula albida; alis hyalinis, venis fuscis.

♂. Feminæ similis.

Long., ♀ 10 mm., ♂ 8 mm.

♀. Clypeus shining, the apical margin transverse and deflexed; the base of the clypeus and the front clothed with short silvery pubescence. Second joint of the flagellum equal to the third, twice as long as the first; eyes separated on the vertex by a distance almost equal to the combined length of the two basal joints of the flagellum; vertex behind the posterior ocelli somewhat concave, and divided by an obscure longitudinal sulcus. Thorax very minutely and closely punctured, subopaque; median segment nearly twice as long as the scutellum, broad, opaque, microscopically punctured, the dorsal surface without a sulcus except at the extreme apex. Abdominal segments subopaque, microscopically punctured; dorsal segments 1–4 with a narrow apical band of silver pubescence, the margins of the segments under the pubescence fuscous. Pygidial area broad, subtriangular, rounded at the apex, the basal line a little shorter than the sides, the surface covered with very coarse elongate punctures, from which spring very short fusco-ferruginous setæ. Basal joint of fore tarsus with five spines on the outer margin. Second abscissa of the radius longer than the third; first recurrent nervure nearer to the second recurrent than to the first transverse cubital nervure.

The male is very similar to the female, but the antennal joints are shorter, so that the distance between the eyes on the vertex is nearly as great as the combined length of the second and third joints of the flagellum; the seventh dorsal segment is covered with silver pubescence.

Hab. Busselton, W.A. (*Turner*), ♂ ♀, January; Cottesloe, W.A. (*Giles*), ♂ ♀, December.

The female is easily distinguished from other Australian species by the coarse sculpture and very sparse setæ of the pygidial area.

11. *Tachytes tachyrrhostus*, Sauss.

Tachytes tachyrrhostus, Sauss. Mém. soc. phys. & hist. nat. Genève, xiv. p. 18 (1854). ♂; Sauss. Reise d. 'Novara,' Zool. ii., Hymen. p. 73 (1867). ♂; Schulz, Zool. Ann. iv. p. 189 (1911). ♂.

I have been quite unable to identify this species, of which the male only is described; it is, however, certainly a *Tachytes*, and may prove to be the male of *T. fatalis*, but

the species from S.E. Australia are very poorly represented in the British Museum, and will probably prove to be more numerous than is indicated in this paper.

Tachytes (?) *nigripes*, Sauss.

Larrada nigripes, Sauss. Reise d. 'Novara,' Zool. ii., Hymen. p. 74 (1867). ♀.

Schulz (Zool. Ann. p. 191, 1911) described the specimen now bearing the type-label in Saussure's collection. It is, however, a male, and has a head, whereas Saussure describes his species as female and implies that the type is headless. Schulz considers the generic position as intermediate between *Tachytes* and *Notogonia*, but nearest to the former. The locality given by Saussure is Tasmania, but the localities of the 'Novara' are most unreliable, and the species may not be Australian.

Tachytes australis, Sauss. (Reise d. 'Novara,' Zool. ii., Hymen. p. 69, 1867, ♂), is doubtless a *Tachysphex*; and *T. femoratus*, Sauss., and *T. australis*, Sauss. (1854, nec 1867), belong respectively to *Larra* and *Notogonia*.

Tachytes tarsatus, Sm., an Indian species, was recorded by me as Australian (Proc. Zool. Soc. London, p. 348, 1910) owing to an error in identification; in the same paper I also included *T. australis*, Sauss. (1867), as a *Tachytes*.

XXXIII.—*On a new Species of* Solpuga *from the Belgian Congo.* By Stanley Hirst.

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Solpuga hewitti, sp. n.

♂.—*Chelicera.* Basal enlargement of flagellum rather high and shaped like an ear. Free portion of flagellum short, being much less than half the length of the chelicera; it arises above the second tooth, and at first is fairly wide and flattened dorso-ventrally; towards the middle of its length, however, it is rotated sideways, becoming higher than wide, and is furnished with a short little keel crowned with denticles; distal end of flagellum slender and bifurcated, consisting of a sharp little spine and a minute soft twisted

structure, which is shaped rather like a sickle and clothed with short hairs. Immovable finger of chelicera with the end strongly curved; the first two teeth are large, and there are two little intermediate teeth between them and the next large tooth ; there is a very minute denticle on the upper surface of this finger in front of the flagellum. Movable finger with a single minor tooth between the principal ones. Width of *head-plate* considerably less than length of tibia of palp, but almost equal to that of the metatarsus.

♀.—Width of *head-plate* very slightly exceeding length

Chelicera of *Solpuga hewitti.*

A and B, distal half and extreme end of flagellum, greatly enlarged.

of tibia of palp, but a little less than the length of its metatarsus + tarsus. Armature of chelicera practically the same as in the male sex.

The female (type) of *S. butleri*, Poc., from the Congo, is a very large specimen, the length of its body being about 52 mm. ; the width of its head-plate is considerably less than the length of the tibia of the palp or than the metatarsus + tarsus.

Colour. Head-plate pale brownish or reddish yellow; apparently it is not nearly so deeply infuscate as in *S. butleri.* Chelicera yellowish at the sides, but darker above. Abdominal tergites rather dark brown, but the rest of the abdomen

is yellowish with the exception of a narrow dark strip immediately bordering the tergites. Palp and legs yellowish; they are slightly darker in the male than in the female, however; malleoli pale and seemingly without any dark rim.

[*Note.*—There are two more female specimens of *Solpuga* from Kapiri which resemble those described above very closely in structure, but are very much darker, the dorsal surface of the chelicerae, head-plate, and abdomen being very deeply infuscate. The palpi and legs also are rather dark brown in these specimens. Probably they are the female of another species.]

Measurements in mm.—♂. Length of body 31; width of head-plate 8·5; length of tibia of palp 10·8, of metatarsus + tarsus of palp 11·25.

♀. Length of body 32·5; width of head-plate 9; length of tibia of palp 8·75, of metatarsus + tarsus of palp 9·75.

Loc. Kapiri, Belgian Congo; a male and a female collected by L. Charliers (10–13. xi. 1913).

XXXIV.—*On a new Variety of European Tick* (Dermacentor reticulatus, *var.* aulicus, *var. nov.*). By Stanley Hirst.

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♂.—Colour-markings on dorsum very similar to those of the typical form; the posterior pale linear markings are rather fine. Cornua of capitulum distinctly shorter than in typical form. Trochanter of first leg with the angular projection rather short, wide, and blunt. Second segment of palp practically without any spine dorsally. Stigmata rather wide comma-shaped, closely resembling those of the typical form.

♀.—Second segment of palp without any spine dorsally. Angular projection of first trochanter short and wide.

Measurements in mm.—♂. Length of scutum 3·6–5·4; width of scutum 2·6–3·8.

♀. Length of body 5·6, of scutum 1·5; width of scutum 1·65.

Material. Three males and three females from the skin of a wild boar, killed in France (exact locality not known). A female specimen from Valescure, France, 2. iv. 1910; host not given (*N. C. Rothschild's Coll.*).

This new variety will be described in greater detail and figured in a later paper on parasitic Acari.

XXXV.—*A Third Species of the Genus* Elporia, *Edw.* (*Diptera*, Blepharoceridæ). By F. W. Edwards, B.A., F.E.S.

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Some time ago (June 1912) I described in this periodical the first known South-African Blepharocerid under the name *Kelloggina barnardi*. More recently (September 1915) I erected for this species the new genus *Elporia*, adding at the same time a second South-African species, *E. capensis*. I now describe a third, also from South Africa, of which my friend Mr. K. H. Barnard, of the South African Museum, has recently sent me larvæ and pupæ, which were collected by him in January of the present year at a height of about 3000 feet on the Caledon side of the Hottentots Hollands Mountains. Several of the pupæ were sufficiently advanced in development to enable me to dissect out the adults, and it is from these specimens that the adult characters have been drawn. As in the case of *E. capensis*, this fact precludes any reference to coloration. The new species is much more nearly allied to *E. barnardi* than to *E. capensis*, but the male claws resemble those of the last-named, and the larvæ are quite distinct from those of either of the two known species.

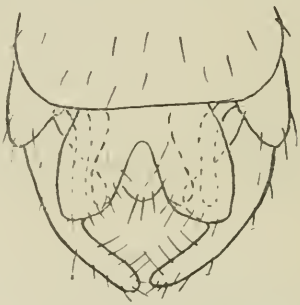
Elporia spinulosa, sp. n.

Imago.—Front considerably broader in the female than in the male, being just one-third the width of the head in the former and one-fourth in the latter sex. Eyes of the male divided into two portions; the upper part is a very little larger than it is in *E. capensis*, but, as in *E. barnardi*, it is composed of larger facets than those of the lower part. The female eyes closely resemble those of *E. barnardi*, the upper portion being very small and its facets very much smaller than those of the lower. Pubescence of eyes about as long as the width of two facets. Antennæ 15-jointed in both sexes, the joints somewhat oval, sessile, and all about equal in length, except the fourth, which is shorter; last joint slightly enlarged in both sexes; there are no strong hairs, except one on the first joint, but the whole flagellum is covered with a short dense pubescence. Mouth-parts agreeing closely with those of *E. barnardi* in structure, but rather shorter, being very little longer than the vertical diameter of the head; the blade of the maxilla is a little longer than the first palpal

joint, and the suture between the third and fourth palpal joints is hardly discernible; the labella have the same honeycombed structure and the same taste-hairs as in *E. barnardi*.

Genitalia much resembling those of *E. barnardi*, but those of the male at least showing good specific differences (see figure); the female appears to have only one spermatheca, which is feebly chitinized; *E. barnardi* and *E. capensis* each have three spermathecæ, those of *E. barnardi* being feebly and those of *E. capensis* strongly chitinized. It seems very remarkable that such differences should occur within the limits of one genus. The ovipositor resembles that of *E. barnardi*, the taste-hairs being more numerous than in *E. capensis*.

Front tarsi: first joint nearly as long as the three following together; second and fifth equal in length and



Elporia spinulosa, sp. n. Male genitalia from above.

rather longer than the third or fourth. Middle tarsi shorter than the front or hind pair, the first joint barely longer than the next two together; second, third, and fourth gradually decreasing in size; fifth as long as the second and third together. Hind tarsi: first joint almost as long as the remaining four together; second, third, and fourth gradually decreasing in length, fifth as long as the second. Male claws very similar to those of *E. capensis*, but the swollen basal part is not quite so hairy and the bare apical part is rather longer and straighter; the female claws, on the other hand, are long, thin, and straight, like those of *E. barnardi*, but are perfectly smooth.

Venation, as far as discernible, like that of *E. barnardi*.

As will be seen from the above description, the male is readily distinguishable from that of *E. barnardi*, but the

females of the two species are very similar. The female of the new species differs chiefly in the somewhat narrower front, in the fourth antennal joint being somewhat shorter than the fifth and following joints, and in the perfectly smooth claws *.

Pupa.—Closely resembles that of *E. barnardi*; I can detect no differences.

Larva.—Resembles that of *E. barnardi* in its two-jointed antennæ; its hairy but spineless lateral "pseudopodia," bifid at the tip beneath; its five-branched gill-tufts; its four spherical, equal-sized, anal papillæ; and in the absence of any distinct knobs bearing the two pairs of long hairs on the anal segment. It differs from both *E. barnardi* and *E. capensis* in the extremely numerous short, thick, black spines on the dorsal surface. These spines are arranged as follows:—The cephalic segment, behind the horny head-plates, has four more or less regular transverse rows of them, about fifteen in each row; behind the fourth row is a transverse bare area, then a patch of about forty spines, about half of which are in the middle third, the remainder being rather smaller and scattered over the lateral thirds. The five intermediate segments each have about fifty to sixty spines, which, again, are most closely placed on the middle third; some of these spines are very slightly larger than the others and occupy the same positions as the spines in *E. capensis* and *E. barnardi*. There are about twenty spines on the terminal segment, which is more evenly rounded than in *E. barnardi*.

XXXVI.—*A new Genus of* Pythidæ (*Coleoptera*) *from the Falkland Islands.* By G. C. Champion, F.Z.S.

Poophylax, gen. nov.

Head short, broad, inserted into the prothorax to near the eyes and obliquely narrowed before them, broadly truncate in front, and excavate on each side behind the short epistoma; eyes small, rounded, convex, laterally projecting; antennæ inserted beneath the cariniform orbits at a little before the eyes; labrum transverse; mandibles exposed at the tip, their

* In my original description of *E. barnardi* I only noted the male claws as having spines on the underside. In reality these spines occur in both sexes, though they are more conspicuous in the male.

apices cleft; mentum strongly transverse; terminal joint of the labial palpi oblong-ovate, narrow, that of the maxillary pair short-ovate, rather stout, and obliquely truncate at the tip; antennæ short, widening outwards; prothorax short-oval, obliquely compressed at the sides posteriorly, finely margined at the base, immarginate laterally; scutellum transverse, subvertical; elytra oval, striato-punctate, the epipleura rapidly narrowed and about reaching the second ventral suture; prosternum well developed anteriorly; anterior coxæ separated by a narrow lamella, the cavities open behind and closed by the narrow sinuous ridge on the front of the mesosternum; metasternum short, the episterna narrow; ventral segments decreasing in length, 4 and 5 subequal; tarsi pilose beneath, rather stout, the ante-penultimate joint excavate to near the base above for the reception of the small narrow penultimate joint, the terminal joint and claws long; wings wanting.

Type, *P. falklandica*.

The single species from which the above characters are taken has been found in numbers (dead) in seeds of tussac-grass, *Poa flabellata* (*Dactylis cæspitosa*), sent from the Falkland Islands for the purpose of attempting to introduce the plant into Scotland.

It may be described as large, pallid, apterous *Salpingus*, Gyll. (*Sphæriestes*, Steph.), with small, convex, laterally projecting eyes, a short, broad, deeply inserted head, and rather stout tarsi, with the ante-penultimate joint deeply excavate above for the reception of the narrow penultimate one. Two allied monotypic genera, *Thalassogeton* and *Chorimerium*, from the Island of South Georgia*, in the S. Atlantic, have been recorded by Behrens (Stett. ent. Zeit. 1887, pp. 18–22, pl.). These S. Georgian insects have the head more exserted than in the present genus, the eyes less prominent, the tarsi simple, the antennæ subfiliform, &c.

Poophylax falklandica, sp. n.

Oblong-oval, somewhat convex, shining, sordid testaceous, the eyes and the tips of the mandibles black, almost glabrous. Head sparsely, irregularly punctate, transversely depressed on the vertex and with two large foveæ in front; antennæ rather stout, about reaching the hind angles of the prothorax, joints 6–10 gradually becoming stouter, 9 and 10 about as broad as long, 11 ovate. Prothorax rather convex, wider than the head, broader than long, narrowed and constricted

* Tussac-grass is also found on this island, according to Skottsberg.

behind, obliquely sulcate on each side before the base, the hind angles obtuse; closely, rather coarsely punctate, usually with an indication of a smooth median line. Elytra moderately long, oval, at the base a little wider than the prothorax, separately rounded at the apex, leaving the tip of the last dorsal segment exposed, the humeri obtuse; coarsely striato-punctate, and with some additional punctures on either side of the suture at the base, the interstices flat, smooth. Beneath closely, finely punctate. Penis-sheath of ♂ long, parallel-sided, abruptly acuminate in the middle at tip.

Length 5–5⅔, breadth 1¾–2 mm. (♂ ♀).

Hab. Falkland Is. (*H. N. Sulivan*).

Numerous specimens, received by the British Museum in July 1915. Dr. M. Cameron, R.N., collected a few Coleoptera in these islands in Dec. 1914, but he did not meet with *P. falklandica*.

XXXVII.—*Rhynchotal Notes*.—LIX. By W. L. Distant.

Homoptera.

Fam. Membracidæ (continued from p. 159).

Xiphistes crassus, sp. n.

Body and legs pale brownish testaceous; tegmina hyaline, the veins pale brownish, about basal two-thirds reflecting the dark abdomen beneath; pronotum with the anterior lateral angles very short, broad, robust, three-sided, slightly directed upwardly and forwardly, their apices broadly, obtusely angulate, moderately centrally, longitudinally carinate, the posterior process tricarinate, its apex a little passing the posterior angle of the inner tegminal margin, posterior margin of the frontal area above face distinctly concave, tibiæ compressed and moderately dilated.

Long. 7 mm.; exp. pronot. lat. process. 3½ mm.

Hab. Mashonaland, Salisbury (*G. A. K. Marshall*).

The salient characters of this species are its elongate form and the short, broad, obtuse, anterior lateral angles of the pronotum.

Basilides bipennis.

Centrotus bipennis, Walk. List. Hom. ii. p. 606 (1851).
Anchon albolineatum, Buckt. Mon. Membrac. p. 216, pl. xlviii. figs. 6 *a*, *b* (1903).
Anchon fuscum, Buckt. Tr. Linn. Soc. Lond. (2) ix. p. 334, pl. xxii. fig. 2 *a* (1906).
Monocentrus albolineatum, Schmidt, Zool. Anz. xxxviii. p. 238 (1911).
Basilides bipennis, Dist. Ann. & Mag. Nat. Hist. (8) xvii. p. 149 (1916).

Hab. W. Africa.

Since placing this species in my genus *Basilides* I have found that Buckton's *Anchon albolineatum* is also a synonym, and must fall accordingly.

As regards the genus, Schmidt (*supra*) inclines to the view (judging from the figure) that Buckton's species is to be included in *Monocentrus*, Melich. (Wien. ent. Zeit xxiv. p. 297, 1905). I have not seen a typical specimen of *Monocentrus*. Melichar placed his genus after *Anchon*, but if Schmidt is right in his determination, then the structure of the pronotum with its anterior processes should ally it to *Leptobelus*, Stål.

Centrochares borneensis, sp. n.

Head, pronotum, and body beneath brownish testaceous; legs testaceous; tegmina ochraceous, base and costal margin brownish testaceous; pronotum punctate, sparsely finely tuberculate, lateral processes obliquely erect, their apices broadened, flattened, slightly recurved; anteriorly convexly rounded, posteriorly truncate, with the apical angle subacute, centrally longitudinally carinate, posterior process undulate, shortly spinous above, distinctly raised and gibbous above scutellum, but deflected to apex of same, and from thence conterminous with tegmina, a strong trilobed erection about two-thirds from base, the apex robust and about reaching tegminal apex; anterior tibiæ moderately dilated.

Long., incl. tegm., 4½ mm.; exp. pronot. lat. process. 4 mm.

Hab. Borneo; Kuching (*R. Shelford*).

Centrochares posticus.

Pterygia postica, Buckt. Mon. Membrac. p. 70, pl. xi. fig. 5 *a* (1901).

Hab. Philippine Islands.

Centrochares bucktoni, sp. n.

Pterygia postica, n. s., ♀?, Buckt. Mon. Membrac. p. 70, pl. xi. fig. 4 *a* (1901).

Hab. Philippine Islands.

Leptocentrus aureomaculatus, sp. n.

Head, pronotum, and scutellum shining black; head and sternum darkly greyishly pilose; femora black, tibiæ and tarsi paler and more castaneous; tegmina subhyaline, pale brownish ochraceous, the veins darker, a large bright ochraceous spot at base; pronotum thickly punctate, the posterior process somewhat slender, tricarinate, impinging on inner tegminal margin at posterior angle and extending beyond it, the anterior lateral processes slender and directed backwardly.

Long. 7–7½ mm.; exp. pronot. lat. process. 5 mm.

Hab. Uganda Prot., Valley of Kafu R., Unyoro, 3400 ft., Kampala Rd., 3500 ft., Ankole-Toro Border (*S. A. Neave*).

Allied to *L. altifrons*, Walk., but with the lateral pronotal processes more slender, less curved, and more straightly directed backward, pronotum more elevated at base, &c. The large bright ochraceous basal tegminal spot is also indicative.

Leptocentrus grossus, sp. n.

Head, pronotum, scutellum, sternum beneath, and legs dark castaneous; tegmina pale bronzy brown, extreme base castaneous, immediately followed by an obscure, pale ochraceous, transverse, macular fascia, veins castaneous; pronotum thickly punctate, strongly centrally, longitudinally carinate, the anterior lateral processes robust, centrally longitudinally carinate, their posterior apices slightly recurved, posterior process tricarinate, its apex passing the posterior angle of inner tegminal margin; legs palely castaneous, somewhat thickly greyishly pilose.

Long. 9–10 mm.; exp. lat. pronot. process. 5½–6 mm.

Hab. Uganda; Entebbe (*C. A. Wiggins and C. C. Gowdey*). Entebbe Forest, 3800 ft., and Buamba Forest, Semliki Valley, 2300–2800 ft. (*S. A. Neave*).

In size allied to *L. limbipennis*, Jacobi, from Ruwenzori, but with the posterior pronotal process much more slender and less undulate, &c.

Centrotypus shelfordi, sp. n.

Head and pronotum black with a dark bluish reflection; body beneath and legs fuscous brown, tarsi brownish ochraceous; tegmina shining castaneous, the costal margin blackish; pronotum thickly punctate, the lateral processes broad, laminate, obliquely upwardly directed, their apices broadly truncate, anteriorly rounded and posteriorly shortly

subacute, apical areas wrinkled, and behind middle strongly transversely carinate, the disk somewhat obsoletely centrally carinate, the posterior process strongly tricarinate, its apex slightly passing the posterior angle of the inner tegminal margin.

Long. 6½ mm. : exp. pronot. lat. process. 6 mm.

Hab. Borneo; Sarawak (*R. Shelford*).

A small well-marked species, the expanse of its broad lateral pronotal processes almost equalling its longitude including tegmina.

Centrotypus taurus, sp. n.

Pronotum bluish black, apical areas of the lateral processes purplish black; face and body beneath thickly, longly, ochraceously pilose; legs castaneous brown, the tarsi more ochraceous; tegmina very pale ochraceous, the apical area castaneous, the costal margin blackish; pronotum thickly coarsely punctate, the lateral processes broad, transverse, slightly recurved, their apical areas laminate, almost impunctate, wrinkled, their apices anteriorly broadly, obliquely rounded, posteriorly shortly subacute, the disk obsoletely centrally carinate, the posterior process strongly tricarinate, its apex subacute and passing the posterior angle of the inner tegminal margin.

Long., incl. tegm., 8½ mm.; exp. lat. pronot. process. 7 mm.

Hab. Siamese Malay States (*Annandale and Robinson*).

Centrotypus siamensis, sp. n.

Head and pronotum bluish black; body beneath and legs dull black; tegmina pale ochraceous, subhyaline, the apical area pale castaneous, the costal area broadly black; pronotum thickly punctate, the lateral processes moderately broad and long, transverse, their apices very slightly recurved, their apical areas very distinctly obliquely impressed, posteriorly transversely carinate, their apices anteriorly rounded, posteriorly broadly subacute, the disk faintly carinate, the posterior process strongly tricarinate, its apex subacute and about reaching the posterior angle of the inner tegminal margin.

Long., incl. tegm., 8 mm.; exp. lat. pronot. process. 5 mm.

Hab. Siamese Malay States, Bulsit Besar (*Annandale and Robinson*).

Allied to *C. latimargo*, Walk., and *C. pactolus*, Buckt.

Centrotypus latimargo.

Centrotus latimargo, Walk. Journ. Linn. Soc. Lond., Zool. i. p. 163 (1857).

Hab. Borneo.

Centrotypus pactolus.

Otinotus pactolus, Buckt. Monogr. Membrac. p. 233, pl. lii. fig. 7 *a* (1903).

Hab. Perak.

Centrotypus tauriformis, sp. n.

Pronotum dark bluish black; face and body beneath thickly greyishly pilose; legs fuscous brown; tegmina pale ochraceous, apical third castaneous, costal area black; pronotum thickly, somewhat coarsely punctate, lateral processes strongly recurved, somewhat slender, excluding bases almost impunctate, convexly narrowing to apices, which are subacute, behind middle strongly transversely carinate, the carination not reaching apex, disk obsoletely centrally carinate, posterior process strongly tricarinate, its apex narrowed and subacute and passing the posterior angle of the inner tegminal margin.

Long., incl. tegm., 9 mm.; exp. lat. pronot. process. 7 mm.

Hab. Java (ex. Buckton Coll.).

A species to be recognized by the somewhat slender, strongly recurved, lateral pronotal processes.

Centrotypus pronotalis, sp. n.

Pronotum bluish black; face and sternum greyishly pilose; abdomen beneath and legs testaceous; tegmina shining ochraceous, the costal and apical areas a little darker and more purplish; pronotum thickly coarsely punctate, the lateral processes gradually narrowing and strongly recurved, their apices subacute, behind middle transversely carinate, the disk faintly carinate, the posterior process strongly tricarinate, its apex almost reaching the tegminal apex.

Long., incl. tegm., 9 mm.; exp. lat. pronot. process. 8½ mm.

Hab. Java (*A. R. Wallace*).

Allied to the preceding species, *C. tauriformis*, but with the lateral pronotal processes longer and more crescented; colour of tegmina quite dissimilar, &c.

Centrotypus perakensis, n. nom.

Centrotypus alatus, Buckt. Monogr. Membrac. p. 237, pl. liv. fig. 2 *a* (1903).

Hab. Perak (*Doherty*).

The *Centrotypus alatus*, Fairm., is well figured, but the locality given (Brazil) is evidently incorrect. The British Museum possesses a typical example. The *Centrotypus alatus*, Buckt., was described from a specimen in my own collection and now contained in the British Museum. This, therefore, required a new name.

Centrotypus aduncus.

Leptocentrus aduncus, Buckt. Monogr. Membrac. p. 236, pl. liii. fig. 6 (1903).

Hab. Philippine Islands; Luzon.

Centrotypus longicornis.

Centrotus longicornis, Vuillef. Ann. Soc. Ent. Fr. (4) iv. p. 142, pl. i. fig. 8 *a* (1864).

Centrotypus longicornis, Griffini, Soc. Ital. Scien. Nat. liv. p. 7, fig. (1915).

Hab. Borneo; Sarawak (*J. E. A. Lewis*).

The British Museum now possesses a single (somewhat damaged) specimen of this very rare Membracid, the original type of which has been recently minutely and excellently redescribed by Dr. Achille Griffini.

Lestarches, gen. nov.

Allied to *Centrotypus*, Stål, but differing principally by the structure of the posterior pronotal process, which is broad, very distinctly carinate, distinctly moderately convex beyond scutellum, its apex subacute and distinctly deflected over the posterior angle of the inner tegminal margin; disk and front of pronotum strongly centrally longitudinally carinate.

Type, *L. forticornis*, Walk.

Lestarches forticornis.

Centrotus forticornis, Walk. Journ. Linn. Soc. Lond., Zool. vol. x. p. 185 (1868).

Hab. Celebes.

Emphusis agnatus, sp. n.

Head, pronotum, body beneath, and legs dark purplish brown; tegmina pale shining ochraceous, extreme base and costal area dark purplish brown, apical area more or less tinged with castaneous; pronotum very coarsely punctate, finely, centrally, longitudinally carinate, posterior process tricarinate, only slightly elevated above scutellum, and then continuously impinging on inner margin of tegmina to a little before tegminal apex, disk of pronotum crescented in form, the lateral processes broad and prominently directed backwardly, in a line with the lateral pronotal margins.

Long. 10 mm.; exp. lat pronot. process. 6 mm.

Hab. Siam; Chantaboun (*M. H. Mouhot*).

Dacaratha, gen. nov.

Allied to *Emphusis*, Buckt., but pronotum less regularly crescented in form, its frontal area shorter and strongly centrally carinate, the posterior process undulate and distinctly elevated above scutellum, the apical area upwardly directed beyond the posterior angle of the tegminal inner margin, the anterior lateral processes much more angulately and less crescently produced.

Type, *D. nyasana*, Dist.

Emphusis appears to be confined to the Oriental and Malayan regions; *Dacaratha* at present is only known from Central Africa.

Dacaratha nyasana, sp. n.

Head, pronotum, and scutellum black; body beneath and femora black, tibiæ and tarsi dark castaneous; anterior and lateral areas of sternum greyishly pubescent; tegmina subhyaline, wrinkled, base black, outwardly obscurely margined with dull ochraceous, apical area more or less bright testaceous; pronotum thickly, finely punctate, centrally longitudinally carinate, the posterior process tricarinate, convexly raised above scutellum and then impinging on the posterior angle of the inner tegminal margin, and beyond this it straightly continues for a short distance, the lateral pronotal processes short, moderately obliquely angularly directed backwardly.

Long., incl. tegm., 8 mm.; exp. lat. pronot. process. 4 mm.

Hab. Near Lake Nyasa (*H. B. Cotterill*).

Periaman wallacei, sp. n.

Pronotum and legs black; an arcuate linear spot beneath the lateral pronotal processes, a large spot on each side of base of posterior process and apices of anterior femora ochraceous; face and body beneath thickly greyishly pilose; tegmina pale bronzy subhyaline, base and costal marginal area—extending to apex—black; pronotum coarsely punctate, the disk strongly centrally carinate, the lateral processes moderately well produced, slightly recurved, centrally carinate, the anterior and posterior margins broadly sublaminate, their apices subacute; posterior process robust, strongly tricarinate, moderately laterally compressed, beyond middle strongly narrowed to apex, which is subacute, and reaching the posterior angle of the inner tegminal margin; femora moderately thickened; face concavely emarginate before clypeus.

Long., incl. tegm., $8\frac{1}{2}$–$9\frac{1}{2}$ mm.; exp. lat. pronot. process. 5 mm.*

Hab. Borneo; Sarawak (*A. R. Wallace*, Brit. Mus.).

Otinotoides, gen. nov.

Allied to *Otinotus*, Buckt., from which it principally differs by the posterior pronotal process, which is more robust, especially at base, where it has a distinct medial carination on each side; it touches the scutellum and then is distinctly moderately convexly elevated, its apical half roundly deflected, its apex slender, subacute, and almost reaching the tegminal apex.

Type, *O. pallipes*, Walk.

Otinotoides pallipes.

Centrotus pallipes, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 185 (1868).
Otinotus pallipes, Buckt. Monogr. Membrac. p. 232, pl. lii. figs. 4, 4*a* (1903); Dist. Trans. Zool. Soc. Lond. xx. p. 356 (1914).
Centrotus tibialis, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 188 (1868).
Centrotus ramivitta, Walk. MS.?
Centrotus semiclusus, Walk. MS.?

Hab. New Guinea, Batchian, Mysol.

Otinotoides semilucidus.

Centrotus semilucidus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 186 (1868).

* In smaller specimen and type; in a second larger specimen these processes are mutilated.

Centrotypus tibialis, Buckt. Monogr. Membrac. p. 238, pl. liv. fig. 3 *a* (1903).

Hab. Waigiou (*A. R. Wallace*).

Otinotoides albidus.

Centrotus albidus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 188 (1868).

Hab. Mysol (*A. R. Wallace*).

Otinotoides brevivittus.

Centrotus brevivitta, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 185 (1868).

Hab. New Guinea (*A. R. Wallace*).

Otinotoides strigatus.

Centrotus strigatus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 184 (1868).
Ophicentrus curvicornis, Buckt. Monogr. Membrac. p. 250, pl. lvii. fig. 3 *a* (1903).
Eufrenchia strigata, Dist. Ann. & Mag. Nat. Hist. *ante*, p. 153.

Hab. New Guinea.

I had previously included this species in the Australian genus *Eufrenchia*, to which it had considerable affinity. Having now founded the genus *Otinotoides* for a number of Papuan species, it finds a natural position within it.

Gondopharnes, gen. nov.

Pronotum not prominently raised, the lateral processes moderately robust, their apices more or less recurved and subacute, centrally longitudinally carinate, posterior process broad, laterally compressed, tricarinate, sinuous, at base almost touching the scutellum and then impinging on the tegmina, its apex longly narrowed and acute, convexly deflected, and reaching the tegminal apex; tegmina with three large apical cells.

Type, *G. piceus*, Walk.

A genus to be placed near *Otinoides*, Dist.

Gondopharnes piceus.

Centrotus piceus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 187 (1868).

Hab. Batchian (*A. R. Wallace*).

Genus Tricoceps.

Tricoceps, Buckt. Monogr. Membrac. p. 249 (1903).
Tambusa, Dist. Insect. Transvaal. p. 216 (1908), nom. præocc.
Tambusana, Dist. Ann. & Mag. Nat. Hist. (8) ix. p. 652 (1912), n. nom.

Type, *T. brunnipennis*, Germ.

I did not recognize Buckton's genus at the time, as his figure of the typical species is defective, and he gave no reference as to its origin ; he also placed it in juxtaposition to a genus with which it had no affinity.

Tricoceps brunnipennis.

Centrotus brunnipennis, Germ. Rev. Silb. iii. p. 257. 4 (1835) ; Fairm. Ann. Soc. Ent. Fr. ser. 2, iv. p. 512 (1846).
Tricoceps brunneipennis, Buckt. Monogr. Membrac. p. 249 (1903).

Hab. S. Africa.

Buckton gave a different spelling to the specific name and no reference to its author.

Tricoceps bubipennis.

Centrotus bubipennis, Fairm. Ann. Soc. Ent. Fr. ser. 2, iv. p. 511 (1846) ; Stål, Hem. Afr. iv. p. 95 (1866).
Tambusa bubipennis, Dist. Insect. Transvaal. p. 216, tab. xxi. fig. 17 (1908).

Hab. S. Africa.

Tricoceps curvispina, sp. n.

Body and legs black ; tegmina bronzy brown, base and a costal line black, a large spot at posterior angle of inner tegminal margin castaneous ; pronotum thickly punctate, anterior lateral processes recurved, somewhat long, their apices subacute, the disk strongly centrally carinate, the posterior process tricarinate, strongly raised at base and then straightly obliquely continued to posterior angle of inner tegminal margin, which it distinctly passes, its apex subacute ; scutellum with its apex prominently upwardly recurved.

Long., incl. tegm., 5–6 mm. ; exp. lat. pronot. process. $3\frac{1}{2}$–4 mm.

Hab. Congo Free State ; Katanga, Kambove, 4000–5000 ft. (*S. A. Neave*).

Allied to *T. brunnipennis*, Germ., but with the lateral pronotal processes longer, much more recurved, and considerably more acute.

Centrotus borinus, sp. n.

Head, pronotum, scutellum, body beneath, and legs black, a white spot at each basal angle of the scutellum; sternum largely whitely tomentose; tegmina subhyaline, wrinkled, the veins castaneous, the base black, the apical area pale bronzy brown; pronotum wrinkled and punctate, centrally longitudinally carinate, the anterior lateral processes somewhat slender, centrally carinate, and distinctly recurved, their apices subacute, posterior process tricarinate, very slightly elevated above scutellum and from thence recurved and impinging on tegmina, its apex passing the posterior angle of the inner tegminal margin.

Long., incl. tegm., 7–7½ mm.; exp. lat. pronot. process. 4½–5 mm.

Hab. Uganda; Kadungurn, East. Province (*C. C. Gowdey*). Brit. E. Africa; Mumias Distr. (*A. D. Milne*).

Allied to *C. bantuantus*, Dist., but is to be separated from that species by the strongly recurved lateral pronotal processes, &c.

Centrotus shoanus, sp. n.

Pronotum, body beneath, and femora dark ferruginous brown; tibiæ and tarsi testaceous; lateral areas of sternum strongly ochraceously tomentose; tegmina subhyaline, strongly wrinkled, venation dull ochraceous, extreme base ferruginous brown; pronotum thickly punctate, the lateral processes moderately short and robust, transverse, their apices obsoletely acute, the disk rather finely centrally carinate, posterior process finely tricarinate, distinctly separate from scutellum, apical area narrowed, the apex subacute and reaching the posterior angle of inner tegminal margin; scutellum with a small spot at each basal angle and the lateral margins ochraceous.

Long., incl. tegm., 8 mm.; exp. lat. pronot. process. 4 mm.

Hab. Abyssinia; Shoa. Collected on the mission of Sir W. C. Harris to Shoa.

Centrotus matangensis, sp. n.

Head, pronotum, and scutellum black; scutellum with a dark (sometimes pale) ochraceous spot in each basal angle; pronotal front, face, and legs dark purplish; lateral areas of sternum and abdomen beneath palely ochraceously tomentose; tegmina purplish brown; pronotum punctate and coarsely granulate, centrally longitudinally carinate,

the anterior lateral processes robust, broad, directed outwardly and a little upwardly, their apices subtruncate; posterior pronotal process tricarinate, impinging on tegmina immediately beyond scutellum, gradually narrowing to apex, which is subacute, and passing posterior angle of inner tegminal margin.

Long. 8½ mm.; exp. lat. pronot. process. 5 mm.

Hab. Borneo; Mt. Matang (*R. Shelford*).

Centrotus albilatus.

Centrotus albilatus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 184 (1868).

Hab. New Guinea.

Genus Tshaka.

Tshaka, Dist. Insect. Transvaal. pt. ix. p. 214 (1908).

Tshaka undulatus, sp. n.

Head, pronotum, scutellum, and body beneath black; legs more or less castaneous, the tarsi ochraceous; tegmina flavescent, the veins darker, especially on the apical area, base and a small costal spot beyond middle black, a small castaneous spot at posterior angle of the inner tegminal margin; pronotum strongly, centrally, longitudinally carinate, the posterior process tricarinate, undulate, impinging on tegmina before the posterior angle of the inner tegminal margin, and then recurved and running almost parallel with it to beyond the posterior angle, the apex subacute; lateral pronotal processes robust, their apices slightly recurved and subacute; scutellum about as broad as long, its apex bispinous.

Long. 5 mm.; exp. pronot. process. 4 mm.

Hab. Mashonaland; Salisbury (*G. A. K. Marshall*).

Allied to *T. naturalis*, Dist., from the Transvaal, but with the posterior pronotal process shorter, more robust, more convexly arched over the scutellum, and the apical area more recurved; tegmina shorter and proportionally broader.

Platybelus escalerauus, sp. n.

Head, pronotum, scutellum, body beneath, and legs blackish brown; a pale spot at each basal angle of the scutellum; tegmina subhyaline, apical margin ochraceous,

basal area and two transverse fasciæ (one near middle broad and straight, the other narrower and curved before apex) purplish brown; pronotum thickly punctate, strongly centrally, longitudinally carinate, the lateral processes recurved, gradually narrowing to apices, which are acute, posterior process above finely serrate, robustly raised at base, and downwardly convexly curved above scutellum and to a little beyond its apex, and then again recurved to apex, which extends beyond the posterior process of inner tegminal margin.

Long. 7 mm.; exp. lat. pronot. process. 4 mm.

Hab. Cameroons (*Escalera*, Brit. Mus.).

Allied to *P. flavus*, Sign., but with the posterior pronotal process more slender and with its basal angle more pronounced; lateral pronotal processes also more slender and their apices distinctly and regularly acute.

Platybelus gowdeyi, sp. n.

Allied to the preceding species *P. escalerauus*, but with the lateral pronotal processes considerably more slender and a little more directed backwardly; tegmina ochraceous, with the basal and costal areas black; base of posterior pronotal process more obliquely raised.

Long. 7 mm.; exp. lat. pronot. process. 4 mm.

Hab. Uganda: Mabira Forest (*C. C. Gowdey*).

Platybelus africanus, sp. n.

Head, pronotum, body beneath, and legs black or blackish brown; disk of pronotum with a slender waved greyish line on each lateral area and a similarly coloured small linear spot at each basal angle of the scutellum; tegmina dark ochraceous, base and a spot at posterior angle of inner tegminal margin castaneous, a very obscure pale transverse macular fascia beyond middle; pronotum thickly punctate, the lateral processes as in the two preceding species, but with their apices less regularly convexly recurved; the posterior process is also more robust and its base more obliquely raised.

Long. 7; exp. lat. pronot. process. $4\frac{1}{2}$ mm.

Hab. Cameroons (*Escalera*, Brit. Mus.). Uganda Prot., Buamba Forest, Semliki Valley, and Budongo Forest, Unyoro (*S. A. Neave*).

Platybelus flavus.

Centrotus flavus, Sign. in Thoms. Arch. Ent. ii. p. 339 (1858).
Platybelus flavus, Stål, Hem. Afr. iv. p. 96 (1866).
Ophiceutrus varipennis, Buckt. Monogr. Membrac. p. 250, pl. lvii. fig. 1 *a* (1903).

Hab. Calabar.

Platybelus insignis, sp. n.

Head, pronotum, scutellum, body beneath, and legs black; tarsi ochraceous; tegmina pale shining ochraceous, the base and a spot on costal margin beyond middle black, a brownish spot on inner margin near posterior angle; pronotum punctate, the anterior margin truncate, the lateral processes robust, their apices recurved and subacute, posterior process arched above scutellum, where it is robust and impinging on inner tegminal margin before the posterior angle, and thence attenuated and recurved to apex, which passes the posterior angle.

Long., incl. tegm., 5 mm.; exp. lat. pronot. process. $3\frac{1}{2}$ mm.

Hab. Near Lake Nyassa (*Thelwall.* Brit. Mus.).

Maurya, gen. nov.

Pronotum very strongly centrally longitudinally ridged, the lateral processes somewhat short, broad, sublaminate, the apical margins oblique, the posterior process impinging on the scutellum and tegmina, laterally broad and sublaminate for about half its length, where it is convex above and then suddenly attenuated to apex, which passes the posterior angle of the inner tegminal margin; face moderately globose; legs simple, not dilated; tegmina with four apical cells.

Maurya gibbosulus.

Centrotus gibbosulus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 187 (1868).

Hab. Macassar (*Wallace*).

Antialcidas, gen. nov.

Pronotum broad, strongly centrally carinate, the posterior process prominently convexly, laminately raised, its margins strongly carinate, the apex shortly acute and not passing the posterior angle of the inner tegminal margin, the lateral angles broad and robust, their apices obliquely truncate,

moderately raised and slightly directed backward, viewed from the front they appear to be obtusely acute; tegmina more than twice as broad as long, strongly wrinkled, four apical cells, the veins straight.

The principal character of this genus is found in the convexly laminately raised posterior pronotal process.

Antialcidas trifoliaceus.

Centrotus trifoliaceus, Walk. List Hom., Suppl. p. 163 (1858).

Hab. North China.

Pantaleon, gen. nov.

Body somewhat short and broad; pronotum strongly, centrally, longitudinally carinate, the lateral angles upwardly raised, their apices angulate and moderately recurved, on their inner margin before apex a strong obtuse spine somewhat upwardly directed, the posterior process strongly laminately subconvexly raised, with the margins robust and thickened, its apex shortly acute and slightly passing the posterior angle of the inner tegminal margin; tegmina not more than twice as broad as long, apical veins four in number, with the veins slightly curved.

Allied to the preceding genus, *Antialcidas*, by the laminately raised posterior pronotal process, but differing in the peculiarly bispined lateral pronotal angles, short tegmina, &c.

Pantaleon montifer.

Centrotus montifer, Walk. List Hom. ii. p. 620 (1851).

Hab. Hong Kong.

Amitrochates, gen. nov.

Head truncately declivous in front, with two strong central ridges, more than twice broader than long; pronotum with the disk elevated, very strongly centrally longitudinally carinate, the lateral angles short and very robust, upwardly directed, anteriorly coarsely serrate, their apices continued in a slender spine a little directed backwardly, at frontal base before eyes distinctly, obtusely, angularly produced, posterior process very robust, strongly undulate, well separated from scutellum, near base shortly strongly globose, then nodulate and strongly directed downward, afterward raised, strongly longitudinally globose and with a long, slender, slightly curved, apical spine which distinctly

passes the posterior angle of the inner tegminal margin; scutellum a little longer than broad, the apex slender and recurved; tegmina about three times longer than broad, apical cells four, preceded by three subapical cells; legs elongate.

Amitrochates grahami, sp. n.

Head, pronotum, and scutellum shining black, a small greyish-white spot at each basal angle of the scutellum, a

Amitrochates grahami, Dist.

similar spot on each lateral margin of the pronotum, and another spot near insertion of tegmina; legs black, tibiæ and tarsi ochraceous, bases of the tibiæ black; abdomen more or less greyish white; tegmina pale hyaline, the basal area black, venation brownish ochraceous, a transverse linear spot at posterior angle of inner tegminal margin, and a marginal costal spot beyond middle pale brownish; pronotum thickly, somewhat coarsely punctate, posterior pronotal process with the upper and lower margins irregularly coarsely serrate; other structural characters as in generic diagnosis.

Long., incl. tegm., 5 mm.

Hab. Ashanti; Obuasi (*Dr. W. M. Graham*). Gold Coast; Aburi (*W. H. Patterson*).

Genus Tricentrus.

Tricentrus, Stål, Hem. Afr. iv. p. 89 (1866); Œfv. Vet.-Ak. Förh. 1869, p. 283; *l. c.* 1870, p. 728; Dist. Faun. Brit. India, iv. p. 53 (1907).
Otaris, Buckt. Monogr. Membrac. p. 249 (1903).
Taloipa, Buckt. Trans. Linn. Soc. Lond. ix. p. 334 (1905).

Tricentrus auritus.

Otaris auritus, Buckt. Monogr. Membrac. p. 249, pl. lix. fig. 1 *a* (1903); Schmidt, Zool. Anz. xxxviii. p. 242 (1911).

Hab. Sumatra.

I cannot separate this species (type of the proposed genus *Otaris*) from the genus *Tricentrus*. The type of *O. auritus* is now before me, and I think that Buckton must have originally described from a mutilated specimen and afterwards obtained a perfect example which he marked as type. I am forced to this opinion, as he writes of the "posterior horn" as "almost obsolete," and, again, "the posterior horn is blunt." The posterior pronotal process is, however, normal, slightly passing the posterior angle of the inner tegminal margin, and its apex is distinctly narrowed and acute. It is, however, a species very broad compared with its length.

Tricentrus basalis.

Centrotus basalis, Walk. List Hom. ii. p. 626 (1851); Matsum. Annot. Zool. Japon. viii. p. 19 (1912).

Hab. China; Hong Kong; Japan.

Tricentrus finitimus.

Centrotus finitimus, Walk. List Hom. ii. p. 628 (1851).

Hab. China; Hong Kong.

Tricentrus caliginosus.

Centrotus caliginosus, Walk. Journ. Linn. Soc. Lond., Zool. i. p. 93 (1857).

Hab. Malacca (*A. R. Wallace*); Singapore (*H. N. Ridley*). Siam Malay States; Biserat (*Annandale & Robinson*). Malay Archipelago; Bali (*W. Doherty*).

Tricentrus femoratus.

Centrotus femoratus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 186 (1868).

Hab. Celebes; Macassar (*A. R. Wallace*).

Tricentrus congestus.

Centrotus congestus, Walk. Journ. Linn. Soc. Lond., Zool. x. p. 187 (1868).

