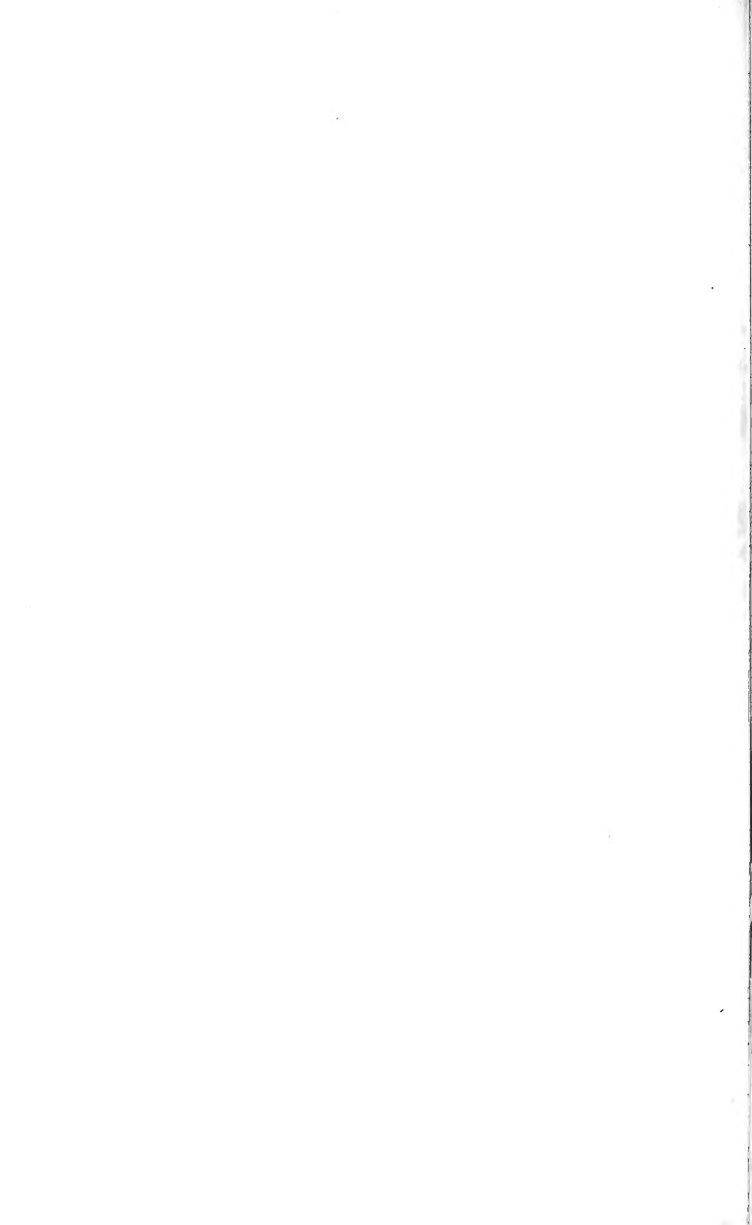


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THE ANNALS
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MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

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AND

WILLIAM FRANCIS, F.L.S.

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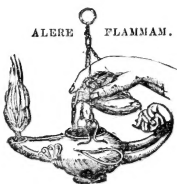
“Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; 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.”—BRÜCKNER, *Théorie du Système Animal*, Leyden, 1767.

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

J. TAYLOR, *Norwich*, 1818.

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ERRATA.

- Page 73, line 25, *for greater read greatest.*
 „ 74, „ 4, *for deflexed read reflexed.*
 „ 75, „ 36, *for anfr. read dente.*
 „ 77, „ 33, *for fine read liner.*
 „ 77, „ 35, *dele particularly and read less.*
 „ 82, „ 10, *for cuticles read scratches.*
 „ 335, „ 21 from bottom, *for ocular read preocular.*

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

"..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettusi, Ecl. 1.

No. 1. JANUARY 1908.

I.—*The Genera and Subgenera of the Sciuropterus Group, with Descriptions of Three new Species.* By OLDFIELD THOMAS.

THE old genus *Sciuropterus*, as already indicated by Forsyth Major and Heude, contains a very heterogeneous collection of forms, and a study of them brings me to the conclusion that they should be divided into at least six genera. Heude has already erected the genus *Trogopterus* for the remarkable Chinese species described as *Pteromys vanthipes* by Milne-Edwards.

IOMYS, gen. nov.