Hab. Sula (*A. R. Wallace*).

Genus Sipylus.

Sipylus, Stål, Hem. Afr. iv. p. 89 (1866).

Sipylus dilatatus.

Centrotus dilatatus, Walk. List Hom. ii. p. 630 (1851).
Sipylus nodipennis, Funkhous. Journ. Ent. & Zool. (Pomona College, Calif., U.S.A.) vi. p. 72, fig. 5 (1914).

Hab. Philippine Islands.

Walker described his species as having the "fore wings greyish, ferruginous at the base; veins ferruginous, nodose," whereas in his type the tegmina are also very distinctly ferruginous on the apical areas, as in Funkhouser's figure.

XXXVIII.—*On some of the External Structural Characters of the Striped Hyæna* (Hyæna hyæna) *and related Genera and Species.* By R. I. Pocock, F.R.S.

This paper is based primarily upon the carcase of a female example of *Hyæna hyæna*, from India, which died in the Zoological Society's Gardens in Dec. 1915. Of the other species of Hyænas I have seen no fresh specimens; but in 1908 I made some sketches of the anal pouch and glands of an example of *Proteles cristatus*. These I take the opportunity of reproducing. Unfortunately, no notes were made of other external features of this animal.

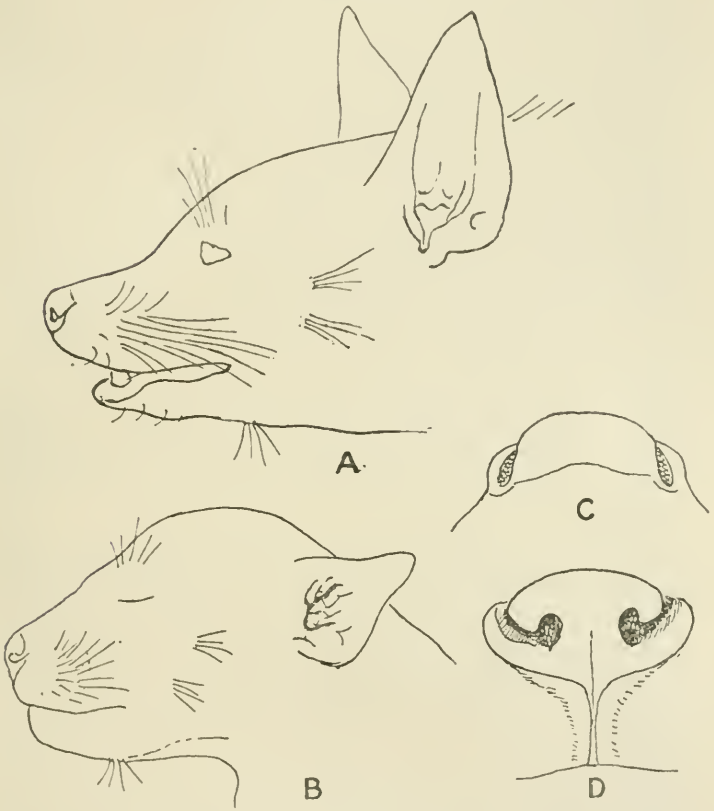
The Facial Vibrissæ and Rhinarium.—The facial vibrissæ of *Hyæna hyæna*, as in all Æluroid Carnivora, except the Felidæ *, consist of the normal number of tufts—namely, the mystacial, superciliary, two genals, and the interramal. The latter consists of about four well-developed bristles, and each of the two genal tufts of approximately the same number. These tufts are set rather close together near the middle of the cheek, the inferior of the two being above the posterior corner of the mouth. All the vibrissæ may be described as of medium length and considerable thickness.

In living examples of the Spotted Hyæna (*Crocuta crocuta*) the corresponding tufts of vibrissæ are quite apparent, and on a dried skin of a *Proteles* from South

* In this family the interramal tuft is always absent, as I have elsewhere recorded (P. Z. S. 1914, ii. p. 901).

Africa I find the vibrissæ precisely as described by Flower (P. Z. S. 1869, p. 476)—that is to say, the mystacial, superciliary, and interramal tufts are present; but the upper genal tuft appears to be suppressed, while the lower is

Fig. 1.



A. Head of adult *Hyæna hyæna*, showing the facial vibrissæ and the ear.
B. Head of newly-born cub of the same, showing the facial vibrissæ.
C. Rhinarium of *Hyæna hyæna* from above. $\frac{3}{4}$ nat. size.
D. The same from the front.

represented by a single stiff vibrissa. Supplementing Flower's account, I may add that the mystacial vibrissæ are unusually thick for a terrestrial mammal of the size of

Proteles, being actually as thick as those of the Hyænas, thus recalling the stiff vibrissæ of predatory aquatic or amphibious mammals like *Cynogale* or the Seals.

The rhinarium is large, naked, and nearly smooth. From the front its upper edge is evenly and lightly convex from side to side. Its lower half is marked by a groove ascending to a point midway between the two nostrils and continuous inferiorly with the cleft dividing the upper lip. The infranarial portion on each side is deep and its lower edge curves obliquely upwards and outwards, overlapping laterally to a considerable extent the internal rim of the narial slit above. In profile view the upper anterior margin is rounded and not prominent. From the dorsal aspect, the naked portion, measured from the inner margins of the narial slit, is rather more than twice as wide as long ; its antero-lateral margin is convex from side to side, and, as stated above, is considerably overlapped externally by the naked margins of the narial slits. It may be added that the height of the upper lip in the middle line is about two-thirds the height of the middle line of the rhinarium above it.

The rhinarium of *Crocuta* appears to be similar to that of *Hyæna*; and the same applies to *Proteles*, except that Flower described the anterior orifices of the nostrils as "turning upwards." In the hyænas they look straight forwards.

Ears.—A detailed description of these organs has been rendered unnecessary by the exact account of them published by Boas*. The principal point to notice is the complete absence of the marginal bursa found in all other Æluroids, except the mongooses. Boas considers the bursa to be represented by a shallow depression on the postero-inferior portion of the surface of the pinna, rather nearer to the auditory cavity than to the posterior edge of the pinna and a little below the level of the supratragal ridge (*plica principalis* of Boas). There is nothing particularly remarkable about this ridge, which follows the usual longitudinal course and exhibits a swelling near the middle of its length. The antero-internal ridge descends as a long crest with a sinuous edge, but without definite enlargements of any kind, and disappears inferiorly behind the much shorter antero-external or tragal ridge. The inferior orifice of the ear is a small notch bordered in front by the tragus and behind

* 'Ohrknorpel und äusseres Ohr der Säugethiere,' pp. 145-146, pl. xxi. fig. 223 (1912).

by the antitragus, the inferior prominence of the postero-external ridge which ascends obliquely upwards and backwards. The postero-internal ridge is well developed, but there is no definite supplementary ridge on the pinna outside the lower end of the postero-external ridge.

The interesting point connected with the ear of the hyæna is the absence of the marginal bursa, a feature which suggests affinity with the mongooses. But the arrangement of the main cartilages of the ear is not in the least like that of the mongooses, and differs in no important respects from the arrangement seen in other Æluroidea.

There is nothing in Flower's account of the external ear of *Proteles* to distinguish it from that of the Striped Hyænas, if, as appears tolerably certain, he was describing in the following passage the depression regarded by Boas as the homologue of the marginal bursa:—"The hinder edge [of the ear] is produced near the base into a slight 'lobule' with a hollow on its inner side, separated from the 'concha,' or main cavity of the pinna, by a well-marked ridge."

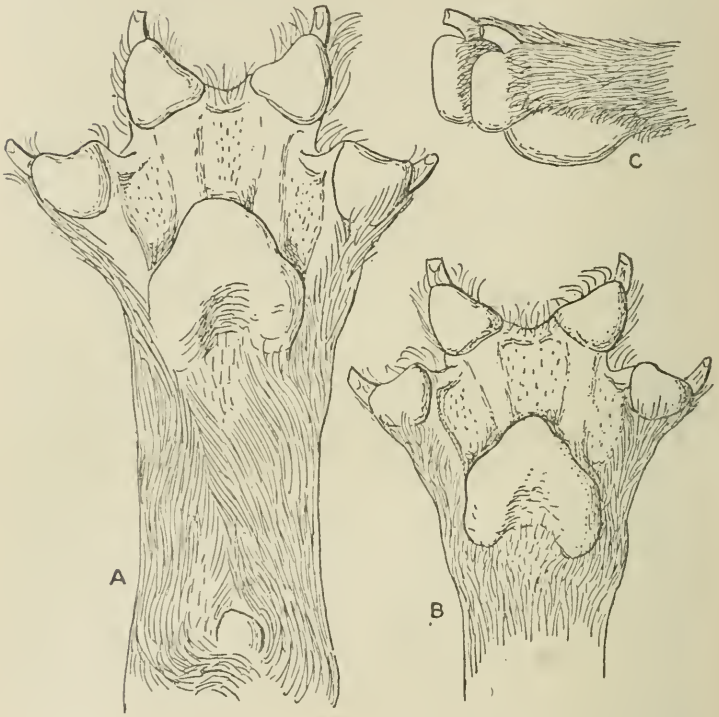
Feet.—Certain characters in the feet of hyænas, such as the complete absence of the pollex and also of the hallux, the shortness and bluntness of the unretractile claws, have often been described; but it does not appear that the feet have ever been figured or described in detail, and, since they differ somewhat remarkably in certain points from the feet of all other Æluroidea that I have examined, it may be useful to supply the defects above alluded to. In the fore foot the pads are smooth. The plantar pad is cushion-like and trilobed; but the lobes are ill-defined marginally and are not marked by superficial grooves. It is comparatively long and narrow*, its length being approximately equal to its width. In the middle line posteriorly it is depressed and obliquely corrugated, and its posterior border is emarginate.

The digital pads, which like the plantar pad are smooth, show several peculiarities. In the first place, the plane of the lower surface of each is approximately at right angles to the long axis of the foot when the latter is in the lying position. This indicates the extreme of digitigradism exhibited in the Æluroidea. Another peculiarity is their shape. Instead of being elliptical, or approximately so, in outline as in most Æluroidea, their shape may be described as irregularly semi-conical. The posterior margin of each is truncated, the external margin lightly convex, and the internal

* In the newly born cub this pad is much broader than in the adult.

margin lightly concave. They narrow somewhat rapidly from the base to the apex, and the infero-internal angle is prominent. The digits are very symmetrical, and compactly united by strong webbing extending up to the proximal end

Fig. 2.



A. Right fore paw of *Hyæna hyæna* from below, with the digits fully spread. ½ nat. size.
B. Right hind paw of the same.
C. Right hind paw from the side, showing the vertical plane of the digital pads.

N.B.—In figs. A and B the digital pads are drawn diagrammatically in the same plane as the plantar pad to show their shape. Naturally, they only assume this position by great muscular contraction.

of the digital pads. The underside of the sole of the foot between the digital and plantar pads is naked, but the webs are marked with scattered speckling, showing the position

of hair-follicles in the skin. The upperside of the webs is naked and the tips of the digits carry long hairs, some of which spread on to, and to a slight extent beneath, the edge of the web joining the third and fourth digits together.

The carpal pad is small, nearly hemispherical, and set almost in the middle line a long distance above the plantar pad. The area between the carpal and plantar pads is covered with hairs, which arise in two streams above the carpal pad, encircle it, and converge to a line passing between that pad and the postero-external angle of the plantar pad. Just above the plantar, to a point nearly midway between it and the carpal pad, the skin is scantily hairy and there is a similar scantily hairy area on the inner side and in front of (below) the carpal pad.

The hind foot is very similar to the front foot, but is shorter and narrower, and the hairs above the plantar pad run in a continuous downward direction; but there is here also a scantily hairy area just above that pad in the middle line.

In rigidity, compactness, and in the shape and uptilting of the digital pads, as well as in the shortness and bluntness of the claws, the feet of hyænas resemble those of the Canidæ, generally speaking, rather than of other Æluroidea. In the latter the plane of the digital pads, which are almost always elliptical in outline, is usually the same as that of the plantar pad when the foot is in the lying position.

The feet of *Crocuta* seem to be quite like those of *Hyæna*; and the same applies to the feet of *Proteles*, except for the presence of the pollex, which is situated halfway between the wrist-joint (carpus) and the tips of the other digits, and of a patch of naked skin on the heel, which Flower considered to be normal and not due to wear. It may be particularly noticed that this author stated:—"The animal appears to be perfectly digitigrade." There is, however, one point connected with the feet of *Proteles* to which Flower did not allude. In the skin of a South African specimen, the area between the plantar and digital pads is covered tolerably thickly, though not so thickly as the rest of the foot, with short hair, and the upperside of the webs is also hairy. In this particular the feet of *Proteles* differ from those of all the hyænas, judging from skins of the Striped, Brown, and Spotted species in the Zoological Society's collection.

Anal Pouch and Glands.—These structures have been described by several authors in the three existing species of hyænas. Murie's account of the pouch in *Hyæna brunnea*

and Watson's in *Crocuta crocuta* agree closely with that of Daubenton in *H. hyæna* ; and my observations in connection with the latter species are quite in accord. In *Crocuta*, however, the skin of the pouch is said by Watson to be partially hairy, whereas in *Hyæna* it seems to be quite smooth.

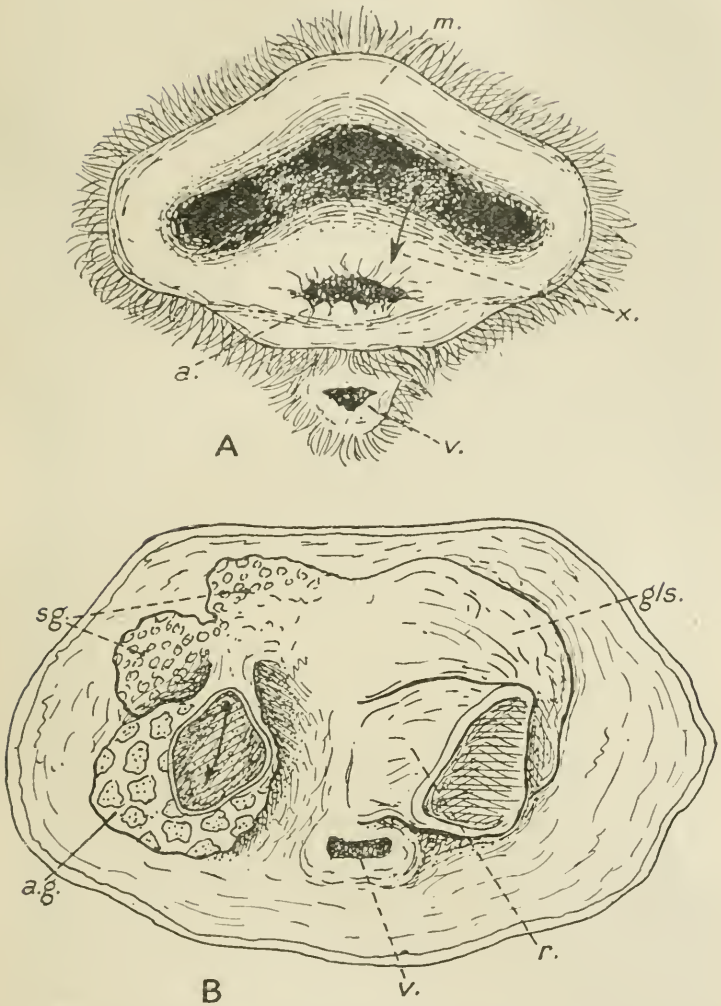
When the tail is lowered, the walls of the pouch are in close apposition and its orifice appears as a curved slit above the anus, the concavity of the curve being downwards. It has a thickened rim, the inferior portion of which is continuous with the naked skin above the anus. Thus the orifices of the pouch and of the anus lie one above the other in a large disk of naked skin surrounded by hair, the hair in the middle line below forming a narrow strip above the vulva. The skin of the disk is very soft and pliable, and the pouch is susceptible of considerable dilatation. The orifices of the anal glands lie deeply within it, one on each side of, but not close to, the middle line. They are thus far removed above the anal orifice, a condition not known, so far as I am aware, in any other Carnivore, though foreshadowed in some mongooses, e. g. *Cynictis*.

In the newly-born young the pouch is well developed and in the same position as in the adult, but the orifice of the pouch is transverse with the two ends slightly upcurved, instead of downcurved, and this orifice and the anus are sunk in a common depression near the centre of the anal disk.

Mivart, perhaps (but not certainly) correctly, cites the presence of an anal pouch as evidence of affinity between the hyænas and the mongooses. There is, however, considerable difference between the pouches in the two groups. In the mongooses the anus opens near the centre of the pouch, which, apparently in these animals, represents the entire anal disk in the hyænas ; and the margins of the pouch close right over the anus when the pouch is closed. In the mongooses, moreover, the orifices of the two anal glands open into the pouch tolerably near the anus, and not very far above it and remote from it as in the hyænas.

As Murie (Tr. Zool. Soc. vi. p. 305, pl. lxiii.) described in the case of *Hyæna brunnea*, the anal glands are enveloped in muscular tissue ; but the glands in *H. hyæna* differ from those of that species in the following particulars. In *Hyæna brunnea* it appears that the normal anal gland found in all Æluroid Carnivores is tripartite. At all events, Murie figured three closely juxtaposed saccular glands, each with a separate compartment for storage of the secretion, which makes

Fig. 3.



A. Anal pouch of female *Hyæna hyæna*, partially distended. *v.*, vulva; *a.*, anus; *x.*, arrow indicating bristle passed through orifice of duct of anal gland; *m.*, upper margin of anal pouch.

B. The same cut away and seen from its inner aspect, with the principal glands dissected out on the right side. *ag.*, saccular or flask-shaped anal gland, with its upper wall cut away to show the orifice of the duct, with arrow indicating a bristle passed through it from the pouch; *sg.*, auxiliary glandular mass; *gls.*, mass representing the glands enveloped in muscular and connective tissue and fat; *v.*, vagina in section; *r.*, rectum cut short and turned aside.

its way to the exterior along a narrow passage—the three passages converging and fusing to form a common duct opening to the exterior within the anal pouch. In the example of *Hyæna hyæna*, on the contrary, the normal anal gland is piriform and saccular and undivided, and opens at its narrow end by a small duct into the anal pouch. Close to its narrow end, externally and in front, there is a large, double, supplementary, glandular mass, which differs from the flask-shaped or piriform gland in containing no cavity and no definite duct. The secretion from this gland makes its way into the anal pouch by means of a number of minute orifices scattered over the wall of the pouch adjacent to the orifice of the duct of the piriform gland, which unmistakably corresponds to the normal anal gland of other Carnivora.

According to Murie, therefore, *H. brunnea* has a single pair of anal glands, each subdivided into three compartments, the passages from which join to form a common duct, and there are no accessory glands; whereas in *H. hyæna* there is a single pair of simple undivided anal glands, each being accompanied by an accessory mass of enlarged cutaneous glands opening into the anal pouch by numerous small apertures. Considering the tolerably close resemblance in other respects between the two species, this difference is full of interest.

Judging from Watson's account of these glands in *Crocuta crocuta* (P. Z. S. 1877, p. 369, pl. xli. and 1878, p. 416, pl. xxv.), there is also a single pair of piriform anal glands in the Spotted Hyæna, and these are connected along the lower portion of the pouch by a band of accessory glands opening into the pouch by a "line of perforations."

The very exact and detailed account given by Daubenton (Buffon's Hist. Nat. ix. pp. 287–288, pls. xxvii. & xxviii. 1761) of the glands in the Striped Hyæna agrees closely with my observations upon that species, except that in Daubenton's example the walls of the sack above the rectum were more highly glandular than in my example, and the lateral glandular mass does not appear to have been in any way subdivided.

Mivart (P. Z. S. 1882, pp. 198–199 and 201) summarised the facts recorded by Daubenton, Murie, and Watson by saying "There is an anal pouch with two (*H. striata* = *hyæna*) or three (*H. brunnea*) pairs of anal glands on each side of the rectum; and in one [*H. hyæna*], if not in both, species there is a transverse band of isolated [glandular] follicles at the bottom of the anal pouch" (pp. 198–199); and in *Crocuta* "there is but a single pair of anal glands, one on

each side of the rectum and a transverse band of follicles" (p. 201). Again, when comparing *Proteles* with the hyænas, he remarked: "There is an anal pouch with one pair of anal glands and a supra-anal band of follicles as in *Crocuta*" (p. 203).

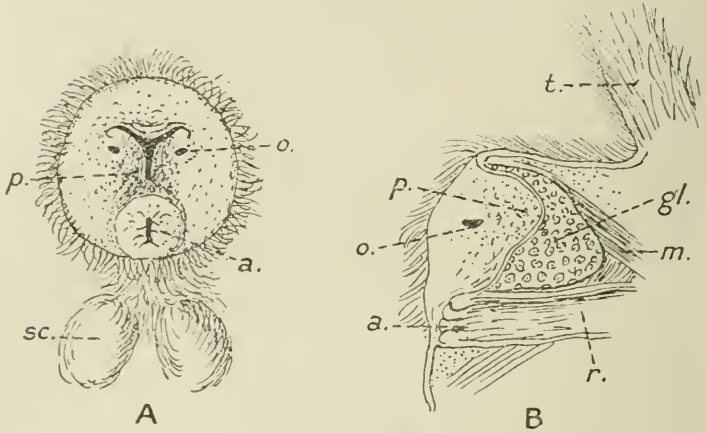
This summary is, however, not very happily worded. In the first place, "the transverse band of isolated follicles" referred to by Mivart in connection with *H. hyæna* appears to be the enlarged cutaneous glands generally distributed over the wall of the sack, between the flask-like glands, which Daubenton described. Judging from Flower's account of *Proteles* (P. Z. S. 1869, p. 495), which Mivart consulted, the corresponding area of the sack is very similarly glandular in that animal; whereas in *Crocuta* alone does it seem that the enlarged glands form a definite and comparatively narrow transverse band running across the sack from one flask-like gland to the other. Watson, at all events, figures it so. In the second place, it is wholly misleading to say that *H. hyæna* has two pairs of anal glands. Like *Proteles* and *Crocuta*, it has but a single pair, corresponding to the saccular anal glands of other Carnivora. What Mivart described as the second pair is the mass of greatly enlarged cutaneous glands of the anal sack, each with a pore to itself, opening upon the surface. These in the aggregate do not constitute an "anal gland," properly speaking, any more than the transverse belt in *Crocuta* constitutes an anal gland. Therefore, since *Hyæna hyæna*, *Crocuta*, and *Proteles* have but a single pair of anal glands, it is in the highest degree probable that *Hyæna brunnea* is similarly supplied, with the difference that each of these glands is tripartite instead of simple.

Probably the correct way of expressing the facts is to say that in the Hyænidæ and *Proteles* the normal pair of anal glands is retained, usually unmodified in form (*H. hyæna*, *Crocuta*, and *Proteles*), but sometimes partially subdivided into three compartments (*H. brunnea*): and that, except in *H. brunnea*, certain cutaneous glands of the anal pouch adjoining the saccular glands are enlarged and active, and emit their secretion by separate pores into the anal pouch—the most highly developed of these form a great mass outside and above the saccular gland on each side (*H. hyæna*) or are arranged in a band between these glands (*Crocuta*).

Enough has been said to show that the anal sack and glands of *Proteles* resemble those of the hyænas tolerably closely: but, since Flower's figure only displays the parts dissected from the dorsal aspect, I take this opportunity of

reproducing two sketches, made many years ago, of the anal disk as it appears from behind, when the tail is raised, and when dissected from the inside. From the first sketch it may be seen that when the disk is slightly spread, the orifice of the pouch is somewhat Y-shaped, the upright branch extending downwards towards the anus and the transverse branches obliquely upwards with their ends curving slightly downwards over the orifices of the anal glands. The disk is carried on a very distinct anal prominence, jutting backwards beneath the tail. A corresponding prominence is well marked in newly-born cubs of the Striped Hyæna, but is hardly so noticeable in the adult.

Fig. 4.



A. Anal pouch of male *Proteles lalandii*, partially distended. *p.*, the pouch with Y-shaped crease, showing its deepest part; *o.*, orifice of right anal gland; *a.*, anus: *sc.*, scrotum.

B. Median vertical section through the anal prominence. *t.*, tail raised; *p.*, anal pouch; *o.*, orifice of left anal gland; *gl.*, left anal gland; *m.*, muscle; *r.*, rectum; *a.*, anus.

The odour of the secretion of the anal glands in *Proteles* is much stronger and more repulsive than in the hyænas. According to a note I made at the time of dissection, the secretion has a "waxy consistency and smells like strong cheese blended with the scent of skunk or pole-cat."

The repulsiveness of the odour, to which several observers have testified, is interesting in connection with the comparative uselessness of the teeth of *Proteles* for defensive purposes; and, considered in connection with the record

that the animal discharges the secretion when attacked *, is suggestive of the use of the secretion for defence to make good the deficiency of the teeth in that respect.

Since the above-given account of the female *Hyæna hyæna* was written, a male of the same species, also from India, has come into my hands. Apart from its sexual organs it agrees with the female in all essential respects.

Although the external sexual organs of the male were described and illustrated by Daubenton, neither his description nor his figures are quite as detailed as is desirable. The following account of them may therefore prove useful :—

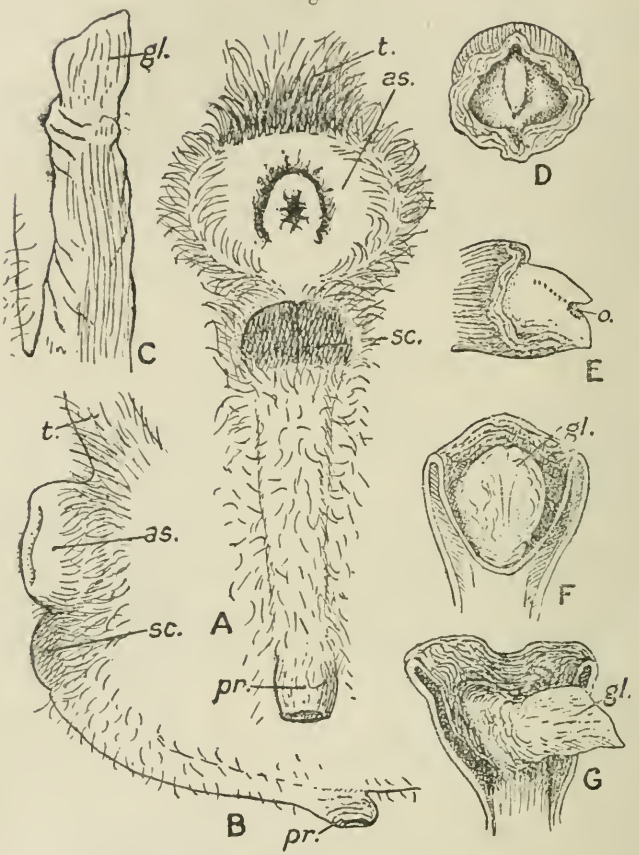
The scrotum (fig. 5, A, B, *sc.*), as in *Crocuta*, is not a prominent or pendulous sack, but consists of an area of naked skin slightly raised above the level of the surrounding integument and marked with a median groove. It looks backwards just beneath the lower edge of the anal sack, and is separated therefrom by a hairy tract of skin. The perineal region beneath the scrotum inclines convexly forwards, and the prepuce forms an excrescence far in advance of the scrotum in approximately the same position on the prepubic area as in the Canidæ and Ursidæ and in some Æluroids, e. g. *Cryptoprocta* and *Paradoxurus*. Dorsally the prepuce is tied closely to the abdominal wall, so that the penis when retracted is in no sense pendulous (fig. 5, A, B, *pr.*).

When the skin of the prepuce is cut along its ventral side and turned over laterally, the glans penis, ovate in outline, is seen lying with it (fig. 5, F, *gl.*). The apex of the glans (fig. 5, C, G, *gl.*) is obliquely truncated, the inferior edge being more prominent than the superior, and has a shallow median orifice formed by a prominent rim of wrinkled or puckered skin, suggesting two labia or lips which can be pulled back on each side of the rigid central portion, and this is provided dorsally with a smooth low ridge, cartilaginous in consistency and ending in a point, beneath which is placed the aperture of the urethra (fig. 5, D, E). As Daubenton observed, the outer wall of the glans is beset with minute recurved spicules.

Owing to the elasticity of the skin of the prepuce (fig. 5, G) and of the tissue of the penis, the latter organ is capable of being drawn out, so that it projects about four

* Quoted by W. L. Sclater, 'Fauna of S. Africa, Mammalia,' i. p. 83 (1900).

Fig. 5.



A. Anal and genital area of *Hyæna hyæna*, ♂, the parts represented as lying in one plane. *t.*, root of tail; *as.*, anal sack, or pouch, with horseshoe-shaped orifice, closed and curving round the anus; *sc.*, scrotum; *pr.*, prepuce, the outline of the penis shown beneath the sparsely hairy skin.

B. The same in profile view, showing the forward curvature of the penis. Lettering as in A.

C. The penis unsheathed, but not quite fully stretched, its ventral side to the right. *gl.*, glans with its obliquely truncated or bevelled apex.

D. Glans penis seen from the end, with its puckered labia partially separated to show the central portion with its median elevation.

E. The same from the side with the labia pulled back below the median portion, with the median elevation apically overhanging the urethral orifice (*o.*).

F. Prepuce cut down the median ventral line and the flaps turned aside to show the glans (*gl.*) *in situ*.

G. The same, with the glans (*gl.*) pulled back and turned aside.

inches beyond the abdominal integument and is then pendulous. The preputial sack is then completely evaginated. When turgid and erected, the organ projects very much farther and resembles that of a horse in a similar condition (fig. 5, C).

I am unable to find any structural difference between the penis of *Hyæna* and that of *Proteles* as described by Flower, and can thus confirm his remark that, judging from Daubenton's account, the male organs in *Hyæna* "are an almost exact counterpart of those of *Proteles*." I have seen no examples of the male of *Crocuta* enabling me to substantiate the small differences between the penis of that genus and *Hyæna*, pointed out by Flower on the evidence of a preparation in the Museum of the College of Surgeons.

Considering the opinion held by some authors that the relationship between the hyænas and mongooses is tolerably close, the difference in the length of the penis and the position of the prepuce in the two groups is remarkable. In the mongooses the prepuce is quite close to the scrotum, as in the Felidæ, and the penis is comparatively short, is provided with a bone, and has an elongated urethral orifice on the underside of the glans, which is simple in structure.

XXXIX.—*Edriophthalma from South America.*

By Alfred O. Walker.

The Crustacea in the following list were received from :—

(A) Sr. Carlos Moreira, Director of the Laboratory of Economic Entomology in the National Museum of Rio de Janeiro, collected by him "on the shore of Capacabana near and outside the harbour of Rio de Janeiro." Of these II., III., VI., and IX. were in considerable numbers, and must have cost the collector not a little time and trouble, especially no. VI., if as active as most of the Talitridæ! The specimens are in excellent condition, reflecting great credit on Sr. Moreira, at whose request examples of each species have been sent to the British Museum (Nat. Hist.).

(B) Monsieur le Prof. Carlos E. Porter, Editor of the 'Chilian Review of Natural History,' Santiago, Chile, collected at Arica, Chile.

Isopoda.

I. ? *Cymodoce truncata*, Leach, 1818, ♂.

1818. *Sphæroma prideauxianum*, Leach. ♀.
1868. *Sphæroma prideauxianum*, Bate & Westwood, Hist. Brit. Sessile-eyed Crustacea, p. 415. ♀.
1868. *Cymodocea truncata*, Leach, Hist. Brit. Sessile-eyed Crustacea, p. 426. ♂.
1873. *Cymodocea truncata*, Hesse, Ann. Sci. Nat. (5) vol. xvii. p. 14, pl. i.
1900. *Exosphæroma prideauxianum*, Leach, Stebbing, Proc. Zool. Soc. London, p. 553.
1905. *Cymodoce truncata*, Leach, H. J. Hansen, "Propagation, Classification, &c. of Sphæromidæ," Quart. Journ. Micr. Sci. xlix. (1) pp. 69–135, pl vii.
1906. *Cymodoce truncata*, Norman & Scott, Crust. Devon and Cornwall, p. 44, pl. iv. figs. 3–14.

As all the specimens collected (about thirty) appear to be immature, the species cannot be identified with certainty; none of them exceeded 5 mm. in length, and no ovigerous females were observed. They agree pretty closely with the form figured by Norman and Scott (*op. cit.* p. 44, pl. iv. fig. 6) and considered by them to be possibly young males. Regarding the specific identity of *Cymodoce truncata* and *Sphæroma prideauxianum*, the references given above may be consulted.

II. *Idothea baltica* (Pallas). Rio de Janeiro.

A large number of specimens, very variable in colour, marking, and size. Females with ova measure from 6 mm. to 10 mm. in length. This is a cosmopolitan species: for localities and synonyms see "Isopods of N. America," Miss H. Richardson (Bull. U.S. Nat. Mus. no. 54, 1905, p. 364).

Amphipoda.

III. *Nototropis minikoi* (A. O. Walker). Rio.

1905. *Paratylus minikoi*, A. O. W., Gardiner, Fauna Mald. Laccad. vol. ii. p. 925, fig. 141.

In quantity: previously recorded only from the lagoon of the island Minikoi, one of the Maldives.

IV. *Elasmopus rapax,* Costa. Rio and Arica (var.).

A few—male, female, and young.

A very widely distributed species.

In connection with this may be mentioned a form received from Prof. Carlos E. Porter, of Santiago, Chile, and collected

Elasmopus rapax, var. *dentipalma.* Second gnathopod, adult ♂.

at Arica, which I can only regard as a variety of the above. The female and young male do not differ from *E. rapax,* nor does the adult male except in the second gnathopod, of which the following is a description :—Side-plates irregularly rounded, rather small. Hind lobe of fifth joint not projecting beyond hind margin of sixth, densely setose. Sixth joint: hind margin about half as long as the palm, which is defined

by a strong tooth ; on the inner side near the hinge of the dactylus is a broad irregularly rounded tooth, below which is another similar to that defining the palm but larger. On the outer side, opposite to the rounded tooth and projecting beyond it, *is a long curved tooth with rounded apex* (as in figure, p. 345), the dactylus when closed lying between the two teeth. Length of adult male 9 mm. It may be called var. *dentipalma*. Specimens in the British Museum (Nat. Hist.).

V. *Mœra inæquipes* (A. Costa). Arica.

Three specimens.

VI. *Orchestoidea brasiliensis* (Dana). Rio.

In quantity. Length of female with ova 10 mm.

VII. *Orchestia chiliensis*, M.-E. Arica.

Many. Length of large ♂ 20 mm.

VIII. *Hyale grandicornis* (Kröyer). Arica.

About twelve.

IX. *Hyale media* (Dana). Rio.

Many.

X. *Amphithoë intermedia*, A. O. Walker. Rio.

Seven.

Widely distributed: Ceylon, Indian Ocean, Gambier Islands *, S. Africa.

XI. *Caprella scaura*, Templeton. Rio.

Caprella attenuata, Dana [from Rio de Janeiro], Mayer, Die Caprelliden, p. 67, figs. 24, 25.

Caprella scaura, Temp., Mayer, Caprellidæ 'Siboga' Exped. p. 117, pl. v. figs. 13–18.

Six specimens.

* Chevreux, Mém. Soc. Zool. de France, vol. xx. 1907, p. 515, fig. 29.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 1st, 1915.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

The PRESIDENT exhibited lantern-slides lent by Prof. ELLIOT SMITH to illustrate the fossil human skull found at Talgai, Darling Downs, Queensland, in 1914. The specimen was brought to the notice of the British Association in Sydney by Prof. T. W. Edgeworth David, and would shortly be described by him and Prof. Arthur Smith. It was obtained from a river-deposit in which remains of *Diprotodon* and other extinct marsupials had already been discovered, and there could be no doubt that it belonged to the Pleistocene fauna. It therefore explained the occurrence of the dingo with the extinct marsupials. The skull is typically human and of the primitive Australian type, but differs from all such skulls hitherto found in possessing relatively large canine teeth, which interlock like those of an ape. The upper canine shows a large facet worn to its base by the lower premolar. The discovery of the Talgai skull is, therefore, an interesting sequel to that of Mr. Charles Dawson's Piltdown skull, in which the canine teeth are even more ape-like.

The thanks of the Fellows present were accorded to Prof. Elliot Smith.

MISCELLANEOUS.

Pareiasaurian Nomenclature.

To the Editors of the 'Annals and Magazine of Natural History.'

SIRS,—Mr. D. M. S. Watson published a paper in the Ann. & Mag. Nat. Hist. for July 1914, "On the Nomenclature of the South African Pariasaurians," in which he revises the names at present in use.

The trouble arises mainly from the fact that Owen's type-skull of *Pareiasaurus serridens* is lost, and we have only a bad cast and a fragment of lower jaw. In the British Museum are one nearly perfect and two imperfect skeletons which have been referred to *Pareiasaurus* by every previous worker. The skeletons found in Russia and others in South Africa have also been hitherto referred to *Pareiasaurus*.

Watson has discovered in the British Museum a number of

portions of the posteranial skeleton of what appears to be the original type; and as there is evidence of the presence of large dorsal scutes, he proposes to remove most of the other so-called Pareiasaurs to other genera. The classical specimen figured by Seeley and represented in most geological textbooks becomes *Bradysaurus*. The magnificent Cape Town specimen becomes *Embrithosaurus*. But a more serious matter is that our South-African *Pareiasaurus* zone, accepted by all our geological surveys and textbooks, becomes the *Tapinocephalus* zone. One might put up with the inconvenience if it cleared up all the confusion, but unfortunately it does not. All the larger Pareiasaurs are undoubtedly very closely allied one to the other, and were it not for the condition of the dermal scutes would be placed in one genus. All those specimens in which the dermal scutes are unknown will have to be left in a kind of limbo. Thus, even Watson cannot tell us whether *Pareiasaurus bombidens*, of which there are two fair skeletons in the British Museum, belongs to *Pareiasaurus*, *Bradysaurus*, or *Embrithosaurus*.

Now, while Watson's conclusions may, strictly speaking, be perfectly sound, one would like some way out of the inconvenience, and I might suggest the following *modus vivendi*.

In palæontology a genus and species cannot have quite the same relative value as in living forms, as we can never know much of hairs, feathers, or epidermal scales. If a herpetologist were given the skulls of one hundred species of *Lygosoma*, it is pretty certain he would not find many differences; and if they were found in an Eocene deposit, most probably all would be referred to a very few species. In fact, a genus of recent herpetology is about equivalent to a species of the palæontologist; and considering that the palæontologist has usually only imperfect skeletons to work on, it can never be otherwise.

With regard to *Pareiasaurus*, what I should suggest is to regard the condition of the dermal scutes as of merely subgeneric value, and to keep all the large Pareiasaurs in the original genus *Pareiasaurus*. If one wishes to subdivide the genus, one can place in a distinct subgenus any forms whose scutes appear to differ considerably from the type. The British Museum fine skeleton would be *Pareiasaurus* (*Bradysaurus*) *baini*, if one wished to be very precise, and the Cape Town mounted specimens *Pareiasaurus* (*Embrithosaurus*) *schwarzi*, and *Pareiasaurus* (*Pareiasuchus*) *peringueyi*; but for the majority of mankind the generic name *Pareiasaurus* would be sufficient, and the *Pareiasaurus* zone would remain as the zone where the Pareiasaurs first appear.

I remain, &c.,

R. Broom.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 101. MAY 1916.

XL.—*New* Tipulidæ *from the Malay Peninsula.*

By F. W. Edwards, B.A., F.E.S.

(Published by permission of the Trustees of the British Museum.)

Among a collection of mosquitoes recently received by the Imperial Bureau of Entomology, from Dr. A. T. Stanton of Kuala Lumpur, were eight specimens of crane-flies which the sender wished to have named. These were referred to the writer for examination, and proved to belong to seven undescribed species. Descriptions of these are appended in the following pages, and the opportunity has been taken of including a few other hitherto-undescribed species from the same region, which are represented in the British Museum collection. The types of Dr. Stanton's new species have been presented to the British Museum by the Imperial Bureau of Entomology.

Subfam. *Tipulinæ*.

Group Dolichopezini.

Mitopeza, gen. n.

No distinct nasus. Antennæ (♀) 12-jointed, not longer than head and thorax; flagellar joints slender, with fine pubescence and a few stiff hairs on the upper side. Third antennal joint longer than the first two together. Pronotum not prominent. Ovipositor (fig. 1, p. 356) extremely short,

the lower valves fleshy and hairy; ducts of spermathecæ enormously long, if uncoiled they would be much longer than the whole body. Legs long and slender, the tarsi hair-like. Venation: Rs moderately short; R_2 vertical, but scarcely perceptible, being only represented by a slight thickening of the membrane; base of R_{4+5} vertical, in a straight line with the R–M cross-vein; cell 1st M_2 present, twice as long as broad; cell M_1 sessile; Cu_1 fused with M for a considerable distance, but leaving it again before the fork; cell Cu_1 broadest at the base; Cu_2 straight; Ax rather long.

Genotype.—The species described below.

Mitopeza differs from *Dolichopeza* in possessing the cell 1st M_2 and in the position of the fork of M_1, which is just before the R–M cross-vein instead of far beyond it, and from all other genera of the Dolichopezini in the fusion of Cu_1 with M taking place well before the fork. The female genitalia are very remarkable.

Mitopeza nitidirostris, sp. n. (Fig. 1, p. 356.)

♀. *Head* dull, dark brownish; front smooth, a quarter of the width of the head in its narrowest part. Proboscis shining, brownish, shorter than the head. Labella and palpi blackish. Antennæ scarcely as long as the head and thorax together; scape and first flagellar joints light brown, remainder dark brown. First joint about twice as long as broad; second nearly round, narrower towards the base; third joint slender, half as long again as the first two together; fourth rather more than half as long as the third, remainder gradually and slightly decreasing in length. Second joint with a small forwardly-projecting tuft of black hairs on the inner side; flagellar joints with inconspicuous hairs on the upper surface. *Thorax* dark brown, with indications of three darker stripes above extending from the front margin to the suture. Mesonotum scarcely, pleuræ considerably shining. *Abdomen* dark brownish, with shimmering whitish lateral spots (the specimen is too contorted to describe accurately). *Legs* blackish, femora lighter on the basal fourth (middle legs missing). *Wings* somewhat infuscated, strongly iridescent; stigma dark brown, with a whitish spot on each side, that towards the apex being the more conspicuous; a minute whitish spot over the veins at the base of cell 1st M_2; cross-veins and branches of Cu narrowly bordered with fuscous, especially on Cu_1a. *Halteres* with pale stem and dark knob.

Length of body about 7 mm.; wing 12 mm.

Kedah: Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 1 ♀.

In coloration *M. nitidirostris* must strongly resemble *Tipula sinabangensis*, de Meij., recently described from Simalur, but presumably de Meijere's species has the venation of a *Tipula*, though he does not describe the wing in detail.

Group Tipulini.

Tipula klossi, sp. n.

♀. *Head* dark brown, with a blackish median line; front occupying more than a quarter of the width of the head, rather prominent above the antennæ. Proboscis brownish, shorter than the head; nasus extremely short, a mere rounded prominence; palpi dark brown. *Antennæ* 13-jointed, the 13th joint less than half as long as the 12th. Scape light brownish. First flagellar joint cylindrical, light brownish, with some short black hairs in the middle on the underside, longer than the first scapal joint; intermediate flagellar joints light brown with a blackish base which is slightly enlarged on the upper side; last two or three joints entirely dark brown; verticillate hairs much longer on the upper side of the joints than on the lower. *Thorax* dull, brown, with four darker brown stripes, the lateral pair shortened in front and extending back on to the scutum. Postnotum more greyish in the middle. *Abdomen* rather light brownish, the segments with dark brown bands apically. *Legs* blackish, the femora lighter towards the base. *Wings* very slightly infuscated, the costal cell rather more so; stigma dark brown; a narrow dark brown cloud over Cu_1a; a small whitish spot on each side of the stigma, and another obliquely across cell 1st M_2. Pubescence on the veins in the apical part of the wing very noticeable. Venation: Rs extremely short, much shorter than the stigma, and equal in length to the first section of M_{1+2}. Stalk of cell M_1 nearly one-third as long as the cell. Cu_1 meeting M exactly at the fork and fused with M_3 for about half the length of the cell 1st M_2. Cross-vein connecting M_{1+2} with M_3 extremely short, the cell 1st M_2 being therefore almost diamond-shaped. M_2, M_3, and the descending portion of Cu_1 parallel and rather close together. Anal angle of wing well-marked, the cell Ax, therefore, broadest in the middle. *Halteres* light brownish, the club somewhat darker.

Length of body 13 mm.; wing 11 mm.

Kedah: Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 2 ♀ (type in British Museum; paratype in Kuala Lampur Museum).

In the rudimentary nasus, the extreme shortness of Rs, and the long fusion of Cu_1 with M_3, as well as in the small size of the cell 1st M_2, this species is very distinct. *T. inconspicua*, de Meij., is similar in many respects, but in that species the contact of Cu_1 with M_3 is almost punctiform. In the rudimentary nasus and the shortness of the verticillate hairs on the under side of the flagellum the new species resembles the European *T. variicornis*, Schum.

Subfam. *Limnobiinæ*.

Group Limnobiini.

Rhipidia rostrifera, sp. n.

♂. *Head* brownish-grey. Proboscis black, slightly longer than the head; palpi black, placed near the tip of the proboscis. Antennæ: first joint yellowish, dark at the tip; second joint yellowish; third to thirteenth joints obscurely yellowish, dark at the base, from which springs a pair of long black pubescent processes; the processes on the third and thirteenth joints are not much longer than the joint, those on the intermediate joints are much longer, the longest being quite four times the length of a joint; fourteenth joint black, simple, rather longer than the others. *Thorax* covered with a brownish-grey pollinosity, without distinct markings, a dark central line, however, is observable when the thorax is looked at from behind. *Abdomen* dark brown; in certain lights the hind margins of the segments are whitish. Genitalia of the ordinary *Dicranomyia* type. *Legs* brownish, femora lighter towards the base; claws simple. *Wings* hyaline with four dark brown spots on the costa situated at the tip of the wing, the tip of Sc, the tip of R_1, and the middle of Sc, the last two being larger than the first two; there is also a dark brown spot in the base of the basal cells and another at the tip of Ax; the tips of the other veins and the cross-veins are also darkened, but less conspicuously. Sc_1 ending opposite base of Rs, Sc_2 near its tip; cells 1st and 2nd M_1 confluent (*i. e.*, discal cell open, confluent with the 2nd posterior); Cu_1a meeting M at the fork. Veins dark, except costa, Sc, and R_1, which are yellow except where crossed by the dark spots. *Halteres* with yellow stem and black knob.

Length of body 5 mm.; wing 5 mm.

Kedah : Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 1 ♂.

Readily distinguishable from the other Oriental species by the wing-markings.

Limnobia crocea, sp. n.

Head: vertex orange, blackish anteriorly; front grey, linear, the eyes almost touching for a considerable distance. Proboscis, palpi, and antennæ entirely black. Flagellar joints (except the first) each with a single very long hair in the middle on the upper side, and a few short ones below: first few joints of the flagellum rounded, remainder gradually becoming elongate-oval; last joint slender and nearly twice as long as the penultimate. *Thorax* entirely orange, except for a broad black median stripe on the præscutum and two large black spots on the scutum, the black parts shining, the rest not. *Abdomen* orange except the eighth segment and male genitalia, which are black; ovipositor orange. *Legs*: coxæ and trochanters orange, remainder black. *Wings* slightly tinged with brownish-yellow, stigma small, brown; larger brown spots over the base of Rs and the apex of Sc, and a brown band over the central cross-veins which practically reaches the hind margin; basal fifth of wing dark brown. Venation as in *L. longinervis*, Brun., except that the marginal cross-vein is long, oblique, and slightly curved, simulating the tip of R_1, the real tip being less distinct and turned sharply up to the costa. *Halteres* with orange stem and black knob.

Length of body 7–10 mm.; wing 9·5–11 mm.

Siam : Sungkie, 9. ii. 1902 (*Robinson & Annandale*), 1 ♂, 2 ♀.

The only previously described species with which this can be compared is *L. longinervis*, Brun., which is quite distinct in coloration. Both species might be placed almost equally well in *Libnotes*.

Libnotes scutellata, sp. n. (Fig. 2, p. 356.)

Head deep ochreous. Frons very narrow. Proboscis and palpi blackish. Antennæ shorter than the thorax, scape blackish, flagellum brownish. Basal flagellar joints expanded apically, scarcely longer than broad; apical joints more slender, but hardly longer, except the last one; hairs short. *Thorax*: pronotum ochreous; a brown streak on each side below its edge, almost connected with a rather large brown patch above the front coxæ. Præscutum brownish-ochreous; two pairs of brown marks on the

lateral margin, on each side of the pseudo-suture; two pairs of short brown streaks above near the suture, the outer pair very small. Scutum ochreous, paler in the middle, with a pair of dark brown spots. Scutellum whitish, the posterior margin narrowly blackish. Postnotum dark brown, rather narrowly ochreous at the sides. Pleuræ ochreous; a small, roundish, blackish-brown spot below and in front of the root of the wing, and a dark brown patch just above and in front of the middle coxa. *Abdomen* ochreous; a narrow blackish lateral line, most distinct on the basal segments, and more prominent in the male than in the female. Hypopygium, fig. 2. *Legs* ochreous brown; tips of tibiæ and a preapical ring on the femora dark brown. *Wings* slightly ochreous-tinged, with numerous brown patches, the three largest of which are near the base of the cell R, at the anal angle, and over the tips of M_1, M_2, and Cu_1; others are situated over the cross-veins, at the base of Rs, at the tips of Sc, R_1, Cu_2, and Ax, at the fork of M_{1+2}, and near the base and apex of R_{2+3}; besides these there are a few other smaller spots on some of the veins. Venation: R_1 continued beyond the cross-vein for more than twice the length of the latter before turning up to the costa; cell 1st M_2 about five times as long as its greatest breadth; M_{1+2} forking a little before middle, and Cu_1 meeting M at about one-third of cell 1st M_2. *Halteres* ochreous.

Length of body 15 mm.; wing, ♂ 20 mm., ♀ 17 mm.

Siam: Talum, 18. i. 1902 (*Robinson & Annandale*), 1 ♂, 1 ♀.

Allied to *L. pœciloptera*, O.-S., in venation, but readily distinguished by the thoracic and wing markings.

Libnotes stantoni, sp. n.

♀. *Head* brownish; proboscis, palpi, and antennæ black, except the last four flagellar joints, which are dark brownish. Front very narrow. Basal flagellar joints almost rounded, very little longer than broad, the other joints becoming towards the apex gradually more slender and rather longer, so that joints 11–13 are nearly three times as long as broad, and very little broader in the middle; the last joint is slender, four or five times as long as broad; short hairs on the upper sides of the flagellar joints. *Thorax* slightly shining, dark brownish, without distinct markings except for the usual pair of darker spots on the scutum; a dark patch on the pleuræ above the front coxæ; postnotum

blackish. *Abdomen* ochreous, without markings; long yellow hairs at the base of the ovipositor. *Legs* brown, femora with a black preapical ring. *Wings* very faintly yellowish-tinged, the base of the wing and the costal cell conspicuously so; veins yellowish, black where the dark markings cover them. Anal angle darkened; a fuscous band near the base of the wing extending almost continuously from R to the hind margin and covering the apex of Ax; fuscous clouds over all the cross-veins and the base of Rs, the tips of R_1 and Cu_2, and the base of the fork of M_1 and M_2; in addition, there is a cloud near the base of R_{2+3} which just extends on to R_{4+5}, another near the apex of R_{2+3}, and one at the tip of M_1 which just extends on to the tip of M_2; a few other dark specks on the veins of the apical third of the wing. Sc_2 exactly at the tip of Sc_1; R_1 continued beyond the marginal cross-vein for a distance rather greater than the length of the cross-vein, then turned sharply up to the costa, with a stump at the angle; Rs nearly three times as long as the basal section of R_{4+5}; M_{1+2} forks a little before middle of cell 1st M_2; Cu_1 meeting M_3 a little before the fork of M_1 and M_2; cell 1st M_2 more than three times as long as its greatest width. *Halteres* ochreous.

Length of body 9 mm.; wing 11 mm.

Kedah: Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 1 ♀.

This species is in some respects intermediate between *L. notatinervis*, Brun., and *L. punctipennis*, Meij., but seems to be distinct from both. The wing-markings are very similar to those of *L. scutellata*, but not quite so extensive; *L. scutellata* also differs in its thoracic markings and its much greater size.

Libnotes limpida, sp. n.

♀. *Head* rather dark ochreous-brown; proboscis and antennæ brownish, the latter light ochreous apically. Flagellar joints rounded, only the last two or three being rather more elongate. *Thorax*: præscutum brownish, lighter in front, whitish in the middle posteriorly; scutum, scutellum, and postnotum whitish-ochreous; postnotum brownish at the sides, with a small blackish spot on each side at the base; pleuræ light ochreous, a black dot beneath the root of the wing, and several small short brownish streaks, some of which form a discontinuous line across the middle of the coxæ. *Abdomen* dingy ochreous, the segments darker towards the base on the dorsal side. *Legs* light

Fig. 1.

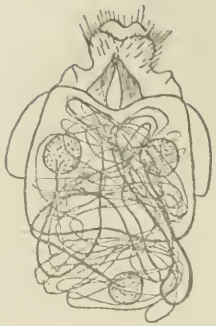


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 1.—*Mitopeza nitidirostris*, gen. et sp. n. Apex of ♀ abdomen from above. The tergite is represented as transparent, in order to show (diagrammatically) the spermathecæ with their coiled ducts.
Fig. 2.—*Libnotes scutellata*, sp. n. Left half of hypopygium from above.
Fig. 3.—*Rhamphidia nigriceps*, sp. n. ,, ,,
Fig. 4.—*Gymnastes pictipennis*, sp. n. ,, ,,
Fig. 5.—*Gnophomyia maculipleura*, sp. n. ,, ,,
Fig. 6.— ,, *fraterna*, sp. n. ,, ,,

All figures made with aid of camera lucida from balsam preparations.

ochreous, tips of tibiæ and a preapical ring on the femora brownish. *Wings* slightly greyish, without distinct dark markings on the membrane; veins yellowish, cross-veins, base of Rs, tips of R_1, M_1, M_2, Cu_1, Cu_2, An, and Ax, and base of fork of M_1 and M_2, dark; a dark mark near base and another smaller one near apex of R_{2+3}, another near base of An. Venation much as in *L. stantoni*, but R_1 not continued quite so far beyond the cross-vein as the length of the latter; M_{1+2} forking beyond the middle of cell 1st M_2, and Cu_1 meeting M_3 before one-third of this cell. *Halteres* ochreous.

Length of body 9 mm.; wing 11 mm.

Kedah: Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 1 ♀.

Though it might be taken for a very pale specimen of *L. stantoni*, this species is undoubtedly distinct, if only on account of the structural difference in the antennæ.

Libnotes lutea, sp. n.

♀. *Head* dark grey, whitish round the eye-margins; front narrow, silvery. Proboscis and palpi brownish. Antennæ with the scape light brown, the flagellum dark brown; flagellar joints oval, shortly stalked, the last two or three more elongate. *Thorax* uniformly shining light ochreous, except for a dark brown spot on each side of the scutum immediately in front of the root of the wings. *Abdomen* uniformly shining light ochreous. *Legs* light ochreous, the extreme tips of the femora and tibiæ and the last three or four basal joints dark. *Wings* practically hyaline, with light fuscous stigma; veins yellowish, except the central cross-veins and the whole of Cu, which are dark; extreme tip of wing indistinctly darkened. Sc_2 strong, oblique, more conspicuous than the tip of Sc_1; tip of R_1 turned sharply up to the costa, simulating a cross-vein, the marginal cross-vein right-angled, with a short stump arising from the angle, the horizontal portion longer than the vertical (in other words, the first longitudinal vein ends in the second and is connected with the costa by a cross-vein); cell 1st M_2 less than three times as long as broad, M_{1+2} forking near its apex; Cu_1 meeting M_3 a little before middle of cell.

Length of body 6 mm.; wing 7 mm.

Kedah: Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 1 ♀.

This species seems to be quite distinct in coloration from any previously described.

Group Rhamphidiini.

Rhamphidia nigriceps, sp. n. (Fig. 3, p. 356.)

Head velvety blackish-brown, frons rather narrow, with a small grey spot above the antennæ. Antennæ, proboscis, and palpi brown. Proboscis a little longer than the head. Antennæ not much longer than the proboscis; first five flagellar joints roundish, remainder oval; hairs about twice as long as each joint. *Thorax* dark brown above, lighter brown on the pleuræ, without markings. *Abdomen* uniformly dark brown; ovipositor lighter. Hypopygium, fig. 3. *Legs* dark brown, the tarsi lighter apically. *Wings* nearly hyaline, stigma rather faint. Venation: Sc_1 continued far beyond base of Rs, its tip much less distinct than Sc_2; Rs arising exactly in middle of wing-length; cell R_1 narrow in apical third; R_1 and R_{2+3} ending in costa rather close together; R–M cross-vein present, situate about its own length beyond the fork of Rs; cell 1st M_2 pentagonal, its apical side shortest; Cu_1 meeting M just before or at the base of the cell. *Halteres* brown.

Length of body 4–5 mm.; wing 5–6 mm.

Siam: Bukit Besar, 2 ♂ (incl. type), 1 ♀; Talum, 18. i. 1901, 2 ♂, 1 ♀ (*Robinson & Annandale*).

Differs from *R. kambangani* in the blackish head and the position of Cu_1.

Rhamphidia rufescens, sp. n.

Head light grey; proboscis, palpi, and scape of antennæ light reddish brown; flagellum brownish, the basal joints round, the rest oval, last three or four a little more elongate, and with longer hairs, the hairs on the rest of the flagellum being very short. *Thorax* and abdomen slightly shining, uniformly light reddish-brown. *Legs* light brownish. *Wings* transparent; venation as in *R. nigriceps*. *Halteres* pale.

Length of body 5 mm.; wing 5·5 mm.

Selangor: Bukit Kutu, Feb. 1903 (*Dr. H. E. Durham*), 1 ♀.

Evidently closely related to the preceding, but seems distinct on account of its grey head, lighter colour, and slightly different antennæ. It should be noted that the specimen is somewhat immature.

Gymnastes pictipennis, sp. n. (Fig. 4, p. 356.)

Head yellowish, darker in the middle, rather thickly covered with black hair; frons very broad. Scape of

antennæ reddish-brown ; flagellum black, the joints oval, with long hairs. *Thorax* almost uniformly shining blue-black, tinged with brown on the sides of the mesonotum. Pronotum well developed, but not to the same extent as in typical *Teucholabis*. *Abdomen* uniformly dark purplish, somewhat shining. Hypopygium, fig. 4. *Legs* dark, clothed with dark purple scales, a narrow ring of yellow on the apical third of each femur ; the femora are not clubbed, but gently and slightly enlarged towards their tips. *Wings* whitish hyaline, with three complete dark brown fasciæ, the first well before, the second immediately beyond the middle, the third occupying rather more than the apical fourth of the wing ; the first fascia is nearly or quite connected with the second by a median projection in cell M ; the second has its distal margin irregularly concave, and between it and the third is a squarish dark brown spot over the apex of cell 1st M_2. Venation : R_2 present, short, ending exactly in the tip of R_1 ; Rs arising before one-third of the wing-length, not at all curved at its base ; marginal cross-vein situated on R_2 a little beyond its base ; cell 1st M_2 about twice as long as broad, scarcely narrowed at the base, the three veins at its apex equidistant ; R–M cross-vein joining M_{1+2} a little beyond its base ; Cu_1 meeting M_3 near base of cell 1st M_2. *Halteres* black, tip of knob white.

Length of body 6 mm. ; wing 6 mm.

Siam : Bukit Besar (*Robinson & Annandale*), 2 ♂.

The genus *Gymnastes* was founded by Brunetti in 1911 for *G. violaceus*, Brun. (= *Teucholabis cyanea*, Edw.), the author differentiating it from *Teucholabis* chiefly on the absence of a distinct neck and the clubbed femora. Neither of these characters being of much value, Alexander proposed to sink *Gymnastes* in *Teucholabis*, a course which the writer was till now inclined to favour. *G. cyaneus*, however, shares with the present new species the very peculiar character (for a Tipulid) of having the legs covered with scales ; and this, together with some other minor characters, such as the reduced neck and the colour of the halteres, will perhaps serve to keep *Gymnastes* distinct. The apparent gulf between *G. cyaneus* and *G. pictipennis* with regard to neuration is bridged by *Gnophomyia ornatipennis*, de Meij., which is almost identical with *G. cyaneus* in colouring and yet has R_2 present, and in much the same condition as in *G. pictipennis*. A specimen of an undescribed Japanese species or variety closely resembling *G. ornatipennis* is in the British Museum collection, and shows the same scales on the legs as in *G. cyaneus* and *G. pictipennis*. I have,

therefore, no hesitation in referring *Gnophomyia ornatipennis*, de Meij., to *Gymnastes*, which is a very interesting genus, as it appears to connect *Teucholabis* with the *Gnophomyia* group. The hypopygium shows a greater resemblance to *Teucholabis* than to *Gnophomyia*.

Group Eriopterini.

Gnophomyia maculipleura, sp. n. (Fig. 5, p. 356.)

Head dull blackish, front very broad. Antennæ nearly twice as long as the thorax in both sexes; scape light brown, flagellum dark brown; first joint not much longer than broad, second round; flagellar joints elongate-oval, almost cylindrical, at the base about four times as long as broad, at the apex not quite so long, all clothed with a dense pubescence as long as their width and with rather numerous hairs as long as the length of the joints. *Thorax* dark reddish-brown, scutellum and pleuræ lighter, the pleuræ with two large roundish black spots, one on the hypopleura and one just below and in front of the root of the wing. *Abdomen* uniformly dark brown. Hypopygium, fig. 5. Ovipositor resembling that of *G. orientalis*, de Meij. *Legs* brownish, tarsi somewhat darker. *Wings* hyaline, the veins blackish, stigma faint. Venation as in *G. orientalis*, de Meij., the relative lengths of Rs and R_{2+3} are somewhat variable. The pubescence on the veins is not quite so noticeable as in de Meijere's figure. *Halteres* blackish.

Length of body, ♂ 4 mm., ♀ 5 mm.; wing, ♂ 4 mm., ♀ 5 mm.; antennæ 2 mm.

Siam: Bukit Besar (*Robinson & Annandale*), 2 ♂ (incl. type), 1 ♀.

This species belongs to the same group as the American *G. tristissima*, O.-S., the type of the genus. As Osten-Sacken long ago pointed out, there are two distinct types at present included within the genus; in the present writer's opinion the other group might well be removed to a distinct genus, to which the name *Dasymallomyia* may perhaps be applicable, though *D. signata*, Brun., the type of this latter genus, presents some rather noticeable differences from the other species, such as *G. luctuosa*, O.-S., and *G. elegans*, Wied.

G. maculipleura is evidently closely allied to *G. orientalis*, de Meij., and may eventually prove to be the same species, but appears to be well distinguished by the two distinct blackish spots on the pleuræ.

Gnophomyia fraterna, sp. n. (Fig. 6, p. 356.)

Coloration and wing-venation as in *G. maculipleura*, but the antennæ a little shorter, the pubescence on the flagellum longer and the hairs shorter, so that the difference in length between pubescence and hairs is not so noticeable; male genitalia (fig. 6) of quite different structure; pubescence of wing-veins rather more evident.

Selangor (*A. L. Butler*), 1 ♂.

Gnophomyia nigrescens, sp. n.

Whole body, except the ovipositor, blackish, somewhat shining. Antennæ a little longer than the head and thorax together, with long hairs as in *G. maculipleura*, but here the flagellar pubescence is rather longer and less regular. Ovipositor reddish-brown, of similar structure, but rather longer than that of *G. maculipleura*. Wing as in *G. maculipleura*; legs rather darker.

Siam: Talum, 3500 ft., 17. i. 1902 (*Robinson & Annandale*), 1 ♀.

Oxydiscus umbrosus, sp. n.

♀. *Head* dull grey; front almost silvery, broad and rather swollen. Antennæ 15-jointed, first joint yellowish, dark at the tip, second joint whitish, remainder blackish; joints 3–5 rather broadly oval, joint 6 cylindrical, a little longer than broad, joints 7–15 cylindrical, rather more than twice as long as broad. *Thorax*: mesonotum shining ochreous-brown, without markings; pleuræ light ochreous with two indistinct dark stripes. *Abdomen* dark brown, ovipositor lighter. *Legs* almost uniformly light ochreous, only the apical tarsal joints lighter. *Wings* slightly greyish with darker clouds at the tips of all the veins (except Sc) and over the cross-veins; additional dark clouds over the base of Rs, at the base of the forks of M_1 and M_2, and in the middle of cell 1st R_1. Tip of wing slightly hairy. Rs angulated near the base, the cell 1st R_1 rather broad; marginal cross-vein vertical, placed exactly at the fork of R_{2+3}; cross-vein R–M meeting M_{1+2} a little above the fork, so that cell 1st M_2 does not quite come to a point at the base; fork of M_1 and M_2 scarcely as long as the second section of M_{1+2}; second section of M_3 straight and scarcely longer than the cross-vein connecting it with M_{1+2}; Ax turned rather sharply downwards at the tip. *Halteres* light ochreous.

Length of body 4 mm.; wing 4 mm.

Kedah: Kedah Peak, 3200 ft. (*Dr. A. T. Stanton*), 1 ♀.

In spite of its obviously close relationship with *O. nebulosus*, de Meij., there are a number of small differences in venation in which the new species bears a greater resemblance to *Cladura*. The characters common to both species of *Oxydiscus*, distinguishing them from *Cladura*, are the shortness of Sc and the presence of surface-hairs towards the apex of the wing.

XLI.—*A new Species of the Amphipodan Genus* Hyale *from New Zealand*. By Chas. Chilton, M.A., D.Sc., LL.D., F.L.S., C.M.Z.S., Professor of Biology, Canterbury College, New Zealand.

The genus *Hyale* is represented in New Zealand by several species, of which, perhaps, the commonest is *H. rubra* (G. M. Thomson), which is found on all parts of the New Zealand coast, and agrees well with the brief description given by Stebbing in 'Das Tierreich, Amphipoda' (p. 572). In November 1915 a number of specimens of *Hyale* were sent to me by Mr. P. W. Grenfell from Cuvier Island. Most of these proved to belong to *Hyale rubra*, but among them there was one that attracted my attention by its peculiar maxillipedes, the terminal joints of which were greatly expanded and thickly covered with long setæ. On examination it proved that this specimen, which was a male, differed from *H. rubra* in the second gnathopod also, and I am therefore describing it as a new species. Unfortunately I have only the single specimen, but the characters of the maxillipedes and the second gnathopods are so distinctive that it will be easy to recognize it again. It is quite likely that the peculiar development of the maxillipedes is found in the male only, and is to be looked upon as a secondary sexual character, but the female of this species is at present unknown. The following will serve as a description:—

Hyale grenfelli, sp. n. (Figs. 1–5.)

Specific diagnosis. Male.—In general resembling *H. rubra* (G. M. Thomson), but differing in the maxillipedes, which have the carpus and propod greatly dilated and thickly covered with long slender hairs, and in the second gnathopod, in which the palm is only slightly oblique, well defined, broad, the margin on both outer and inner sides being deeply

concave and provided with numerous short setules, the finger short and rather blunt.

Colour. The body variously marked with pink, as in *H. rubra.*

Size. 7 mm.

Female unknown.

Fig. 1.

Fig 2.

Fig. 3.

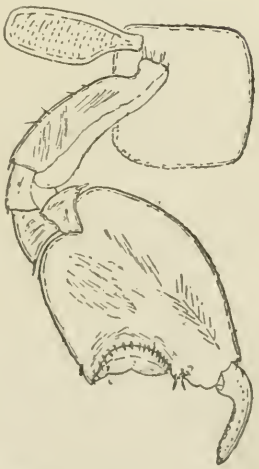


Fig. 1.—*Hyale grenfelli*, ♂. Maxillipeds.
Fig. 2.—Ditto. First gnathopod.
Fig. 3.—Ditto. Second gnathopod.

Locality. Cuvier Island, off the coast of Auckland, New Zealand; between tide-marks.

I have named the species after Mr. P. W. Grenfell, Keeper of the Cuvier Island Lighthouse, to whom I am indebted for many interesting specimens of Crustacea.

In addition to the above brief diagnosis, the following description may be given :—

Side-plates 1–4 fairly deep, first one widening slightly below and produced a little anteriorly. Third segment of pleon with postero-lateral corner quadrate, very little outdrawn, subacute, the posterior margin nearly straight, but

Fig. 4.

Fig. 5.

Fig. 4.—*Hyale grenfelli*, ♂. Fifth peræopod.
Fig. 5.—Ditto. Urus, with uropoda and telson.

with a few faint irregularities and three very minute setules. Eyes rather large, irregularly rounded. Antenna 1 half as long as antenna 2, peduncle short, the segments decreasing regularly in size, flagellum with about sixteen joints. Antenna 2 more than half as long as the body, ultimate joint of peduncle slightly longer than preceding; flagellum long, about twice as long as peduncle, with many joints.

Mouth-parts with exception of maxillipeds present no abnormal features. The maxillipeds are of the usual structure in the proximal joints, but the carpus and propod are very greatly dilated, so as to be fully as broad as long, the inner margins being very convex; the inner part of the surface of the carpus and the whole surface of the propod thickly covered with long hairs irregularly arranged in transverse rows, the longest extending considerably beyond the end of the finger. The finger is much shorter than the outer margin of the propod, it is narrow and tapers regularly to the extremity. The outer margins of the carpus, propod, and finger are fringed with setæ. The carpus is narrowed at the base, and the distal portion of the limb is twisted upon this so as to lie in a plane more or less at right angles to that of the proximal portion.

First gnathopod with side-plate slightly widened below and produced a little anteriorly; basis widening distally; carpus with well-rounded lobe of hind margin fringed with a regular series of setæ, which increase in length distally; propod oblong, anterior margin slightly convex, devoid of setæ except for a tuft at base of finger, posterior margin straight, with a regular row of setæ which increase in length distally; palm slightly oblique, curved, and fringed with setæ of varying lengths; finger fitting closely on to palm.

Second gnathopod with side-plate quadrate; basal joint long; hind margin a little convex, with a few setæ; anterior margin produced on the outer side into a thin flange, which projects in a rounded lobe beyond the end of the joint and provides a groove for the reception of the propod when reflexed; ischium with the outer margin similarly produced into a thin rounded lobe; merus and carpus both very short and of the usual form; propod very large, oval except for the excavation of the palm; anterior margin fairly convex, without setæ; hind margin well developed, rather longer than palm, which is oblique, deeply concave, broad, both inner and outer margins very concave, and with a regular row of setules; the surface of the palm itself thin, membranous, slightly protruding beyond the firm margins; finger short and stout, narrowing abruptly towards the end, produced at the base on the inner side into a rounded lobe with an irregular thickening beyond; inner margin of finger with a row of very minute setules.

Peræopods 1 and 2 as long as peræopod 3, of normal structure.

Peræopods 3–5 increasing slightly in length posteriorly; basal joint broad, with hind margin very convex and irregu-

larly crenate below; hind margin of propod without setæ except tuft at base of the finger; setæ on anterior margin of uniform size, not serrulate; finger strongly curved, with minute setule.

Uropods 1 and 2 with rami equal in length to the peduncle and provided with lateral and apical spines, the peduncle of the first uropod bearing a specially stout spine on the upper side at the extremity. Third uropod of usual size, with ramus much shorter than peduncle.

Telson apparently cleft almost to the base, margins entire and without setæ.

This species appears to come very close to *H. rubra* (G. M. Thomson), but until the female is known it is difficult to speak positively about its relationships.

XLII.—*Ants from British Guiana.*

By W. C. Crawley, B.A.

The following list consists of ants collected recently in British Guiana by Mr. G. E. Bodkin, who made a number of interesting observations which form a valuable addition to our knowledge of the habits of many of the species. Dr. Forel and Prof. Emery very kindly determined several of the species with which I was unacquainted.

I. Subfam. *Ponerinæ* (Lepeletier).

Tribe Ectatommini (Emery).

Ectatomma (s. str.) *quadridens*, F., ☿.

"A common species about the cultivated coast-land areas. The local nickname is 'Kop-Kop.' These ants are invariably found in the cane-fields, where they perform excellent work by carrying off the larvæ of the small Moth Borer (*Diatræa saccharalis*) and the Weevil Borer (*Sphenophorus hemipterus*, L.). They also destroy the egg-clusters of the small Moth Borer which occur on the leaves of the sugar-cane, and a number of other harmful insects are killed by them. When captured they emit a squeaking sound. They also frequent the flowers of certain commonly occurring plants, and have been observed to capture insects visiting these flowers to obtain the nectar. Formicary unobserved. Insects as soon as captured are carried off by the ants apparently to the nest."

Also in Botanic Gardens.

Ectatomma (s. str.) *tuberculatum*, Oliv., ☿.

Rockstone, 27. 12. 14.

"An uncommon species, and apparently only met with in the interior districts."

Tribe PONERINI (Forel).

Subtribe PACHYCONDYLINI, Ashmead.

Neoponera (s. str.) *villosa*, F., subsp. *inversa*, Sm., ☿.

"Not a common species. Formicary observed on two occasions in a hole in the trunk of a Cacao-tree. The communities were not large, consisting of about 500–600 individuals. The species seems to occur more commonly in the interior districts."

Pachycondyla (s. str.) *crassinoda*, Ltr., ☿.

Botanic Gardens, Georgetown, 27. 5. 15.

Pachycondyla (s. str.) *harpax*, F., ☿.

Issororo, N.W. District, 12. 6. 15.

Tribe ODONTOMACHINI (Mayr.).

Anochetus (*Stenomyrmex*) *emarginatus*, F., ☿.

"A fairly common species. Formicarium, which seldom consists of more than 100 individuals, is frequently found in decaying vegetable matter beneath the dead sheathing leaf-bases of several species of indigenous palms."

Issororo, 3. 6. 15.

Odontomachus hæmatoda, L., ☿.

The single specimen has the node evenly striate all round, as in the var. *rugisquama*, For., from Costa Rica and Columbia, but not so coarsely.

Georgetown, 11. 5. 15.

O. hæmatoda, L., var. *laticeps*, Rog. ?, ☿.

A single specimen in a tube containing *Pachycondyla harpax*, F. It answers very well to the description of Roger, but in the absence of more material I place it with hesitation under var. *laticeps*.

Issororo, 12. 6. 15.

Odontomachus hæmatoda, L., var. *pallipes*, var. nov.

☿. Differs from the typical form in being slightly larger, more elongate, the scale slightly broader from back to front, not tapering so gradually into the spine, and particularly in colour, which is entirely ferruginous with the gaster darkest and the mandibles and antennæ lighter, and the legs entirely yellow. The nearest described variety appears to be *palleus*, Wheeler (Bahamas), which is smaller and with a narrower and smoother scale. In var. *pallipes* the scale is faintly striate transversely in front and behind. Pubescence as in typical form.

British Guiana, 20. 4. 15.

II. Subfam. *Dorylinæ* (Leach).

Tribe Ecitini, Forel.

Eciton (s. str.) *hamatum*, F., ♀, ☿.

"This species and *E. burchelli*, Westw., are the two common species of 'foraging ants' in British Guiana. Both occur fairly commonly."

E. (s. str.) *burchelli*, Westw., ☿.

E. (*Labidus*) *cœcum* (s. str.), Ltr., ♀, ☿.

"A common species, but owing to its habit of burrowing beneath the surface of the soil it is not frequently observed."

Berlice, 3. 3. 15.

E. (*Acamatus*) *pilosum*, Sm., ☿.

"This is not a common species of *Eciton*; it seems to be more partial to the forest areas."

Rockstone, 27. 12. 14, &c.

III. Subfam. *Myrmicinæ*, Lep.

Tribe Pseudomyrmini, For.

Pseudomyrma biconvexa, For., ☿.

"From bark of *Sapium jenmanni*, Hemsl.," Botanic Gardens, Georgetown, 1. 3. 14.

"A fairly common species. Formicarium unobserved."

Ps. gracilis, F., ☿.

British Guiana, 20. 4. 15.

This is a most variable species. Forel (Biol. Cent.-Amer., Formicidæ) says it nests in hollow stems, where the ☿ ☿ rest one behind the other, and varies in colour from yellow through red to black with every imaginable pattern.

Ps. elegans, Sm., ☿.

British Guiana, 24. 5. 15.

Tribe Pheidolini, Emery.

Pheidole fallax (s. str.), Mayr., ♀ ☿.

"This species is of fairly common occurrence in British Guiana. Formicarium constructed beneath the soil."

Tribe Crematogastrini, For.

Crematogaster stolli, For., var. *guianensis*, var. nov., ♀, ☿.

L. 3·2–7 mm.

These examples of this extremely polymorphic *Crematogaster* differ from the typical form as follows: Head and thorax a lighter chestnut-brown, with the gaster a much darker brown; the head much smoother, with hardly any of the irregular punctures so noticeable in Forel's duplicates, ocelli in ☿ major distinct, the pro-mesonotum with finer and more regular longitudinal striation; the basal surface of epinotum longitudinally striate fanwise (irregularly and transversely striate in *stolli*), spines of epinotum rather longer. In the ☿ minor the sculpture is also finer and more regular, and the striation on the epinotum similar to that in the ♀.

This variety does not appear to be the var. *amazonensis*, For., from the Amazon and also Costa Rica, as the description only refers to the colour and spines, and makes no mention of the sculpture.

Tribe Solenopsidini, For.

Subtribe Monomoriini, Em.

Monomorium floricola, Jerd., ♂, ♀, ☿.

"In coconut," Botanic Gardens, Georgetown, 7. 4. 14.

A cosmopolitan species.

Subtribe Solenopsidini, For.

Solenopsis geminata (s. str.), F., ☿.

"In hollow stems of plants, and in houses," 1913 and 1915.

This is the typical American form (dark). It appears, however, to be becoming cosmopolitan, like the var. *rufa*, Jerd., for Sautschi records it from Africa (Gabon, Liberia), and says that in certain districts it is ousting the local species (Ann. Soc. Ent. Belg. lvii. 1913).

S. pylades, For.

Port Mourant, 1915, and elsewhere.

"Nest in soil at bottom of sugar-canes."

S. corticalis, For., subsp. *amazonensis*, For., ☿.

"This is one of the commonest ants in British Guiana. It is almost exclusively found in human habitations, and is fond of all food-stuffs, especially sweet oils, sugar, and milk. In the entomological laboratory it is impossible to breed insects unless the benches are kept with the legs standing in kerosene oil, for they speedily discover the presence of living larvæ or other forms of insect life in the breeding-cages, and will then enter and destroy them. The formicarium, which is often hard to find, is constructed in crevices in wood-work and is never large, consequently they are difficult to destroy. They do not hesitate to use their sting, which, for the size of the ant, is surprisingly sharp and powerful. I have frequently observed small masses of them floating on the surface of water by means of surface-tension; their object in doing this is not apparent."

Tribe Tetramoriini, Emery.

Tetramorium guineense, F., ☿.

"A common species, especially in the cane-fields. Formicary is usually constructed in the earth at the base of the canes, and varies in size. The larger formicaries form roughly conical mounds about a foot and a half high and a foot in diameter. These mounds are intersected internally with innumerable galleries. The smallest formicaries are only slightly raised above the surface of the ground. The common coccid or 'Mealy Bug' of the sugar-cane (*Ripersia* sp.) is invariably attended by this ant. Considerable inconvenience is caused at times to the cane-cutters by this species owing

to its sharp and painful sting, the effects of which last for some time. As soon as the nest is disturbed the ants swarm out with their abdomens raised and readily attack the intruder. If the nests become flooded the ants ascend the canes and there construct a temporary shelter of fine earth-particles cemented together, which form a covering. This species has been also observed to attend the coccid *Pseudococcus citri*, Risso, when occurring on cacao pods."

This interesting account of this cosmopolitan species shows very different habits from those exhibited in hot-houses in this country. I have observed the habits of this ant in hot-houses at West Leake, Leicestershire, in 1908 and 1909, and at Kew in 1910; in the former locality the nest appeared to be in the crevices of the walls, and the ants ran about on the floor and among the plants. The females, which are ergatoid, and only slightly larger than the workers, were running about among the workers. The ants probably attended coccids, though they were not observed to do so. A species of *Ripersia* (*formicarii*, Newstead) is common at Seaton, Devon (1912), and at Porlock, Somerset, in the nests of *Lasius niger* and *flavus*, and is highly myrmecophilous. I found the ants always removed the coccids when the nest was disturbed, often before their own larvæ.

Tribe Cryptocerini (F. Smith).

Cryptocerus pusillus, Klug., ☿.

"This species is frequently found moving about on the branches and twigs of smooth barked trees. It is a common species."

Georgetown, and Botanic Gardens, Georgetown, 1914.

C. minutus, F., ☿.

"A common species. A very sluggish ant which will remain absolutely motionless on a leaf for hours together. It has been observed to attend the following Coccidæ: *Pulvinaria pyriformis*, Ckll.; *Coccus hesperidum*, L."

Botanic Gardens, Georgetown, 1914.

C. atratus, L., ☿.

"A common species. Formicary has been observed in a large hollow in the trunk of a tree (*Pachira insignis*). The community is large, consisting of several thousands of individuals. The species has been observed to attend the

following species of Coccidæ: *Pseudococcus citri*, Risso; *Coccus hesperidum*, L.; *Saissetia nigra*, Nietn."
Botanic Gardens, Georgetown, 1914.

C. maculatus, Eur., ♀.

"On leaves of mango tree," Botanic Gardens, Georgetown, 1915.

Tribe Dacetini, For.

Daceton armigerum, Ltr., ☿.

"Fairly common in some districts. When captured with the forceps and placed in alcohol it emits from time to time a sharp click, which continues for some time after being placed in the liquid. Has been observed to attend the Coccid *Pseudococcus citri*, Risso, on cacao pods. Formicary unobserved."
British Guiana, 1914.

Tribe Attini (F. Sm.).

Atta (s. str.) *lævigata*, Sm., ♃, ☿ media.

"This species appears to inhabit the sandy soils of the interior. The process of cutting up leaves and carrying them into the nest is carried on exclusively at night, commencing shortly after sundown and ceasing just before dawn. I have always observed this species to carry pieces of dead and dry leaves into the nest, not green leaves as with other species of leaf-cutting ants."
Rockstone, 1914.

A. (s. str.) *cephalotes*, L., ♃.

"The common leaf-cutting ant of British Guiana. The local name is 'Coushi' or 'Acoushi' ant. It seems to prefer the lighter sandy soils for its nests, and these are frequently found in the large sand-reefs which intersect the heavy clay soils in some districts. The formicaries are usually very large and have long underground galleries. This species works at leaf-cutting exclusively at night, though in the daytime some of the smaller forms may occasionally be seen carrying off particles of sand and depositing them at the exits of the galleries. Slight disturbances, such as those caused by a person walking about on the surface of the nest, are sufficient to arouse the ants, including some of the largest

forms, which swarm out to the attack. They speedily ascend the legs of the intruder, and having secured a good grip with their jaws, retain it with a bull-dog tenacity. They are specially fond of all kinds of cultivated plants, and it is almost impossible to cultivate any kind of plant in some districts owing to their depredations. The leaves of the Para Rubber Tree (*Hevea braziliensis*) are readily attacked despite the exudations of the sticky sap which often proves fatal to other insects. No reliable method for their extinction has yet been devised. I have frequently observed, though have never been able to capture, a small species of fly (apparently a Muscid) which hovers over the ants while working in the daytime. From time to time the ants excrete from the tip of their abdomens a tiny globule of liquid, and as soon as this appears the fly darts down and rapidly absorbs it; the ants, though apparently uneasy, make no attempt to drive away the intruder.

Atta Acromyrmex octospinosa, Reich., ☿.

Issororo, N.W. District, 1915.

A. (*A.*) *mölleri*, For., subsp. *meinerti*, For., var. *globoculis*, For. (in litt.).

☿. "This species appears to inhabit the interior; it has never been met with on the coastlands. The communities are never large, but frequently a number of communities are met with in a small area. Formicarium with fungus-chamber is invariably found within a decaying log of wood, either just under or slightly above the soil-surface, and easily accessible. I have always observed this species to utilise freshly cut pieces of leaves and they are daylight workers. This species also enters human habitations and will carry off particles of food-stuffs. On one occasion the greater part of a half-pound packet of dried raisins were carried off by these ants. They have a distinct partiality for the foliage of Para Rubber (*H. braziliensis*)."

N.W. District, 1913.

It would be interesting to know whether the number of communities in a small area, spoken of by Mr. Bodkin, all belong to the same colony, or are separate colonies. As far as is known, the colonies of *Acromyrmex* are much less populous than those of *Atta*, sensu stricto.

IV. Subfam. *Dolichoderinæ*, For.

Tribe Dolichoderini, Em.

Dolichoderus (s. str.) *attelaboides*, F., ☿.

Konawaruk, 1914.

D. (*Monacis*) *bispinosus*, Oliv., ☿.

D. (*M.*) *debilis*, Em., ☿.

"The formicary of this species was observed in the nest of the termite *Entermes costaricensis*, Holmgr. The termite nest was situated on the stump of an old tree about four feet from the ground, and was partly inhabited by termites and partly by this species." 1913.

D. (*M.*) *gagates*, Em., ☿.

"This appears to be another uncommon species occurring in the interior. Observed to feed on the honey-dew given out by a Sassid nymph." 1914.

D. (*Hypoclinea*) *bidens*, L.

"A common species of ant throughout the colony. Small nests are constructed by slightly drawing together the edges of a leaf and covering the intervening space with a thin covering of dark-coloured vegetable substance of paper-like consistency, though somewhat more fragile. Any plant whose leaves are suitable for this purpose is utilised by this species as a dwelling-place. Coffee-trees (Liberian coffee), if not properly pruned, are particularly liable to infestation. The picking of the coffee is then rendered a difficult matter, as the slightest disturbance causes the ants to sally forth and attack the intruder by inflicting exceedingly sharp bites. This species has been observed to feed on the honey-dew of the coccid *Pseudococcus citri*, Risso, on cacao pods."

N.W. District, 1913, &c.

D. (*H.*) *lutosus*, Sm., ☿.

"A fairly common species, invariably found beneath the bark of trees. Formicary unobserved."

Botanic Gardens, Georgetown, 1914.

Tribe TAPINOMINI (Emery).

Azteca schimperi, Em., ☿.

"I have only once taken this species. It appears to infest the belt of low-growing trees termed 'Courida' (*Avicennia nitida*), which fringe the seashore in British Guiana. In this particular instance the ants were attending the coccid *Lecanium æquale*, Green, which had infested several trees. Formicarium unobserved."

A. chartifex, For., subsp. *laticeps*, For., ☿.

"A common species. Forms large carton nests on the trunks of trees, and is especially fond of the mango for this purpose. Some nests are as much as two feet in length This species inflicts a very sharp bite, and on the slightest disturbance the ants swarm out to attack the intruder, making an audible rustling sound. The nests may be easily destroyed by fire, but a breeze is required to keep the conflagration smouldering until the nest is entirely consumed. Within six months, however, the ants will be found to have made considerable progress in the construction of another nest, frequently in the same spot."
West Bark, 1914.

A. instabilis, Sm.

British Guiana, 20. 4. 15.

A. trigona, Em., subsp. *subdentata*, For.

Aruka River, N.W. District, 5. 6. 15.

A. alfaroi, Em., var. *ovaticeps*, For., ☿.

"An uncommon species. Inhabits the medullary cavities of the trumpet-tree (*Cecropia peltata*)."
Rockstone, 1914.

A. velox, For., ☿.

British Guiana, 20. 4. 15.

Tapinoma melanocephalum, F., ☿.

Cosmopolitan. In houses, 1914.

Tapinoma sp.

V. Subfam. *Camponotinæ*, Forel.

Section EUCAMPONOTINÆ, Forel.

Tribe Prenolepidii, Forel.

Prenolepis longicornis, Ltr., ☿.

"A commonly occurring and very widely distributed ant in British Guiana. To be found as an inhabitant of most houses. Is especially fond of sugar and dead insects of all kinds. I have also frequently observed it to infest steamers and other craft which call at the port of Georgetown. Formicarium usually constructed just beneath the surface of the soil at the base of posts, walls, &c., or in crevices in wood-work; they are usually small. Houses may be successfully cleared of them by exposing a mixture of molasses and arsenic or by hunting for the nests and destroying them with carbon bisulphide."

A well-known cosmopolitan species.

Tribe Camponotini, Forel.

Camponotus (*Myrmothrix*) *abdominalis*, s. str., F., ☿.

"Inhabiting the disused sacs of the larva of the moth *Œceticus kirbyi*."

Georgetown, 1915.

C. (*M.*) *abdominalis*, F., var. *mediopallidus*, F., ☿, ♀.

Issororo, N.W. District, 1914.

C. (*M.*) *abdominalis*, F., subsp. *stercorarius*, For., ♀, ☿.

These specimens answer very well to Forel's description and appear identical with examples received from him.

"Nesting under leaf-sheaths of sugar-cane," Botanic Gardens, Georgetown, 1914.

(*C. M.*) *femoratus*, F., ☿.

Issororo, N.W. District, 1913.

C. (*Myrmosphincta*) *sexguttatus*, F., var. *ornatus*, Emery.

Botanic Gardens, Georgetown, 1914, 1915. ☿ major and minor.

These specimens answer perfectly to Emery's description. From small carton nest on underside of palm-leaf.

Appendix.

The following species have previously been collected in British Guiana, and identified by the Imperial Bureau of Entomology :—

Paraponera clavata, F.

"A fairly common species. The local name is 'Muniri.' Formicarium observed on two occasions at the base of young trees. The soil is carefully cleared away from around the base of the trunk to a considerable depth, and this serves as the means of communication to the nest. It is only necessary slightly to tap the trunk of the tree, when the ants swarm out making the stridulating noise common to the species. They soon return to the nest, however. The sting as exceedingly painful, and will bring on fever in a susceptible individual."

Odontomachus hæmatoda, L.

O. affinis, Guér.

Eciton burchelli, Westw.

E. cœcum, Ltr.

Cryptocerus clypeatus, Oliv.

"A fairly common species. The formicary has once been observed beneath the loose decaying bark of a tree ; the community consisted of about 1000 individuals."

Atta fervens, Say.

"This species seems occasionally to occur in the interior districts ; it has never been taken near the coast."

Camponotus maculatus, F., subsp. *picipes*, Oliv.

Note on Claviger testaceus.

Donisthorpe has recently (Ent. Rec. xxviii. 2, p. 34, 1916) commented on my experiments with this myrmecophilous beetle and the queens of *Lasius niger*, *flavus*, and *umbratus* (Ent. Rec. xxvii. 9, p. 205, 1915). My remarks, owing to their brevity, have evidently given rise to a misapprehension. The beetles, as I have previously observed myself, sometimes rest on the queens in nests of *L. flavus*, their normal host,

but the point I wished to make is that, in my experiments last year, the queens of *L. umbratus* appeared to possess an attraction for the beetles superior to that possessed by the queens of *L. flavus*, or *L. niger* (with which *Claviger testaceus* is occasionally found, *e. g.* Seaton, 1912, Porlock, 1915). The nest of *L. flavus* referred to, which contains four queens and fourteen *Claviger*, and is in a small frame, so that the beetles are continually coming across the queens, has been in my possession for eleven months, under daily observation, and it is curious that I have never seen any of the *Clavigers* resting on the queens. On the other hand, when a few of these beetles and others taken at the same time, were put into nests containing *L. umbratus* queens, the beetles were constantly clinging to the queens, and for weeks never appeared to change their resting-place. The striking contrast in this behaviour of the *Claviger* appears to me to be additional evidence that the parasitic queens (*L. umbratus*, *fuliginosus*, &c.) have a body-secretion which renders them attractive to other species of ants and myrmecophiles.

XLIII.—*Descriptions of new Species of Lepidoptera.* By G. T. Bethune-Baker, F.L.S., F.Z.S.

Rhopalocera.

Lycænidæ.

*Liptenin*æ.

Epitola crowleyi.

There is an interesting variety of the male of this species in the Joicey collection from the Cameroons.

The primaries are entirely brown, with a very few blue scales near the base on the fold; the secondaries have also less blue than usual, a reduction of the area taking place at the anal angle and along the inner margin. The underside of the secondaries is much whiter, with but little of the bronze hue. The specimen is also small.

If it is a constant variety it might, perhaps, be known by the name *Epitola crowleyi semibrunnea*.

Lycæninæ.

Turania cytis, Chr.

I made this genus (*Turania*) in the 'Entomologists' Record,' 1914 (vol. xxvi.). p. 160, with *cytis*, Chr., as the

type. My friend Dr. J. McDunnough, of Decatur (U.S.A.), has recently drawn my attention to the fact that *Turania* of Ragonot already exists in the Pyralidæ ; so that a new name is needed. I propose, therefore, the name *Turanana*, with *cytis* for its type.