Upper cheek-teeth subequal, square, with low ridges, the usual high internal antero-posterior ridge almost obsolete as a ridge, being represented by two separate cusps, to which respectively the two usual transverse ridges run directly across parallel to each other, instead of (as in *Sciuropterus*) converging and nearly meeting on the external slope of the highest part of the main antero-posterior internal ridge. As

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1

a consequence the teeth appear from above to be simply quadricuspidate, and when viewed from their inner aspect show two definite cusps instead of the usual single crest.

No small upper premolar (p^3) present.

Usual antero-external cusp of p^4 situated more mesially on the tooth, so as to function partially as a p^3 .

Bullæ well inflated.

Type—*Iomys horsfieldi* (*Pteromys* (*Sciuropterus*) *horsfieldi*, Waterh.).

Other species: *I. thomsoni*, Thos.; *I. davisoni*, Thos.

This genus is readily distinguishable from any member of the group by its peculiar quadricuspidate teeth and by the entire suppression of p^3 .

Figures of upper and lower molars of *I. horsfieldi* have been given in Dr. Major's paper*.

BELOMYS, gen. nov.

Upper cheek-teeth brachyodont, but exceedingly complicated, as in *Trogopterus*, masking the essential pattern, which is, however, as in *Sciuropterus*. The ridges are deeply grooved, wrinkled, and excavated, and not only is the postero-internal cusp of each tooth separated by a deep notch from the main part of the inner longitudinal crest, but the anterior end of the same crest is cut off by another deep notch from the middle part. The inner aspect of m^1 and m^2 shows therefore three cusps—a small anterior, a middle larger, and a fairly developed posterior. Externally, where in some species of *Sciuropterus* there is a small supplementary cusp at the exit of the middle valley, there is a well-marked externally projecting angle, deeply grooved down its centre, so as to form a projecting gutter. p^4 not immensely large as in *Trogopterus*, but nevertheless larger than m^1 ; p^3 comparatively large, internal to the front cusp of p^4 .

Ears large, their bases in the known species with tufts of bristles.

Type—*Belomys pearsoni* (*Sciuropterus pearsoni*, Gray).

Other species: *B. villosus*, Blyth, from Upper Assam, which is probably different from the Darjiling *B. pearsoni*; *B. kaleensis*, Swinhoe, from Formosa; and the Manipur species described below.

This form was included in *Trogopterus* by Heude on the statement by Forsyth Major that its molars were of similar pattern †; but it appears to me that the hypertrophy of p^4 in

* P. Z. S. 1893, p. 194, pl. viii. fig. 21 and pl. ix. fig. 21.

† T. c. pl. viii. fig. 20 and pl. ix. fig. 20.

Trogopterus xanthipes is a character of generic rank, while in addition that species is to a certain extent hypsodont, which is not the case in *Belomys*.

With less complicated teeth than *Belomys*, though still much more so than in *Sciuropterus*, is

PTEROMYSCUS, gen. nov.

Molars agreeing with those of *Belomys* in their general structure, but the degree of complication is less. Thus, among other details, there is no notching off of an anterior portion of the inner longitudinal boundary-wall, and the spout-like projection in the middle of the outer edge is less developed.

p^4 a little smaller than in *Belomys*, barely or not equalling m^1 in area. p^3 minute, closely crushed against the antero-internal side of p^4 , and often hardly visible from above. It is present in all the skulls available, but looks as if it could hardly be of any functional value.

Ears quite small, untufted.

Type—*Pteromyscus pulverulentus* (*Sciuropterus pulverulentus*, Günth.).

A second species described below.

PETAURILLUS, gen. nov.

Molars with very low, rounded, and almost obsolete ridges, quite different from the high and well-defined ridges present in *Sciuropterus*, although their relative positions are much the same. The ridges not wrinkled or notched.

p^4 distinctly smaller than m^1 ; not of the usual triangular shape, but nearly symmetrical, its outer scarcely longer than its inner border. p^3 well developed, standing in front of the centre of p^4 , not overlapped by it. The three anterior teeth of the row, therefore, evenly and symmetrically diminish in size forwards, a condition not found in any of the other groups.

Skull in general form short, broad, and low, with a short muzzle. Bullæ well swollen, the mastoid portion also slightly inflated.

Mammæ 4.

Type—*Petaurillus hosei* (*Sciuropterus hosei*, Thos.).

A second species described below.

The two species of *Petaurillus* are the pigmies of the group, being decidedly smaller than the smallest species of *Sciuropterus*. They are readily distinguishable by the straight

graduated series formed by their anterior cheek-teeth and by the low and rounded nature of their molar ridges.