Lycænesthes crawshayi.

Capt. Wilson took a pair of this species from the Nuba Hills of a very diminutive size ; the measurement of the male is 20 mm., compared with an average of 30 mm. from Sierra Leone and Uganda. I have several of a small race from the Budonga Forest, but they are 24 and 25 mm., as compared with 20 mm. from the Nuba Country. If this small form is constant, it might well be named *crawshayi minuta.*

The markings are quite the same, but all crowded up into the much smaller area.

The specimens are in the Oxford Museum.

Argiolaus ismenias, Klug.

Several specimens of this fine but delicate species were taken at Sungikai and Kadugli, in the Nuba Hills (Southern Kordofan), on November 13 and December 16 by Captain R. S. Wilson in 1904.

Spindasis kaduglii, sp. n.

♂. Head and collar very pale fawn-colour. Both wings faded straw-colour, much obscured with the dark markings. Primaries with the base pale brownish, terminating in a darker transverse dash, the costa broadly pale brownish ; postmedian band broad, angled outwards at vein 4, reaching well below vein 2, and confluent about vein 2 with the subterminal broad dark band, which increases in width from the apex to the tornus ; the subcostal triangle of spots also touches the inner edge of the subterminal band, between which and the termen is a trace of a pale line. Secondary almost entirely obscured with the dark pattern, the short broad subapical dash and the broad subterminal stripe being the only definite markings. Underside : primaries pale straw-colour, with the markings more or less pupilled with metallic silvery ; there is a small subbasal spot, followed by two larger ones, one in the cell and one below ; the postmedian and other bands follow the upper surface pattern, being merely more or less darkly outlined. Secondaries deeper straw-colour, with a trace of four basal spots, followed by three transverse rows

of spots, the third terminating on vein 4; all these rows are more or less parallel, and are followed by a terminal row which has only a trace of the metallic pupilling.

Expanse 34 mm.

Hab. Kadugli, Nuba Hills, Kordofan, December (*R. S. Wilson*).

Type in the Oxford Museum.

This species will come near *victoriæ*, Btl.

Hesperidæ.

Caprona adelica kordofani, var. n.

♂. Head, thorax, abdomen, and all the wings very pale pinkish buff, with the usual marks as in *adelica*, Karsch, but the broad pale median area is more or less filled in with stripes and lines.

This is no doubt the dry-country form of *adelica*, and I think that any *Cassualalla* from Angola is the more variegated Western form of the same insect.

Heterocera.

Noctuidæ.

Stictoptera obalaui, sp. n.

♂. Head and collar fawn-brown, the latter with pale edging; patagia fawn-brown; abdomen pale grey. Primaries fawn-brown, the basal and antemedian areas somewhat mottled; a pale ash-grey median band, in which there is a short dark dash in front of the reniform stigma, outside which is a twin, sharply crenulated, curved postmedian line; two paler subterminal rows of spots almost forming lines. Secondaries hyaline, with the terminal third dark.

Expanse 38 mm.

Hab. Obalau Island (Fiji).

Type in my collection.

Near *melanistis*, Hmpsn.

Pseudophix pratti, B-B.

I described this species in Novit. Zool. xiii. pp. 261 & 262, 1906, and I considered that the female I described on p. 262 was the female of *pratti*; but I find this is not the case. Mr. Joicey has received a specimen from the Wandammen Mountains, Dutch New Guinea, which is without doubt the female of *pratti*; the markings are precisely the same, except

that the basal and antemedian areas are as dark as the rest of the wing, not pale chestnut-colour as in the male. It is necessary, therefore, to give a new name to the female first described; it will probably be well to repeat the description. I therefore name it

Pseudophix callipepla, sp. n.

♀. Head reddish; thorax and dorsum of proximal (not prominal) abdominal segments pale orange-reddish; abdomen dark grey. Primary with base and median area orange-fawn colour; postmedian area dark reddish, edged by a fine irregular line of white scales; terminal area broadly reddish orange mottled with brown. Secondary orange-fawn; median and postmedian area reddish, edged by an irregular line of whitish scales; terminal area very broadly reddish orange mottled with brown.

Expanse 64 mm.

Hab. Mount Kebea and other New Guinea localities.

Type in my collection.

Lymantriadæ.

Dasychira wandammena, sp. n.

♂. Head, collar, and thorax greyish white, the latter with a bar of black on each side of the metathorax, abdomen brownish. Primaries whitish grey, a deeply indentated fine black subbasal line; there is an irregular greyish area edged externally with blackish adjoining the subbasal line; median area white, with a slight yellow tinge; median line sharply dentate and irregular; the postmedian crenulate black line is irregular; between these last two lines there is an ovate white mark, edged finely with black around two-thirds of it; area greyer up to the termen; a very irregular subterminal row of black internervular dashes. Secondaries yellowish, with the outer half sooty brown.

Expanse 64 mm.

Hab. Wandammen Mountains (3000–4000 ft.), Dutch New Guinea.

Type in Coll. Joicey.

This species is very near *D. cerigoides*, Wlk., from Borneo.

Euproctis flavipunctata, sp. n.

Head, thorax, and proximal segments of the abdomen bright orange-red; abdomen black, with whitish anal tuft.

Primaries with a restricted basal area of pale orange-yellow, beyond which the wing is entirely rufous-grey for three-fifths; at the end of the cell there is a largish ovate yellow spot; terminal area orange-red, with the veins pale yellow. Secondaries uniformly pale yellow.

Expanse 46 mm.

Hab. Dinawa, British New Guinea, 4000 ft.

Type in my collection.

The species is near *huntei*, but is, I think, distinct.

Porthmeia radiata, sp. n.

Head, thorax, and patagia yellow, abdomen blackish. Primaries yellow, with the basal area radiated with blackish, especially along the fold, where the radiations extend the greater length of the wing; apical area broadly radiated with blackish between the veins; fringes black. Secondaries black, with the hind margin dotted with yellow, which on the underside is transformed into a marked yellow terminal line.

♀. Like the male, but more orange in colour.

Expanse, ♂ 32, ♀ 42 mm.

Hab. Owgarra, British New Guinea.

Type in my collection.

The species is very like my *P. subnigra*, but the head, collar, and thorax are black in *subnigra* and yellow in the present species.

Caviria avolaënsis, sp. n.

♀. Frons, head, thorax, and abdomen white; antennæ very dark grey, so as to look blackish to the naked eye; legs brownish, with white femora; all the wings pure white, not lustrous.

Expanse 44 mm.

Hab. British New Guinea: Avola, 6000 ft., August (*A. E. Pratt*).

Type in my collection.

Notodontidæ.

Gargetta punctatissima, sp. n.

♂. Head, collar, and thorax dark variegated brown, palpi very dark brown; patagia rather paler; abdomen greyish. Primaries cinnamon-brown without the red in it, clouded with dark brown at the base and along the costal area. The whole of the wing has a mottled appearance; an antemedian row of dark dots, somewhat indistinct; an oblique median

row of similar dark dots, followed by a double similar post-median row, a subterminal row of dark dots; termen with a minute dark triangle at the end of each vein. Secondaries palish greyish brown.

♀. Similar to the male, but much paler, so that the dark dots stand out much more prominently.

Expanse, ♂ 52, ♀ 50 mm.

Hab. British New Guinea: Mount Kebea and Babooni, 3000 ft., July to September (*A. E. Pratt*).

Types in my collection.

Scranchia idioptila, sp. n.

♂. Head and collar deep coffee-brown, thorax and abdomen grizzly. Primaries greyish, mottled, with an indefinite, clearer, interrupted, twin subbasal line not reaching the inner margin, a similar median line between the two; almost on the fold is a raised ovate spot of brownish colour, an irregular dark median stripe across the wing, adjoining which is a tawny spot of moderate size with a fine black crescent in it; a fine dentate dark postmedian line, beyond which is a broad, very interrupted, dark, curved band; outside, but adjoining it, is a small dark cloud, with an irregular serrate subterminal line; termen finely dark, on the costa before the apex are four dark dots. Secondaries brownish.

Expanse 42 mm.

Hab. Madagascar, 2500 ft., January to March.

Type in my collection.

Parathemerastis turneri, var. *melanistis*, var. nov.

♀. Thorax and primaries sooty grey, with the markings just visible, the ash-grey orbicular stigma standing out very prominently from its dark surroundings, a slightly cinnamon-coloured cloudy area before the stigma. Secondaries dark brown.

Expanse 62 mm.

Hab. Mount Kebea (6000 ft.), March to April; Dinawa (4000 ft.), August; British New Guinea.

Type in my collection.

Omichlis erythra, sp. n.

♂. Head and thorax cinnamon-red, abdomen dirty ochreous. Primaries cinnamon-red with the basal and antemedian areas finely irrorated with brownish grey; a median serrated line loses itself in the darker area, the postmedian dark line is

strongly excurved in the radial area and recedes very deeply on the fold terminating about the middle of the inner margin; this is followed at a little distance away by another fine dark line almost parallel with the preceding one and more or less broadly edged externally by pale ochreous, especially in the costal area; terminal area darkly suffused. Secondaries pale brownish, and of the usual silky-looking texture.

Expanse 48 mm.

Hab. Mount Kebea, British New Guinea, 6000 ft., July (*Pratt*).

Type in my collection.

Cascera callima, sp. n.

♀. Head and thorax chestnut-brown mixed with grey. Primaries pale pinkish brown with a dark broadish subbasal dash on the lower margin of the cell, followed by a whitish patch in the angle of vein 2, at the edge of which is an oblique irregular stripe of dark shading edged by an indefinite and interrupted paler line; a subterminal row of pale dots darkly edged externally. In the cell there is a twin dark line across the centre and a dark spot at the end with a pale centre, beyond which are two or three dark dots. Secondaries pale grey.

Expanse 50 mm.

Hab. British New Guinea: Mount Kebea, 6000 ft., March and April (*A. E. Pratt*).

Type in my collection.

Nearest to my *Cascera bella*.

Stauropus mediobrunnea, sp. n.

♂. Head and thorax grizzly ash-grey, pale fawn-brown. Primaries with the basal area ash-grey slightly irrorated with brown, the whole of the median area dark brown terminating very irregularly, from where to the termen the colour is palish chocolate-brown, with a fine subterminal irregular line. Secondaries pale brownish with the usual darker "*stauropus*" mark at the apex.

♀. Similar to male, but with the basal and terminal areas very pale ochreous grey, the dark median area large and deep brown, the fine terminal line accentuated strongly.

Expanse, ♂ 48, ♀ 61 mm.

Hab. British New Guinea: Mount Kebea, 6000 ft., March and April; Babooni, 3000 ft., July and August; Ekeikei, 1500 ft., July.

Types in my collection.

Stauropus mixta, sp. n.

♀. Head and thorax greyish mixed with brown, abdomen buff-colour. Primaries variegated grey and whitish with bright green iridescent scales and dark lines; base with many green scales; antemedian line broad, blackish, oblique, nearly straight, beyond which is a second parallel, somewhat indefinite, fine line; end of cell whitish grey, below which the fold is darker and has green scales; postmedian line broadish, blackish, deeply crenulate on each side of the interspace of veins 3 and 4, beyond this line the area is whitish grey, edged externally by a row of irregular dark dashes interrupted at each vein. Secondaries pinkish brown.

Expanse 48 mm.

Hab. British New Guinea: Mount Kebea, 3000 ft., July (*A. E. Pratt*).

Type in my collection.

Lasiocampidæ.

Aryuda ninayi, sp. n.

♂. Head, thorax, and abdomen creamy grey, palpi fawn-colour. Primaries pale fawn-colour, with two oblique fine darker lines, the antemedian being short and the postmedian much more oblique and curved basewards immediately below the costa; a small dark spot at the end of the cell, an indistinct oblique crenulate line of grey shading in the subterminal area (this line is quite distinct in some specimens). Fringes dark fawn. Secondaries warm pinkish fawn-colour.

Expanse 46 mm.

Hab. Ninay Valley, Dutch New Guinea, 3000 ft. (*A. E. Pratt*).

Type in my collection.

Chrysopsyche jacksoni, B-B.

I described this species in this Magazine for the year 1911, p. 563, having before me a series of fifteen specimens from Entebbe (Uganda). At a later date I was overhauling some of this genus and its allies, and I was struck by the fact that I had nothing but males, whilst in the same collection from the same place I had a series of twenty-one females of a species very closely allied to *Lechriolepis varia*, Wlk. These I have no doubt are the females of my species *jacksoni*, but they are so close to the female of *varia* that I had at first named them so. Walker's species is, however, rather larger and the markings are redder, but the males are very different.

Varia is, however, a *Chrysopsyche*, not a *Lechriolepis*.

XLIV.—*Notes on the Synonymy of the Genus* Ogyris.

By G. T. Bethune-Baker, F.L.S., F.Z.S.

Waterhouse and Lyell are to be congratulated on the production of their recent work 'The Butterflies of Australia.' Whilst, however, I have the greatest regard for both authors, and particularly for my old correspondent Mr. Waterhouse, I cannot refrain from criticising their treatment of some species in the genus *Ogyris*; for, instead of clearing up matters, they have made them more involved by adding yet more to the synonymy, by completely ignoring Hewitson's original descriptions and figures, and by ignoring the rules of nomenclature as laid down in the International Code.

Ogyris zosine, Hew.

This species was described in Hewitson's Exot. Butt. i., and the male was figured on plate xlviii. figs. 3 and 4.

Ogyris genoveva, Hew.

This was the next species to be described in the same work, and it was figured on the same plate, the numbers being 5 and 6.

In the Spec. Cat. Lyc. B. M., p. 2, he (Hewitson) catalogues the known species of the genus and again figures *zosine*; here he only figures the underside, referring to it in error as the ♀. The specimen figured is, however, a male; it is unfortunate that it is so, as he had the female before him at the time and this was *the same colour as the male.*

In the Trans. Ent. Soc. London, 1905, pp. 296 *et seq.*, I monographed the genus and revised it up to date. Here I definitely selected the dull purple ♀ as the ♀ type of Hewitson's species, and in so doing I acted quite correctly and in accordance with the Code. It matters not whether the dull purple form is rarer than the paler blue form. Hewitson himself had described the blue form as *genoveva*; he thought it was another species, but that does not alter the fact that he gave it another name, and he did so because he had lying before him the dull purple form of the ♀ as well as the pale lustrous one, and this alone not only justifies me in selecting that form as the type-form, but, in view of Hewitson's action, it is the only reasonable thing to do. Dimorphic females are always named in these days, and I think rightly named, the object being to designate the form. Waterhouse and Lyell,

however, sink *genoveva* as a direct synonym of *zosine*, and, in thus overriding my selection of the ♀ type and in sinking *genovera* as a direct synonym, my good friend Mr. Waterhouse is entirely ignoring all nomenclatorial rules—and he is ignoring the Code, and must not be followed.

Ogyris zosine duaringa, B-B.

This local race, a well-marked form as to colour, is sunk also as a direct synonym. The question of a local race will, I suppose, always be a matter of opinion to a certain extent; in some cases, as in this, it will be a question of the keenness of the eye to colour-differences. There is no doubt, however, of the difference of colour in this case; it is quite marked, and the name should stand. Our authors have registered this form as typical *zosine zosine*, but this is evidently an error—it is quite different to Hewitson's type.

Ogyris zosine magna, B-B.

This is also sunk as a direct synonym, but the extraordinary part of it is that the authors absolutely re-name the very form under the name *zosine araxes*; they describe the male as bright purple with the costa near the apex splashed with white. I described my *magna* as rich purplish blue, with the apical third and the apical half of the termen hoary in the male; whilst the female is described as having the basal fourth of the primary and the central area extending toward the tornus as metallic green. I describe the same areas as greenish blue, more greenish than in *duaringa*, and as lustrous greenish; the types in the former case come from Dimboola and a similar form from Sydney—my types come from Brisbane. From the descriptions it would appear that the two forms must of necessity be the same—knowing the species as well as I do, I feel quite sure they are.

Four female forms are in nearly all large collections: there is the type-form as indicated by Hewitson, and as selected by me (but, unfortunately, he figured a male), of the duller purple colour; there is the pale bright blue form named by the same author *genoveva*; there is the lustrous greenish form named by me *magna* and by Waterhouse and Lyell *araxes*; and there is also a rich true-blue form, quite different from *genoveva*, not purple at all—it is in the British Museum from Townsville and from N.W. Australia, and I suppose it is the form that our authors have called *zosine typhon*. They are all separable at a glance, and anyone investigating local

races or constant varieties would without doubt keep the four forms separate with their individual names.

The authors, however, state in their preamble to the species : "The original descriptions and plates provide some evidence that the type examples . . . came from Moreton Bay (Brisbane) ; the type is purple with distinct black margins. The type female (Hewitson's *Ogyris genoveva*) is described as blue, but figured as green." This is pure guess-work on their part. We have no evidence at all that the original three species come from Moreton Bay ; in fact, we have rather evidence to the contrary, for when, years later on, he (Hewitson) received a specimen from that district he definitely so labelled it and gave exact localities (as, Swan River) whenever possible. Hewitson's type male has dark margins (not black), but by no means distinct on their inner edge and the purple is very dull in tone. The type female is the same colour as the male ; this, as already mentioned, I selected in my monograph in 1906, and our authors have not the power or right with a stroke of their pen to alter that selection—as first reviser, my selection must stand. Hewitson's original material, dealt with in his Exot. Butterflies, consisted of a pair (♂ and ♀) of the dull purple form, and a bright pale blue ♀ (the *genoveva* ♀). I have made a special search at the British Museum (Natural History), and there is not any evidence whatever to enable us to say from what part of Australia those specimens came ; the purple ♀ is apparently identical with what Waterhouse and Lyell have renamed *typhon iberia*, which therefore must sink as a synonym to *zosine zosine*, as I had already restricted the type ♀ to that form. Subsequently, Hewitson received another male specimen from Moreton Bay (it is labelled in his own handwriting). There can be no doubt that he (Hewitson) knew exactly what he was doing when he described the species. He had a male and female, dull purple, which he called *zosine*, and he had a second female very pale lustrous blue, which he thought was another species and which he called *genoveva*. This he indicates in his letterpress, so that, when I selected the adult purple female as the type female form of *zosine zosine*, I was not only acting legitimately, but I was carrying out the original intention of the first describer of the species; and it is contrary to the Code for a subsequent author to nullify the selection, and would also be very detrimental to progress. Taking up now the forms Waterhouse and Lyell mention, we have :—

Ogyris zosine typhon.

Apparently the form with the dull purple ♂ and the rich true-blue ♀, *not* the pale blue ♀ form.

Ogyris zosine typhon, ♀ *iberia.*

This sinks to *zosine zosine*, being the dull purple female form already selected as the type-form of *zosine*.

Ogyris zosine zosine.

I have no doubt that this is my *zosine duaringa*. The authors describe the ♂ as rich purple, so that it is quite obvious that this male cannot be typical *zosine*, as it is *not* like Hewitson's type, figure, or description.

Ogyris zosine zenobia, ♀.

This is described as a rich purple form of the female, and is one that I have not seen.

Ogyris zosine araxes.

This must sink to my *zosine magna*—I have no doubt whatever on the point. The two descriptions coming from two different pens are practically identical.

The synonymy, so far as Waterhouse and Lyell and myself are concerned, should be as follows :—

Ogyris zosine zosine, Hew. (nec Waterhouse & Lyell).

Syn. *iberia*, ♀ form.

The form with both sexes of a dull purple colour.

Ogyris zosine genoveva, Hew.

The dimorphic female of *zosine zosine*, of a lustrous very pale blue, occasionally slightly tinged with greenish.

Ogyris zosine duaringa, B-B.

Syn. *zosine zosine* of Waterhouse and Lyell.

The bright purple male with lustrous greenish-blue female. My locality is Coomooboolaroo (the adjoining district to Duaringa). Waterhouse and Lyell's locality is Duaringa; they also give Brisbane and the Richmond River.

Ogyris zosine zenobia, ♀ form.

A bright purple female form from Brisbane and the Richmond River.

Ogyris zosine magna.

Syn. *zosine araxes.*

A very distinct race, the most distinct that I know both in colour and size—the males being the richest purple and the females the most lustrous greenish blue, the greenest form I know.

Localities. Brisbane, Sydney, Illawarra, Dimboola.

I am rather at a loss to know why Waterhouse and Lyell have included Sydney in their localities, for they say of the female, "Sydney examples are not sufficiently distinct to be separated as another geographical race."

It is very many years since my old friend Mr. Waterhouse and I began to correspond, and, knowing as I do the careful and accurate work that he has accomplished, I feel sure that if he had been able to refer again to Hewitson's types and if he had borne in mind the rules of the International Code on nomenclature, he would not have come to some of the conclusions laid down in the recent book, which, in spite of this, is a most valuable contribution on the Australian fauna, and one that no students of the Rhopalocera of that region ought to be without.

Ogyris halmaturia, Tepper.

I only had the ♂ type of this insect before me, so, of course, could not make the correction the authors refer to; there were, however, quite sufficient deviations from typical *otanes*, especially on the underside, to justify the use of Tepper's name, and I left it with specific rank, with the express object of drawing attention to these deviations; for in the closing sentence of p. 277 of my monograph I broadly hint at the possibility of *halmaturia* being a form of *otanes*, Felder, and I am quite willing to concede it as a race of that species.

XLV.—*The Races of* Dremomys pernyi.

By Oldfield Thomas.

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The handsome squirrel *Dremomys pernyi* is now known to range from the Chin Hills, Upper Burma, eastwards across the whole of China to An-hwei and Fokien, and it is not unnatural that in this large area a number of local subspecies should have become differentiated.

Mr. Glover Allen has recently pointed out reasons for giving special names to the forms of Ichang and South Yunnan; and in laying out the Museum series of *D. pernyi*, about sixty in number, I find that his races both deserve recognition, while four others appear to need description.

My attention was first attracted to this question about 1896, and as so much depended on the identification of the original *Sciurus pernyi*, which was said to come from the province of Sze-chwan, Prof. Milne-Edwards was good enough to send to us two examples representing the typical form, collected by Père Soulié at Tse-kow, in N.W. Yunnan, close to the western border of Sze-chwan. In Mr. Allen's papers quite a different form is taken as the typical *pernyi*, and I have therefore again consulted Paris as to the characters of the actual type collected by Perny. About this Prof. Trouessart has been so good as to give me such details as to show that it is really the same as the N.W. Yunnan form, as I had hitherto supposed. The grey form considered by Mr. Allen as typical *pernyi* therefore needs a new name.

The subspecies which I should recognize are as follows, passing from west to east :—

1. *Dremomys pernyi pernyi*, M.-Edw.

Rev. Mag. Zool. (2) xix. p. 230, pl. xix. (1867).

Size comparatively large, an adult skull measuring 53·5 mm. in greatest length, with a facial length * of 27·6. General colour saturate, rich brownish olivaceous, the postauricular patches strongly contrasted. Middle area of underside of

* See P. Z. S. 1886, p. 75 (footnote). In these squirrels, where the length of the nose is of importance, and yet the nasal bones are too irregular posteriorly to furnish a satisfactory measuring-point, the lengths of "face" and "brain-case," as described in the above reference, appear worthy of utilization.

tail grizzled buffy or brown, varying a good deal, as it does in all the races, but never clear grey. The buffy colour is clearly shown in Milne-Edwards's original plate.

Range. Chin Hills, Upper Burma (*Mackenzie*), Tengyueh (=Momein, Western Yunnan (*Howell*), Tse-kow, N.W. Yunnan (*Soulié*), Western Sze-chwan (*Perny*).

2. *Dremomys pernyi flavior*, G. All.

P. Biol. Soc. Wash. xxv. p. 178 (1912).

Size small, the smallest of the forms, greatest skull-length about 49 mm., facial length 25. General colour distinctly olivaceous (approaching "deep olive"), not so brown as in other subspecies.

Hab. S.E. Yunnan, Möng-tze (*H. Orii*).

Seven examples belonging to the original series are in the British Museum. The type was one of a few specimens abstracted by a native from the collection and sent to America for sale.

This is, perhaps, the most distinct from the rest of all the subspecies by its smaller size, delicate skull, and more olivaceous coloration.

3. *Dremomys pernyi griselda*, subsp. n.

Dremomys pernyi, G. All. Mem. Mus. Harvard, xl. no. 4, p. 228 (1912)

Size about as in true *pernyi*. General colour much greyer than in the other races, back nearly approaching, though darker than, greyish olive of Ridgway. Post-auricular patch not very strongly contrasted. Median area of underside of tail liberally mixed with long greyish-white hairs, which nearly or quite hide the buffy bases of the lateral hairs.

Skull-measurements of type :—

Greatest length 51·3 mm.; condylo-incisive length 45; facial length 25·5; length of brain-case 26·5; upper tooth-series exclusive of p^3 8·2.

Hab. Eastern part of the mountainous region of Western Sze-chwan, at altitudes of 9000 to 14,000 feet; Nagchuka (=Ko-kou) and Yao-chao (*Bailey*); Ta-chien-lu, Nagchuka, Ramala Pass, and Shuo-low (*Zappey*).

Type. Adult female. B.M. no. 11. 10. 3. 3. Original number 6. Collected at Nagchuka, 10,000 feet, 25th May, 1911, and presented by Major F. M. Bailey.

This is the form which, from its occurrence in Sze-chwan, Mr. Glover Allen identified with typical *pernyi*; but, as

already explained, it is the saturate form of N.W. Yunnan and the extreme western edge of Sze-chwan which should bear that name. I myself also originally identified Major Bailey's specimen as *D. pernyi*, and may therefore, perhaps, have misled Mr. Allen.

D. p. griselda is readily distinguishable from all other forms by its greyish general colour and the long grey hairs along the underside of the tail.

4. *Dremomys pernyi modestus*, subsp. n.

Fur rather harsher than in the western and more highland subspecies. General colour more drabby brown, near "Saccardo's umber," the type even approaching "buffy brown." Ear-patches comparatively inconspicuous, scarcely contrasting at all with the colour of the head. Under surface distinctly tinged with buffy, especially posteriorly. Middle area of underside of tail dull buffy.

Dimensions of typical skull :—

Greatest length 52 mm.; facial length 26·5; length of brain-case 27; upper tooth-series exclusive of p^3 8·4.

Hab. Sui-yang, Kwei-chow.

Type. Old male. B.M. no. 8. 8. 11. 41. Collected April 1898. Presented by F. W. Styan, Esq. Three specimens.

All the eastern forms of *D. pernyi* (east of about 106° E.) have a more brownish tone than the western ones. *D. p. modestus* is most allied to *D. p. senex* of Ichang, but is a paler brown, with less conspicuous ear-patches.

5. *Dremomys pernyi senex*, G. All.

Dremomys senex, G. All. Mem. Mus. Harvard, xl. no. 4, p. 229 (1912).

General colour brownish olivaceous, not so brown as in the next subspecies or *D. p. modestus*, not so olivaceous as in *D. p. flavior*. Ear-patches very conspicuous, usually rich ochraceous, but white in the type, a variation which occurs in other members of the genus. Under surface more or less suffused with buffy, which is specially well marked on the area in front of the thighs.

Skull-dimensions of type (from Allen) :—

Greatest length 53 mm.; upper tooth-row, exclusive of p^3, 9.

Hab. Ichang. Eight specimens in the British Museum, presented by Mr. Styan.

Although none of our specimens have white ear-patches, I have seen enough examples of this particular variation in the genus *Dremomys* to feel sure that Mr. Glover Allen's type belonged to the same form as those obtained at Ichang for Mr. Styan.

6. *Dremomys pernyi chintalis*, subsp. n.

General colour paler than in *senex*—in fact, of very much the same more drabby brown as in *D. p. modestus*,—but the ear-patches large and strongly contrasted. Under surface wholly whitish, with scarcely a trace of buffy suffusion, the area on the inner front surface of the thighs without the strong buffy tinge so marked in *senex* and *calidior*. Ochraceous area round anus smaller and less conspicuous than usual.

Skull small, scarcely larger than that of *flavior*.

Dimensions of skull :—

Greatest length 49·5 mm.; condylo-incisive length 43; facial length 24·8; brain-case length 26·2; upper tooth-row without p^3 7·4.

Hab. Chin-teh (also written Tsing-tō), An-hwei.

Type. Adult female. B.M. no. 99. 3. 9. 12. Collected 29th October, 1896. Presented, with five other specimens, by F. W. Styan, Esq., to whom, as in other cases, the National Museum is indebted for much of its most interesting Chinese material.

This, one of the brown eastern races of *pernyi*, is distinguishable by its small size, pale colour, and the absence of the prominent buffy patches in front of the thighs.

7. *Dremomys pernyi calidior*, subsp. n.

General characters very much as in *D. p. senex*, but the upper colour a much warmer brown, approaching "olive-brown." Ear-patches mixed white and ochraceous, the bases of the hairs white and their tips ochraceous. Under surface whitish, but ordinarily with well-marked buffy thigh-patches.

Skull-dimensions of the type :—

Greatest length 51·5 mm.; condylo-incisive length 44·3; facial length 25·8; length of brain-case 26·3; upper tooth-series exclusive of p^3 8·2.

Hab. Kuatun, N.W. Fokien.

Type. Young adult male. B.M. no. 99. 3. 9. 17. Collected and presented by F. W. Styan, Esq. Sixteen specimens examined.

XLVI.—*A new Genus of* Anthicidæ (*Coleoptera*) *from the Islands of Mysol and Waigiou.* By G. C. Champion, F.Z.S.

Mr. Blair having called attention to the systematic position of the Australian genera *Lemodes*, *Lemodinus*, and *Trichananca* [Ann. & Mag. Nat. Hist. (8) xi. pp. 207–209 (1913)], it is advisable to describe an allied genus found by the late A. R. Wallace in the above-mentioned Malayan islands. Specimens of this insect were acquired by Westwood for the Hope Museum more than fifty years ago, and others have also been detected amongst the Lagriids in the British Museum.

Lagriomorpha, gen. nov.

Head short, subtriangular, broadly truncated above the moderately wide neck, the eyes small, rounded, prominent, inserted at a little before the base, the epistoma transverse, depressed, confused with the front, and somewhat prominent, the antennæ stout, rapidly widened outwards, inserted beneath a tuberculiform prominence at some distance from the eyes; labrum short; mandibles short, broad, feebly bidentate at tip; mentum strongly transverse, supported by a broad gular process; maxillary palpi stout, joint 4 strongly securiform: terminal joint of labial palpi stout, ovate, obliquely subtruncate at tip; prothorax subcampanulate, convex, immarginate laterally and at base, about as wide as the head; scutellum transversely quadrate; elytra long, confusedly punctate, the inflexed portion almost covering the metathoracic episterna, the epipleura narrow, incomplete; prosternum separated from the propleura by an oblique suture; anterior coxal cavities widely open behind the large, conical, contiguous coxæ; mesosternum long, very narrowly separating the middle coxæ; ventral segment 1 as long as the metasternum, 2–5 comparatively short, subequal; posterior coxæ rather large, well separated; legs moderately stout; tibiæ finely carinate towards their outer edge, above and beneath, the spurs minute and scarcely visible; tarsi with their penultimate joint narrow, deeply excavate above for the reception of the terminal joint, the claws simple.

Type, *L. semicærulea*.

The Malayan insect forming the type of this genus would perhaps be mistaken at first sight for a Lagriid; but the

widely open anterior coxal cavities and other characters bring it near *Lemodes*, Boh., and *Trichananca*, Blackb., recently referred by Blair to the Anthicidæ. The carinate tibiæ and the greatly widened outer joints of the antennæ separate *Lagriomorpha* from both these genera, the general facies, too, being very different.

Lagriomorpha semicærulea, sp. n.

Elongate, depressed, a little widened posteriorly, especially in ♂, subopaque, the elytra and under surface shining, finely pubescent; ochraceous or rufo-testaceous, the elytra with about the apical two-thirds metallic blue, the antennal joints from 4–6 onward (the rufescent tip of 11 excepted) black and densely pubescent, the posterior legs with the knees, tibiæ, and first tarsal joint (and in one specimen the corresponding portions of the intermediate legs also) sometimes more or less infuscate, the abdomen in great part piceous. Head closely, shallowly punctate; antennæ moderately long, joint 3 slightly longer than 2, 4–11 more elongate, becoming rapidly wider, 8–10 very broad, triangular, 11 acuminate-ovate, much longer than 10, constricted at the middle; joint 4 of maxillary palpi broader in ♂ than in ♀. Prothorax about as long as broad, rounded at the sides, obliquely constricted before the base, closely, shallowly punctate, the interspaces alutaceous. Elytra broader than the prothorax, more elongate in ♀ than in ♂, slightly depressed below the base, closely, rather coarsely, confusedly punctate. Beneath closely, minutely punctate, with scattered larger punctures intermixed.

Length $5\frac{1}{2}$–8, breadth $1\frac{1}{2}$–$2\frac{1}{4}$ mm. (♂ ♀).

Hab. Mysol and Waigiou (*A. R. Wallace*).

Described from four females and two males, two of the former, from Mysol, belonging to the British Museum (*ex coll. Pascoe*), the others purchased by the Oxford Museum in 1862 or 1863, one only of them (a ♂) being from Waigiou. The males (one from each island) are smaller and less elongate than the females, and both of them have an indication of a faint, transverse or curved, pallid fascia on the disc of each elytron at about one-third or one-fourth from the apex.

XLVII.—*Brief Descriptions of new Thysanoptera.*—VIII.

By Richard S. Bagnall, F.L.S.

Suborder Terebrantia.

Family Æolothripidæ.

Subfamily *Orothripinæ.*

Orothrips propinquus, sp. n.

♀.—Very like *O. australis*, Bagn., but stouter and larger (1·8 mm. long as against 1·5 mm.) and also darker in coloration. The head is shorter than the prothorax; the maxillary palpi are distinctly 8-jointed, whilst the antennal joints 3 and 4 are practically subequal, the relative lengths of joints 3 to 9 being as follows :—

O. propinquus, sp. n., 108 : 102 : 51 : 39 : 28 : 20 : 15.
O. australis, Bagn., 104 : 82 : 52 : 32 : 24 : 18 : 12.
O. tenuicornis, sp. n., 165 : 126 : 66 : 48 : 50 : 30 : 19.

All legs dark grey-brown; fore-tibiæ and tarsi a shade lighter—yellowish-grey-brown. Colour of antennæ as in *O. australis.* Fore-wings broader than in *O. australis*, with the brown markings across middle and tip occupying only about 0·20 and 0·15 of the total length, the comparative extent of areas being as follows :—

	propinquus.		*australis.*		*tenuicornis.*	
	Fore-margin.	Hind-margin.	Fore-margin.	Hind-margin.	Fore-margin.	Hind-margin.
Clear	9·0	8·0	5·0	4·5	6·0	6·0
Dark	3·5	5·5	5·5	6·0	6·5	6·0
Clear	5·0	3·0	2·0	2·5	3·5	3·0
Dark	2·5	3 5	3·5	3·0	3·0	4·0
Comparative length .	20		16		19	

Setæ on veins of fore-wings minute.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Australia, Creswick, Victoria; on sweet pea, ♀s only, 17.i.15 (*R. Kelly*).

Orothrips tenuicornis, sp. n.

♀.—Near *O. propinquus*, colour of abdomen lighter, and apical abdominal bristles shorter and more slender. Antennæ more slender and the third joint long, clear lemon-yellow.

Relative lengths of antennal joints and of the areas of fore-wing (which latter approximate *australis* more than *propinquus*) as shown in tables under description of *O. propinquus*. Maxillary palpi 7-jointed.

Setæ on veins of fore-wings minute.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. AUSTRALIA, Healesville, Victoria; 3 ♀ s from flowers of *Erythræa australis*, December 1913 (*A. E. Shaw and R. Kelly*).

Family **Thripidæ.**

Pseudothrips achætus, sp. n.

♀.—Length 1·1 to 1·2 mm.

Chestnut-brown; fore-legs yellow, femora tinged with grey-brown and tibiæ lightly with grey; intermediate and hind legs brown shaded with grey, tibiæ yellowish distally; all tarsi yellowish. Antennæ with joint 1 light grey-brown, 2 concolorous with head, 3 yellowish-brown, 4–5 yellowish-brown to grey-brown and 6 to 8 grey-brown to brown. Fore-wing yellowish-brown, a shade lighter at base.

Head transverse, about 0·6 as long as broad; eyes large, not bulging, somewhat coarsely facetted, pilose; ocelli large; no post-ocular or interocellar bristles. Antennæ longer and more slender than in *parvus*, Bagn., about 2·3 times the length of the head; relative lengths of joints approximately as follows:—7 : 12 : 17 (including stem) : 15 : 13 : 17½ : 3 : 4.

Prothorax scarcely longer than the head, and about 0·6 as long as broad; hind margin with a series of moderately stout setæ, but no prominent bristles at hind angles. Wings pointed at apex; both veins of fore-wing regularly set with setæ.

Setæ at apex of abdomen stouter than in *P. parvus*, a pair of short curved dorsal setæ on 9, and posterior margin of tergite 8 not fringed.

♂.—Smaller, lighter, all legs yellowish marked with brown; sternites apparently without transparent areas.

Easily separated from *P. parvus*, Bagn., by the dark colour of body, the comparatively shorter head, longer and more slender antennæ, and the absence of prothoracic bristles.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. S. Australia, Mt. Lofty Range, Adelaide; amongst a tube of thrips from flowers of *Acacia myrtifolia* and *Epachris impressa*, Aug. 9, 1914 (*E. B. Poulton*), Reg. 41.

Genus Physothrips, Karny.

a. *Seticollis* group.

Physothrips setipennis, sp. n.

This species is very closely related to the Western Australian species, *Physothrips seticollis* (Bagn.). The antennæ are brown except joint 3 which is clear yellow, and the base of 4 yellowish.

Head as long as or slightly longer than the prothorax. Antennæ about 2·25 times the length of the head, longer than in *seticollis*; relative lengths of joints as follows:— 12 : 16 : 27 (with stem) : 26 : 15 : 22 : 3 : 4.

Prothorax with the bristles at hind angles (which are exceptionally slender and light in colour in *seticollis*) somewhat stout and dark, about 0·65 the length of prothorax; surface somewhat closely and irregularly set with minute setæ. In *seticollis* these setæ are regularly disposed (including three widely-seated pairs down the centre), stouter and about twice the length.

Apical abdominal bristles distinctly stouter and darker; ninth tergite with a pair of rather short dorsal bristles, moderately widely separated and the posterior margin of the eighth tergite with a close and moderately long microscopic fringe.

Upper vein of fore-wing regularly set with setæ for the whole length as in *seticollis*.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Australia, Healesville, Victoria; on cultivated white briar, 25. i. 14 (*R. Kelly*).

b. ? group.

Physothrips flavidus, sp. n.

♀.—Exactly as in *Thrips flavidus*, sp. n., but having the antennal style 2-segmented.

In this case the type is distinctly of the genus *Thrips*, and closely allied to *T. flavus*, Schr., and this as well as *Physothrips albipes* are named in the genus *Physothrips* as well as

in *Thrips* to avoid confusion by other workers who may receive only one or other of the two forms. Further material may enable us to write upon this curious phase, so far only noticed in Japanese material.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Japan, Kobe; 1 ♀ with *T. flavidus*, sp. n., June 1915 (*J. E. A. Lewis*).

c. *Pallipennis* group.

Physothrips pallipes, sp. n.

♀.—Length 1·1–1·3 mm.

Head and thorax brown lightly tinged with grey, abdomen black-brown. Antennal joints 1 grey-brown, 2 brown, 3 clear yellow, 4 to 8 brown, with 4 yellowish at extreme base and 5 inclined to be lighter at base. Legs yellow, the fore-femora lightly and the intermediate and hind femora more strongly shaded with grey-brown. Outer margin of the fore and intermediate tibiæ shaded with grey-brown, and the hind tibiæ with grey in some specimens. Fore-wings dark smoky-grey, basal fourth light grey.

Head about 0·65 as long as broad, broadest across cheeks which are gently arched; eyes large, coarsely facetted, pilose. Ocelli large, anterior one protected by a pair of rather short setæ. Antennæ about 2·5 times as long as the head; joints 3 and 4 fusiform; relative lengths of joints as follows:—18 : 32 : 48 : 45 : 30 : 42 : 5 : 5.

Prothorax about 1·2 times as long as the head, about 0·7 as long as broad; surface sparingly setose; hind margin depressed; bristles at posterior angles stout, rather short, not much more than 0·4 the length of the prothorax. Setæ on fore-wings rather long; three widely spaced setæ in distal half of upper vein; lower vein with a series of 15–18 and costa with about 30.

Apical abdominal bristles moderately long, a short dorsal pair on segment 9; posterior margin of tergite 8 with a short irregular fringe.

Easily separated from *P. vulgatissimus* (*pallipennis*) by the coloration of body, legs, and wings.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Japan, Kobe Harada ; on chrysanthemum, 15. xi. 15, Reg. 128 and 129 ; Kobe, vi. 15, Reg. 126 (*J. E. A. Lewis*).

Physothrips albipes, sp. n.

♀.—Exactly the same as *Thrips albipes*, Bagn., but with the antennal style 2-segmented. Somewhat closely related to *P. pallipes*, sp. n.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Japan, with *Thrips albipes*, Bagn., Okinawa, Luchu Isl., on nasturtium, v. 13 ; Kobe, vii. 13 (*J. E. A. Lewis*).

Dendrothrips sexmaculatus, sp. n.

♀.—Length 0·6 to 0·7 mm.

Like *D. degeeri*, Uz., but smaller, approaching *D. saltatrix*, Uz., in size.

Head, prothorax, pterothorax, and abdominal segments 1, and 7 to 9 dark chestnut-brown ; abdominal segment 10 lighter, 2 and 3 grey-brown, 3 posteriorly and 4 to 6 light yellow to greyish-yellow, the latter three segments each with a pair of dark brown spots. Wings dark grey with the distal fifth (0·2) white or clear. Legs brown to grey-brown, hind tibiæ inclined to be lighter ; all tarsi yellowish.

Surface of head near base irregularly striate, inclined towards reticulation ; prothorax sparingly and minutely setose. Antennæ about 2·5 times the length of the head. Segment 1 light grey-brown, short ; 2 dark chestnut-brown, globular, bigger and much broader than any of the others ; 3 and 4 yellowish, with the slightest tinge of grey ; 5 greyish-yellow shading to grey distally ; 6 to 8 grey-brown ; 3 and 4 subequal, relative lengths of segments 4 to 8 approximately as follows :—10 : 11 : 11 : 4 : 4 ;—6 narrowing to style and narrower than 5, not divided.

Separated from *D. degeeri*, Uz., by the white band at base of wings, the entire sixth antennal joint, the coloration of antennæ and body, and the smaller size ; and from *D. saltatrix*, Uz., by the white band at base of wing, the shorter intermediate antennal joints, and the coloration of body, &c.

Type. British Museum of Natural History.

Hab. Ceylon, Peradeniya, No. 47/13 (*A. Rutherford*) per the Bureau of Entomology. Reg. no. 240.

Genus Euchætothrips, nov.

Head not quite as long as broad, *broadest anteriorly*; *vertex broadly rounded*, with antennæ seated below; *a dorso-lateral hump or prominence behind each eye.* Maxillary palpi apparently 3-jointed. Antennæ with single-jointed style, 7-jointed.

Prothorax about as long as the head, *a pair of long mid-lateral bristles* as well as those at posterior angles; *antero-marginal setæ rather long.* Wings as in *Thrips* s. s. *Outer margins of all tibiæ with a pair of long outstanding slender hairs or bristles near apices and one or two, not quite so long, near middle.*

Abdomen sharply narrowed from segment 8 to apex, terminal bristles long and strong.

Nearest *Thrips* (*Bagnallia* group), but characterized at once by the italicized features in above diagnosis.

Type. *Thrips króli,* Schille.

Genus Thrips s. s.

a. *Flavus* group.

Thrips flavidus, sp. n.

♀.—General colour, shape, and size as in *Thrips flavus,* Sch. (as described by Uzel). Antennæ about 2·5 times as long as the head; first joint white, 2 deep yellow tinged with grey; 3 lighter yellow with distal third grey-brown; 4 dark grey-brown, yellow basally; 5 dark grey-brown with basal three-fifths (0·6) sharply light yellow; 6 dark grey-brown, inclined to be yellowish basally in some specimens; style dark grey-brown. Relative lengths of segments 3 to 7 as follows :—30 : 28 : 20 : 28 : 7.

Prothorax about as long as head, more transverse than in *flavus*; setæ at hind angles shorter than in *T. flavus* (16 as to 23). Apical abdominal setæ much as in *T. flavus,* but relatively shorter.

♂.—Smaller and more slender, whitish. Antennal joint 6 with the basal two-fifths (0·4) distinctly yellow. Eighth tergite with a weakly arcuate series of long slender setæ.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Japan, Kobe, June 1915 (*J. E. A. Lewis*).

b. *Physopus* group.

Thrips griseus, sp. n.

♀.—Size and general form as in *T. physopus*.

Dark grey to grey-brown; fore-tibiæ light yellow shaded on their outer margins with grey-brown; all tarsi yellowish; fore-wings entirely grey, hind-wings lighter. Antennæ grey-brown, joint 3 yellowish and 4 brownish-yellow basally. 5 lighter at extreme base.

Head as in *T. physopus*, transverse, with cheeks widest behind eyes and thence converging to base. Ocelli rather large. Antennæ much as in *T. physopus*, but with the intermediate joints comparatively stouter; relative lengths of joints 3 to 7 approximately as follows:—20 (with stem) : 17 : 12 : 19 : 6.

Prothorax wider than and at least as long as the head, 1·7 times as broad as long; bristles at hind angles moderately long and stout, 0·45 the length of the prothorax. Legs moderately stout, hind tibiæ with a double row of six spines to apex within. Setæ on costa and veins of fore-wings as in *T. physopus*, dark.

Bristles at apex of abdomen dark, long and strong, twice as long as the segments carrying them; a short and not very strong dorsal pair on segment 9. Posterior margin of tergite 8 with a short fringe, the cilia apparently running in pairs; segment 10 divided above.

Sharply distinguished from *T. physopus* by the coloration and form of antennæ, and the colour generally.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Japan, 2 ♀ s, Kobe, vi. 15 (*J. E. A. Lewis*).

Suborder Tubulifera.

Family **Idolothripidæ**.

Genus Gigantothrips, Zimmermann.

1900. *Gigantothrips*, Zimmermann, Bull. de l'Inst. Bot. de Buitenzorg, No. vii.
1908. *Panurothrips*, Bagnall, Trans. Nat. Hist. Soc. Northumberland & Durham, n. s. iii. p. 208.

Gigantothrips gracilis, Bagnall.

Panurothrips gracilis, Bagnall, *l. c.* p. 208 (1908).

This species is closely relately to *Gigantothrips elegans*,

Zimm., but compared with specimens of the latter in my collection (*ex et teste* Karny), *gracilis* is larger and has the tube very noticeably longer, about 0·5 as long again as in *elegans* (18 : 12); viz., in *gracilis* about as long as the abdominal segments 7–8 together, and in *elegans* about 0·75 the length of those segments.

Genus Elaphrothrips, Buffa.

Idolothrips, Hinds, Bagnall, and others.
Elaphrothrips, Buffa, Redia, v. p. 162 (1909).

Genus Idolothrips, Haliday.

Idolothrips, Froggatt, Proc. Linn. Soc. N.S.W. 1904, pt. 1.
Acanthinothrips, Bagnall, Trans. Nat. Hist. Soc. Northumberland & Durham, n. s. iii. p. 207 (1908) (and others).

Mr. Froggatt is undoubtedly right in assigning *Idolothrips marginata* and *spectrum* as ♀ and ♂ of the one species, and I withdraw anything I may have written in 1908 on that point. I do not agree with him, however, in that *I. lacertina*, Hal., is a "smaller and more variable form of the ♂" (*spectrum*). Regarding the female *marginata* as the genotype of *Idolothrips*, I erected the genus *Acanthinothrips* for the strongly characterized species *spectrum*, but being sexes of one species they must be placed in the genus *Idolothrips*, and the *Idolothrips* of most modern authors must be known as *Elaphrothrips*. The females of the two genera are very much alike.

Idolothrips marginata, Haliday.

1852. *Idolothrips marginata*, Haliday in Walker, Homopt. Ins. Brit. Mus. p. 1096.
1852. *Idolothrips spectrum*, Haliday in Walker, Homopt. Ins. Brit. Mus. p. 1097.
1904. *Idolothrips spectrum*, Froggatt (with *marginata* (♀) and *lacertina* as synonyms), Proc. Linn. Soc. N.S.W. pt. 1, p. 54.

I. marginata, being the first used, would seem to be the name by which this species should be known.

Idolothrips lacertina, Haliday.

1852. *Idolothrips lacertina*, Haliday, *l. c.* p. 1097.
1904. *Idolothrips spectrum* (in part), Froggatt, *l. c.* pt. 1, p. 54.

The ♂, apart from being noticeably much smaller and more slender than the ♂ of *marginata*, widely and constantly

differs in the structure of the lateral abdominal processes, as may be seen by the accompanying table and rough figures.

Process on segment	*I. spectrum*, ♂. Approximate length of process.	*I. spectrum*, ♂. Approximate length of spine or bristle compared with length of process.	*I. lacertina*, ♂. Length of process.	*I. lacertina*, ♂. Length of spine or bristle.
2	5 times as long as breadth at apex.	*Spine* 0·3 as long.	As long as breadth at apex.	*Spine* 2·0 as long.
3	4·5 „ „	*Spine* about 0·45 as long.	About 2·0 as long.	*Bristle-spine* 3·0 as long.
4	4 „ „	Slender *spine* 0·8 as long.	About 1·5 as long.	*Bristle* 6·0 as long.
5	3 „ „	*Bristle* 3·0 as long.	As long.	*Bristle* 6·0 as long.
6	3·5 „ „	*Bristle* 2·5 as long.	Slightly longer than.	*Bristle* 6·0 as long.
7	4 „ „	*Spine* about 0·5 as long.	About 2·0 as long.	*Bristle* 4·0 as long.
8	5·6 „ „	*Spine* about 0·35 as long.	About 2·5 as long.	*Spine* about as long.

Fig. 1. Fig. 2.

Fig. 1.—*Idolothrips marginata*, Hal., ♂.
Fig. 2.—*Idolothrips lacertina*, Hal., ♂.

Left lateral processes of second (*a*), third (*b*), and eighth (*c*) abdominal segments.

In *lacertina* the head is shorter compared to its breadth and the genal spines are fewer, shorter, and less strong than in *marginata* (♂), whilst the third antennal joint is approximately as long (compared to 1·25 times as long in *marginata*) as the length of head behind eyes. The surface-setæ of tube are, on the other hand, slightly longer and stronger compared to the breadth of the tube than in *marginata*.

I have an abundant material of these interesting insects, chiefly through Mr. Kelly's kindness, and hope in the near future to make close descriptions of the two species.

Family **Megathripidæ**.

This family will probably have to be reduced as a subfamily of Idolothripidæ.

Megathrips quadrituberculatus (Bagnall) *.

1908. *Idolothrips quadrituberculatus*, Bagnall, Trans. Nat. Hist. Soc. Northumberland & Durham, n. s. iii. p. 210, pl. vii. fig. 9.

A female example sent to me by Mr. Lewis in 1912 is certainly the species I described as *Idolothrips 4-tuberculatus*; the tube is present and suggests that the species is a Megathripid. In 1915 I received a ♂ *Megathrips* which despite certain colour-differences is presumably the ♂ of the same species.

♀.—Length (including tube) 5·0 mm.

Sixth antennal joint (not described in type) with basal half yellow; 7 and 8 black. Antennæ twice as long as the head (which latter is very slightly produced beyond eyes); very slender, excepting the two basal joints; relative lengths of joints 3 to 8 as follows:—64 : 53 : 43 : 32 : 17 : 15. Joint 2 constricted near base and curved outwards.

Tube long, 1·8 as long as the head, slightly curved upwards before apex; about 6 times as long as broad near base, and with tip about 0·45 as broad as at base; sparingly furnished with fine backwardly directed setæ. Bristles at apex broken off.

♂.—Length (including tube) 4·5 mm.

A darker specimen than the ♀. Fore-tibiæ brown excepting at apex and basally; intermediate tibiæ brown except

* In a footnote to a paper on some Japanese Thysanoptera Dr. Karny mentions eight then-known species, and refers to this as *Idolothrips tuberculatus*. I mention this error to avoid confusion, as Hood has described an *Idolothrips* under that name from U.S.A.

at apex, and hind tibiæ brown except the extreme base and distal third which are yellow. Antennæ more than twice as long as the head ; relative lengths of joints 3 to 8 as follows :— 61 : 50 : 45 : 33 : 16 : 14.

Abdominal segment 6 furnished with a pair of lateral spine-like tubiform processes at anterior angles, slightly outwardly directed but scarcely curved, and not quite reaching the line of the posterior margin ; 8 with a pair of lateral tooth-like processes near posterior angles.

Tube about 1·5 times as long as head, stout near base but sharply constricted in the first fourth ; more strongly setose (and with longer setæ) than in the ♀. Terminal hairs short.

Hab. Japan, Kobe, 1 ♀, 1912 ; 1 ♂, April 1915, the latter Reg. no. 139 (*J. E. A. Lewis*).

Family **Phlœothripidæ** s. l.

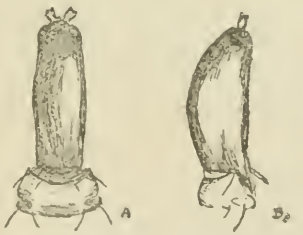
a. *Docessissophothrips* group.

Docessissophothrips longiceps, sp. n.

♀.—*Forma aptera.* Length about 5·5 mm.

Colour deep blackish-brown, second antennal joint reddish-brown (rest of antennæ broken off in the unique specimen) ; all tibiæ orange-yellow, tarsi clouded with brown.

Fig. 3.



Head and prothorax of *Docessissophothrips longiceps*, sp. n.
A. Viewed dorsally. B. Viewed laterally.

Head more than 4·5 times as long as the prothorax and 2·7 times as long as broad at middle ; dorsum gently arched in profile. Eyes small, finely facetted, not prominent ; post-ocular bristle apparently absent.

Fore-margin of prothorax strongly emarginate ; bristles moderately long, colourless. Pterothorax short ; wings absent.

Abdomen much as in *D. major*; tube long, about 0·72 the length of the head, about 5·0 times as long as broad near base, narrowed in the distal fifth, the apex being about 0·6 as wide as near base; surface sparsely and minutely setose.

At once separated from *D. major* by the length of the head, the non-prominent eyes, and the coloration of the tibiæ.

Type. British Museum of Natural History.

Hab. 1 ♀, Madeira (*Wollaston*).

This makes the sixth species of the genus, each as yet known from but a single example. Ignoring *D. monstrosus*, which becomes the type of a new genus characterized below, the remaining five species fall into two well-defined groups as follows:—

1. Length 3·0 mm. or under, head shorter and broader, less than twice as long as broad; containing *ampliceps*, Bagn., and *laticeps*, Bagn.

2. Length more than 5·0 mm., head longer and 2 to 3 times as long as broad; containing *major*, Bagn., *frontalis*, Bagn., and *longiceps*, sp. n.

Genus Egchocephalothrips, nov.

Separated from *Docessissophothrips*, Bagn., by the extreme form of the head which, viewed dorsally, is as figured in the original description of *D. monstrosus*. It is extraordinarily adpressed and, viewed dorsally, represents the end view of a stoutish "plate," with a slight swelling (representing the cheeks) on each side of the marked carina.

Type. *Docessissophothrips monstrosus*, Bagnall.

b. *Trichothrips* group.

Œdemothrips (?) *propinquus*, sp. n.

♀.—Length 1·8 mm.

Colour brown, the last 4 or 5 abdominal segments darker. Legs yellowish shaded with light grey-brown. First antennal joint light yellowish-brown, 2 slightly darker, 3 brown with basal half clear yellow, 4 and 5 brown with basal thirds yellowish, 6 to 8 totally brown.

Almost the same as *Œdemothrips* (?) *brevicollis*, Bagn. (Japan) in general form. The head is not quite so markedly convergent behind, the prothorax is not so short compared to its breadth, and the tube is stouter.

Antennæ about 2·4 times the length of the head ; relative lengths of joints 3 to 8 approximately :—31 : 29 : 28 : 24 : 19 : 14.

Prothorax about twice as broad as long ; setæ at posterior angles widely spaced, somewhat short and stout ; the outer longer than the inner, about 0·4 the length of the prothorax.

Tube short and stout, about 0·9 as long as the head ; 1·45 times as long as broad at base, and 0·45 as broad at tip as at base ; terminal bristles light coloured, about 0·7 the length of the tube.

Very closely allied to *brevicollis*, but at once recognized by the coloration of the body and the antennæ.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. AUSTRALIA, Badger Weir, Healesville, Victoria ; 1 ♀ on clover, 6. iv. 15, Reg. 120 (*R. Kelly*).

c. *Leptothrips* group.

Gynaikothrips uzeli (Zimmermann).

1909. *Leptothrips flavicornis*, Bagnall, Trans. Nat. Hist. Soc. Northumberland & Durham, n. s. iii. pt. 2, p. 528, pl. xiv. figs. 6–8 (from Madeira).
1909. *Phlœothrips longitubus*, Bagnall, *l. c.* n. s. iii. pt. 2, p. 534, pl. xiv. figs. 21 & 22 (from Java).
1910. *Leptothrips flavicornis*, Bagnall, Ann. Soc. Ent. Belg. liv. p. 464 (from *Ficus carnosa*, Madeira).
1910. *Leptothrips longitubus*, Bagnall, *l. c.* liv. p. 464 (rectification of generic position).

I have long been aware of the identity of the Madeiran *Leptothrips flavicornis* and the Javanese *L. longitubus* with Marchal's *Phlœothrips ficorum* from Algeria, and I was surprised that the above were not included in Hood's lengthy list of synonyms in *Insecutor Inscitiæ Menstruus* (1912, i. p. 153). I was under the mistaken impression, however, that I had published a note on the synonymy, and now rectify the omission.

d. *Haplothrips* group.

Cephalothrips hispanicus, sp. n.

♀.—*Forma aptera.* Length 1·3 to 1·4 mm.

Grey-brown, head and first two antennal joints chestnut-brown ; fore-femora yellowish at inner margin, fore-tibiæ

yellow clouded with grey to grey-brown basally and along outer margin; intermediate and hind tibiæ shading to yellow distally; all tarsi yellowish with brown spot. Antennal joint 3 lemon-yellow, 4 to 6 yellowish to light brownish-yellow; 7 and 8 light brown.

Head about 1·3 times as long as wide across eyes, widest just below the middle; cheeks broadly arched; eyes slightly protruding, coarsely facetted, occupying about 0·35 the total length of head and each about 0·25 the breadth. Vertex raised; ocelli large, posterior pair on a line across the anterior third of eyes; anterior ocellus forwardly directed; postocular setæ short, inconspicuous. Antennæ about 1·7 times the length of head, rather stout; joint 3 obconical, narrower than 2 or 3 to 5, 6 and 7 somewhat broadly and 7 and 8 broadly united; relative lengths of segments approximately as follows:—8 : 15 : 14 : 15 : 16 : 15 : 12 : 8. Mouth-cone reaching about 0·7 across prosternum; apex blunt; joint 1 of maxillary palpus short, about 0·2 the length of 2.

Prothorax about 0·75 the length of head and about twice as broad as long. All setæ present, colourless and therefore difficult to discern; the pair at posterior angles largest, 0·4 the length of prothorax. Pterothorax slightly broader than width across fore-coxæ, about as long as broad; wings absent; legs rather short and stout; fore-tarsus with a minute, sharp, but broad-seated tooth.

Abdomen not much broader than pterothorax; elongate; roundly narrowed from segment 7 to base of tube. Tube about as long as the prothorax, 0·65 as broad at apex as at base, sides gently and evenly narrowed from near base; terminal hairs about as long as tube, colourless except for basal third or thereabouts. Abdominal setæ on segment 9 about 0·8 the length of tube, other setæ shorter; all colourless and inconspicuous. Wing-retaining setæ on tergites 2 to 7.

Separated from *C. monilicornis* (Reuter) by the smaller size, shape, and coloration of the antennæ, and the shape and modest or normal proportions of the head. It should be noted that the *Cephalothrips yuccæ* of Hinds cannot be regarded as congeneric with *monilicornis* or *hispanicus*.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Spain, Zaragosa; 2 ♀s collected (with other interesting Thysanoptera) by the well-known neuropterist, Father Navas, S.J., 8. iv. 13.

Rhopalothrips froggatti, sp. n.

♂.—Length about 0·75 mm.

Apterous; short and broad.

Uniform brown, distal third of fore-tibiæ and extreme apices of intermediate and hind tibiæ yellowish-white; tarsi yellowish marked with brown; apex of antennal joint 2 and whole of 3 yellowish, 4 and 5 a trifle lighter brown than 6 to 8.

Head much as in *R. bicolor*, Hood, but with the outline of eyes merged in the cheeks; scarcely wider at base (where it is widest) than long; ocelli absent; postocular bristles short, broad apically, apparently infundibuliform. Antennæ short and stout, about 1·7 times as long as the head, shaped as in *R. bicolor*, but joint 6 distinctly constricted at base forming a short stem.

Prothorax transverse, 0·6 as long as the head, and 2·8 times as broad as long; all usual setæ apparently present, colourless, short, and infundibuliform. Pterothorax short, transverse, only slightly broader than the prothorax. Legs short and stout; fore-tarsal tooth strong, sharp.

Abdomen short and broad, narrowing evenly from segment 4 to tube; segments—especially 1 to 8—very strongly transverse; segment 4 about 7 times and 7 about 5 times as broad as long. Tube very short, broad, 0·5 the length of the head, about 0·8 as broad at base as long and 0·6 as broad at apex as at base; terminal hairs pointed, colourless, and about 0·6 the length of the tube. Abdominal setæ short, colourless, infundibuliform.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. Australia, Upper Mangrove, N.S.W.; 1 ♂ and larvæ from glands on the foliage of the black wattle (*Acacia decurrens*), Sept. 7th, 1900 (*W. W. Froggatt*).

This, the smallest described species of the suborder, is one of an interesting collection of Tubuliferous Thysanoptera (chiefly Gall-causers) made by Mr. Froggatt, upon which we propose to publish a joint paper; and I have chosen to describe it now, firstly, that I may name it in Mr. Froggatt's

honour, and, secondly, on account of its general interest in the light of Mr. Reginald Kelly's * recent paper "Observations on the Function of Acacia Leaf-glands," wherein he mentions that microscopic insects, some white (? larval) and others brown, are sometimes found in the so-called "glands."

R. froggatti, apart from its minuteness, may be distinguished by its very broad form, the broad intermediate antennal joints, the very short and broad prothorax and abdominal segments, and the short broad tube, &c.

Rhopalothrips brunneus, sp. n.

♀.—Length about 1·25 mm.

Apterous. Very like *R. froggatti*, larger and more slender. Dark black-brown, fore-tibiæ yellow near apex, other tibiæ and all tarsi as in *R. froggatti*. Antennæ with joint 3 yellow shaded with grey, 4 and 5 light brown, yellowish basally, and 6 with stem yellowish.

Head as in *P. froggatti*, about as wide as long; antennæ 1·8 times as long as the head, intermediate antennal joints not so broad compared to their length as in *froggatti*.

Prothorax 0·75 as long as the head and 2·25 times as broad as long.

Abdomen elongate, roundly narrowed from segment 7 to base of tube; segment 4 about 4·5 times and 7 about 3·8 times as broad as long. Tube about 0·75 the length of head, nearly twice as long as broad at base and about 0·5 as broad at apex as at base; terminal hairs pointed, a little more than 0·5 the length of the tube.

All setæ as in *froggatti*, but longer.

Type. Hope Department of Zoology, University Museum, Oxford.

Hab. AUSTRALIA, Victoria, on *Acacia dealbata*, 2 ♀s (*R. Kelly*).

Sharply distinguished from *froggatti* by its larger size, deeper colour, the coloration and more slender form of intermediate antennal joints, the less broad form, &c.

The coloration of both *froggatti* and *brunneus* distinguishes them from the genotype, *R. bicolor*, Hood.

* Vict. Nat. xxx., Nov. 1913, pp. 121–127.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 102. JUNE 1916.

XLVIII.—*On some of the External Characters of* Cryptoprocta. By R. I. Pocock, F.R.S.

The personal observations recorded in this paper are based upon an adult male example of *Cryptoprocta ferox* that died in the Zoological Gardens on Jan. 2, 1914.

Although the Fossa (*Cryptoprocta*), as befits its importance, has probably received more anatomical attention than any single genus of Carnivora, no pretext is needed for publishing an account of its external characters, because the too brief account of some of its organs by previous writers has led to the omission of records of interest and the current descriptions of a few require explanation or correction.

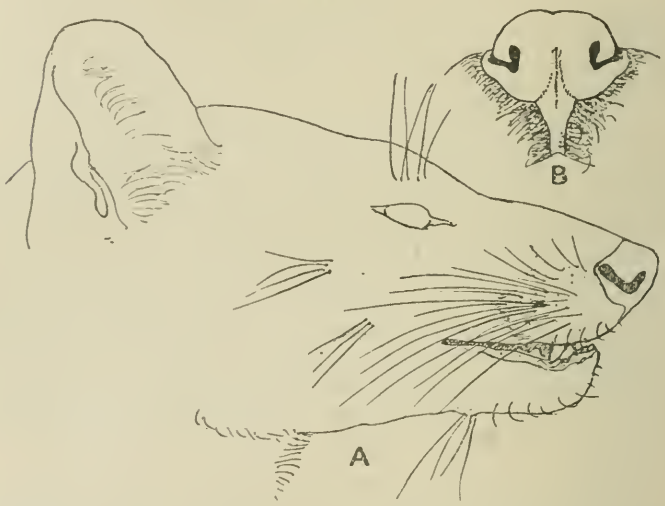
Second-hand accounts of the animal, such as are contained in zoological text-books and natural histories, have not been quoted in the following pages; but to avoid repetition of titles in the text, I subjoin a list of the principal original memoirs dealing with its external features:—

Bennett, Tr. Zool. Soc. London, i. pp. 137–140 (1835).
Milne-Edwards and Grandidier, Ann. Sci. Nat. Zool. (5) vii. pp. 314–336 (1867).
Schlegel and Pollen in Pollen and Van der Dam, 'Faune de Madagascar,' ii. p. 13 (1868).
Mivart, Proc. Zool. Soc. 1882, pp. 193–196 and 519–520.
Filhol, C. R. Acad. Sci. Paris, cxviii. p. 1060 (1894).

Beddard, Proc. Zool. Soc. 1895, pp. 430–437.
Lönnberg, Bih. Sv. Vet.-Akad. Handl. xxviii. pt. 4, no. 3, pp. 1–10 (1902).
Carlsson, Zool. Jahrb. Syst. xxx. pp. 419–467 (1911).

The Rhinarium and Facial Vibrissæ.—When Bennett described the rhinarium of an immature example of *Cryptoprocta* as small, he gave a very erroneous idea of its appearance in the adult, although it must be admitted that his standard for size was not stated. As compared with the rhinarium of the Felidæ, that of *Cryptoprocta* is large and prominent as in most Viverridæ. Its inferior border in front is continued downwards as a naked tract dividing the

Fig. 1.



A. Side view of head of *Cryptoprocta ferox*, showing the tufts of facial vibrissæ. The mystacials are represented as shorter than they are in reality, so as not to conceal the two genal tufts below the eye.
B. Rhinarium seen from the front.

upper lip, but this tract is not marked by a central and dilatable groove as in most Carnivores that possess it. There is, however, a shallow groove extending approximately as high as the top of the nostrils, in the middle of the anterior surface of the rhinarium. The nostrils are widely separated, and the lateral narial slits are dilated throughout their length. The infranarial portions are deep beneath

the nostril in front—a noticeable non-feline character,—and their inferior edge extends obliquely upwards, outwards, and backwards, with a slightly sinuous curvature, and they are continued laterally beneath the narial slits to their posterior end. The upper margin of the rhinarium is widely rounded on each side, and nearly flat on the summit, but for a very shallow median depression. In profile the apex is prominent and obtusely rounded.

Carlsson briefly referred to the facial vibrissæ, recording the lengths of the mystacials and the presence of others below the eye and on the under jaw. As a matter of fact, the vibrissæ are of the normal type found in predatory Carnivores, consisting of the mystacial tuft, two genal tufts, and a superciliary tuft on each side and of a well-developed median interramal tuft below. In this respect *Cryptoprocta* agrees with the Viverridæ, Mungotidæ, Hyænidæ, and other non-feline Æluroids, and differs from the Felidæ in which the interramal tuft is always absent.

Ear.—Although in his brief description Bennett recorded the presence of the bursa, the ear was not fully described until the publication of Miss Carlsson's paper, where it is pointed out that the ear does not differ in any essential points from that of the Felidæ. She draws particular attention to the complete separation of the small "annular cartilage" from the rest of the ear, as in the Felidæ, as compared with its partial severance therefrom in *Genetta* and *Mungos*. Her figure further shows the insertion of the posterior flap of the bursa behind the rim of the ear and a deep rounded notch in the anterior flap as in *Genetta* and *Felis*. Beyond noting the presence of the marginal bilaminate bursa, I did not critically examine the ear in my example of *Cryptoprocta*.

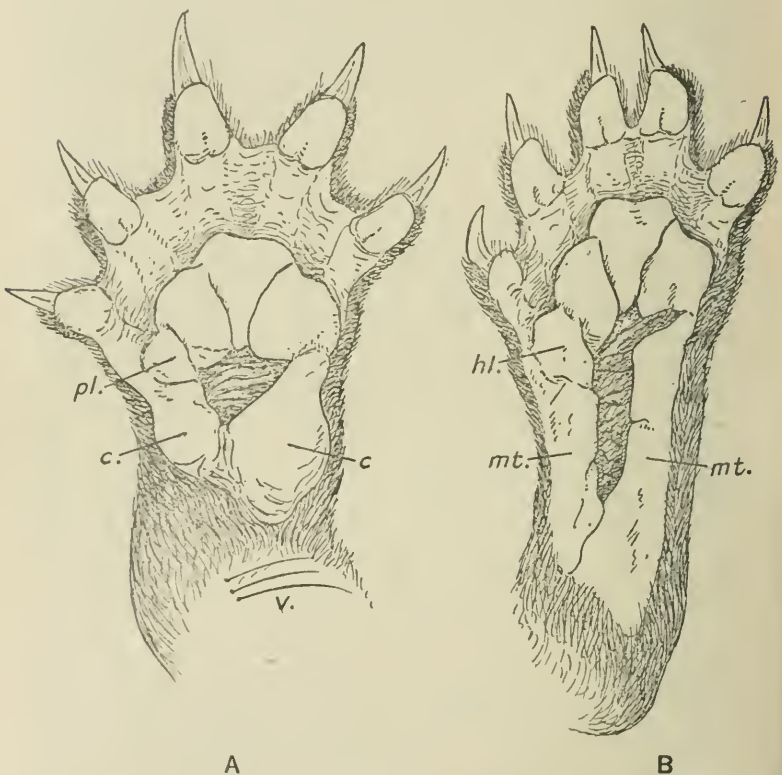
Feet.—As Bennett originally pointed out, the feet of *Cryptoprocta* resemble those of *Paradoxurus* in having retractile claws, naked soles, and digits united nearly to their ends. Good figures of the feet were published by M.-Edwards and Grandidier, and inexact copies of these were reproduced by Mivart. Additional figures, with a short description confirming and amplifying Bennett's account, were published by Carlsson.

Since the above-quoted figures represent the digits in contact, I take this opportunity of issuing new illustrations to facilitate comparison with the figures of the feet of other Æluroids I have published elsewhere; and the description that follows contains references to some interesting structural features not touched upon by previous authors.

The fore foot is broader than the hind foot and has more

powerful claws. The claws are retractile in the sense that the terminal phalanx can be withdrawn along the outer side of the penultimate phalanx, but there are no lobes of skin constituting protective sheaths to the claws thus retracted. Although the webs extend at least up to the proximal ends of the digital pads, the digits are capable of considerable

Fig. 2.



A. Left fore foot with digits spread. *pl.*, pollical lobe of plantar pad; *c.*, double carpal pad; *v.*, carpal vibrissæ.
B. Left hind foot with digits partially spread. *hl.*, hallucal lobe of plantar pad; *mt.*, double metatarsal pads.

and subequal distension. The webs are quite naked beneath. The pollex is comparatively long. The plantar pad is quadrilobate, but the pollical lobe, set behind the postero-internal angle of the internal lateral lobe, is relatively to

the other lobes considerably smaller than in *Paradoxurus* (*Paguma*) *larvatus*. The edge of the three main lobes, although sinuously curved, may be described as semicircular in a broad sense. Behind the plantar pad there is a median depressed smooth area, flanked by the two moieties of the carpal pad, the inner edges of which converge posteriorly and meet. The outer moiety, narrowed distally, where it abuts against the external lateral lobe of the plantar pad, is both longer and wider than the inner moiety, which is not narrowed anteriorly where it similarly abuts against the pollical lobe of the plantar pad. The two moieties of the carpal pad taken together are longer than the plantar pad and almost as wide as it. Above the proximal end of the carpal pad there is a tuft of carpal vibrissæ.

In general features the hind foot, so far as the claws, digital and plantar pads are concerned, resembles the fore foot, except that the claws are a little shorter, the hallucal lobe is larger than the pollical lobe, and the third and fourth digital pads are tied much more closely together, though not actually confluent as in *Paradoxurus* and *Arctictis*. The heel itself is hairy, but the metatarsal area is quite naked and provided with two broad metatarsal pads or ridges, separated by a median depression which extends distally from the plantar pad, but is proximally cut off from the hairy area of the heel by the broad confluence of the two metatarsal ridges. The inner of these two ridges is broadly in contact distally with the hallucal lobe. It is much shorter than the external ridge, which touches the plantar pad distally and proximally expands where it runs up against the hairy area of the heel.

The feet above described are essentially Paradoxurine in type, and do not differ more from the feet of *Paradoxurus* than the latter differ from those of *Arctictis* or *Arctogalidia*. They are not Hemigaline and most emphatically they are not Viverrine, Euplerine, Galidictine, Mungotine, or Feline. They differ, indeed, from the feet of the Felidæ as profoundly as the feet of any Æluroid differ therefrom.

The resemblance between the feet of *Cryptoprocta* and *Paradoxurus* cannot be attributed to close affinity between the two genera. It must be explained as the mutual inheritance of a primitive feature.

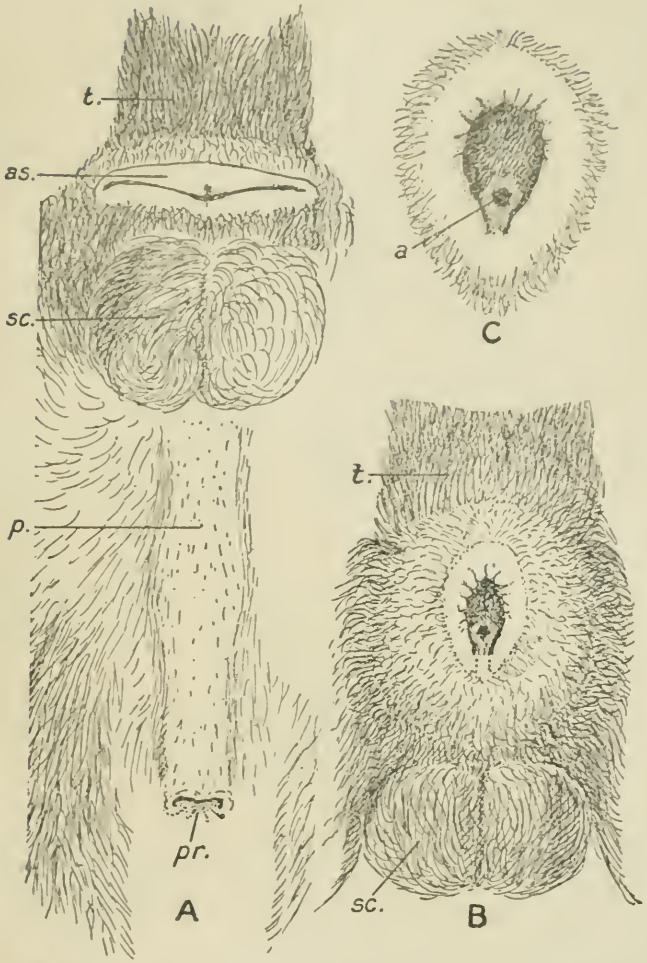
The Anal Sac and Glands.—The area between the root of the tail and the scrotum forms a vertically elliptical thickened elevation which is closely hairy at the sides, less closely towards the middle, and then quite naked. In the middle of the naked area there is a deep ovate naked

depression, at the lower end of which is situated the anus with its tumid margins (fig. 3, B, C). From the lower end of the tumid margin of the anus a cutaneous ridge, called the frenum by Bennett, extends to the lower edge of the depression. This depression in the anal sac in a general way resembles that of the mongooses, except that the anus is placed near the bottom edge of the sac, so that much the greater part of the sac lies above the anus. The point is of interest, because in the hyænas the whole of the anal sac is above the anus. Thus *Cryptoprocta*, with respect to this character, connects in a measure the anal sac of the mongooses with that of the hyænas. Nevertheless, the sac in *Cryptoprocta* is, on the whole, more like that of the mongooses, because the anus lies within the depression, and the thickened edges of the latter close completely over the anus, meeting to form a transverse rima when the tail is lowered (fig. 3, A, *as.*).

Mivart was, I believe, the first author to mention the anal glands of *Cryptoprocta*. In his enumeration of the characters of this genus (P. Z. S. 1882), he wrote (p. 196) : "One pair of anal glands?" But subsequently he asserted (p. 520) : "There are constantly two anal glands, one on each side of the anus, in all Æluroids. The glandular structure may be a transverse band of follicles extending between the two anal glands as in (at least some) *Herpestes*, *Crocuta*, and *Proteles*. The anal glands may be augmented to three pairs as in *Hyæna brunnea*, or even to five pairs, as in *Crossarchus*. These glands, together with the anus, may open into a deep anal pouch, as in the Hyænidæ, *Crossarchus*, *Suricata*, and *Cryptoprocta* . . . ." Nevertheless, from the text of his two papers in the volume quoted, it is quite evident that Mivart had had no opportunity of examining the anal glands of *Cryptoprocta*. His statement regarding them must therefore have been a pure inference.

Carlsson dismissed the anal glands as follows :—"Die glandulæ anales sind 2, die wie bei einigen *Herpestes*-Formen (Mivart, P. Z. S. 1882, p. 520) durch eine unpaarige Partie miteinander zusammenhängen." It does not, however, appear from this passage whether the information it contains is based upon what Mivart said or upon her own observations. But it is noticeable that there is neither a reference to the position of the orifices of the glands, nor does her figure of the anal sac indicate that point, which is of importance in view of the very unusual position of these orifices in *Hyæna*, *Proteles*, and to a lesser extent in some mongooses.

Fig. 3.



A. Inferior view of anal and genital organs of male. *t.*, root of tail; *as.*, anal sac closed; *sc.*, scrotum; *p.*, penis withdrawn and showing as a subcutaneous thickening; *pr.*, orifice of prepuce.

B. Anal sac in centre of elevated area, as seen from behind when the tail (*t.*) is raised: *sc.*, scrotum beneath elevated anal area.

C. Anal sac partially opened, showing its smooth thickened rim and the anus (*a.*) in its inferior portion.

Lönnberg also, although he examined the anal sac carefully, is silent about these glands. But he described a pair of valvular orifices opening one on each side of the middle line close to the inferior margin of the pouch below the anus (fig. 4, F, *d.*). Each orifice leads into a saccular diverticulum which extends beneath the integument in a dorso-lateral direction beneath and on the sides of the anus and also inferiorly, where their position is marked externally by a pair of small, hairy, scrotum-like swellings below the inferior edge of the pouch on the perineal region (fig. 4, F, *t.*).

Since Lönnberg discovered no normal anal glands, it appears to me that these paired diverticula must represent them. In that case they differ from the anal glands of other Æluroids in having their orifices widely dilated and placed side by side below the anus, as well as in the subcutaneous extension of the saccular portion of the gland. If these structures described by Lönnberg are the anal glands referred to by Carlsson, it is singular that the latter author failed to mention the peculiarities above recorded. If they are not the anal glands of other Æluroids, they must be interpreted as a special modification of the anal sac, peculiar to *Cryptoprocta*.

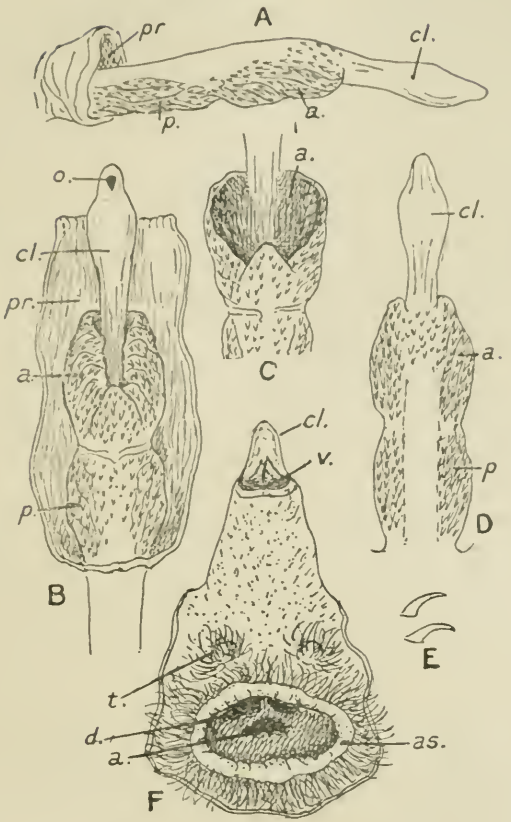
In the specimen I examined, of which the skin had to be left intact, I could not find the orifices of the anal glands in the normal position ; and, not having read Lönnberg's paper at the time, I did not look below the anus for the orifices of the diverticula he discovered.

Lönnberg, however, so far as I can ascertain, did not dissect the anal pouch, and he speaks of his material as "not very well preserved," adding "the function of these pouches is quite difficult to understand or explain .... There were no contents to be seen and no large glands could be detected. It is, however, possible that the surrounding walls contain small glands, the secretion of which is stored up in the pouch." From this it appears that he did not consider these pouches as the homologues of the true anal glands, but as secondary reservoirs for secretion emitted, presumably, by the walls of the anal sac *.

Further testimony of the existence of anal glands in *Cryptoprocta* and of the offensiveness of their secretion is supplied by two independent sources. Telfair, as quoted by

* Owing probably to an oversight, neither of Lönnberg's figures of the anal sac shows the anus, although, both in the text of his paper and in the legend of the plate, fig. 2 is stated to represent the "circumanal pouch more open, so that the constricted anus can be seen," as well as the openings into the "subfrenal pouch" (saccular diverticula).

Fig. 4.



A. Lateral view of glans penis protruded from prepuce (*pr.*), its dorsal side uppermost. *cl*, smooth clavate portion; *a.*, anterior, and *p.*, posterior portion of spicular thickening.

B. Inferior view of glans penis with preputial sheath (*pr.*) cut down the middle line and turned aside. *o.*, orifice of urethra; other lettering as in A; the two flaps of the anterior thickening (*a*) almost closed.

C. Portion of glans penis showing the two flaps of the anterior part of the spicular thickening (*a*) spread open.

D. Dorsal view of glans penis; lettering as in A.

E. Two of the spicules enlarged.

F. Anal and genital area of young female, adapted from Lönnberg's figures and descriptions. *cl.*, clitoris protruding from vulva (*v.*); *t.*, hairy swelling in front of anal pouch (*as.*), containing the anus (*a.*) and the pair of diverticula (*d.*).

(All ⅔ nat. size, except fig. E.)

Gray, says that the Fossa "has an anal pouch, and when violently enraged emits a most disagreeable smell, very like that of *Mephitis*"; and, according to Pollen, the natives of Madagascar declare that, when prowling round the chicken-pens at night, the animal gives out a fetid odour which instantly kills the fowls. Though doubtless an exaggeration, this statement probably reflects the experience of the natives of the disgusting, very likely suffocating, nature of the scent described by Telfair.

The External Genitalia.—The *scrotum* is large as in mongooses and most Æluroids, not small as in Hyænas. The remarkable *penis* of *Cryptoprocta* was described and figured by Grandidier and Milne-Edwards and by Carlsson. But the brevity of the descriptions and my inability to reconcile them with my own observations suggest that the organ was imperfectly examined by these authors. I propose, therefore, to describe it at some length before attempting to point out the discrepancies between the observations of the French and Swedish authors and my own.

The penis is of great length, and in a state of rest the glans is concealed within a sheath attached throughout its length to the abdominal integument, the orifice of the prepuce opening as far forwards on the abdomen as in the Hyænidæ (fig. 3, A). The skin in front of the prepuce is naked, the prepuce itself and area adjoining it being scantily hairy.

The glans, lying within the preputial sheath, is of unusual length for the Æluroidea, and, as has been recorded by other authors, is provided with a long curved bone reaching from the tip almost as far back as the attachment of the skin of the prepuce. The curvature of this bone imparts a dorso-ventral curvature to the glans. The distal portion of the glans is everywhere quite smooth for about a third of its length and the smooth area is cylindrical posteriorly, but exhibits a marked expansion, more marked laterally than dorso-ventrally, towards its distal end, but it narrows again before the tip which is blunt. The orifice of the urethra opens just beneath the tip.

Behind the smooth part the glans is enormously swollen, especially laterally, and this swollen area shows a transverse constriction and is, for the most part, thickly beset with curved sharp spinules, the points of which are directed backwards; but in the dorsal middle line the shaft or axis of the glans is smooth, except quite at the anterior end of the swollen portion. The swollen part—at all events, when the

glans is unerected—is grooved and more or less folded, suggesting considerable capacity for expansion ; and these folds are particularly well-developed on the anterior portion in front of the constriction. The structure of this portion is peculiar. In its posterior portion it forms a median inferior angular flap, with the apex directed forwards, and in front of this flap the swollen portion consists of a pair of thick flaps or laminæ which are directed inferiorly and constitute together a sort of half collar or half sheath round the posterior continuation of the smooth portion of the glans. These two thick flaps or laminæ are capable of meeting in the middle line inferiorly in front of the apex of the triangular flap or of being widely separated laterally. Their inner surface shows a few spicules near the margin, but for the most part this surface is smooth, as also is the middle of the axis of the glans which they overlap. The three flaps, combined with the median axis of the adjacent portion of the glans, enclose a space which is probably highly glandular in the living animal (fig. 4, A–D).

In the light of the facts recorded above, Milne-Edwards's description of the penis requires amplification and correction. He speaks of the distal end of the penis, with its bone, as forming a very pronounced projection in front and as passing greatly beyond the orifice of the urethra. From this, in the first place, it is quite clear that he did not detect this orifice just beneath the tip of the glans where the bone ends ; and, in the second place, it is probable that he regarded the channel between the axis of the glans and the two anterior laminæ of the spicular thickening as the orifice of the urethra. He did not, therefore, perceive that this thickening, which he correctly designates "la portion renflée du gland," consists of two separable laminæ ; nor did he notice apparently that the dorsal surface of the glans is smooth almost throughout its extent in the middle line.

Carlsson's figure of the glans shows a somewhat cucumber-shaped organ, the distal third of which is smooth and apically pointed, and the proximal two-thirds thick and subcylindrical, but gradually thickening posteriorly and uniformly covered with spicules. Since, however, the examples of this genus she had for examination were immature and preserved in alcohol, it is needless to comment further on her brief contribution to this portion of their anatomy.

The significance of the penis in the classification of the Æluroidea has never been properly appreciated, and since the penis of *Cryptoprocta* has been compared with that of

the Felidæ, and even stated by Filhol to resemble it (R. Acad. Sci. Paris, cxviii. p. 1062, 1894), it is necessary to assert positively that no member of the Felidæ possesses a penis like that of *Cryptoprocta* in any important characters. The penis in the cats is always short, the glans is conical and spicular or smooth, the prepuce is close in front of the scrotum, and there is at most a small bone in the glans.

The only Æluroid penis known to me, which, in the length of the glans and its armature of spicules, recalls that of *Cryptoprocta* is the penis of *Paguma* and *Paradoxurus*. In these genera the greater part of the glans is subcylindrical and covered with spicules above and below, but it ends in a short, smooth, styliform point, upon which the orifice of the urethra opens. This smooth-pointed termination is probably, I think, the homologue of the very much larger and longer, smooth, clavate termination seen in *Cryptoprocta*. Similarly, the undifferentiated spicular portion in *Paguma* is probably the homologue of the very specialised spicular portion seen in the Mascarene animal. But, despite these somewhat remote resemblances, it must be remembered that the glans penis of *Paguma* and *Paradoxurus*, long though it be, is unsupported by bone, as also is the very long penis of *Hyæna* and *Proteles* *.

The external genitalia of the female are no less remarkable than those of the male, as Lönnberg has shown (Bih. Sv. Vet.-Akad. Handl. xxviii. pt. 4, no. 3, 1902). The very large peniform clitoris is provided with a bone and armed anteriorly with spicules. It protrudes from a well-developed prepuce, about two inches in front of the anal sac, the urogenital orifice opens just behind the clitoris, and this orifice, with the prepuce and clitoris, is at the extremity of a conical, pendulous, and movable prominence (fig. 4, F). In their general arrangement these parts were compared both by Filhol and Lönnberg to the corresponding parts of *Crocuta* as described by Watson. No other Æluroid shows any special resemblance to *Cryptoprocta*, so far as the parts discussed are concerned. Certainly the Felidæ and Mungotidæ do not.

If the current classification of the Æluroidea into Felidæ, Viverridæ, Hyænidæ, and Protelidæ be adhered to, there is, in my opinion, no escape from Mivart's opinion that *Cryptoprocta* must be ranked with the Viverridæ, where Bennett

* In connection with the long bony penis of *Cryptoprocta*, it is interesting to recall Pollen's record, made on the testimony of natives, that these animals copulate after the manner of dogs. So also do bears and hyænas. The method of cats is, of course, totally different.

originally placed it. The attempt made by Milne-Edwards and Filhol, and, comparatively recently, by Trouessart, to include it in the Felidæ or in a special family associated with the Felidæ must bring about an extension of the definition of that family or group, with the result that the definition ceases to be of scientific value. It is significant that no such definition was attempted. For my part I quite agree with Lönnberg that the cross-resemblances *Cryptoprocta* exhibits to other families of Æluroids, coupled with its own peculiarities, entitle it to rank as a family by itself; and this family is susceptible of definition as precise as that of the Felidæ or Hyænidæ.

XLIX.—*A new Rat from Tenasserim.*

By Oldfield Thomas.

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Epimys tenaster, sp. n.

Quite like *E. cremoriventer*, Miller, but much larger. The fur similarly spiny, the colour buffy or ochraceous with sharply defined under surface, and the tail similarly well haired, uniformly brown.

Skull conspicuously larger than that of *cremoriventer*, proportionally perhaps somewhat narrower. Supraorbital ridges well developed, evenly curved, not forming marked postorbital angles as in *E. surifer*.

Dimensions of the type (measured on the spirit-specimen) :—

Head and body 160 mm. ; tail 208 ; hind foot 33·3 ; ear 24.

Skull : greatest length 42·3 ; condylo-incisive length 37·7 ; zygomatic breadth 18·8 ; nasals 16·3 ; interorbital breadth 6·8 ; breadth across parietal ridges 15·4 ; palatilar length 17·8 ; palatal foramina 7 ; upper molar series 6·5.

Hab. Mount Muleyit, Tenasserim. Alt. 5000–6000′.

Type. Adult male. B.M. no. 88. 12. 1. 53. Collected by L. Fea, and presented by the Marquis G. Doria.

This is one of two species put by me under the erroneous heading of *Mus jerdoni*, Blyth, in my account of the Fea collection, the other being a smaller form recently named by Mr. Miller *Epimys gracilis*, and closely allied to *E. bukit*. *E. tenaster* appears to be only nearly related to the Malayan *E. cremoriventer*, from which the dimensions given above will readily distinguish it.

L.—*On a new Species of* Microtus *from Asia Minor.*

By W. F. Griffitt Blackler, M.A., F.Z.S.

Through the courtesy of Mr. Oldfield Thomas, I have recently had the opportunity of examining at the British Museum of Natural History a number of specimens of small mammals collected by me in Western Asia Minor a few years ago, and presented to the National Collection. On careful examination of a vole, of which three specimens were obtained in the vicinity of Smyrna, I have been led to the conclusion that they represent a new species of the genus *Microtus*, although they have at the same time a superficial resemblance to *M. guentheri* (Alst.), from Marash in Cilicia, and to *M. hartingi* (B.-Ham.), from Thessaly, and I therefore propose to give it the name of :—

Microtus lydius, sp. n.

Somewhat similar to the typical *M. guentheri*, but distinguishable from it by its longer tail and greyish-white belly as well as by other minor differences.