The genera now admitted of the smaller flying-squirrels may be briefly indicated as follows:—

- A. Molar pattern consisting essentially of two transverse ridges converging internally towards the central part of a longitudinal internal crest, though this structure is marked in the very wrinkled-toothed forms. Never as described under B.
- a. Teeth excessively wrinkled. An outwardly projecting angle developed at the middle of the external edge. Postero-internal cusp well developed.
- a². Teeth semihypsodont. p^4 very large, twice the size of m^1 *Trogopterus*.
- b². Teeth brachyodont. p^4 not or little larger than m^1 .
- a³. p^3 well developed; p^4 rather larger than m^1 . Ears large *Belomys*.
- b³. p^3 minute; p^4 rather smaller than m^1 . Ears small *Pteromyscus*.
- b. Teeth not excessively wrinkled. No projecting angle on outer edge. Postero-internal cusp rarely developed.
- c². p^4 generally a little larger than m^1 . Molar ridges well developed *Sciuropterus*.
- a². p^4 decidedly smaller than m^1 . Molar ridges low and rounded *Petaurillus*.
- B. Molars each with two parallel transverse ridges rising into cusps laterally, so that the tooth appears evenly quadricuspidate from above, and shows two subequal conical cusps on its inner aspect. p^3 absent..... *Iomys*.

An alternative key may be based on the characters of the premolars only, as follows:—

- A. Five cheek-teeth. p^3 present.
- a. Large premolar (p^4) approximately equal to or larger than first molar (m^1); p^3 standing internal to its anterior angle.
- a². p^4 very large, twice the size of m^1 *Trogopterus*.
- b². p^4 not or little larger than m^1 .
- a³. p^3 small but functional.
- a⁴. p^4 more complicated, the anterior of its three outer cusps highest; p^3 not visible externally *Belomys*.
- b⁴. p^4 less complicated, the antero-external cusp shorter; p^3 generally visible externally.... *Sciuropterus*.
- b³. p^3 minute, apparently not functional *Pteromyscus*.
- b. p^4 decidedly smaller than m^1 ; p^3 in front of its centre. *Petaurillus*.
- B. Four cheek-teeth. p^3 absent..... *Iomys*.

But, further, the genus *Sciuropterus*, even as thus restricted,

needs further division into subgenera, of which there appear to me to be at least four. These may be distinguished as follows:—

- A. Bullæ well inflated. Molar ridges high.
- a. Mammæ 8. (Holarctic.)
- a². Posterior transverse ridge of p^4 , m^1 , and m^2 deeply notched, so as to cut off a separate cusp in the centre of the tooth. *Sciuropterus*.
- b². Transverse ridges of teeth complete, as usual. *Glaucomyx*.
- b. Mammæ 6. (Oriental.)
- c². Bullæ well inflated, often double. Molar ridges complete. *Hylomyx*.
- B. Bullæ low, flat, little inflated. Molars with lower ridges, their enamel usually much sculptured, and with supplementary cusps between the transverse ridges externally *Petinomyx*.

Subgenus SCIUROPTERUS.

Teeth more complex than in other members of the genus, the cusps and ridges high and well defined. Internal wall of each tooth grooved on its lingual aspect, so as to be more or less divided into three, and approaching *Belomys* in this respect. Posterior transverse ridge of p^4 , m^1 , and m^2 deeply notched halfway across at right angles to its length, its dividing-line from the inner wall of the tooth also more deeply notched in; as a result a distinct conical cusp is isolated in the centre of the tooth. No similar structure is found in any other member of the group.

Skull: muzzle narrow, with parallel sides which are nearly at right angles to the spring of the zygomatic arch. Palatal foramina comparatively large.

Range. Palearctic Region from Scandinavia to Japan.

Type—*Sciuropterus russicus*, Tiedem.

Other species: *S. momonga*, Temm.; *S. büchneri*, Sat.; *S. aluco*, Thos.

GLAUCOMYS, subgen. nov.

Teeth comparatively simple; a slight tendency to the development of grooves on the lingual side of the internal wall. Posterior transverse ridges complete, partially joined internally to the outer slope of the internal wall, and without any notch halfway across the tooth.

Muzzle long, tapered forwards, its sides meeting the spring of the zygomata at a slant. Palatal foramina comparatively small.

Mammæ 8.

Range. North America and N.W. Himalayas.

Type—*Sciuropterus (Glaucomys) volans* (*Mus volans*, Linn.).

Other species : those of N. America, and also *S. fimbriatus*, Gray.

Extraordinary as the above-given range may appear to be, I can find no character of subgeneric importance to separate the large Himalayan *S. fimbriatus* from the N. American flying-squirrels, while both are equally distinct from the intervening species belonging to the restricted subgenus *Sciuropterus*.

HYLOPETES, subgen. nov.

Teeth very much as in *Glaucomys*, though there is an increasing tendency, which culminates in the next group, for the enamel to be finely sculptured between and on the sides of the ridges.

Bullæ well inflated, sometimes doubled by the swelling up of the posterior mastoid portion.

Mammæ 6.

Range. Oriental Region from Nepal to the Malay Islands.

Type—*Sciuropterus (Hylopetes) everetti*, Thos.

Other species : *S. alboniger*, Hodgs. ; *nigripes*, Thos. ; *spadaceus*, Bly. ; *phayrei*, Bly. ; *aurantiacus*, Wagn. ; *platyurus*, Jent. ; *phaemelas*, Günth. ; *tephromelas*, Günth. ; *thomasi*, Hose.

PETINOMYS, subgen. nov.

Teeth with rather lower cusps and ridges than in true *Sciuropterus*, the enamel rather more elaborately sculptured, and with a more frequent development of accessory cusps, especially at the outer exit of the valley between the two main transverse ridges.

Skull broad and low, with a short muzzle. Bullæ fairly large horizontally, but peculiarly low and flattened, scarcely rising above the general level of the base of the skull, their substance unusually thick and opaque.

Mammæ 4 or 6.

Range. S. India and Ceylon, Malay Peninsula and islands.

Type—*Sciuropterus (Petinomys) lugens*, Thos.

Other species : *S. fuscocapillus*, Jerd. ; *hageni*, Jent. ; *marens*, Mill. ; *genibarbis*, Horsf. ; *setosus*, Temm. ; *vordermanni*, Jent.

I should have been inclined to consider the striking and peculiar flattening of the bullæ in this group as a generic

character, were it not that *S. fuscocapillus* and *S. thomasi* tend to be intermediate in this respect between *Petinomys* and *Hylopetes*.

The following new members of the group may be here described:—

Belomys trichotis, sp. n.

External characters apparently very much as in *B. pearsoni*, though the ears of the single specimen seem to be a little larger and more heavily tufted, and the hairs of the chest are whitish without the slaty bases present in all our other specimens of the group.

Skull with the nasals not surpassing posteriorly the frontal processes of the premaxillaries.

Molars conspicuously lighter than in *B. pearsoni*, the tooth-row not much shorter, but so much narrower that the palate-breadth between the premolars exceeds the combined length of p^4 and m^1 , while in *pearsoni* the same breadth only equals the length of p^4 + half that of m^1 . The teeth themselves are of essentially the same pattern, but owing to their smaller size appear much more finely sculptured.

Dimensions of the type (measured in skin):—

Head and body 196 mm.; tail 151; hind foot 32·5.

Skull: fronto-parietal suture to tip of nasals 28; nasals $12\cdot2 \times 6\cdot5$; interorbital breadth 8·1; intertemporal breadth 9·6; palatilar length 20; diastema 9·5; distance between inner sides of p^1 5·2; length of tooth-series 9, of molars only 6·2.

Hab. Manipur. Type from Machi.

Type. Adult male. B.M. no. 85. 8. 1. 136. Collected 7th May, 1881. Presented by Allan O. Hume, Esq.

Pteromyscus borneanus, sp. n.

Very closely allied to the Malaccan *P. pulverulentus*, Günth., to which, without examination of the skull, I have hitherto referred it. External characters very much as in that species, the upper colour of the same blackish brown flecked with light, but the light rings on the hairs which form the fleckings are smaller and more nearly white. Under surface of the body and of the basal third of the tail clearer whitish, without the subdued buffy or "clay-coloured" suffusion found in *pulverulentus*.

Skull rather larger than that of *pulverulentus*, the brain-case broader, and both the interorbital and intertemporal spaces noticeably wider.

Incisors broader and heavier, nearly one third broader than in equally aged examples of *pulverulentus*.

Dimensions of the type (from skin):—

Head and body 290 mm.; tail 215; hind foot 41.

Skull: greatest length 46; basilar length 37·5; greatest breadth 30; nasals 12·2 × 7·8; interorbital breadth 10; intertemporal breadth 12·3; breadth of brain-case 21; palatilar length 20; length of upper tooth-series (probably slightly reduced by age) 9.