Description.—General colour above light fawn, presenting a slightly grizzled appearance on the back proper, where some of the hairs are tipped with black. Flanks more brightly coloured owing to the practical absence of black-tipped hairs, and slightly tinged with fulvous at the lines separating them from the greyish white of the underparts. The hairs are all slate-grey at their bases. Underpart of body, belly, throat, and inner sides of legs uniformly greyish white ; the hairs all slate-grey at their bases, and white distally for about a third of their length ; but, owing to the grey of the bases of the hairs showing through to a certain extent, the general appearance is greyish white to pale grey. In *M. guentheri* and in *M. hartingi* the greyish white of the underside is washed with yellow, giving it (especially in the former) a decided buffy appearance, which is totally absent in these Smyrna specimens. Ears moderate, very thinly clad with hairs along their outer edges. Hind feet moderately hairy on underside, but not nearly so much as in *M. guentheri*. Both fore and hind feet are coloured pale fawn on the upper side, a paler shade of the dorsal fawn-colour. Tail relatively short, covered with short hairs, whitish below, fawn above; it is roughly about one and a half times the length of the hind foot.

Skull.—It is difficult to compare this with that of *M. guentheri*, as the skulls of both specimens of the latter at the British Museum are broken and the posterior parts missing. The length of the molar series is approximately the same. Pattern of molars about as in *M. guentheri*, but the angles of the enamel folding less strongly acute or sharply pointed, and more rounded, and the dentine spaces slightly wider in relation to width of the enamel—a fact difficult to explain, but readily discernible to the eye. This is particularly evident in the first fold in the upper molar series.

Dimensions of the type (as measured in the flesh) :—

Head and body 115 mm.; tail 26; hind foot 18; ear 11.

Skull : Condylo-incisive length 27·6 ; basilar length 24·0 ; greatest zygomatic breadth 15·7 ; width of brain-case 12·0 ; interorbital breadth 4·0 ; nasals 7·8, palatilar length 13·0 ; length of molar series 6·5 ; diastema 8·4 ; palatal foramina 4·7. The auditory bullæ are rather small and slightly flattened on the exterior side.

Hab. Smyrna. Alt. 400 ft. "Trapped in an olive grove."

Type. Young adult male. B.M. no. 5. 10. 6. 8. Original number 46. Collected September 20, 1905. Presented by W. F. Griffitt Blackler.

Two more specimens of an adult male and old female were examined, but unfortunately the skull of the former was not preserved, owing to having been badly smashed by the trap. This specimen, caught in January, is larger than the type—measuring, head and body 122 mm., tail 29—and the colouring is not quite so bright, probably owing to seasonal change.

This vole is distinguishable from *M. guentheri* and *M. hartingi*, the only two species to which it is at all nearly related, by the complete absence of any yellowish or buffy tinge on the greyish white of the underparts, the longer tail, and the colouring of the upper sides of the feet, besides the slight variation in the molar teeth.

I originally intended making it a subspecies of *M. guentheri*, but, on examining the type of *M. hartingi* from Thessaly, I have come to the conclusion that it presents even greater differences from either of these two than these do from each other, in general appearance as well as by the characteristics enumerated above, and I consider it therefore as deserving of full specific rank.

LI.—*Descriptions and Records of Bees.*—LXXII.

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

Liphanthus sabulosus, Reed.

This insect was described by Reed as a new genus of Philanthidæ. Friese and Ducke refer it to *Psaenythia*, but it is a peculiar little species, with remarkably long filiform male antennæ, and I am inclined to accept Reed's generic name. A specimen from the British Museum is labelled "Chili," and Mr. Meade-Waldo informs me that Philippi had proposed a new generic and specific name, which was not published.

Tetralonia hirsutissima, sp. n.

♀.—Length about 14 mm.

Robust, black; the head, thorax, and two basal segments of abdomen with long erect white hair; sides of face, vertex, and cheeks anteriorly with black hair; head extremely broad; mandibles robust, black, with no orange spot; labrum covered with white hair; clypeus strongly punctured; antennæ black, third joint almost as long as next three combined; mesothorax dull; no intermixture of dark hair on thorax above; legs with hair mostly white, but black on inner side of basitarsi and dark chocolate on inner side of hind tibiæ; hind spurs not hooked; tegulæ black. Wings dusky translucent, venation ordinary. Abdomen with white hair-patches at sides of segments 2 to 5, that on 2 rather small, the others large, transverse, and brilliant white; other parts of these segments (except second) black; apical segment with shining chocolate hair; venter with bands of white hair.

Hab. British Columbia, 4. 11. 07 (*Capt. G. A. Beazeley*; British Museum). It also has a type-written label, "Toba."

Among the North-American species it falls nearest to *T. lata* (Prov.), described from Vancouver I., but it is easily known by the long white hair and spotted abdomen. It has a South-American aspect, recalling such species as *T. bipunctata*, Friese. The locality may be erroneous; could it have come from Chile, where the bees are so often black and greyish-white haired? I do not find any S.-American species with which I can identify it.

Protandrena scutellata, sp. n.

♀.—Length nearly 7 mm.

Rather slender; head and thorax black, with very scanty

pale hair; pale yellow markings as follows:—base of mandibles, upper part and middle of clypeus (but not lower corners or margin, which are brown), transverse supraclypeal mark, tubercles connecting with band across prothorax (slightly interrupted in middle), scutellum (except irregular anterior edge), and postscutellum. Process of labrum brown, extremely broadly truncate; clypeus sparsely punctured; facial quadrangle broader than long; eyes pea-green; flagellum very bright ferruginous beneath except at base, and red at apex above; mesothorax dull, minutely granular; area of metathorax granular, scarcely defined; legs rufopiceous, the tarsi ferruginous; anterior and middle knees and their tibiæ at base outwardly pale yellow; anterior tibiæ ferruginous in front: tegulæ testaceous, with a yellow spot. Wings pale brown: nervures and stigma (which is rather large) dull red; b. n. falling far short of t.-m.; first r. n. joining second s.m. a short distance from its end. Abdomen rather long and narrow, shining black, with broad ferruginous bands at bases of second and third segments, extending downwards (caudad) at sides, and some red at sides of fourth; third and fourth segments with very thin hair-bands; apex with ochreous hair; pygidial plate large. The thin scopa of hind tibiæ has collected orange pollen. Maxillary palpi 6-jointed.

Hab. Acaguizotla, Guerrero, Mexico, 3500 ft., October, 2 ♀ (*H. H. Smith*; British Museum).

Very distinct by the yellow scutellum and postscutellum, but somewhat related to the Mexican *P. modesta* (Smith).

Chelynia herberti, sp. n.

♀.—Length about 6 mm.

Black, with cream-coloured markings. Very close to *C. permaculata* (Ckll.), but much larger, wings strongly dusky in marginal cell and apical field; instead of spots above eyes are long transverse stripes (each longer than the interval between them), mesothorax anteriorly with two transverse spots, tegulæ with small light spots, transverse dorsal marks on third and fourth abdominal segments only narrowly separated, and none of them as widely separated as half the length of one. Also very close to *C. nyssonoides* (Brues), but second r. n. joining second s.m. nearer end, wings dusky, vertex and mesothorax punctured about alike, bands instead of spots on head above, lateral spots on first abdominal segment not larger than the middle ones, and other small details.

Hab. Chilpancingo, Guerrero, Mexico, 4600 ft., October (*H. H. Smith*; British Museum).

In *C. permaculata* the mandibles have a large bright red subapical spot, but in *C. herberti* this is represented only by an obscure reddish tint. Both species have a white band along anterior orbits.

Strandiella ruficornis, sp. n.

♂.—Length about 7·5 mm.

Shining black, slender, with dark fuliginous wings; head broad, eyes converging below; face densely covered with white hair; mandibles bidentate, apical half chestnut-red; maxillary palpi 6-jointed, joints measuring in microns (1) 96, (2) 64, (3) 50, (4) 50, (5) 50, (6) 64; antennæ short for a male; third joint 160 microns long, fourth 128; scape rather slender, curved, with very long hair; flagellum thick, clear ferruginous beneath except at base; front and vertex strongly punctured; a smooth space on each side of ocelli; mesothorax and scutellum very strongly but sparsely punctured; area of metathorax triangular, with irregular large rugæ; sides of metathorax shining and finely punctured; legs piceous, anterior tibiæ and tarsi pale reddish brown in front; tegulæ dark brown, with a very large fulvous spot; stigma large; b. n. falling short of t.-m.; two s.m. cells, about equally long (second very long), the second receiving first r. n. some distance from base and second near apex; abdomen polished, with very sparse punctures, a constriction at base of second segment; sides subapically with dark hair; apical plate small and rounded.

Hab. Willowmore, Cape Colony, Dec. 19, 1911 (*Dr. Brauns*; British Museum).

Nearest to *S. glaberrima*, Friese, but distinguished by the colour of the antennæ and the shining male abdomen. The insect looks like some small fossorial wasp.

S. longula, Friese, is herewith designated as the type of *Strandiella*.

Sphecodes turneri, sp. n.

♀.—Length about 8 mm.

Head, thorax, antennæ, and legs black, with thin dull white hair; abdomen bright ferruginous, with the last segment black and the apical half of fourth strongly suffused with blackish; head very broad, facial quadrangle much broader than long; sides of face with appressed dull white hair; clypeus irregularly rather densely punctured, with no

median groove; mandibles bidentate, obscurely red apically; process of labrum very broadly truncate; mesothorax polished, shining, with sparse strong punctures; greater part of scutellum impunctate; area of metathorax with very strong plicæ; tegulæ piceous, punctured. Wings dilute fuliginous, paler at base; stigma and nervures dark; only two submarginal cells, the second receiving both recurrent nervures. Abdomen shining, with fine and obscure irregular punctures; second segment slightly depressed at base; hair at apex soot-colour.

Hab. Shillong, Assam, May 1903 (*R. Turner*; British Museum).

Smaller than *S. fumipennis*, and with more of abdomen red than *S. montanus*. It is also readily known by having only two submarginal cells, a character which it shares with the American *S.* (*Dialonia*) *antennariæ*, Rob., and *S. distolus*, Lovell.

Exomalopsis perimelæna, sp. n.

♀.—Length about 8·5 mm.

Robust, black, with black hair, except that on dorsum of thorax, which is clear white; mandibles bidentate, with a fulvous subapical patch; eyes converging below, but face broad; ocelli quite large, in a curve; antennæ entirely dark, flagellum short; discs of mesothorax and scutellum bare, polished and shining, with only very minute scattered punctures; legs with dense black hair, scopa of hind tibia and basitarsus very large, dense and compact, but with many long black hairs projecting beyond the general mass; tegulæ black. Wings rather short, strongly smoky; b.n. meeting t.-m.; marginal cell ending in a point (slightly appendiculate) away from costa; second s.m. subtriangular, receiving first r.n. at its apex; third s.m. at least as large as first. Abdomen broad and short, smooth and shining, with black hair at apex.

Hab. V. del Lago Blanco, Chubut, Patagonia (British Museum).

A very peculiar species, not a typical *Exomalopsis*. *E. herbsti*, Friese, is black-haired, with disc of thorax and head above white-haired, but it has the scopa pale.

Halictus hesperus, Smith.

Bugaba, 800–1500 ft., and Torola, 1000 ft. (*Champion*; British Museum).

Pachyprosopis kellyi, sp. n.

♀.—Length about 5 mm.

Rather robust, but head not enlarged; shining, almost without hair; head orange, finely and sparsely punctured, with a pair of very broad black bands passing halfway down the front from the lateral ocelli; the narrow facial foveæ, interocellar region, and occiput also black; antennæ fulvous, the short flagellum black or nearly so above; mesothorax terra-cotta red, the punctures so minute as to be hardly visible with a lens; scutellum and axillæ orange; postscutellum and shining area of metathorax black; truncation (except upper part) and sides of metathorax, and pleura except narrow upper and broad lower part, yellowish fulvous; legs orange-fulvous, anterior femora black behind except at apex, middle and hind tibiæ black on outer side, their tarsi brownish; tegulæ pellucid. Wings hyaline; stigma large, black, obtuse apically; marginal cell bulging below; first r. n. joining first s.m. near apex; second s.m. narrow and elongated above. Abdomen orange, with dorsal region black from middle of first segment to end of fourth, the orange indenting the black at sides; a black mark at extreme sides of first segment; venter orange.

Hab. Mt. Yule, Healesville, Victoria, on *Eucalyptus calophylla rosea*, Feb. 20, 1915 (*R. Kelly*; British Museum).

Quite unique by its peculiar markings; except for the venation, it could go in *Eurygloss*a.

AUSTRODIOXYS, gen. nov.

Parasitic bees, similar in form and colour to *Dioxys*, with two submarginal cells; eyes bare; scutellum produced, overlapping postscutellum, very broadly truncate, more or less emarginate in middle, the posterior corners angular though not sharp, the margin above the corner translucent; no tooth on postscutellum; stigma small, lanceolate; marginal cell broad, very obliquely truncate, appendiculate, formed essentially as in *Ammobates carinatus* (not rounded at end as in *Dioxys*); first s.m. more than twice as large as second, receiving first r. n. very near its end; second s.m. very broad below, much narrowed above, receiving second r. n. not much beyond middle; b. n. going a little basad of t.-m.; pubescence minute and appressed, as in *Epeolus*; apex of abdomen broadly truncate, with two large rounded projecting teeth, shaped like the tip of a finger; legs bristly; no pulvilli; anterior claws bifid at end, the others simple.

Austrodioxys thomasi, sp. n.

♂.—Length about 7 mm.

Moderately slender; head and thorax coarsely and closely punctured, but shining between the punctures, abdomen densely rugoso-punctate. Head and thorax black, with faint suggestions of reddish spots on scutellum, and a reddish tint on sides of thorax beneath wings; legs bright ferruginous; abdomen with the first three segments bright ferruginous, the others black, all with narrow, apical, pale ochreous-tinted hair-bands; face densely covered with pale ochreous-tinted hair; antennæ slender, rather dark ferruginous; tubercles, upper border of prothorax, and parts of pleura with appressed pubescence, mesothorax with browner hair, not hiding the surface; tegulæ ferruginous. Wings hyaline, slightly reddish; stigma and nervures pale ferruginous.

Hab. Argentina (*O. Thomas*; British Museum).

A curious isolated genus, resembling *Dioxys*, but structurally very distinct.

Halictus etheridgei, sp. n.

♀.—Length 9·5 mm.

Black, very robust; pubescence dull white, abundant on cheeks, sides of thorax, and postscutellum; vertex, disc of mesothorax, and posterior border of scutellum with black hair; head extremely broad; clypeus shining, with rather widely separated large punctures, and a deep median sulcus which extends upward over supraclypeal area; mandibles black, reddish at extreme tip; antennæ black, scape very long, flagellum short; front dull and granular; mesothorax shining but quite densely punctured, the punctures large and very minute; scutellum distinctly bigibbous, with minute punctures and scattered larger ones; metathorax sharply truncate, the basal area poorly defined, with dense, wrinkled, labyrinthiform rugæ all over; mesopleuræ finely striate; spurs pallid; tegulæ piceous. Wings dusky; stigma rather small, dull reddish, nervures fuscous; second s.m. quadrate, very broad; first r. n. meeting second t.-c.; outer r. n. and t.-c. very slender; third s.m. short. Abdomen shining, finely and evenly punctured, including broad apical depressed part of segments; no hair-bands or patches, but a fine pale pruinosity due to thin hair; hair surrounding caudal rima dark fuscous; venter with only short stiff hair, but collecting pollen toward base.

Hab. Yallingup, S.W. Australia, Dec. 23, 1913–Jan. 23, 1914 (*R. E. Turner*; British Museum).

Distinctly *Halictus*, not *Parasphecodes*; recognized at once among the large black species by the sculpture and sulcate clypeus.

Euryglossa ruberrima, Ckll.

♀.—Mt. Yule, Healesville, Victoria, on *Eucalyptus calophylla rosea*, Feb. 20, 1915 (*R. Kelly*).

The metathorax varies to entirely black. A characteristic feature of this species is the pair of large reddish-fulvous spots at sides of fifth abdominal segment.

Euryglossa perpulchra, sp. n.

♂.—Length about 5 mm.

Head and thorax black, with thin, rather long, dull white hair; mandibles white, ferruginous at apex; labrum pale; head broad, with very large eyes, which converge above, the inner orbits strongly arched outward; face depressed; clypeus shining, finely punctured; front dull, except the pronounced median sulcus and a line along orbits, which are shining; scape black, with a yellow spot at end; flagellum extremely short, subclavate, pale yellow, with the apical half above and nearly as much below dark brown; mesothorax polished, with a large square yellow patch in front, and yellow lateral margins above the tegulæ; scutellum, axillæ, and stripe on postscutellum (broad in middle) clear canary-yellow; tubercles and a small mark behind yellow; legs clear canary-yellow, anterior tibiæ short; tegulæ hyaline, with a yellow patch. Wings perfectly clear, the large stigma and the nervures almost colourless; first s.m. at least twice as large as second, the latter subquadrate. Abdomen bright canary-yellow above and below, without spots or bands, but with a faint reddish suffusion beyond the middle.

Hab. Kalamunda, S.W. Australia, Feb. 9–28, 1914 (*R. E. Turner*; British Museum).

A remarkable and very beautiful species, most like *E. blanda*, Sm., but very different by the thoracic markings &c.

Euryglossina sulphurella, var. *perlutea*, var. n.

Entirely bright canary-yellow, the head and thorax above with variable faint reddish suffusion.

Hab. Kalamunda, S.W. Australia, Feb. 9–28, 1914 (*R. E. Turner*; British Museum).

The original specimens of *E. sulphurella* have the head bright yellow, but the thorax and abdomen very pale ; they appear to be immature, and possibly should show brighter colours.

Prosopis fulvicornis, Smith.

This species has been rediscovered at Kalamunda, Feb. 9–28, 1914, and March 1–11, 1914 (850 ft.), by Mr. R. E. Turner. Smith's description is good, but the sex described is male, not female, and the yellow spot on anterior femora is at the apex, not at the base. The second s.m. is very broad (long). The type of *fulvicornis* was in the Baly collection, and until now the species has not been represented in the British Museum.

Prosopis elongata, Smith.

Kalamunda, Feb. 9–28 (*R. E. Turner* ; British Museum). The wings are dusky and the second s.m. is not especially long.

LII.—*Notes on Fossorial Hymenoptera.*—XXII. *On new Ethiopian Species.* By Rowland E. Turner, F.Z.S., F.E.S.

Family Psammocharidæ.

Genus Batozonus, Ashm.

Batozonus, Ashm. Canad. Entom. xxxiv. p. 81 (1902).
Heteronyx, Sauss. Soc. Entom. ii. p. 3 (1887) (nom. præocc.).

The type of *Batozonus* is *B. algidus*, Sm., that of *Heteronyx* is *H. madecassus*, Sauss. The tarsal ungues are bifid in the male, but in the female the ungues of the fore tarsus only are bifid, the others being unidentate. The cubitus of the hind wing originates before the transverse median nervure in both sexes, and the third cubital cell is always shorter than the second on the radius, often almost quadrate. The middle joints of the flagellum are strongly arcuate beneath in the male. The differences between the sexes are very striking in this genus.

Key to the Ethiopian Species of Batozonus.

♀♀.

1. Cubitus of hind wing originating at a distance before the transverse median nervure equal to more than half of the length of the third joint of the flagellum.	*B. fuliginosus*, Klug.
Cubitus of the hind wing originating at a distance before the transverse median nervure scarcely exceeding one-eighth of the length of the third joint of the flagellum	2.
2. Wings yellow, with a broad fuscous or fusco-violaceous apical margin	*B. capensis*, Dahlb.
Wings black flushed with blue	3.
3. Legs bright fulvo-ferruginous	4.
Legs black, fore legs sometimes partly fusco-ferruginous	*B. separabilis*, Turn.
4. Pronotum and scutellum yellow	*B. capensis*, Dahlb., var.
Thorax entirely black.....	*B. gowdeyi*, Turn.

♂♂.

1. Cubitus of the hind wing originating at a distance before the transverse median nervure equal to more than half of the length of the third joint of the flagellum.	*B. fuliginosus*, Klug.
Cubitus of the hind wing originating at a distance before the transverse median nervure never exceeding one-third of the length of the third joint of the flagellum.	2.
2. Wings flavo-hyaline, with a fuscous margin; frontal carina not strongly raised; clypeus with a median carina only.....	*B. capensis*, Dahlb.
Wings fuscous flushed with blue; frontal carina very high and sharp; clypeus with an oblique carina on each side from near the base	3.
3. Legs fulvo-ferruginous; dorsal surface of scutellum convex	*B. gowdeyi*, Turn.
Legs black, fore legs only ferruginous; dorsal surface of scutellum flat	*B. separabilis*, Turn.

Batozonus separabilis, sp. n.

♀. Nigra; mandibulis, clypeo, fronte parte inferiore, scapo, tibiis anticis, femoribus anticis apice, tarsisque anticis basi fusco-ferrugineis; flagello, articulis tribus apicalibus exceptis, fulvo; alis nigro-cæruleis.

♂. Niger; capite, pronoto, mesonoto, tegulis, scutello pedibusque anticis sordide ferrugineis; flagello supra infuscato; alis fusco-cæruleis, cellulis apicali discoidalique secunda subhyalinis.

Long., ♀ 17–19 mm., ♂ 13–14 mm.

Var. ♀. Pedibus anticis fere omnino nigris.

Var. ♂. Scutello nigro.

♀. Clypeus broadly rounded at the apex; the labrum very shallowly emarginate at the apex and divided by a deep longitudinal sulcus. Second joint of the flagellum long, about half as long again as the third; eyes reaching the base of the mandibles, distinctly divergent towards the clypeus, separated on the vertex by a distance about equal to the length of the third joint of the flagellum. Pronotum widely arched posteriorly, not angulate in the middle; the anterior angles very broadly rounded. Scutellum with a flat dorsal surface, narrowly rounded at the apex; median segment gradually sloped posteriorly, without a median sulcus. Sixth dorsal segment broadly rounded at the apex and thinly clothed with long black hairs. Third abscissa of the radius shorter than the second, a little shorter than the second transverse cubital nervure; second recurrent nervure received beyond the middle of the third cubital cell; basal nervure of the fore wing interstitial; cubitus of the hind wing originating just before the transverse median nervure. Fore tarsi with a long comb, three spines on the basal joint. Ungues of the fore tarsi bifid, of the others unidentate.

♂. Clypeus very broadly rounded at the apex, subcarinate longitudinally in the middle; from the base a low carina branches towards the anterior angles, but does not extend to them. Labrum rounded at the apex, without a sulcus. A very high sharp carina between the antennæ extending to the base of the clypeus. Front marked with an arched low carina on each side below the anterior ocellus, the area below the carinæ slightly concave. The joints of the flagellum from the fifth to the ninth are strongly arcuate beneath, the second joint is equal to the third. Pronotum arcuate on the posterior margin, rather strongly narrowed in front. Seventh ventral segment with a longitudinal carina. Third abscissa of the radius shorter than in the female, being scarcely more than half as long as the second transverse cubital nervure. All the tarsal ungues bifid.

Hab. Mlanje, Nyasaland, October to March (*S. A. Neave*); Usagara District, German East Africa, 2500 ft., December (*S. A. Neave*).

The female of this species closely resembles the tropical form of *B. fuliginosus*, Klug, and, like that species, varies much in the colour of the antennæ and front; it may, however, at once be distinguished by the great difference in the point of origin of the cubitus of the hind wing, which in *fuliginosus* is separated from the transverse median nervure by a distance exceeding half the length of the third joint of the flagellum, whereas in *separabilis* the distance does not

exceed one-eighth of the length of that joint. The male is very different from *fuliginosus*, and though it differs much from the female, the sexual dimorphism is not as marked as in that species.

Batozonus gowdeyi, sp. n.

♀. Nigra; mandibulis fusco-ferrugineis; femoribus, tibiis tarsisque ferrugineis; alis nigro-cæruleis.

♂. Niger; mandibulis, clypeo, fronte, orbitis posticis, femoribus, tibiis tarsisque ferrugineis; flagello subtus fusco-ferrugineo; pronoto margine posteriore fascia obliqua utrinque flava; alis fusco-purpureis.

Long., ♀ 15–17 mm., ♂ 13–15 mm.

♀. Except in colour this species strongly resembles *B. separabilis*, but has the scutellum more strongly compressed, without a flat dorsal surface, and distinctly longitudinally carinate in the middle; the clypeus is transverse at the apex; the labrum without a sulcus and very narrowly notched in the middle; the two apical dorsal segments more finely punctured.

♂. The differences between this and the male of *separabilis* are mostly in colour, but the scutellum is much more strongly compressed in *gowdeyi*.

Hab. Uganda, Mabira Forest, July (*C. G. Gowdey*); Tero Forest, July (*C. G. Gowdey*); Tero Forest, 3800 ft., September (*S. A. Neave*); Bugoma Forest, Unyoro, 3700 ft., December (*S. A. Neave*).

A single specimen labelled "West Africa" from F. Smith's collection.

This is very near *separabilis*, and will doubtless prove to be the western representative of that species; but the difference in the form of the scutellum seems to be a sufficient specific distinction.

Batozonus capensis, Dahlb.

Pompilus capensis, Dahlb. Hymen. Europ. i. p. 49 (1843). ♀.
Pompilus vindex, Sm. Descr. New Species Hymen. p. 144 (1879). ♀.
Pompilus ancyloneurus, Cam. Ann. Transvaal Mus. ii. p. 123 (1910). ♀.

A variety of the female from Magadi Junction, British East Africa, has the wings fuscous flushed with blue. The male from the same locality is normal.

Batozonus fuliginosus, Klug.

Pompilus fuliginosus, Klug, Symb. physic. t. xxxviii. fig. 6 (1834). ♀.
Pompilus festivus, Klug, Symb. physic. t. xxxviii. fig. 8 (1834). ♂.
Pompilus bretonii, Guér. Mag. de Zool. xiii. p. 4 (1843). ♀ (nec ♂).
Pompilus vindicatus, Sm. Cat. Hym. B.M. iii. p. 142 (1855). ♀.
Pompilus iridipennis, Sm. Descr. New Species Hymen. p. 144 (1879). ♀.
Pompilus sepulchralis, Sm. Descr. New Species Hymen. p. 145 (1879). ♀.
Priocnemis atlanticus, Kirby, Ann. & Mag. Nat. Hist. (5) xiii. p. 408 (1884). ♀ (nec ♂).
Pompilus solanus, Kohl, Jahrb. wiss. Anstalt. Hamburg, x. p. 184 (1893). ♀.
Pompilus contentiosus, Grib. Ann. Mus. Civ. Genova, xxi. p. 305 (1884). ♀.
Anoplius o'neili, Cam. Rec. Albany Mus. i. p. 127 (1904). ♂.

This is distinguished from the other Ethiopian species of *Batozonus* by the great distance between the point of origin of the cubitus of the hind wing and the transverse median nervure. The female in tropical Africa always has the wings black flushed with blue, the abdomen entirely black, and the antennæ varying from yellow to black. But the typical form figured by Klug has the wings yellow-brown with a fuscous margin and a dull yellow band at the base of the second dorsal segment; this is the Saharan form, having been described by Klug from Dongola; it was also obtained by Wollaston from Sal Island in the Cape Verde Group, though the usual tropical form was described by Kirby from St. Vincent in the western part of the same group. The ground-colour of the male abdomen varies from black to dull ferruginous. The species seems to range over the whole of Africa except the extreme north, and is represented in Madagascar by the nearly allied *B. madecassus*, Sauss. In India it is replaced by the allied *B. unifasciatus*, Sm.

Family Crabronidæ.

Subfamily *Stizinæ*.

Stizus lughensis, Magr.

Stizus lughensis, Magr. Ann. Mus. Civ. Genova, xxxix. p. 606 (1898).

♀. Nigra; mandibulis basi, labro, clypeo dimidio apicali, orbitis internis et externis latissime, fronte sub antennis, scapo subtus, pronoto margine posteriore, postscutello, segmento dorsali primo macula parva transversa utrinque, secundoque fascia lata interrupta flavis; clypeo dimidio basali, antennis, pronoto, mesonoto

lateribus, tegulis, scutello, segmentis ventralibus, segmentis dorsalibus primo, quinto sextoque, segmento secundo basi, pedibusque ferrugineis; alis fusco-hyalinis, apice late hyalinis, cellula radiali fusca, venis nigris.
Long. 24 mm.

♀. Apical joint of the flagellum conical, fully as long as the penultimate; clypeus with a few shallow punctures on the apical half, the basal half with closer and smaller piliferous punctures. Inner margin of the eyes almost parallel. Scutellum with a large puncture or depression near the middle, as in *S. ruficornis*; thorax finely and closely punctured. First dorsal segment much more finely punctured than the rest of the abdomen; sixth dorsal segment very finely and not very closely punctured, rather narrowly rounded at the apex. First transverse cubital nervure straight.

Hab. Bohotle, Somaliland (*Appleton*).

This is very near *S. ruficornis*, but differs much in the colour of the wings and abdomen. The sixth dorsal segment is also more finely and sparsely punctured, and is rather more narrowly rounded at the apex, and the pygidial area more clearly defined. The punctures of the clypeus are also less distinct.

Stizus ritsemæ, Handl.

Stizus ritsemæ, Handl. Sitzungsber. Akad. Wiss. Wien, civ. p. 1000 (1895). ♀.

Hab. Ilorin, N. Nigeria, April (*J. W. Scott Macfie*).

A single female in the British Museum.

Stizus multicolor, sp. n.

♂. Ferrugineus; mesonoto, mesopleuris, segmento mediano basi late, segmento dorsali primo apice, secundo basi late, tertioque basi nigris; clypeo, labro, fronte sub antennis, scapo subtus, pronoto margine posteriore, postscutello fascia apicali, segmento mediano fascia interrupta transversa, segmento dorsali primo macula parva utrinque, segmentis 2–5 fascia lata interrupta, sextoque dimidio basali flavis; alis hyalinis, venis ferrugineis, cellulis radiali cubitalibusque secundo tertioque infuscatis.

♀. Mari simillima, segmentis dorsalibus secundo tertioque basi ferrugineo-maculatis, fasciis flavis latissime interruptis.

Long., ♂ 18 mm., ♀ 21 mm.

♂. Clypeus widely but not deeply emarginate; eyes parallel on the inner margin; apical joint of the flagellum

no longer than the penultimate, slightly curved and excavate beneath, very blunt at the apex; thorax and the whole abdomen finely and closely punctured; seventh dorsal segment narrowly rounded at the apex; first transverse cubital nervure curved; second abscissa of the radius as long as the first.

♀. Apical joint of the flagellum very blunt at the apex; scutellum without a median depression; the whole insect more finely punctured than the male, the punctures on the first dorsal segment microscopic; sixth dorsal segment closely and not finely punctured, clothed with very short fulvous setæ, narrowly rounded at the apex, the margins of the pygidial area not elevated. Basal joint of the anterior tarsi with six spines.

Hab. Uganda; Elephant Camp, Toro, November, 4 ♂♂ (*R. E. McConnell*); Semliki Plains, near southern shore of Lake Albert, 2200 ft., November, 2 ♀♀ (*S. A. Neave*).

In the form of the female sixth dorsal segment, which is produced and narrowly rounded at the apex, this resembles *S. rubellus*, Turn., but in that species the cloud on the fore wing is very faint and does not extend beyond the radial cell; the apical joint of the flagellum is also blunter in *multicolor* and the yellow markings very different, also the fulvous setæ of the sixth dorsal segment. In *S. ferrugineus*, Sm., the clypeus is more deeply emarginate. Handlirsch gives *ferrugineus* as a synonym of *zonatus*, Klug, but this is quite wrong in my opinion.

Stizus rubroflavus, sp. n.

♀. Ferruginea; clypeo dimidio apicali, fronte sub antennis, scapo subtus, pronoto margine posteriore, segmento dorsali primo macula utrinque, segmentis 2–5 dorsalibus et ventralibus fascia late interrupta, segmentoque dorsali sexto macula magna utrinque flavis; alis hyalinis, venis testaceis, cellula radiali leviter infumata.

Long. 20 mm.

♀. Clypeus broad, deflexed from the middle and widely emarginate at the apex, the basal portion subcarinate in the middle and smooth, the apical portion and the labrum coarsely but shallowly punctured. Frontal scutellum between the antennæ and the base of the clypeus short, about twice as broad as long. Thorax almost smooth; scutellum without a median depression; median segment closely punctured. Abdomen shining, the two basal segments almost smooth; the apex of the third and the whole of the fourth

and fifth finely and closely punctured; sixth dorsal segment more distinctly punctured, rather broadly rounded at the apex, the pygidial area distinct but without strongly raised sides. Basal joint of the fore tarsus with seven long spines. Second abscissa of the radius much shorter than the first; the curvature of the first transverse cubital nervure very distinct.

Hab. Gambia (*Simpson*), March.

This is not the female of *ferrugineus*, Sm., which occurs in the same locality. That species was described from a male in which the first transverse cubital nervure is straight; the female of *ferrugineus* is very similar in colour to *rubroflavus*, but has the mesonotum black and has a median depression on the scutellum, the clypeus is not deflexed from the middle and is more sparsely punctured, and the puncturation of the thorax and abdomen, though fine, is much more distinct than in *rubroflavus*. Both species are on the wing in March.

Stizus aurifluus, sp. n.

♀. Nigra; clypeo, labro, mandibulis basi, fronte sub antennis, pronoto margine posteriore, segmento dorsali primo macula transversa utrinque, segmentis dorsalibus 2–5 fascia lata interrupta flavis; capite, antennis, pronoto, mesonoto lateribus, scutello, segmento mediano, pygidio pedibusque ferrugineis; pygidio apice dense aureo-sericeo; alis hyalinis, venis fuscis; costa late infuscata.

Long. 25 mm.

♀. Clypeus broadly emarginate, the emargination slightly angular in the middle; inner margin of the eyes almost parallel; apical joint of the antennæ conical, as long as the penultimate. Thorax finely and very closely punctured, scutellum without a median depression; pubescence long and greyish, more dense on the median segment than elsewhere. Abdomen closely and very distinctly punctured; sixth dorsal segment more closely punctured, clothed with ferruginous pubescence at the base, with shining golden pubescence at the apex, with a well-marked pygidial area, very broadly rounded at the apex. Basal joint of the fore tarsi with eight stout but not very long spines. Second abscissa of the radius shorter than the first; the costa thickened and forming a very distinct rounded stigma at the base of the radial cell.

Hab. Yapi, Gold Coast (*Simpson*).

This is very near *chrysorrhœus*, Handl., but differs from S.-African specimens sent by Dr. Brauns under that name in

the much broader pygidial area, the much stronger puncturation of the abdomen, the colour of the nervures, and the costal infuscation, which in *chrysorrhœus* is confined to the radial and second and third cubital cells, the more clearly defined stigma, and the more deeply emarginate clypeus. The spines of the basal joint of the fore tarsus are shorter and more numerous than in *chrysorrhœus*.

S. marshalli, Turn., is also near *chrysorrhœus*, but has the pygidial area much less distinct and also somewhat broader, with the golden pubescence almost absent; the colouring, especially on the first dorsal segment, is also different. A variety of *chrysorrhœus* from Marsabit, British East Africa, has the basal dorsal segment ferruginous in the middle in both sexes, but appears to be identical otherwise. It is possible that *S. auriflua* may prove to be the female of *S. tenuicornis*, Sm., but the colour of the wings is different.

Stizus neavei, Turn.

Stizus neavei, Turn. Ann. & Mag. Nat. Hist. (8) ix. p. 343 (1912). ♂ ♀.

This species, from North Rhodesia, is nearly allied to the South-African *Stizus imperialis*, Handl., but may be distinguished by the deeply emarginate clypeus as well as by the less extensive yellow markings. The seventh tergite of the male is much narrower than in *S. imperialis*.

Stizus franzi, nom. nov.

Stizus neavei, Kohl, Rev. Zool. Afric. iii. 1, p. 209 (1913). ♀ (nec Turner).

There is a single specimen of the female in the British Museum from Kambove, Katanga, 4000–5000 ft., taken by Neave in June 1907.

Stizus simpsoni, sp. n.

♀. Nigra; clypeo, labro, antennis, fronte sub antennis, pronoto, tegulis, mesopleuris, mesonoto lateribus, scutello, postscutello, segmento mediano pedibusque fusco-ferrugineis; alis anticis fusco-violaceis, basi usque ad aream discoidalem primam hyalinis, margine lato apicali hyalino aream cubitalem tertiam haud attingente; alis posticis dimidio basali hyalinis; segmento mediano nigro-piloso.

Long. 21 mm.

♀. Eyes converging towards the clypeus, separated at the

base of the clypeus by a distance almost equal to the combined length of the second and third joints of the flagellum. Thorax very closely punctured; median segment more deeply punctured than the thorax, without an impressed median line, clothed with short, erect, black hairs. First dorsal segment finely and rather closely punctured, the four following segments more closely punctured; sixth dorsal segment with very sparse and large setigerous punctures, narrowly truncate at the apex, the lateral margins near the apex distinctly carinate. Basal joint of the fore tarsus with seven spines.

Hab. Yapi, Gold Coast (*Simpson*).

This may be distinguished from all other species of the *tridentatus* group with similar colouring of the wings by the black hairs of the median segment. From *fenestratus*, Sm., which occurs in the same district, it is also distinguished by the punctuation of the first dorsal segment, by the very different sculpture of the sixth dorsal segment, and colour-differences. The colour of the abdomen separates it from *pœcilopterus*, Handl., *mionii*, Guér., and *amœnus*, Sm. The sculpture of the sixth dorsal segment seems to be peculiar to this species, all other allied species having that segment much more closely punctured.

Stizus klugii, Sm.

Larra apicalis, Klug, Symb. phys. tab. xlvi. fig. 13 (1845). ♀.
Larra klugii, Sm. Cat. Hym. B.M. iv. p. 345 (1856).

A female specimen from Magadi Junction, British East Africa, has the two apical dorsal segments yellow-brown, with the sides of the third and fourth segments and a spot on each side near the apex of the second segment yellow. I look on this as a colour-variety only, though it may possibly be of subspecific importance.

Subfamily *Larrinæ*.

Tachytes admirabilis, sp. n.

♀. Nigra; fronte argenteo-pubescente, abdomine segmentis dorsalibus aureo-pubescentibus, area pygidiali fusco-aureo-setosa; alis anticis infuscatis, posticis subhyalinis, venis nigris.
Long. 23 mm.

♀. Clypeus scarcely convex, the apical margin almost transverse, very finely and closely punctured, with a few large scattered punctures, clothed with short silver pubes-

cence, slightly deflexed from the middle to the apex. Eyes separated on the vertex by a distance nearly equal to the combined length of the two basal joints of the flagellum; second joint of the flagellum distinctly longer than the third. Median segment more than half as long again as the scutellum, with a very obscure impressed median line; the posterior slope rather indistinctly transversely striated, with a deep median sulcus; pubescence of the thorax and median segment greyish and very sparse. Dorsal surface of the abdomen densely covered with golden pubescence, which is denser and brighter on the apical than on the basal half of the segments; apical half of the fifth dorsal segment and basal half of the first without golden pubescence. Pygidial area elongate, very narrowly rounded at the apex, densely clothed with short setæ, which change according to the light from fulvous-gold to black. Second ventral segment shining, with sparse and fairly large punctures. Basal joint of the fore tarsus with six spines. Second abscissa of the radius a little longer than the third, both being distinctly longer than the space between the two recurrent nervures.

Hab. Uganda; Eastern Mbale district, S. of Mt. Elgon, 3700 ft., August 2–5; Mbale Kumi road, S. of Lake Salisbury, 3700 ft., August 15–17; between Kumi and N.E. shore of Lake Kioga, 3600 ft. (*S. A. Neave*); Entebbe, August 15 (*C. G. Gowdey*).

This is very near *T. mira*, Kohl, but differs in the dark fore wings, in the distinctly greater distance between the eyes on the vertex, in the coarser pubescence of the pygidial area (this area being also rather narrower at the apex), and in the greater size.

The male of this species differs from the male *mira* in the infuscate fore wings, in the shape of the seventh dorsal segment, which is truncate at the apex, not very broadly rounded as in *mira* (this segment in both species is very broad, not narrow as in *observabilis*, Kohl); the eighth ventral segment is much more shallowly emarginate, with shorter teeth at the apical angles than in *mira*.

Tachytes mira, Kohl.

Tachytes mira, Kohl, Ann. Naturhist. Hofmus. Wien, ix. p. 295 (1894). ♀.

Hab. Delagoa Bay (*Dr. Brauns*).

According to my identification this species is also found

at Salisbury, Mashonaland (*Marshall*); Mlanje, Nyasaland (*Neave*); and probably also in Uganda.

This occurs in Nyasaland together with *T. observabilis*, which is very similar in colour.

Tachytes dilaticornis, sp. n.

♂. Niger, aureo-pilosus; capite, thorace segmentoque mediano pallide aureo-pilosis; abdomine læte aureo-pubescente, segmentis dorsalibus fascia apicali densius aureo-pubescente, segmentis dorsalibus et ventralibus apice late brunneis; tegulis fuscis; alis flavis, apice latissime infuscatis; flagello articulis 2–7 infra valide dilatatis.

Long. 14 mm.

♂. Clypeus finely and closely punctured, very broadly rounded at the apex, the apical margin narrowly depressed in the middle. Eyes strongly convergent above, separated on the vertex by a distance not exceeding the length of the third joint of the flagellum. The second joint and those following as far as the seventh joint of the flagellum very strongly arcuate-dilatate beneath, the second and fourth joints both distinctly longer than the third, their greatest breadth exceeding half their length. Head, thorax, and median segment clothed with pale golden pubescence, that on the abdomen much brighter. Median segment more than twice as long as the scutellum; a depressed median line on the surface of the posterior slope, but not extending to the dorsal surface except at the extreme apex. Basal joint of the fore tarsus with five slender spines. Eighth ventral segment broadly rounded or subtruncate at the apex, without lateral spines. Second abscissa of the radius shorter than the third, the first recurrent nervure as far from the second as from the first transverse cubital nervure. The fuscous margin of the fore wing extends to the first transverse cubital nervure.

Hab. Kuja Valley, S. Kavirondo, British East Africa, 4000 ft., April 30–May 1, 1911 (*S. A. Neave*); 4 ♂♂.

This species is easily distinguished by the strongly dilated antennal joints. In the species of *Tachytes* with golden pubescence on the abdomen the form of the eighth ventral segment of the male gives excellent specific characters.

Tachytes memnon, sp. n.

♀. Nigra; clypeo, fronte genisque aureo-pilosis; flagello articulis duobus basalibus scapoque ferrugineis; tibiis tarsisque anticis,

femoribusque anticis apice brunneo-ferrugineis; alis nigris, cæruleo-tinctis; tegulis brunneis.
Long. 18 mm.

♀. Clypeus very broadly rounded at the apex, almost transverse, the apical margin narrowly transversely depressed, with two small teeth on each side, finely and rather closely punctured. Second joint of the flagellum as long as the first and third combined; eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum; an obscure longitudinal sulcus on the vertex behind the posterior ocelli. Pubescence of the thorax, median segment, and abdomen blackish, the median segment about half as long again as the scutellum, with a very obscure median line. Abdomen microscopically punctured, subopaque, the pubescence on the dorsal surface black, a little closer on the apical than on the basal portion of the segments. Sixth dorsal segment rather broadly rounded at the apex, clothed with stiff black hairs. Second ventral segment closely and evenly punctured, the apical margin almost smooth. Basal joint of the fore tarsus with five spines on the outer margin. Second abscissa of the radius shorter than the third, equal to the distance between the two recurrent nervures.

Hab. Mlanje, Nyasaland, April (*S. A. Neave*).

This is allied to *T. natalensis*, Sauss., but I do not think that it is the female of that species, which was described from a male. The pubescence of the clypeus and front is white in *natalensis*. The two species are doubtless very nearly related.

Tachytes nigropilosellus, Cam.

Liris nigropilosellus, Cam. Ann. Transvaal Mus. ii. p. 132 (1910).
Tachytes gigas, Bisch. Arch. f. Naturges. p. 66, A, 3 (1913). ♀.

Cameron has placed this species in the wrong genus, as Bischoff thought probable. I have seen Cameron's type. The species is quite distinct from *natalensis*, Sauss., the male *nigropilosellus* having the clypeus and front covered with long black hairs and the eighth ventral segment rather deeply emarginate on the middle of the apical margin, but without lateral spines, whereas in *natalensis* the front and clypeus are clothed with short white pubescence and the emargination of the eighth ventral segment is extremely shallow.

Subfamily *Nitelinæ*.

Nitela rufiventris, sp. n.

♀. Nigra; mandibulis, scapo, flagello articulis duobus basalibus, tegulis, abdomine pedibusque rufo-ferrugineis; alis hyalinis, iridescentibus, venis testaceis, stigmate radioque nigris.
Long. 3·5 mm.

♀. Clypeus not strongly convex, without a distinct carina. Eyes strongly divergent towards the clypeus, separated on the vertex by a distance equal to the length of the two basal joints of the flagellum. Head finely and closely punctured, the front thinly clothed with short pale golden pubescence; posterior ocelli almost touching the eyes. Pronotum nearly as long as the scutellum, not sunk below the mesonotum, the margins only very slightly raised, so that the usual transverse sulcus is not well defined. Mesonotum closely and finely punctured, with a row of larger punctures before the scutellum, which is almost smooth. Median segment coarsely longitudinally striated, rounded at the apical angles, the posterior slope more finely transversely striated. Abdomen smooth and shining. Legs unarmed.

Hab. Monkey Bay, Lake Nyasa, June (*W. A. Lamborn*).

The neuration is as in typical *Nitela*, but the species is easily recognized by the colour.

LIII.—*Notes on the* Apidæ (*Hymenoptera*) *in the Collection of the British Museum, with Descriptions of new Species.*

By Geoffrey Meade-Waldo, M.A.*

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VII.

The following notes and descriptions were prepared during the recent rearrangement of the collection of Apidæ in the Museum.

Much valuable information on the type-specimens &c. contained in the British Museum has already been published by Professor Cockerell, who had studied them during a

* [We deeply regret the death of our valued contributor Mr. G. Meade-Waldo, who passed away on the 11th of March at the early age of 32. The proof of this paper, which he sent to the 'Annals' shortly before his death, has been kindly corrected by Mr. R. E. Turner.—Eds. 'Annals.']

hurried visit to Europe a few years since. I have here attempted to fill in certain gaps which were left by him, doubtless owing to lack of time; thus, nothing much has appeared on the Ethiopian species of *Halictus* and *Nomia*, the species of which, described by Frederick Smith and other authors, are here tabulated.