Hab. Baram District, E. Sarawak.

Type. Old female. B.M. no. 91. 8. 28. 10. Collected in 1891 by Dr. Charles Hose.

Petaurillus emiliae, sp. n.

Nearly allied to *P. hosei*, but smaller in all dimensions.

Colours in all respects quite like what the type of *hosei* would probably have had if it had not been skinned out of spirit, and therefore presumably discoloured. Thus the type of *emiliae*, sent home as a skin, is paler rufous on the back (tips of hairs near vinaceous-cinnamon of Ridgway), and the belly is pure white, without the slight rufous tinge already suggested as possibly due to spirit. Cheeks pale buffy whitish, no darker line perceptible below the eye. In all other respects the original description of *hosei* will fit *emiliae*.

Skull, apart from its markedly smaller size, quite like that of *hosei*, except that the nasals do not project backwards beyond the fronto-premaxillary processes.

Dimensions of the type (measured on the skin):—

Head and body 72 mm.; tail 62, its longest lateral hairs 7; hind foot 17.

Dimensions of an adult female in spirit:—

Head and body 68 mm.; tail 67; hind foot 16; ear 15.

Skull (of type): greatest length 24; basilar length 17·5; greatest breadth 15·2; length of nasals 6·1; interorbital breadth 6·5; palatilar length 9·6; length of upper cheek tooth-series 3·9, of true molar series 2·7.

Hab. Baram, E. Sarawak.

Type. Adult male. B.M. no. 3. 4. 9. 1. Collected 14th May, 1901, by Dr. Charles Hose.

Readily distinguishable from *P. hosei* by its much smaller size.

I have much pleasure in naming this pretty little flying-squirrel, the smallest member of the group, in honour of Mrs. Hose, the wife of the discoverer of its only near ally.

II.—A Synoptic Revision of the Tanyrrhynchinae (Curculionidae). By GUY A. K. MARSHALL, F.Z.S.

IN the Berliner ent. Zeits. for 1886 (p. 100) the late Dr. Faust published a revision of Lacordaire's tribe Tanyrrhynchides, in which he then included seven genera. In 1889 he gave an additional table of the genera allied to *Myorrhinus*, two of which were described as new (Deutsche ent. Zeits. p. 140). Since that time a considerable number of new forms have been discovered which must be referred to this group, and, as many of these require new genera for their reception, it seems advisable to give a fresh working synopsis of the whole group. This revision has been rendered possible by the kindness of Dr. K. M. Heller, of Dresden, and Prof. Yngve Sjöstedt, of Stockholm, who have been good enough to lend me many types and co-types from their museums; and I am also much indebted to Mr. H. E. Andrewes for the loan of co-types of three Indian species described by Faust.

Before entering into any definition of the group, it may be well to point out that Faust, when dealing with *Tanyrrhynchus*, always treated *T. costirostris*, Boh., and its near allies as the typical forms of the genus. It was for the reception of these very species that, a few years ago, I proposed the genus *Stramia* (Proc. Zool. Soc. 1904, i. p. 140), and the validity of that genus has been confirmed by an examination of the type of *Tanyrrhynchus*, viz. *T. strigirostris*, Sparrm.

The species of *Stramia* differ not only from *Tanyrrhynchus*, but also from all the genera here associated with it, in the structure of the mouth-parts. The peduncle of the submentum is very markedly produced and the mentum itself is quite small, being very little larger than the peduncle, so that the maxillæ and their palpi are entirely exposed when the mandibles are closed. In the Tanyrrhynchinae, as here defined, this condition never occurs. In their case the peduncle of the submentum is always small, sometimes very small, while the mentum is large (many times larger than the peduncle) and nearly fills the whole buccal cavity behind the mandibles, when closed; the maxillary palpi are thus entirely hidden (or occasionally their extreme apices may be seen just projecting beyond the apex of the mentum) and the maxillæ themselves are more or less completely hidden, being more exposed at the base the more the peduncle is developed. In addition to these buccal characters, *Stramia* may be dis-

tinguished from *Tanyrrhynchus* by its lateral scrobes, the internal denticulation of the intermediate tibiæ, the absence of a femoral tooth, the strong curvature of the scape at its apex, the much greater width of the episterna of the metasternum, &c. In the structure of its mouth-parts, as well as in many other characters, *Stramia* shows considerable affinity with *Hipporrhinus*, and I see no reason for altering my previous suggestion that it should be associated with that genus. For similar reasons the nearly allied genus *Solenorrhinus*, Schh., must also be removed into Lacordaire's Hipporrhinides.