The notes on *Bombus* have been gone through by Dr. Franklin, of Massachusetts, who may make further use of them.

The types of all new species are in the British Museum.

Subfamily *Andreninæ*.

Halictus vinctus (Walker).

Nomia vincta, Walk. Ann. & Mag. Nat. Hist. (3) v. p. 305 (1860). ♀. Ceylon.

Halictus kalutaræ, Ckll. *l. c.* (8) viii. p. 189 (1911). ♀. Ceylon.

An examination of Walker's type in the British Museum proves this species is a *Halictus*. Bingham suggests this in the 'Fauna of India,' but does not seem to have examined the type, which was among the rest of Walker's Cingalese types in a separate cabinet apart from the main general collection, and thus likely to be overlooked by students. Cockerell, as is only natural, did not consider Walker's species of *Nomia* when studying the Indian and Cingalese *Halictus* of the Comber Collection. It has already been shown by Cockerell (Trans. Amer. Ent. Soc. xxxvii. p. 218, 1911) that *Andrena exagens*, Walker, also from Ceylon, is a *Nomia*.

Halictus albofasciatus, Smith.

Halictus albofasciatus, Smith, Descr. New Spec. Hymen. p. 33 (1879). ♀.

Paranomia broomi, Cam. ? MS.

Halictus jucundus, Smith.

Halictus jucundus, Smith, Catal. Hymen. Brit. Mus. i. p. 56 (1853). ♂♀.

Halictus atroviridis, Cam. (pars.) Trans. S. Afr. Phil. Soc. xvi. p. 325 (1906). ♀.

In the British Museum there are four specimens from the Cameron Collection labelled as "types" of *H. atroviridis* by Cameron himself, and two species certainly are represented. One individual of 8½ mm. in length is nothing but *H. jucundus*, Smith. The measurements given by Cameron (3–5 mm.) point to the smaller specimens being the real

types of *H. atroviridis*, which species, however, must become a synonym of *H. æthiopicus*, Cam. (*vide infra*).

Halictus æthiopicus, Cam.

Halictus æthiopicus, Cam. Trans. S. Afr. Phil. Soc. xv. p. 239 (1905).
Halictus atroviridis, Cam. *l. c.* xvi. p. 325 (1906).

Both these species were described from Pearston, Cape Colony, and the types of both are in the British Museum.

Key to Ethiopian Halictus *in the British Museum.*

♀♀.

1. (8) Abdominal tergites with pale tegumentary fasciæ.
2. (5) Larger, more robust species, the fasciæ rather broad. Length 10–12 mm.
3. (4) Face clothed with griseous pubescence. Length 12 mm. ..... *albofasciatus*, Smith. [(S. Africa.) (=*Paranomia broomi*, Cam.)
4. (3) Face clothed with smoky pubescence. Length 10 mm. ..... *vittatus*, Smith. (Cape
5. (2) Smaller, more slender species, the fasciæ linear. Length 7–8 mm. [of Good Hope.)
6. (7) Tergites 1–4 with narrow apical fasciæ pale yellow ..... *flavovittatus*, W. F. [Kirby. (Socotra.)
7. (6) Tergites 1–5 with narrow white fasciæ ..... *albolineolus*, Cam. [(Transvaal.)

H. tricolor (Cam.), *H. nomioides*, Friese, and its var. *grandior*, Friese, come in here.

8. (1) Abdominal tergites with pubescent fasciæ.
9. (10) Tegument brassy green, pubescence pale yellow ..... *jucundus*, Smith. (S. [Africa.)

H. niloticus, Smith, from the White Nile, is a male with brassy-green tegument.

10. (9) Tegument black, some segments at least with griseous fasciæ.
11. (24) Larger species. Length at least 9 mm.
12. (13) Clypeus apically truncate, with a distinct tooth on each side at apex; tergites 1 and 2 with interrupted apical fasciæ of pale pubescence; hind calcar toothed. Length 10 mm. (Cape of Good Hope.) ..... *deceptus*, Smith.
13. (12) Clypeus without any teeth at apex; tergites 1 and 2 at least with complete fasciæ of pale pubescence; hind calcar toothed or not.
14. (15) Hind calcar with three teeth; tergites 2–5 with pale fasciæ. Length 10 mm. (Natal.) ..... *diversus*, Smith.

15. (14) Hind calcar unarmed.
16. (17) Scopa on outer side of tibia dark-haired; tergites 1 and 2 basally with griseous pubescence. Length 11 mm. (S. Africa.) ..... *rufomarginatus*, Smith.
17. (16) Tibial scopa pale-haired; all the tergites with griseous pubescence.
18. (21) Tegument of hind legs black.
19. (20) The base of tergites 1–4 clothed with griseous pubescence; a robust species. (Cape Colony.) ..... *capicolus*, Cam.
20. (19) Tergites with only inconspicuous apical fasciæ; a slender species. Length 9 mm. (S. Africa.) ..... *communis*, Smith.
21. (18) Tegument of hind tarsi at least pale.
22. (23) Tegument of hind legs entirely honey-yellow ..... [(Transvaal.) *lutibalteata*, Cam.
23. (22) Hind tarsi honey-yellow ..... *rubricaudis*, Cam.
24. (11) Smaller species. 7 mm. and less.
25. (26) Tegument of posterior tibiæ ferruginous. Length 7 mm. (S. Africa.) *terminalis*, Smith.
26. (25) Tegument of posterior tibiæ black. Length 6 mm. (Sierra Leone.) .. *iridipennis*, Smith.

♂ ♂.

Halictus frontalis is the only male described by Smith. It is a larger species than any of the females, with the exception of *H. rufomarginatus*.

Halictus (*Corynura*) *chilensis*, Spin.

Halictus chilensis, Spin., Gay, Hist. fis. Chile, Zool. vi. 1851, p. 201. no. 1. ♀ ♂.
Corynura flavofasciata, Spin., Gay, *l. c.* p. 302. ♂.
Cacosoma marginatum, Smith, Descr. New Spec. Hymen. p. 41 (1879). ♂.

Alfken has shown (Deut. ent. Zeit. 1913, p. 325) that *Corynura gayi*, Spin., is the male of *H. rubellus*, Haliday. Spinola seems to have forgotten that he described the male of *H. chilensis* when describing *C. flavofasciata* later on in the same volume, for they are certainly co-specific.

Megalopta, Smith (1853). (Type *M. bituberculata*, Smith.)

= *Sphecodogastra*, Ashm. (1899). Type: *Parasphecodes texana* (Cress.).
= Subgenus *Megaloptidia*, Ckll. (1900). Type: *M. contradicta*, Ckll. ♂.
= Subgenus *Megaloptella*, Schrottky (1906). Type: *Halictus ochrias* (Vach. 1904).
= *Halicti megalopti*, Vach. (1904).

I cannot agree with those authors who sink this well-defined group of Nearctic species to *Halictus*, a genus already far too large for convenience. The size of the ocelli affords an easily recognized and constant structural character.

Ducke (Zeitschr. wiss. Ins. Biol. i. p. 175, 1905) treats of the nocturnal habits of *M. idalia*. The same author, who examined the types of Brazilian bees described by Smith (Deut. ent. Zeit. p. 363, 1910), leaves only *R. idalia* in the genus, relegating *M. bituberculata*, which was selected by Cockerell as the type (Proc. Phil. Acad. p. 374, 1900), to *Halictus*. Of the species described as *Megalopta* by Smith at later dates only *M. purpurata* (1879) can remain in the genus, and its inclusion is open to question ; the remaining species work out mainly as proposed by Ducke (*l. c.*), e. g., *M. nigrofemorata* and *M. ianthina* go into *Halictus* sens. lat., while *M. pilosa* and *M. cuprifrons* belong to the *cacosoma* group of species in that genus. *M. ornata*, a brilliant metallic-green insect, has nothing whatever to do with the genus, and probably needs a new one. *M. vivax* has quite rightly been placed as a variety of *Augochlora atropos*, Smith, though I do not agree with Ducke in synonymizing *Augochlora* with *Halictus*.

Key to the Species.

♀♀.

1. (2) Black species, non-metallic. Length 13 mm. ..... *cherazon*, Vach. (1904).
2. (1) Testaceous species, head and thorax with some metallic iridescence.
3. (4) Cheeks armed with a conspicuous tubercle; clypeus much broader than long. Length 15 mm. ..... *genalis*, sp. n.
4. (3) Cheeks unarmed.
5. (8) Enclosed area well developed; hind spur with six well-developed spines.
6. (7) Joint 3 of antennæ longer than 4, as long as 5. Length 17 mm. ..... *fornix*, Vach. (1904).
7. (6) Joint 3 of antennæ short, not longer than 4. Length 14 mm. ..... *sodalis*, Vach. (1904).
8. (5) Enclosed area very narrow, hardly more than linear; hind spur with four spines.
9. (10) Postscutellum almost as long as scutellum, clypeus only sparsely punctured ..... *chaperi*, Vach. (1904).
10. (9) Postscutellum only half as long as scutellum, clypeus coarsely punctured. *idalia*, Smith (1853).

M. cuprea, Friese (1911), is possibly a variety of *M. idalia*.

♂♂.

1. (4) Black species.
2. (3) Thorax and abdomen with faint coppery and purple iridescence. Length 14 mm. ..... [= *virgili*, Fr. (1911). *purpurata*, Smith (1879)

3. (2) Face and pleura sometimes faintly blue. Length 9-11 mm. ..... *contradicta*, Ckll. (1900)
4. (1) Testaceous species; head and thorax mostly with a coppery iridescence; abdomen, as a rule, testaceous. [(type of subgenus [*Megaloptidia*).
5. (6) Scutellum bituberculate. Length 11 mm. ..... *bituberculata*, Smith
6. (5) Scutellum unarmed. [(1853) (type of genus).
7. (12) Sternite 3, at least at base, without any longitudinal sulcus.
8. (11) Sternite 3 entirely testaceous.
9. (10) First recurrent nervure interstitial with second transverse cubital nervure ..... *idalia*, Smith (1853).
10. (9) First recurrent nervure received about the middle of second cubital cell .. *argoides*, Vach. (1904).
11. (8) Sternite 3 black at base ..... *ochrias*, Vach. (1904)
12. (7) Sternite 3 with longitudinal sulcus to its extreme base. [(type of subgenus *Me-* [*galoptella*, Schr.).
13. (14) Postscutellum as large or almost as large as scutellum ..... *ægis*, Vach. (1904).
14. (13) Postscutellum shorter than scutellum. *æthantis*, Vach. (1904).

M. texana (Cress. 1872), from Texas, and *M.* (*Megaloptella*) *ipomœæ*, Schrottky (1912), are omitted from the above. Further points of difference between the Vachalian species will be found in his key (Miscell. Ent. p. 113, 1904).

Megalopta genalis, sp. n.

♀. Capite thoraceque viridi-cupreis, nitentibus, abdomine pedibusque testaceis, omnino plerumque aureo-hirtis; capite maximo, thorace latiori, genis gibbosis, utrinque infra tuberculatis; mandibulis falciformibus; alis subhyalinis.
Long. 15 mm.

Head for the most part and thorax greenish bronze; antennæ, clypeus at apex, mandibles (except apically), labrum, tegulæ, abdomen, and legs testaceous; the whole covered with pale golden pilosity, that on the ventral scopa longer. Head very massive, rather broader than the thorax, the genæ much swollen, produced below to form a conspicuous tubercle; eyes slightly emarginate, inner orbits converging above but parallel below; no malar space; ocelli large, forming a triangle, clypeus twice as broad as long, depressed towards the apex, the apical margin raised; labrum shining, depressed, with a median process; mandibles falciform, bidentate, the outer tooth projecting considerably beyond the inner. Joint 3 of antennæ hardly longer than joint 4. Basal area of median segment about half postscutellum in length, of equal width transversely, the middle with a longitudinal keel and striæ, colour of chitin a deep purple. Abdomen

with basal segment of a paler testaceous than the apical segment. Posterior tibiæ and metatarsi of equal length, hind calcar with four spines. Head, thorax, and abdomen finely and evenly punctured, the legs coarsely punctured.

Wings subhyaline, slightly smoky.

Length 15 mm.

Panama: Bugaba (Godman-Salvin Coll., *G. C. Champion*), 1 ♀.

This fine species is easily recognized by the swollen tuberculate genæ.

Nomia, Latr.

Some corrections are necessary in the synonymy of this genus and its subgenera, owing to the wrong species having been selected as type. The traditional view was that *N. diversipes*, Latr., was the type, whereas the true type is *N. curvipes* (Fabr.), as selected by Bingham ('Fauna Brit. India,' i. p. 447) Ashmead (1899) and Cockerell (1910) both adopted *N. diversipes* as type.

I am inclined to follow Cockerell in regarding *Nomia* as a single genus including several named subgenera. *Paranomia*, Friese, would contain *N. curvipes*, the type of the genus, and thus becomes *Nomia*, sens. str.

Nomia, Latreille, Hist. Nat. Crust. Ins. xiii. p. 369 (1805). Type *Andrena curvipes*, Fabr. (1781).

=Subgen. *Paranomia*, Friese, Festschr. d. Ver. Schles. Insektenkunde in Breslau, p. 48 (1897). Type: *N. chalybeata*, Smith.

=*Pseudapis*, W. F. Kirby, Bull. Liverp. Mus. iii. p. 16 (1900). Type: *P. anomala*, W. F. Kirby.

=Subgen. *Steganomus*, Rits. Tijdschr. v. Ent. xvi. p. 224 (1873). Type: *S. javanus*, Ritsema.

=Subgen. *Cyathocera*, Smith, Trans. Ent. Soc. Lond. 1875, p. 47. Type: *C. nodicornis*, Smith.

=Subgen. *Crocisaspidia*, Ashm. Trans. Amer. Ent. Soc. xxvi. p. 68 (1899). Type: *N. scutellaris*, Sauss. = *C. chandleri*, Ashm. (1899).

=Subgen. *Hoplonomia*, Ashm. J. N. York Ent. Soc. xii. p. 4 (1904). Type: *H. quadrifasciata*, Ashm.

=Subgen. *Stictonomia*, Cam. Records Albany Mus. i. p. 192 (1905). Type: *S. punctata*, Cam.

=Subgen. *Meganomia*, Ckll. Ann. & Mag. Nat. Hist. (8) iv. p. 402 (1909). Type: *N.* (*M.*) *binghami*, Ckll.

I have made a key to the Ethiopian species of *Nomia* of which the types are in the British Museum. Of some species there are large series, and in these cases several localities have been given as an aid to distribution, the type-locality being followed by a "t."

An interesting new species of the subgenus *Meganomia* is described below.

Key to Ethiopian Nomia *in the British Museum.*

♀♀.

1. (4) Tegulæ enlarged.
2. (3) Tegument black and red, median segment evenly punctured; wings clear hyaline. Length 10 mm. .. *nilotica*, Smith. (White Nile, t.)
3. (2) Tegument black, median segment basally impunctate, dull; wings subhyaline, more fuscous towards apex. Length 8 mm. ..... *tegulata*, Smith. (Sierra Leone, t.; Durban.)
4. (1) Tegulæ normal.
5. (6) Tegument of abdomen red, with some black markings basally. Length 9 mm. ..... *fausta*, Smith. (Natal, t.)
6. (5) Tegument of abdomen otherwise coloured.
7. (8) Abdomen with broad apical tegumentary fasciæ, yellowish white; facial pubescence whitish. Length 9 mm. ..... *candida*, Smith. (Sierra Leone, t., Lagos (*Strachan*); Salisbury (*G. A. K. Marshall*); Nyasaland (*Neave, Stannus*); British East Africa (*Neave, R. C. Wood*); Abyssinia, Harrar (*Kristensen*).)
8. (7) Abdomen with pubescent fasciæ, face with fulvous-golden pubescence.
9. (10) Apices of tergites only laterally pubescent; wings clear hyaline: a small slender species. Length 6 mm..... *avrifrons*, Smith. (Sierra Leone, t.)
10. (9) Tergites 2–5 with broad apical fasciæ of golden pubescence; wings slightly fuscous: a larger, more robust species. Length 10 mm. ..... *fulvohirta*, Smith. (Sierra Leone, t., Lagos (*J. A. de Gaye*).)

♂♂.

1. (2) Tegulæ enlarged; black, abdomen very coarsely punctured, with pale pubescent fasciæ. Length 8 mm. ..... *anomala* (W. F. Kirby). (Socotra, t., Mozambique, and Durban (*Muir*), ♂♀; N. Rhodesia (*Silverlock*), ♂♀; Abyssinia, Harrar (*Kristensen*).)
2. (1) Tegulæ normal.
3. (8) Tegument of abdomen for the most part red.
4. (5) Hind legs simple, not swollen, the tibiæ conspicuously serrate on the outer side; wings subfuscous, the basal half paler. Length 9 mm. .. *serratula*, Smith. (Natal, t., Nyasaland (*Neave*).)
5. (4) Hind legs abnormally swollen.
6. (7) Wings dark fuscous; hind tibiæ

without any lamellar process at apex; terminal joint of flagellum normal. Length 11 mm. ..... *rubella*, Smith = *pulchritarsis*, Cam. (Gambia, t., Lake Nyasa, Port. E. Afr. (*Neave*), ♂ ♀; Natal (*Cregoe*); Transvaal (t. of *pulchritarsis*).)

7. (6) Wings light fuscous, darker towards apex; hind tibiæ with a lamellar process on the inner side; terminal flagellar joint spatulate, basally constricted. Length 13 mm. ..... *strenua*, Cam. (Transvaal, t., Port. E. Afr., and Nyasaland (*Neave*); Matabeleland (*Dr. H. Swale*).)

8. (3) Tegument of abdomen mostly dark; hind legs simple, not swollen.

9. (10) Wings hyaline, the tip very markedly fuscous. Length 10 mm..... *nubecula*, Smith. (Sierra Leone, t., Uganda (*Gowdey, W. P. Lowe Neave*), ♀ ♀.)

10. (9) Wings unicolorous, hyaline or subhyaline.

11. (12) Larger: length 12 mm. Apical segment with two small teeth ..... *testacea* (Smith).

12. (11) Smaller: about 7 mm. No apical teeth. [("Africa," t.)

13. (14) Comparatively stout species; the abdomen with tegumentary fasciæ; scutellum with two blunt tubercles; frontal pubescence whitish ..... *rufitarsis*, Smith. (Angola, t., ♂; Nyasaland (*Neave*), ♂ ♀; Matabeleland (*Swale*).)

14. (13) Slender species; abdominal fasciæ not tegumentary.

15. (16) Frontal pubescence golden; postscutellum covered with dense pale pubescence; stigma and nervures pale testaceous ..... *cinerascens*, Westw. (Natal, t., Durban (*Muir*); Nyasaland (*Neave*); Transvaal (t. of *leviannulatus*).)

16. (15) Frontal pubescence whitish; postscutellum bare; stigma and nervures dark ..... *clavata*, Smith. (Sierra [Leone, t., N. Nigeria (*Macfie*).)

17. (18) Anterior tarsi flattened, lamellate, ivory-white; frontal pubescence golden; abdomen parallel-sided. Length 10 mm. ..... *patellifera*, Westw. (Cape of Good Hope, t., Durban (*Muir*); Matabeleland (*Swale*), ♂ ♀; Nyasaland, German East Africa (*Neave*).)

18. (17) Anterior tarsi simple, not lamellate; species with tegumentary or pubescent fasciæ on abdomen.

19. (22) Mesonotum almost bare of pubescence; legs entirely red.

20. (21) Tergites 3 and 4 with very coarse rugose punctures along the apical

margin; hind femora subtuberculate. Length 10 mm..... *dalyana*, Cam. (Cape Colony; Willowmore (*Cholmeley*).)

21. (20) Tergites evenly punctured all over; a distinct tooth on outer surface of hind femora. Length 8 mm. .... *rufipes*, Smith. (Gambia, t.)

22. (19) Mesonotum densely clothed with velvety pubescence; legs yellow and black.

23. (24) Hind femora armed with three sharp teeth below. Length 9 mm. .... *tridentata*, Smith = *crudelis*, Westw. (West Africa, t., N. Nigeria (*Scott-Macfie*, *Simpson*); Mashonaland (*G. A. K. Marshall*).)

24. (23) Hind femora with only one sharp tooth. Length 11 mm.

25. (26) Abdominal fasciæ griseous; wings fuscous at apex ..... *jansei*, Cam. (Transvaal, t.)

26. (25) Abdominal fasciæ golden; wings hyaline to apex ..... *armatula* (Smith). (Sierra Leone, t., N. Nigeria (*Simpson*).)

Nomia (*Meganomia*) *andersoni*, sp. n.

♂. Nigra; facie prothoraceque flavo-maculatis, plus minusve griseo-hirsutis, tergitibus 1–7 fasciis interruptis flavis; flagello serrato; femoribus posticis inerassatis; alis hyalinis.
Long. 18 mm.

Head and thorax black; mandibles (except apex), clypeus, the inner orbits to above insertion of antennæ, a small line behind each eye, scape beneath, four marks on prothorax in front)(, tubercles, tegulæ in front, and axillæ yellow; mandibles at apex, flagellum beneath, and tegulæ behind ferruginous. Abdomen: tergites 1–7 black, with yellow fasciæ widely interrupted in middle and widening abruptly towards the sides; sternites 1–3 yellow except for three pairs of black spots, the remaining sternites black. Legs: anterior coxæ, trochanters, and femora mostly black; tibiæ and tarsi yellow, the tarsi with a conspicuous fringe of black hairs on the inner side; middle legs yellow; posterior legs about equally black and yellow, the tarsi almost entirely black. Clypeus apically truncate, with a narrow, median, quadrate tooth; joints 4–10 of flagellum subtuberculate beneath, the three terminal joints slender, forming a hook. Hind femora greatly thickened, a distinct carina along the inner side; hind tibiæ more or less flattened, convex, widening gradually towards apex, the upper margin carinate, the apex with a blunt lamellate tubercle on the lower edge;

hind tarsi slightly arched and grooved along the inner margin. The area behind the eye, the thorax (except mesonotum and scutellum), abdomen, and legs more or less clothed with griseous pubescence; hind tarsi with black pubescence on the inner side. Wings hyaline.

Length 18 mm.

British East Africa: Masai Reserve, 14. iv. 1913 (*T. J. Anderson*), 1 ♂. Received through the Imperial Bureau of Entomology.

I have pleasure in naming this fine species after the donor and captor, Mr. T. J. Anderson, Government Entomologist, British East Africa.

In general appearance this species strongly resembles *Anthidium florentinum*, Latr. The subgenus *Meganomia*, Ckll. (Ann. & Mag. Nat. Hist. (8) iv. p. 402, 1909), hitherto contained only one species, *N.* (*Meganomia*) *binghami*, Ckll. (*l. c.*), of which both sexes are described from Damaraland. The following differences seem to justify the description of the East-African species as distinct:—

N. (*Meganomia*) *binghami*, Ckll.	*N.* (*Meganomia*) *andersoni*, sp. n.
Tergites 2–6 with *unbroken* yellow fasciæ.	Tergites 2–6 with yellow fasciæ *widely interrupted* in middle.
Clypeus at apex ⌐‾‾‾‾¬ .	Clypeus at apex ⌐‾‾‾‾¬ .
Flagellum not serrate.	Flagellum serrate.
Hind trochanters pointed behind.	Hind trochanters *not* pointed behind.
Hind tibiæ with a hump on middle of inner side.	Hind tibiæ with no such hump.

Nomia viridicincta, sp. n.

♀. Nigra, nitida; capite thoraceque sat dense pilosis; segmentis 1–4 apice fasciis viridibus; alis subhyalinis.

Long. 12–13 mm.

Black, head and mesonotum rather densely clothed with a mixture of fulvous and black hairs, sternum and truncation of median segment clothed with pale fulvous hair; first abdominal segment at base with conspicuous fulvous hair, the following segments very scantily clothed with similar hair, and some longer adpressed black hairs. The legs black, scopa on hind legs mostly pale, but black on the outer side. Wings subhyaline, but with a distinct fuscous tinge. Abdomen shining black, segments 1–4 with apical green tegumentary fasciæ of even width, the intensity of green varying much in individual specimens.

Clypeus convex, apically truncate; head narrower than

the thorax, which is massive; scutellum separated by a transverse groove from postscutellum, tegulæ normal, basal area of median segment almost obsolete, truncation of median segment rounded laterally.

Head and thorax rather coarsely punctured, the abdomen more finely, the apex of segments impunctate, shining.

Length 12–13 mm.

Uganda Protectorate: Entebbe, Sept. 1–11, 2 ♀ ♀ (type); W. shore of Victoria Nyanza, Buddu, 3700 ft., ix. 1911, 6 ♀ ♀; Seziwa River to Kampala, 3500–3750 ft., viii. 1911, 2 ♀ ♀ (*S. A. Neave*). Sierra Leone: xii. 1912 (*J. J. Simpson*), 1 ♀.

Var. *evanescens*, nov., ♀, resembles the type except in the colour of the fasciæ of segments 1–4, which are without any tinge of green.

Nyasaland: Mlanje, v. 1913; S.W. of Lake Chilwa, i. 1914 (*S. A. Neave*). Many specimens.

This species is a *Nomia* sens. str., and appears to be the first species described from the mainland of Africa with green tegumentary fasciæ, though this group (*iridescens*, *chalybeata*, &c.) is prominent in the Oriental region and occurs in Madagascar (*N. viridilimbata*, Sauss., 1892). From this latter species it differs in having the abdomen only finely punctate and the wings subhyaline (not distinctly fuscous).

Nomia exagens (Walk.).

Andrena exagens, Walker, Ann. & Mag. Nat. Hist. (3) v. p. 305 (1860). ♀. Ceylon.

Halictus timidus, Smith, Descr. New Spec. Hymen. p. 31 (1879). ♀. Ceylon.

Nomia clavatus (Smith), ♂.

Described as a *Halictus*, but is a *Nomia* of the *N. hylæoides* group.

Nomia aurifrons (Smith), ♀.

This species was also described as a *Halictus*. The type is a ♀, not a ♂ as stated in the original description. It may possibly be the ♀ of *N. clavatus*.

Nomia fuscipennis, Smith, and *N. terminata*, Smith.

Bingham (Fauna Brit. Ind. i. p. 449) separates these two species on the presence or absence of a clypeal carina. I have examined the series of each species, and find this character valueless. *N. fuscipennis* (type) has a distinct

carina, *N. terminata* (type) has none, though the whole long series has some indication of one. The two species are readily distinguished by the wings; in *N. terminata* these are flavo-hyaline, only the apex fuscous, while in *N. fuscipennis* the whole costal area is fuscous. I have never seen an authentic specimen of *N. fuscipennis* from British India, though Bingham gives Sikkim. All the specimens in the British Museum are from the type-locality, Sumatra.

Nomia (*Hoplonomia*) *cuneata*, Sauss. (1872).

This species, described from Madagascar, is a *Hoplonomia*.

Nomia candida, Smith.

Nomia candida, Smith, Trans. Ent. Soc. Lond. 1875, p. 68. Sierra Leone.

Nomia braunsiana, Friese, Sjöstedt's Kilimanj.-Meru Exped. viii. p. 124 (1908). E. Africa.

In his description Friese says of his species, "near *candida*, but without golden fascia on first abdominal segment." I have examined Smith's type of *N. candida*, and find it has no such fascia, but, like *N. braunsiana*, there is a little golden pubescence on the sides of the apical margin of the segment.

In the British Museum there are specimens from RHODESIA, Salisbury (*G. A. K. Marshall*), determined by Friese as *N. braunsiana*; NYASALAND, Lake Chilwa and Mlanje (*S. A. Neave*); ABYSSINIA, Harrar, v. 1911 (*G. Kristensen*).

Nomia cinerascens, Smith.

Nomia cinerascens, Smith, Trans. Ent. Soc. Lond. 1875, p. 66. ♂. Natal.

Halictus leviannulatus, Cam. ? MS. Transvaal.

Nomia borneana, Cam.

Nomia borneana, Cam. Journ. Straits Asiatic Soc. xxxvii. p. 115 (1902). Borneo.

Nomia erythropoda, Cam. *l. c.* xliv. p. 157 (1905). Borneo.

Nomia (*Crocisaspida*) *zonaria*, Walker.

Nomia zonaria, Walker, List of Hymen. in Egypt, p. 43 (1871). ♂. Arabia.

Nomia lamellata, Smith, Trans. Ent. Soc. Lond. 1875, p. 65. ♀ ♂. Egypt.

Cockerell suggests the above synonymy (Ann. & Mag. Nat. Hist. (8) v. p. 504, 1910). I have not seen *N. vespoides*, Walker (*l. c.*).

Nomia scutellata, Smith.

Nomia scutellata, Smith, Trans. Ent. Soc. Lond. 1875, p. 45. ♀. Calcutta.
Nomia albofimbriata, Cam. Ann. & Mag. Nat. Hist. (7) ix. p. 252 (1902). ♀. Bengal.
? *Nomia ustula*, Ckll. Trans. Amer. Ent. Soc. xxxvii. p. 231 (1911). ♂. Kandy, Ceylon.

N. ustula would almost certainly seem to be the male of *N. scutellata*; *N. arjuna*, Ckll., is very close to it (*vide* Trans. Amer. Ent. Soc. p. 231, 1911).

Nomia antennata, Smith (1875), var. *sykesiana*, Westw.

In the Fauna of Brit. India, Hym. i. p. 454, Bingham places *Nomia sykesiana*, Westw., doubtfully as a synonym, having only one poor specimen on which to rely for his decision. There are now further specimens of *N. sykesiana* in the collection from Nasik and Malvi in the Bombay Presidency (Comber Coll.) determined by Cockerell; they are fresh specimens and have the abdominal fasciæ of pubescence pale (not golden as in *N. antennata*). I agree with Bingham (*loc. cit.*) that there is no structural difference, but *N. sykesiana* may be considered a well-marked variety.

Nomia bidiensis, Cam.

Nomia bidiensis, Cam. Journ. Straits Asiatic Soc. xliv. p. 166 (1905). ♀. Borneo.
Nomia bicarinata, Cam. ? MS. ♀. Borneo.

A specimen bearing the latter name is identical with *N. bidiensis*, but no description seems to have been published.

Nomia (*Hoplonomia*) *elliotii*, Smith.

Nomia elliotii, Smith, Trans. Ent. Soc. Lond. 1875, p. 44. Madras.
Nomia carinata, Smith, *l. c.* p. 57. Ceylon.

These are certainly the same species; Smith omits any mention of the spinose postscutellum in his description of *N. carinata*.

Andrena eduardi, nom. nov.

Andrena nigra, E. Saunders (nec Prov.), Trans. Ent. Soc. Lond. 1908, p. 195.

Provancher described an *Andrena nigra* from Los Angeles in 1895.

Andrena japonica (Smith).

Nomia japonica, Smith, Trans. Ent. Soc. Lond. 1873, p. 201. ♀. Japan.

A typical *Andrena*, described from Hiogo.

Subfamily *Melittinæ*.

Melitta harrietæ (Bingh.), ♂.

Andrena harrietæ, Bingh. Fauna Brit. Ind., Hymen. i. p. 446 (1897). ♀. Sikkim.
Melitta altissima, Ckll. Entomologist, xliii. p. 240 (1910). ♀. Tibet.

In a note following his description (*l. c.*) Cockerell refers to an undescribed *Melitta* from the Himalayas shown him by Colonel Bingham; it is possible that this specimen may have been since described as *Andrena harrietæ*.

While working through the residue of the Tibetan material I found eight male specimens of a *Melitta* captured at the same time and place (Gyangtse, vi. 1904) as the types of Cockerell's *M. altissima*, of which species at present only the female is known.

In addition to secondary sexual characters, the male differs as follows:—

Clypeus and whole front of head clothed with long, dense, silvery-white pilosity; thorax (except median segment) with a covering of pale fulvous hair; abdomen as in the ♀, but colour of pubescence less intense (? more faded). Rather smaller, 12 mm.

Melitta anthophoroides, sp. n.

♀. Nigra, hirsuta; abdominis segmentis 4–6; tibiis tarsisque plerumque fulvo-hirtis; clypeo carina mediana longitudinali; alis aurantiacis.
Long. 17 mm.

Black, for the most part clothed with thick black pubescence; tergites 4 (apically), 5 and 6 wholly covered with fulvous pubescence, and sternites 2–5 with apical fringes of a similar pubescence; all the tarsi and the intermediate and posterior tibiæ densely covered with fulvous pubescence. Calcaria and tarsal ungues dull ferruginous. Clypeus coarsely punctured, with a distinct longitudinal carina; scape and first joint of flagellum black, remainder of antennæ dull ferruginous; vertex and thorax wholly covered with close medium-sized punctures, scutellum and postscutellum clothed with long, rather sparse hairs; enclosed area of median

segment impunctate, truncation of median segment very sparsely punctured, almost bare of pubescence. Abdomen very finely punctured all over except the apical margins of the tergites, which are shining and impunctate; terminal sternite pointed, shining, impunctate, longitudinally subcarinate. Tegulæ shining, piceous. Wings golden hyaline, the nervures pale; stigma of medium size; third cubital cell at least three times as long as second; first r. n. joining second cubital cell about the middle, second r. n. joining third cubital cell at end of second third; basal nervure feebly arched.

Length 17 mm.

1 ♀.

Sikkim: Lebong, 5000 ft., ix. 1908 (*H. M. Lefroy*), ex Coll. Agricultural Research Institute, Pusa, Bengal.

The superficial resemblance between this species and *Anthophora* (*Habropoda*) *tainanicola*, Strand, is very striking; the type-locality of *A. tainanicola* is Formosa, but there are specimens from Assam in the British Museum which certainly appear identical. Like the other Himalayan species of *Melitta* referred to above, the pubescence is much denser than in the well-known species from the Western Palæarctic region, e. g. *M. hæmorrhoidalis*, *leporina*, &c.

Melitta arrogans (Smith).

Andrena arrogans, Smith, Descr. New Spec. Hymen. p. 56 (1879). ♀.

This species comes very near *M. tarneri* (Brauns), but the condition of Smith's type is too poor to say whether they are identical. There is a co-type of *M. tarneri* in the British Museum.

Colletes neglecta (Smith).

Andrena neglecta, Smith (nec Dours.), Descr. New Spec. Hymen. p. 57 (1879). ♀.

Andrena negligenda, D. T., nom. nov. (1896).

The single specimen in poor condition is evidently a *Colletes*. It seems doubtful whether typical *Andrena* occurs in the Ethiopian Region.

Subfamily *Panurginæ*.

Rhophitulus, Ducke.

Rhophitulus, Ducke, Zeitschr. Hym. Dipt. vii. p. 366 (1907).

Ducke (Zool. Jahrb. p. 88, 1912) suggests that this genus

may be synonymous with *Macrotera*, Smith (1853), but retains it as distinct on differences in the comparative position of the ocelli. I have examined types in both genera concerned, and find no difference in the position of the ocelli. There is, however, another character quite sufficient to separate *Rhophitulus* from *Macrotera*, viz., the large stigma; in both known species of *Macrotera*—*M. bicolor*, Smith (1853), and *M. secunda*, Ckll. (1904)—the stigma is small and linear.

Calliopsis, Smith.

Calliopsis andreniformis, Smith, Catal. Hymen. Brit. Mus. i. p. 128 (1853). ♀.
Calliopsis flavipes, Smith, *l. c.* p. 129. ♂.

These two insects were both described from specimens taken by Edward Doubleday in East Florida, and are certainly only the sexes of one species. In the British Museum is a pair from N. Dakota (*G. A. Stevens*) presented by Prof. Cockerell; the male agrees perfectly with *C. flavipes*, Smith. I am unable to trace *C. flavifrons*, Smith, referred to by Cockerell (Trans. Amer. Ent. Soc. xxxi. p. 321, 1905), the type of which is recorded as being in the British Museum.

Panurgus venustus, Erichson.

Panurgus venustus, Erichs., Waltl. Reise d. Tirol &c., P. 2, p. 106 (1835). ♂.
Panurgus moricei, Friese, Zeitschr. Hym. Dipt. p. 308 (1905). ♂ ♀.

In the Edward Saunders Collection are 2 ♂ ♂ and 2 ♀ ♀ identified as Erichson's species, no doubt correctly. Mr. Morice has presented a pair of co-types of *P. moricei*, Fr.; this species is described from the same series as those labelled *P. venustus* by Saunders; all were captured by Mr. Morice in the same locality on the same day, namely, Jimena, Andalusia, i. v. 1905. Friese places *P. venustus* in *Camptopœum*. Mr. Morice agrees with me in this synonymy, and says that he thinks Friese has noticed it himself; but I am unable to find a record of it.

Subfamily *Xylocopinæ*.

Xylocopa, Latr.

A study of more material of the *cærulea* group of species, this time kindly submitted for examination by Mr. J. C. Moulton, Curator of the Sarawak Museum, has led to some

interesting discoveries. Typical *X.* (*Koptorthosoma*) *caruleiformis*, M.-Waldo (Ann. & Mag. Nat. Hist. (8) xiv. p. 454, 1914), is well represented in both sexes; but there is one specimen—a female—in which the brilliant azure pubescence is replaced with fulvous brown, similar in colour to that of the male. The female is doubtless dimorphic, the phenomenon of dimorphism being already well known in the African species *X. caffra*, L., and *X. inconstans*, Smith.

Xylocopa (*Koptorthosoma*) *cæruleiformis*, M.-Waldo, var. *fusca*, nov.

♀. Formæ typicæ omnino similis, sed capite, thorace segmentoque primo abdominis brunneo-hirtis.

Sarawak: Matang, March 2, 1904.

To the type-locality (Matang) may be added the following localities in Sarawak:—Kuching, March 1900, Feb. 1901, ♂ ♀; Limbang, April 1910. Other localities for the species are Singapore and Mt. Kinabulu (B. N. Borneo), 3000 ft., 30. ix. 1918 (*J. C. Moulton*), ♀.

X. (*Koptorthosoma*) *cærulea*, Fabr., is represented by a series of 7 ♀ ♀ and 1 ♂ from various Bornean localities; there are also 2 ♀ ♀ from Singapore.

Sarawak: Trusan, Aug. 1900. British North Borneo: Kinabalu, Sept. 1913, 4 ♀ ♀, 1 ♂ (*J. C. Moulton*).

In this species, too, the female is apparently dimorphic, one form, as in the preceding species, having the pubescence coloured as in the ♂.

Xylocopa (*Koptorthosoma*) *cærulea*, Fabr., var. *viridis*, nov.

♀. Formæ typicæ similis, sed capite, thorace segmentoque primo abdominis viridi-hirtis.

Sarawak: Kuching, 11. ii. 1908 (*G. Meade-Waldo*), 2 ♀ ♀ (type); Lawas, ix. 1909, 1 ♀ (co-type in Sar. Mus.).

This variety was first considered by me to be the ♀ of *X. malayana* (=*sarawakensis*, Cam., as which it is recorded, Sarawak Museum Journal, no. 3, p. 24, 1913), but the female of that magnificent species still awaits discovery.

Xylocopa matangæ, sp. n.

♀. Nigra, viridi-ænea, nitida; capite fulvo-, thorace tergitequo primo pallide flavo-pilosis; tergitibus 2–4 apice lateribus albo-fasciatis, pedibus nigro-hirtis; alis subfuscis.

Long. 18 mm.

Head black, thorax and abdomen dark greenish bronze, shining; head with dark hair on vertex, cheeks with a whitish pile, the whole thorax above and tergite 1 clothed with a pale yellowish pubescence, tergites 2–4 with pale hair laterally at apex, tergites 5 and 6 fringed with dark hair. The legs entirely black. Wings with three cubital cells, subhyaline, the apical area suffused with fuscous.

Head closely and evenly punctured, that on thorax and abdomen shallower; malar space very short, impunctate, enclosed area of median segment impunctate. Clypeus flat, truncate, with a very small median tooth, sides of clypeus forming two little pits at the junction with face. Apical sternite with a longitudinal carina.

Length 18 mm.

Sarawak: Mt. Matang, 10. ii. 1914 (*G. E. Bryant*), type; Matang Road, iii. 1909 (*J. E. A. Lewis*), and "Matang," iii. 1904, co-types. The last-mentioned specimen in the Sarawak Museum.

The receipt of more material has enabled me to describe this species, which I referred to in an earlier paper (Ann. & Mag. Nat. Hist. (8) xiv. p. 455, 1914). It belongs to *Xylocopa* sens. str., and appears to be most closely related to *X. collaris*, Lep., from which, however, it can be readily distinguished by the colour of the pubescence.

Subfamily *Bombinæ*.

Bombus nasutus, Smith.

Bombus nasutus, Smith, Trans. Ent. Soc. Lond. ser. ii. 1852, vol. ii. p. 44. ♀.
Bombus breviceps, Smith, *l. c.*

A careful examination of the types convinces me that these two are co-specific, *B. breviceps* being a smaller individual. Smith notes their relationship, but adds, "the form of the head is decisive of their difference." I am unable to find any difference. Both were captured at Chusan.

These species, together with *B. diversus*, Smith, from Japan, and *B. opulentus*, Smith, from N. China, both somewhat similar in appearance, have been misunderstood by recent authorities. In Dalla Torre's Catalogue *B. nasutus* is given as a synonym of *B. melanurus*, Lep. (*altaicus*, Er.), doubtless on the authority of Handlirsch (Ann. Naturh. Hofmus. iii. p. 213, 1888), and *B. opulentus* is considered synonymous with *B. breviceps* (l. c.).

These species may be separated by the following characters: they are all richly clothed with bright golden-

yellow hair on the thorax and basal tergites, the apical tergites being clothed with black hair :—

1. (2) Malar space short, about as long as broad at the apex ; third joint of antennæ 1½ as long as joint 4 ..... *nasutus*, Smith (*brevi-*
2. (1) Malar space long, about twice as long as broad at apex ; third joint about twice as long as joint 4. [*ceps*, Sm.).
3. (4) Tergites 1–3 clothed with golden-yellow hair ; wings fusco-hyaline ..... *diversus*, Smith.
4. (3) Tergites 1 and 2 (except laterally) clothed with golden-yellow hair ; wings dark fuscous ..... *opulentus*, Smith.

Friese considers *B. diversus* to be a variety of *B. hortorum*, subsp. *ussureusis*, Rad.

Bombus lapidarius, L., var. *tunicatus*, Smith.

Bombus tunicatus, Smith, Trans. Entom. Soc. Lond. 1852 (2), ii. pt. 2, p. 43, pl. viii. fig. 7.
Bombus incertus, Morawitz, Bull. Acad. Sc. St. Pétersbourg, xxvii. p. 229 (1881).

Authentic examples of *B. incertus*, Mor., from the Radoszkowski Collection differ in no way from typical *B. tunicatus*, Smith. Schmiedeknecht (Apid. Europ. p. 371, 1883) records this synonymy with a query. There seems little doubt that this is only a form of *B. lapidarius*, L., as recorded by Dalla Torre in his Catalogue, by Friese (Ann. Mus. Zool. St. Pétersbourg, p. 518, 1905), and by Friese and Wagner (1910).

Bombus lapidarius, L., var. *gilgitensis*, Ckll.

Bombus gilgitensis, Ckll. Ann. & Mag. Nat. Hist. (7) xvi. p. 223 (1905). ♀.

This species was described from Gilgit, Kashmir. Cockerell notes the resemblance to *B. tunicatus* at the time, and later (Ann. & Mag. Nat. Hist. (8) v. p. 417, 1910) is inclined to think it is a variety of it. I am of his opinion, and consider them both (i. e., *B. tunicatus* and *B. gilgitensis*) varieties of *B. lapidarius*. There are recently acquired specimens from Hunza, North Kashmir, 8000 ft., 3. ix. 1913 (*R. W. G. Hingston*) in the National Collection.

Bombus alienus, Smith.

Bombus alienus, Smith, Catal. Hym. Brit. Mus. ii. p. 402 (1854). ☿.

There is a specimen of this insect, which was described

from North China, in the British Museum from Shillong, Assam, x. 1903 (*R. E. Turner*). The species is omitted from the 'Fauna of British India,' vol. i. (1897). Smith's original description is sufficiently good for colour; the malar space is rather longer than broad at apex, the third antennal joint is rather larger than the fourth.

This is probably the same species as *B. vallestris*, Smith (1878), described from the Second Yarkand Expedition; but I have not seen the type.

Bombus longiceps, Smith.

See Cockerell (Ann. & Mag. Nat. Hist. (8) v. p. 505, 1910) on this species. I agree with him that the Baltistan specimen cannot possibly be a form of *B. hortorum*. Unfortunately the type is not available, being in the same collection as the previous species. The British Museum has recently received six ♀ ♀ from Hunza, North Kashmir, viii. 1913 (*R. W. G. Hingston*).

Bombus bicoloratus, Smith (1879).

Cockerell ('Entomologist,' p. 101, 1911) has written a note on this Formosan species and the nearly related *B. latissimus*, Friese (1910), in which he gives both structural and colour differences.

Bombus ardens, Smith (1879).

This Japanese species is known only from males. The malar space is of medium length, rather longer than broad at apex; joints 3 and 4 of the antennæ are about equal. This may prove to be the male of *B. muscorum*, var. *tersatus*, Smith, also from Japan.

From a perusal of Dr. Franklin's valuable "Monograph of American *Bombus*" (Trans. Amer. Ent. Soc. 1913), it would appear that the majority of the types of species of that genus considered to be in the British Museum are not there. The explanation for this is that the late Colonel Bingham was unwilling to accept as the type any specimen not actually labelled with the word "type" by the author, with the result that species described by Frederick Smith, which are certainly the actual type-specimens, are stated to be untraceable.

Unfortunately there are also instances in which specimens distinctly labelled with the word "type" have been overlooked, and consequently inaccurate data supplied to Dr. Franklin.

Species North of Mexico.

Bombus polaris, Curtis (1831). The type ♀ is in the British Museum labelled "*B. polaris*, Curtis. Type from Curtis," in Frederick Smith's handwriting.

Bombus arcticus, Kirby (1821). Type ♀ in British Museum, labelled "*arcticus*" in Kirby's handwriting.

Bombus frigidus, Smith (1854). The ♀ type of this species is clearly labelled as such, with the word "type." Kirby's misidentified *B. derhamellus* cannot be traced.

Species South of the United States.

Bombus trinominatus, Dalla Torre (1890) = *B. modestus*, Smith (1861) (nec Cresson, nec Eversman). Smith's type is in the British Museum.

Bombus formosus, Smith (1854) = *B. pulcher*, Cress. (1863). This species is erroneously recorded from "India" in Catal. Brit. Mus., but this locality is changed by Smith himself in the British Museum copy to "Mexico, Oajaca." The type-specimen from this locality is marked as "type" by Smith, and there can be no doubt that *B. pulcher*, Cress., is synonymous.

Bombus nigrodorsalis, Franklin (1907) = *B. laboriosus*, Smith (nec Fabr.). Smith's type ♀ is in the British Museum, and agrees in every respect with specimens of *B. nigrodorsalis* named by Dr. Franklin himself. Franklin tells me (*in litt.*) that he now considers *nigrodorsalis* and *montezumæ*, Ckll., to be colour-variants of the same species.

Bombus thoracicus, Sichel (1862) = *B. bellicosus*, Smith (1879) = *B. emiliæ*, Della Torre (1890). Smith's species was quite naturally a source of difficulty to Dr. Franklin, owing to its locality being given as "Sumatra or India." The type-specimen bears no locality-details on the label,

and the Asiatic locality published with the description is certainly wrong.

Bombus mexicanus, Cress. (1878) = *B. unifasciatus*, Smith (1879). The type ♀ of *B. unifasciatus* is marked with the word "type" by Smith himself, and the other specimens are unmistakably the types of the other castes.

Bombus diligens, Smith (1861) = *B. brachycephalus*, Handlirsch (1888).

LIV. — *New Species of the Genus* Platamops, *Reitt.* [= Spithobates, *Champ.*] (*Coleoptera*), *from Tropical South America.* By G. C. Champion, F.Z.S.

The genus *Platamops*, including two species from Colombia, was described by Reitter* (1878) as a Cucujid, and said to have simple, 5-jointed tarsi, with a feebly lobed third joint. There can be no doubt, however, from the other characters given, that his definition of the tarsi was inaccurate (possibly he did not examine the posterior pair, or they were missing in his types), and that *Platamops* is synonymous with the Pythid-genus *Spithobates*, Champ.† (1889), also based upon two Tropical American forms. The four species now added, one from Colombia and three from Brazil, are all contained in the British Museum. These insects have the tarsi 5-, 5-, 4-jointed in both sexes, and the ante-penultimate joint a little stouter than the minute penultimate one; the anterior coxal cavities open behind; the prothorax with four or five setigerous tubercles along the lateral margin; and the elytra clothed with intermixed long, erect, tactile setæ and decumbent hairs. The general facies is very like that of the Cucujid genera *Telephanus* and *Cryptamorpha*, and this doubtless deceived the Austrian author, who compared *Platamops* with *Platamus*, Er., and *Parabrontes*, Redt., whereas the affinity with the Pythid-genus *Salpingus*, Gyll. (*Sphæriestes*, Steph.), is obvious. The species here described have six of the outer antennal joints widened, as in the *P.* (*Spithobates*) *setosus*, Champ., from Chiriqui, the three terminal joints only being thickened in the Central American

* Verh. zool.-bot. Ges. Wien, xxvii. p. 177 (1877, issued in 1878).
† Biol. Centr.-Am., Coleopt. iv. 2. p. 104 (1889).

P. (*Spithobates*) *maculatus*, Champ. The types of *P. decoratus* and *P. vittatus*, Reitt., are, I believe, in the Oberthür collection at Rennes. The eight species may be tabulated thus :—

Antennæ widened from fifth joint.		
Eyes larger ; elytra immaculate	*setosus*, Champ.	[Panama.]
Eyes smaller ; elytra maculate.		
Prothorax smooth at base ; elytra bimaculate	*binotatus*, sp. n.	[Colombia.]
Prothorax closely punctate to base.		
Elytra strongly attenuate posteriorly, fusco-bicruciate	*telephanoides*, sp. n.	[Brazil.]
Elytra less attenuate posteriorly.		
Elytra transversely bifasciate, irregularly punctate	*decoratus*, sp. n.	[Colombia.]
Elytra obliquely bifasciate, striato-punctate	*obliquus*, sp. n.	[Brazil.]
Elytra quadrimaculate	*4-signatus*, sp. n.	[Brazil.]
Elytra vittate	*vittatus*, Reitt.	[Colombia.]
Antennæ widened from ninth joint ; elytra spotted	*maculatus*, Champ.	(America. [Central

1. *Platamops binotatus*, sp. n.

Elongate, attenuate posteriorly, shining ; nigro-piceous, the head in front, the basal joints and tip of the antennæ, the flanks of the prothorax, and a large patch on each elytron below the humeri, rufous or ferruginous, the tarsi testaceous, the femora and tibiæ darker ; very sparsely clothed with decumbent yellow hairs intermixed with very long, erect, scattered setæ. Head rugosely punctate on each side of the smooth median space, the eyes rather small, prominent ; antennæ long, joints 5–10 subequal, longer than broad. Prothorax convex, oblong-cordate, strongly constricted and transversely sulcate before the base ; sparsely, coarsely, separately punctate on each side of the rather broad smooth median space, the constricted basal portion almost impunctate, the five setigerous marginal tubercles small. Elytra moderately elongate, broad, gradually widened to the middle and rapidly narrowed thence to the apex, the transverse post-basal depression deep ; sparsely, rather coarsely punctate, the punctures becoming very small from the middle onwards, and showing a faint trace of a linear arrangement on the disc, the postmedian sutural depression rather deep, the interstices smooth, flat on the disc, uneven towards the sides and apex. Intermediate and posterior tarsi very elongate, much longer than the anterior pair.

Length 5 mm. (♂?)

Hab. COLOMBIA, Santa Fé de Bogota (*Mus. Brit.*).

One specimen, acquired by the Museum in 1871. This insect is labelled "hétéromère," showing that its systematic position was then recognized. The comparatively smooth prothorax, long antennæ, and rufo-bimaculate elytra are characteristic. A Palæarctic *Salpingus* (*Sphæriestes*) is similarly coloured.

2. *Platamops telephanoides*, sp. n.

Elongate, narrow, attenuate posteriorly, shining; ferruginous, the eyes black, the legs and elytra testaceous, the latter with a large, common, subtriangular, scutellar patch connected along the suture with a broader saddle-shaped mark, a common oval patch towards the apex, and an indeterminate space along the sides (extending from just below the humeri to about one-third from the apex, and usually obliquely coalescent posteriorly with the saddle-shaped mark) piceous or nigro-piceous, the under surface and antennæ piceous or obscure ferruginous, the latter with the basal joints and extreme tip testaceous; sparsely clothed with decumbent yellow hairs intermixed with very long, erect, darker setæ. Head rugosely punctate, smooth down the middle, the eyes very prominent; antennæ moderately long, joints 5–10 very gradually decreasing in length, 7–10 triangular, 11 ovate. Prothorax oblong-cordate, constricted and transversely depressed before the base, longitudinally rugose, except along the smooth median line, the five setigerous marginal tubercles well developed. Elytra long, rapidly narrowed from the middle, narrow at the tip; obliquely depressed on the disc below the base, rather coarsely striato-punctate, the punctures becoming very minute on the apical declivity, the interstices flat and almost smooth.

Length $4\frac{4}{5}$–5 mm. (♂ ♀.)

Hab. BRAZIL, Rio de Janeiro (*Fry*).

Four specimens. More elongate than the allied forms, and with the elytral markings very similar to those of various species of the Cucujid genera *Telephanus* and *Cryptamorpha*.

3. *Platamops obliquus*, sp. n.

Moderately elongate, shining; nigro-piceous or piceous, the head and prothorax sometimes wholly or in part ferruginous, the basal joints and tip of the antennæ, the knees and tarsi, and various markings on the elytra testaceous

or ochraceous ; the elytral markings consisting of two fasciæ on the disc, neither reaching the suture—the antemedian one transverse and extending downward on the outer part of the disc (in one specimen divided into two spots), the postmedian one oblique and extending outward to near the margin,—a spot on the shoulder (sometimes extending across the base), and a small apical patch ; sparsely clothed with decumbent yellow hairs intermixed with numerous, very long, erect, dark setæ. Head rugosely punctate on each side of the smooth median space; antennæ with joints 5–10 subtriangular, slightly decreasing in length. Prothorax oblong-cordate, narrower in ♀, constricted and transversely depressed before the base, longitudinally rugose, except along the smooth median line, the setigerous marginal tubercles well developed. Elytra moderately long, subparallel in their basal half; interruptedly striato-punctate, the punctures becoming very fine towards the apex, the transverse post-basal depression deep, the interstices almost smooth, flat on the disc, uneven towards the sides. Penis-sheath of ♂ curved and acuminate at the tip, two long filamentary processes projecting from it beneath, each process dilated at the apex and bearing a conspicuous seta.

Length $3\frac{1}{3}$–$4\frac{1}{5}$ mm. (♂ ♀.)

Hab. Brazil, Rio de Janeiro (*Fry*).

Seven specimens, one somewhat immature. This species seems to be very nearly related to, and a little smaller than, *P. decoratus*, Reitt., from La Luzera, Colombia; but the elytra in the latter are said to be irregularly punctate, and to have two transverse fasciæ, the suture, base, and apex ferruginous. In the Brazilian insect the dark portions of the elytra are condensed into a narrow sutural stripe, a post-basal fascia, a common saddle-shaped mark at the middle, and a large, common, oval, subapical patch. The ædeagus is partly extruded in two of the males before me.

4. *Platamops quadrisignatus*, sp. n.

Moderately elongate, rather convex, shining ; piceous or obscure ferruginous, the basal joints and tip of the antennæ, the tarsi, and a large humeral patch on each elytron and an indeterminate patch of variable extent on the disc towards the apex (not reaching the suture), testaceous or rufescent; sparsely clothed with decumbent yellow hairs intermixed with numerous, very long, erect, darker setæ. Head rugosely punctate on each side of the smooth median space; antennæ rather short, joints 5–10 subequal in length, 6–10 subtriangular. Prothorax oblong-cordate, longitudinally rugose

on each side of the smooth median line, constricted and transversely depressed before the base, the five setigerous marginal tubercles well developed. Elytra moderately long, subparallel in their basal half and arcuately narrowed thence to the apex, the post-basal depression deep; with interrupted rows of scattered punctures, which become very fine towards the apex, the scutellar region sometimes with additional scattered punctures, the interstices smooth and flat.

Length 3½–4 mm. (♂ ♀.)

Hab. Brazil, Rio de Janeiro, Pernambuco (*Fry*).

Described from three specimens. A fourth example (one of the two from Pernambuco), somewhat immature, with a broader head and prothorax, larger eyes, and more closely punctate elytra, seems to belong to the same species. The elytral markings are not unlike those of the variable *P. maculatus*, Champ., from Central America, which has the antennal joints 9 and 10 longer and stouter than those preceding, and the elytra regularly striato-punctate. *P. vittatus*, Reitt., is said to have the elytra ferruginous, with the suture and sides broadly nigro-piceous, and it cannot therefore be conspecific with the present species.

LV.—*Some new Lepidoptera from Siam and Africa.*

By Lord Rothschild, F.R.S., Ph.D.

The two Siamese Amathusiidæ were collected by Mr. Godfrey of Bangkok, who has presented the *Stichophthalma* to the British Museum.

Rhopalocera.

Stichophthalma godfreyi, sp. n.

♂. This very distinct species is nearest to *St. cambodia*, Hew.

Upper surface.—Head brownish rufous; antennæ rufous; thorax and abdomen greyish brown, abdomen washed with blackish. Fore wing: basal half greenish steel-blue washed with olive-brown on costal area and from the base distad; outer half greenish white or white tinged with Nile-green; terminal band, apex, and submarginal row of large excised patches black-brown washed with steel-blue; a postmedian band of dark greenish steel-blue chevrons joined into a chain-like band. Hind wing similar, only the submarginal band of excised patches is replaced by a second row of chevrons and the white ground of the outer half of the wing is

strongly suffused with greenish lavender-blue. Underside very similar to that of *cambodia*, but much darker; all the lines and other markings much sharper and the double submarginal bands deep brown.

Length of fore wing 72 mm., expanse 151 mm.

Hab. Siam (near Kambusi, 8. 5. 1914).

Thauria lathyi siamensis, subsp. n.

In Seitz's 'Macrolepidoptera of the World,' Herr Fruhstorfer has treated the four forms of *Thauria*, known to him, as SUBSPECIES of one species, *Thauria aliris*, Westw.—at the same time remarking that his *lathyi* was almost worthy of specific rank, as it lacked the conspicuous tuft of androconial hairs in the cell of the hind wings.

The Tring Museum possesses, however, from the Tenasserim Valley and Toungoo, Burmah, both typical *Th. a. pseudaliris*, with very narrow, yellow, oblique band on the fore wings and large cellular androconial tuft on hind wings, and also a form of *lathyi* with large whitish-cream oblique bands on fore wing and no cellular androconia on hind wing (described below). From Perak there are also in the Tring Museum a large series (9 ♂ ♂, 3 ♀ ♀) of *a. pseudaliris* and 2 ♀ ♀ of the form of *lathyi* described below. This proves that *lathyi* occurs side by side with *a. pseudaliris* and that it is a quite distinct species.

♂. Differs from *l. lathyi* in being much smaller, the basal one-third of fore wing is suffused with much deeper, more maroon rufous, and the oblique pale band of fore wing is considerably wider and pure white.

Length of fore wing 50 mm., expanse 106 mm. : *l. siamensis*.

Length of fore wing 53 mm., expanse 112 mm. : *l. lathyi*.

Hab. Siam (Hoopbok, 26. 4. 1914).

Thauria lathyi amplifascia, subsp. n.

♂ ♀. Differs from *l. lathyi* by its larger size and by the oblique pale band of the fore wing being quite twice as wide at vein 4.

Width of oblique band (*l. lathyi*) : ♂ 6 mm., ♀ 11 mm.

Width of oblique band (*l. amplifascia*) : ♂ 16 mm., ♀ 17 mm.

Length of fore wing (*l. lathyi*) : ♂ 53 mm., ♀ 61 mm.

Length of fore wing (*l. amplifascia*) : ♂ 60 mm., ♀ 67 mm.

Expanse : *l. lathyi*, ♂ 112 mm., ♀ 128 mm.; *l. amplifascia*, ♂ 126 mm., ♀ 140 mm.

Hab. Toungoo, Burmah (type) ; Shan States ; Tenasserim Valley ; Perak ; (2 ♂ ♂, 6 ♀ ♀ in Tring Museum).

(*Th. aliris intermedia,* Crowley, has wider oblique light bands on the fore wing in the ♀, and very conspicuous cellular androconial tufts in the ♂ ; it occurs in Toungoo, Burmah, alongside of *Th. lathyi amplifascia.*)

Heterocera.

Lymantriidæ.

Ogoa oberthueri, Rothsch., sp. n.

♂. This is undoubtedly a giant, as the largest species described up to now only expands 72 mm.

Antennæ heavily pectinated, shaft black-brown, pectinations deep black ; head, thorax, and first two segments of abdomen dirty cream-white, rest of abdomen cinnamon-buff.

Fore and hind wings, above and below, semivitreous buffish cinnamon, outer half feebly powdered with sooty scales ; on fore wing an angled median band and on hind wing a postmedian convex band of more densely placed sooty scales, some 4 millimetres wide.

Length of fore wing 62·5 mm., expanse 135 mm.

Hab. Grande Comore (named in honour of Mr. Charles Oberthür, who did so much for the exploration of the Comoro Islands).

Ogoa neavei, sp. n.

♂. Legs black ; antennæ deep black ; head and thorax deep orange ; abdomen black, three basal and the anal segment orange.

Fore wing dark smoky grey ; median and outer quarter of costal area orange, intranervular spaces in basal two-fifths suffused with orange, in the outer three-fifths the intranervular spaces are only somewhat washed with orange, more strongly towards termen ; an oval, ill-defined, dull orange patch below median vein between veins 2 and 3. Hind wings orange, a sooty-black patch on upper discocellular veinlet, vein in cell sooty black, a submarginal sooty-black sinuate band beyond which the nervures to termen are also black, and the interspaces sprinkled with black scales.

Several other ♂ ♂ show a second oval patch between veins 3 and 4. ♀ similar, but paler and duller.

Length of fore wing 44 mm., expanse 95 mm.

Hab. Mt. Mlanje, Nyassaland, Dec. 1913 (*A. S. Neave coll.* ; Brit. Mus.).

LVI.—*A new Sphingid and little-known Butterflies from Africa.* By J. J. Joicey, F.E.S., F.L.S., and G. Talbot, F.E.S.

[Plate XII.]

The *Pieris* which we have figured was thought to be new, but has since been ascertained to be *Pinacopteryx renata*, Butl. We are indebted to Dr. G. B. Longstaff for kindly making this correction. The insect is rather rare, and an account of it will be found in Dr. Longstaff's paper on "The Butterflies of the White Nile," Trans. Ent. Soc. Lond. 1913, p. 31, pl. ii. figs. 1 ♂, 2 ♀.

We have 2 ♂♂ from Kengon, and 1 ♂ from Panikwari, April; South Soudan.

Pemba jordani, sp. n.

♀. Distinguished from *distanti*, Roths. & Jord., by the well-defined markings of the fore wing, and the black patagia.

Upperside of *fore wing* whitish grey in basal half and dirty grey beyond, with sooty-black markings. A faint thin basal line ending in a dark patch on costa and reaching its base; a second faint basal line crossing origin of vein 2 and accentuated on costa; a faint oblique discal line from inner margin to origin of vein 3 and continued as a heavy bar, somewhat invaded by ground-colour, at right angles to costa and placed within cell; a heavy postdiscal line curving inwards from inner margin to vein 2 and then outwards to 5 and inwards to costa, forming a large spot at base of cellule 5; a second postdiscal line, strongly dentate and close to, and parallel to, the first, from inner margin to vein 7; a third and narrower line merged into the second above vein 5 and below 2, and outwardly curved; the post-discal band crossed by a streak in 2 and another in 3; veins beyond postdiscal band scaled with whitish grey; an apico-costal patch, somewhat ovate, its inner edge more clearly defined; a marginal border narrowing anteriorly from inner margin to vein 6, its edge irregularly dentate and rounded below vein 2. Fringes sooty brown, greyish ochreous between the veins. *Hind wing* unicolorous grey-brown, whitish grey at extreme base. Fringes whitish grey.

Underside unicolorous grey-brown with a faint post-discal band more distinctly visible on hind wing. Fore wing with basal half darker.

Antennæ, head, thorax, and whole underside of body grey; patagia sooty black; tuft at base of abdomen brown, sooty black laterally; abdomen grey with black segmental lines, a mesial black line, and a dorso-lateral series of spots at apices of the segments.

Length of fore wing 37 mm.

Hab. French Congo, Fort Champel, 1 ♀.

The genus of this species was kindly determined for us by Dr. K. Jordan.

We take this opportunity of figuring the following two remarkable and little-known African butterflies:—

Papilio cariei, Le Cerf, Bull. Soc. Ent. de France, no. 16 (Oct. 1913) (Mauritius).

A second example of this species is in the Paris Museum from Great Comoro. In the Joicey coll. are two ♂ ♂ from the Ivory Coast received from Monsieur Le Moult and collected by Monsieur Dyot. Such a discontinuous distribution is certainly curious, but we are informed by Mr. P. I. Lathy, who examined the Ivory Coast collection when it came to hand, that he found the specimens in that collection.

We regard *P. cariei* as a distinct species which may represent the ancestral type of *P. demodocus*, Esp.

Charaxes acræoides, Druce, Ann. & Mag. Nat. Hist. ser. 8, vol. ii. p. 449 (1908) (Cameroons). ♂.

The type of this species is in the coll. of Joicey and is unique. As stated by Druce, *l. c.*, this wonderful *Charaxes* reminds one at first sight of *Pseudacræa clarki*, Butl., which also came in the same collection. It was taken by Rosenberg's collector, G. L. Bates, in the Cameroons.

EXPLANATION OF PLATE XII.

Fig. 1. *Pinacopteryx venata*, Butl.
Fig. 2. *Pemba jordani.*
Fig. 3. *Papilio cariei.*
Fig. 4. *Charaxes acræoides.*

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GEOLOGICAL SOCIETY.

December 15th, 1915.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

Dr. Aubrey Strahan, F.R.S., gave an account of a deep boring which was made in 1913 in search of coal, in the parish of Little Missenden, at an elevation of 459 feet above sea-level. The collection of specimens and the identification of fossils was carried

out by Mr. J. Pringle. For the first 1200 feet the hole was punched, and nothing is known of the strata traversed down to that depth—beyond the fact that the boring started in the top of the Middle Chalk and passed through some Oxford Clay, and, below that, some oolitic limestones which presumably belong to the Great Oolite Series. From 1200 feet the hole was drilled for 64 feet, and cores were preserved. The cores consisted of alternations of limestone and mudstone, with a rich and characteristic Upper Ludlow fauna. Among the fossils was *Orthoceras damesi* Rœmer, [? Krause], which had not previously been obtained in this country.

The boring serves to fix part of the northern boundary of the tract of Old Red Sandstone which underlies London. It is intended to publish a full account in the next issue of the Summary of Progress of the Geological Survey.

February 18th, 1916.—Dr. A. Smith Woodward, F.R.S., President, in the Chair.

The President, in his Anniversary Address, discussed the use of fossil remains of the higher vertebrates in stratigraphical geology. The study of fossil fishes, to which he had referred in his Address of 1915, raised the question as to whether animals of apparently the same family, genus, or species might not originate more than once from separate series of ancestors. The higher vertebrates, which inhabited the land, might most profitably be examined to throw light on the subject; for the land has always been subdivided into well-defined areas, isolated by seas, mountains, and deserts, so that animals in these several areas must often have developed independently for long periods. Students of shells are unanimous in recognizing what they term homœomorphy, and trace immature, mature, and senile stages in the course of every race that can be followed through successive geological formations. Vertebrate skeletons, which have much more numerous and tangible characters, and approach senility in more varied ways, should afford a clearer view of general principles.

Even among vertebrates the evidence that most concerns the geologist is not always easily interpreted. For instance, the Sparassodonta and horned tortoises of the Argentine Tertiary are so closely similar to the existing Thylacines and the fossil *Miolania* of Australia, that they are still sometimes quoted as proving the former existence of an Antarctic Continent uniting the South American and Australian regions. On the other hand, they may be merely survivors of cosmopolitan races at the two extremes of their former range, with certain inevitable (but not altogether similar) marks of senility. In making comparisons, indeed, it is no longer enough to distinguish the fundamental and merely adaptive characters of animals; it is also essential to note separately those characters which depend on the early,

mature, or senile position of the particular animals in the evolving series to which they belong.

Hitherto there seems to be only one case in which we have enough materials for forming a judgment as to whether a fundamental advance may occur more than once. Mammal-like reptiles are abundant in the Permian of North America and in the Permian and Trias of South Africa and other parts of the Old World. Recent studies have shown that all specializations in the North-American forms are in the direction of higher reptiles, while all those in the South African forms are in the direction of mammals. Hence, although there is evidence of two possible sources of mammals, only one appears to have produced them.

Among advances of lower degree, the origin of the monkeys or lower Anthropoidea may be considered. It is agreed that they arose from the Lemuroidea which were almost universally distributed over the great continents at the beginning of the Tertiary Era. They seem to have evolved separately in America and in the Old World, but the two series are very sharply distinguished, although they form one zoological 'suborder.' When isolated on the island of Madagascar, some of the same animals acquired a few peculiarities of the American, others of the Old World Anthropoidea, but never really advanced beyond the Lemuroid stage, merely becoming senile just before their extinction. Hence, the Lemuroidea evolved in three different ways, and the resulting groups are very easily distinguished.

The study of the Tertiary Ungulata is especially important, because most of the groups arose either in North America or in the Old World, which were united and separated several times. It seems clear that, although each group probably originated but once in one particular area, its members soon diverged into several independently evolving series, each imbued with some definite impulse or momentum towards specialization in the same way in the course of geological time, only at different rates. There were thus, for example, several distinct lines of horses and rhinoceroses, but all from the same source.

It is now well known that the characteristic South American Tertiary Ungulates arose in an isolated area, and many of their specializations are curiously similar to some of those observed among European Eocene and Oligocene Ungulata which soon proved abortive or 'inadaptive.' They are, however, by no means identical.

While so many changes have occurred during the evolution of the vertebrates, the persistence of characters and the strength of heredity in numerous cases are still as perplexing as they were when Huxley first directed special attention to 'persistent types.' The President enumerated some illustrations.

INDEX TO VOL. XVII.

END OF THE SEVENTEENTH VOLUME.

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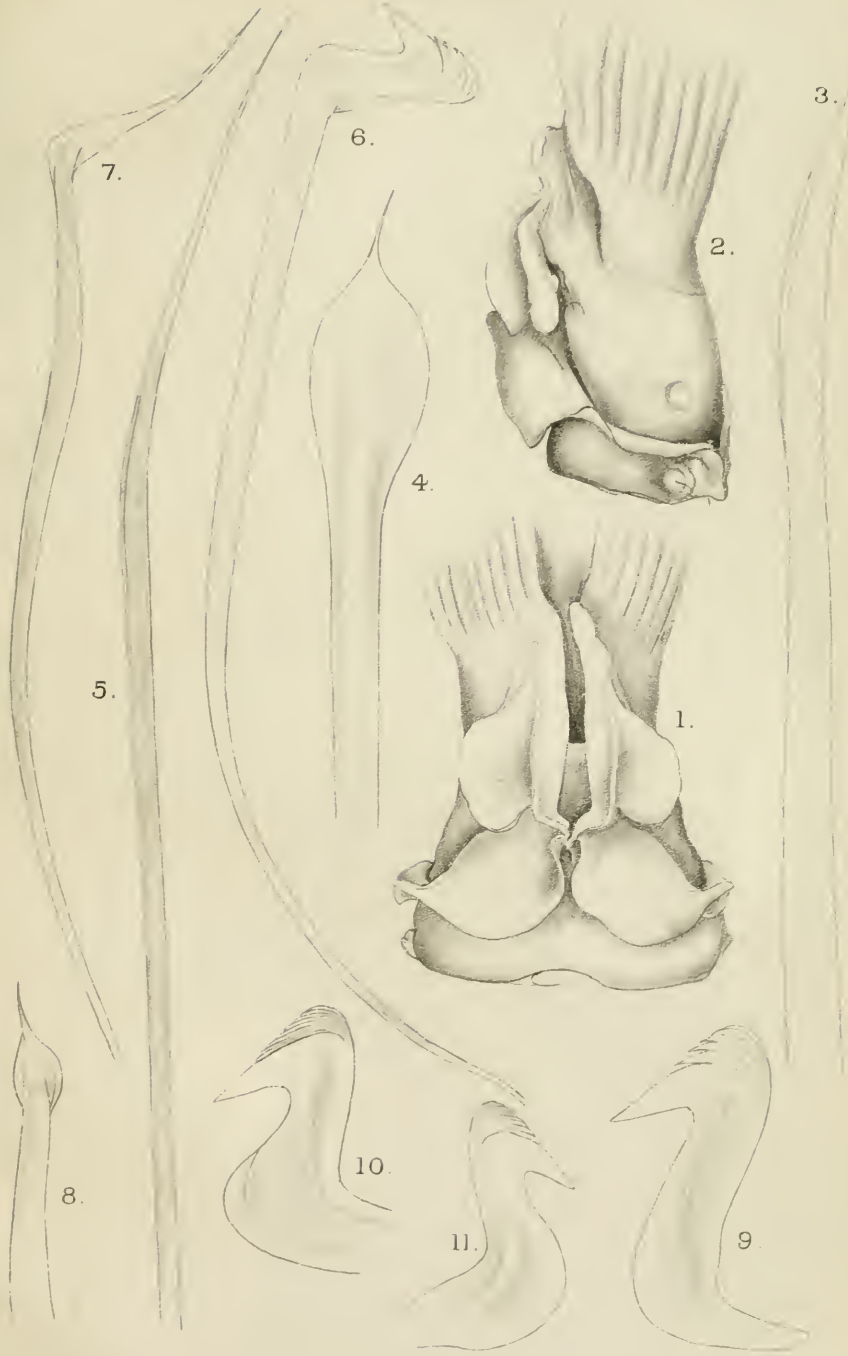
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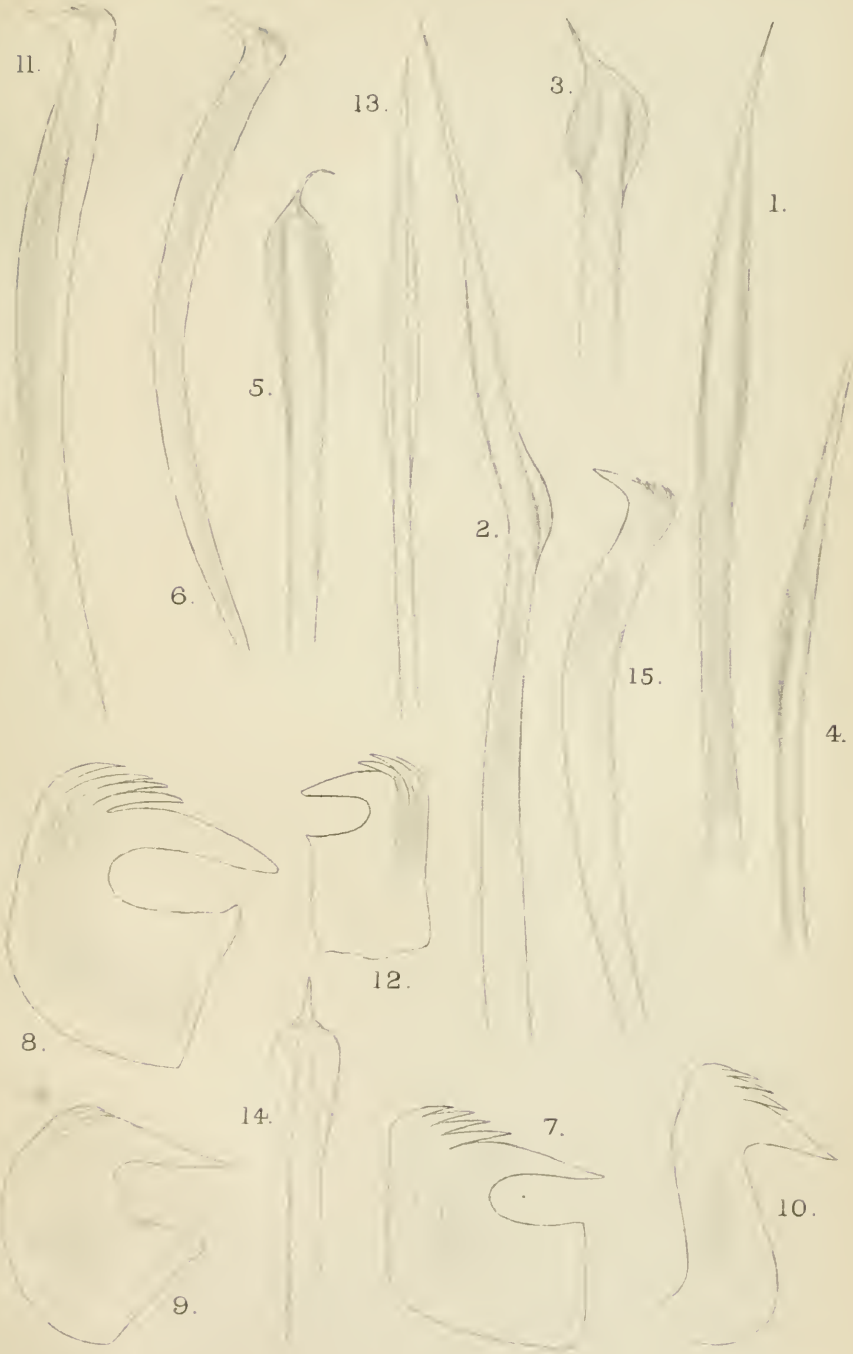
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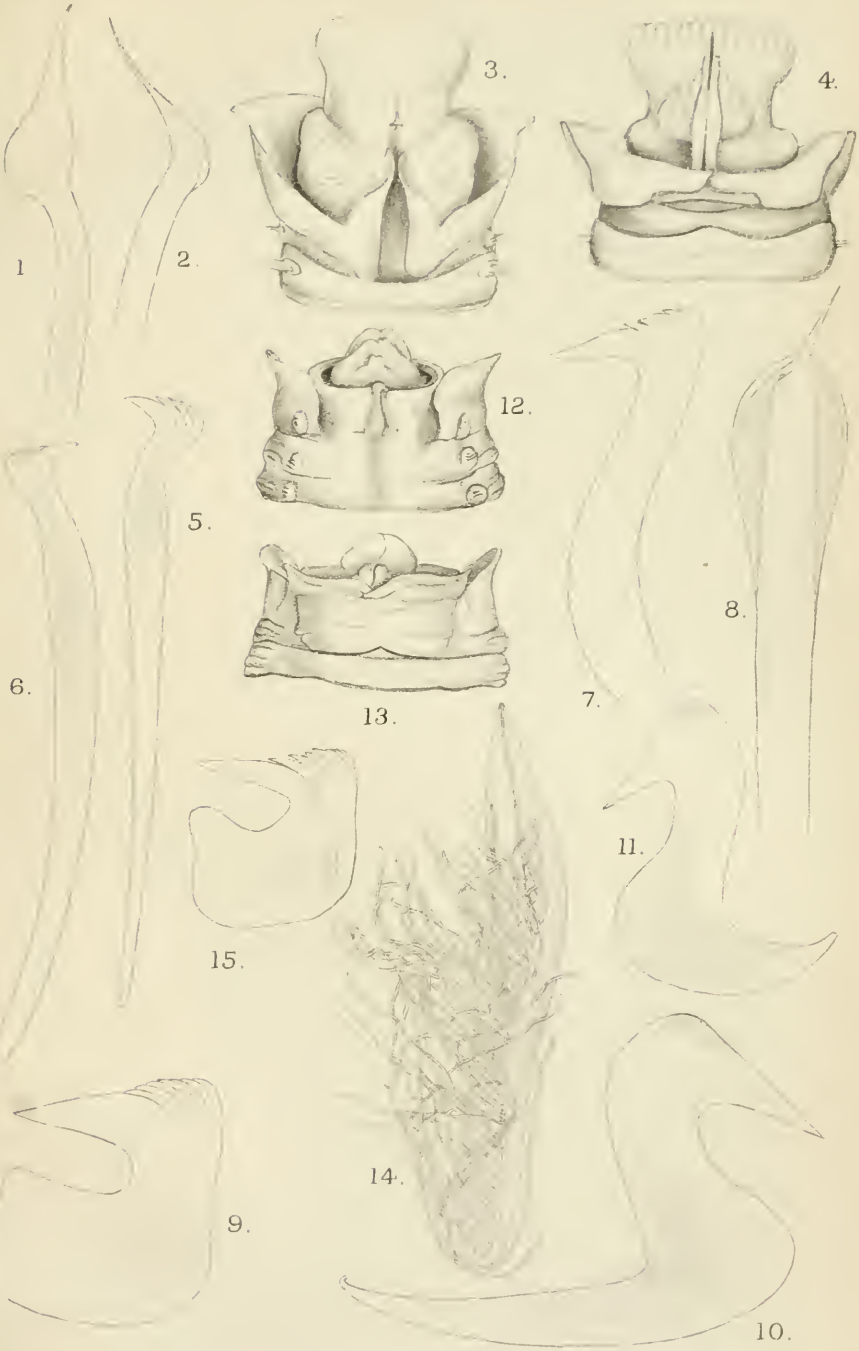
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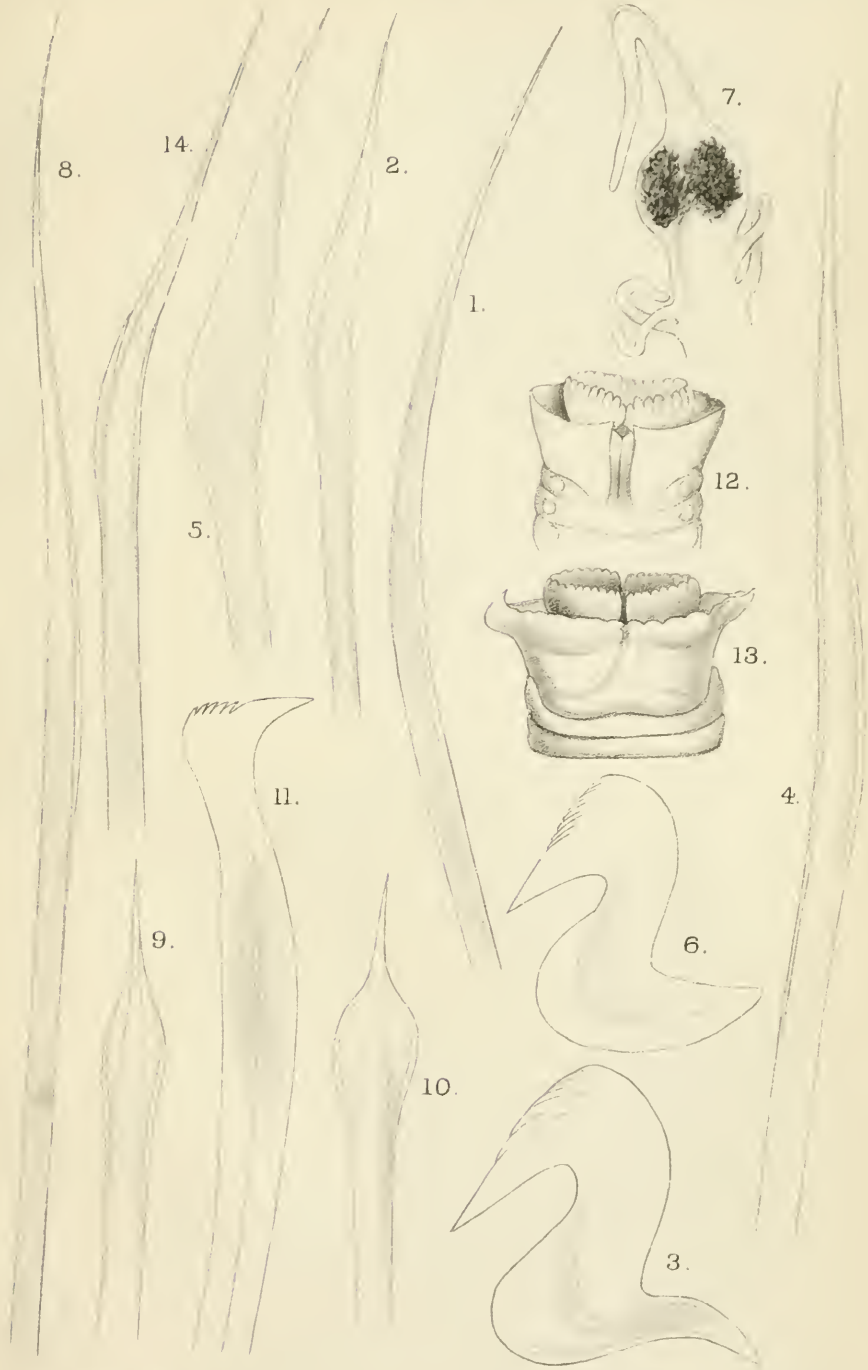
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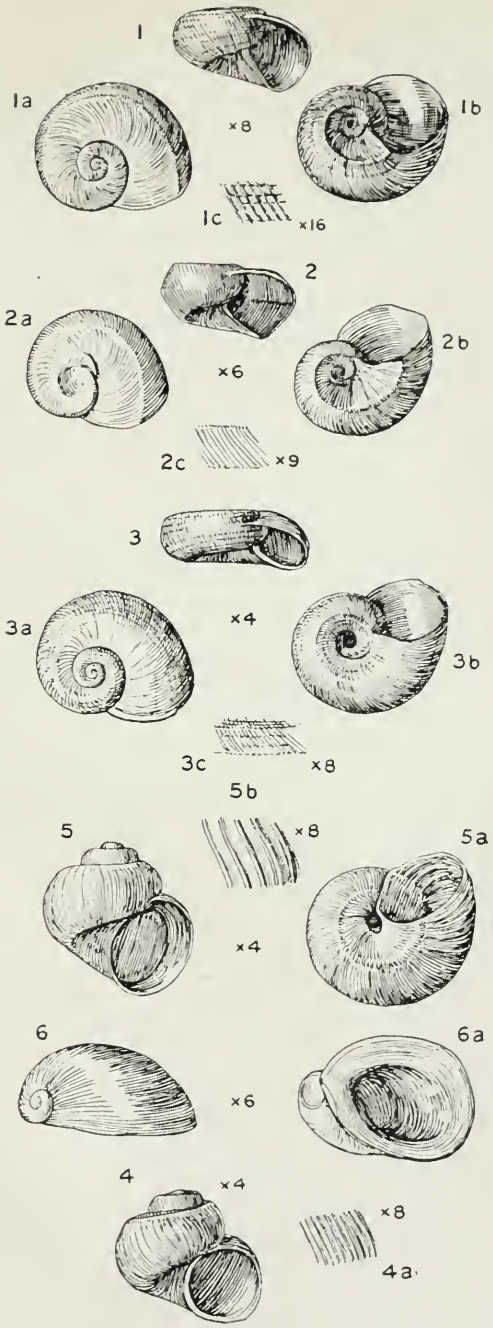
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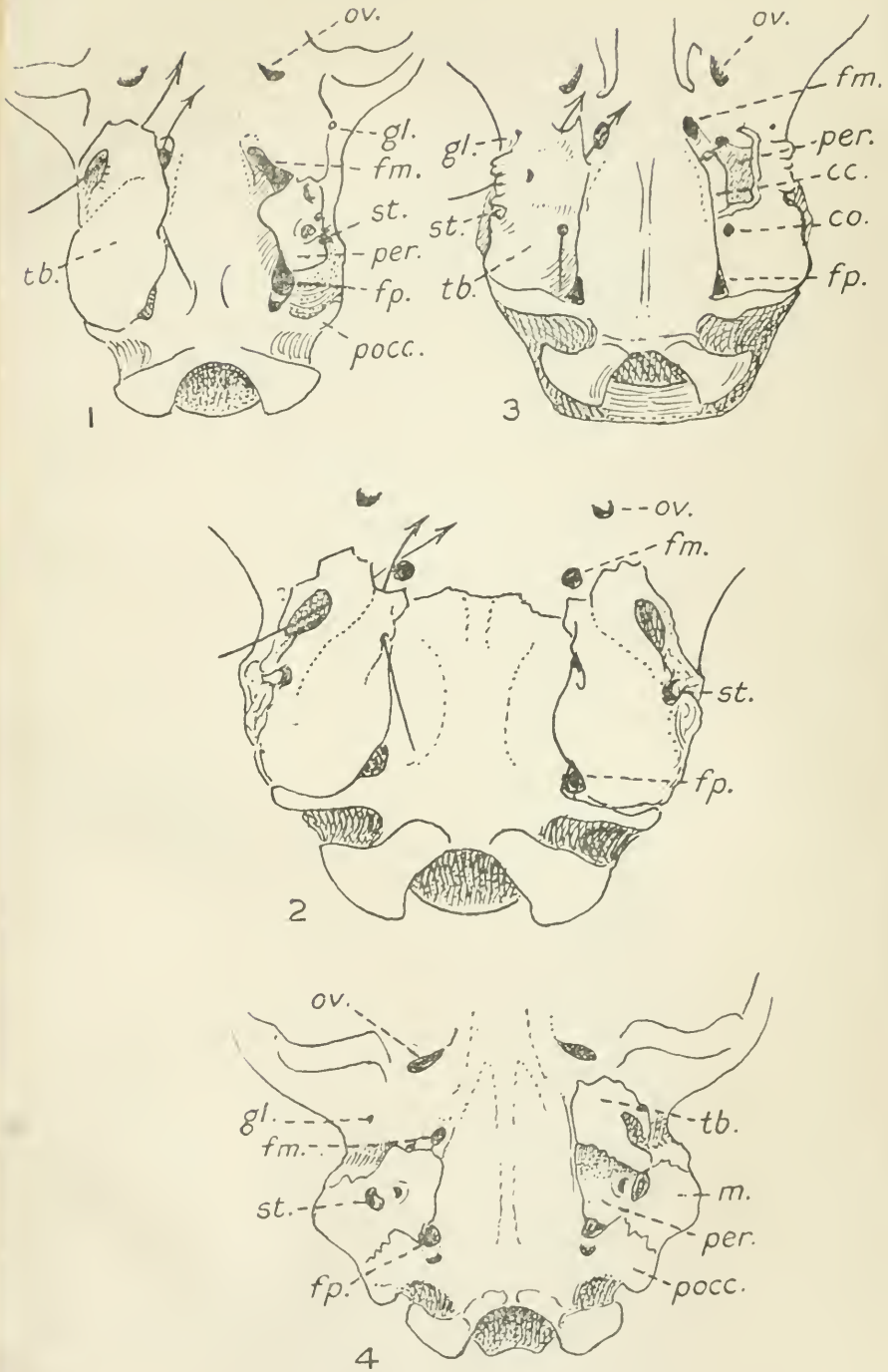
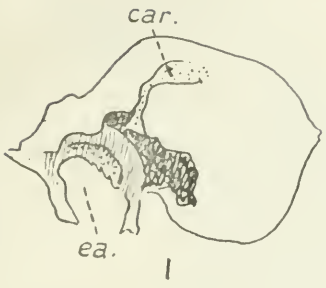
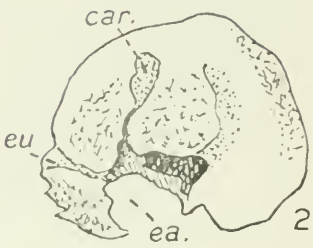
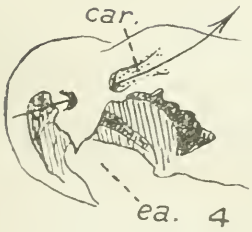
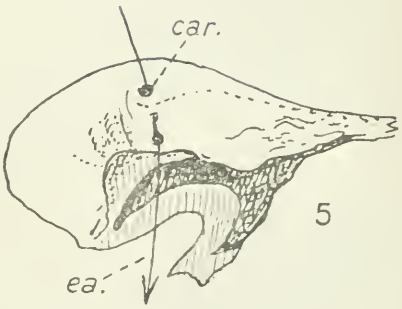


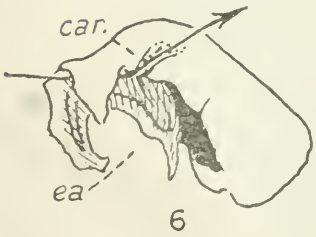
The Internal Carotid Canal in the Viverridæ.

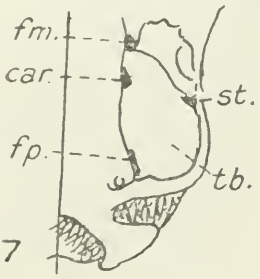












The Internal Carotid Canal in the Viverridæ and Felidæ.

Horace Knight, del

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A New Sphinigid and Little-Known Butterflies from Africa.