With the removal of these two elements the mouth-parts of the genera of Tanyrrhynchinæ become sufficiently homogeneous in character. From what has been said above with regard to the mentum it is clear that they cannot be regarded as true Phanerognathi, and owing to the comparatively large size of that organ, in relation to the buccal cavity, it seems preferable to regard them as slightly transitional Adelognathi. From all of these latter, with the exception of the very distinct Brachycerinæ, they may be distinguished by a combination of two characters, viz.: the comparatively slender and prominent mandibles, and the absence of a mandibular scar; and these have probably been developed correlatively with the greater elongation of the rostrum, which also characterizes the group as compared with normal adelognaths. But here again there are signs of transition. In *Tanyrrh. strigirostris*, Sparrm., *T. squalidus*, Boh., and (what I take to be) *T. loripes*, Boh., there are faint indications of mandibular scars; but owing to their ill-defined character and outwardly oblique position, it seems improbable that they can really serve as supports for temporary false mandibles. They are perhaps mere rudiments indicating that the Tanyrrhynchinæ have comparatively recently diverged from the Otiorrhynchidæ, in the sense of Leconte and Horn. This is borne out by the apparent affinities which can be traced between *Aosseterus* and *Piazomias* (Tanymecides), *Sympiezorrhynchus* and *Ellimenistes* (Oosomides), and *Tanyrrhynchus* and *Eremnus* (Eremnides).

In many of the genera the position of the eyes is abnormal. In *Synaptocephalus*, *Myorrhinus*, *Anathresa*, and some *Haptomerus* they are more or less closely approximated on the forehead; but in *Stereorrhynchus*, *Umzila*, *Malosomus*, *Opseorrhinus*, *Atmesia*, *Euphalia*, and some *Haptomerus* they are situated considerably further forward, so as to be placed on what would normally be considered as the basal part of the rostrum. In the great majority of species the

rostrum presents the somewhat characteristic feature of being covered with scaling on the dorsal surface, but quite bare and very shiny beneath. In the genera allied to *Myorrhinus* and *Stereorrhynchus* the underside of the rostrum is apt to be more or less strongly compressed laterally, so that in cross-section it would appear to be roughly triangular with the apex downwards. The scrobes are always visible from above, at least at the insertion of the antennæ, and are usually quite dorsal in position, being sometimes very closely approximated and foveiform.

As at present known, the great majority of genera are peculiar to Africa, and only a few species are known from the following localities: Eastern Europe, Arabia, India, and Australia.

Synopsis of Genera.

1. (18.) Corbels of posterior tibiæ cavernous or subcavernous, *i. e.* with their external margin bent inwards more or less broadly (narrowly in *Synaptocephalus*).
2. (3.) Rostrum separated from head by a transverse impressed line.—* Scape reaching thorax; claws connate at base; funicle with joint 2 much longer than 1, and 1 longer than 3; elytra without erect setæ 1. *Sympiezorrhynchus*, Schh. (S. Africa.)
3. (2.) Rostrum continuous with the head.
4. (13.) Scape of antennæ exceeding anterior margin of eye.
5. (6.) Tarsal claws free.—Eyes lateral; scrobes sublateral; antennæ inserted about middle of rostrum, the two basal joints of funicle equal; tarsi with joint 1 as broad as 3; elytra with depressed setæ. 3. *Lipothyrea*, Pasc. (Australia.)
6. (5.) Tarsal claws connate at base.
7. (10.) Scrobes dorsal, very close together, the space between them narrower than base of scape; antennæ long and slender, the scape abruptly clavate.—Elytra with long

* In every case the characters given after the rule are always present in the section to which they belong, and they may or may not be present in the next corresponding section. They are not therefore absolutely discriminative characters, but will serve to facilitate exact determination of a genus.

- erect setæ; antennæ inserted beyond middle of rostrum, but at some distance from apex.
8. (9.) Eyes lateral; funicle with joint 2 evidently longer than 1..... 4. *Zeugorygma*, Mshl. (S. Africa.)
9. (8.) Eyes dorsal, very close together, the space between them much narrower than the scape; the two basal joints of funicle subequal 5. *Goniorrhinus*, Fst. (S. Africa.)
10. (7.) Scrobes sublateral, the space between them much broader than the base of the scape; antennæ shorter and thicker, the scape gradually dilated to apex.—Eyes lateral.
11. (12.) Antennæ inserted behind middle of rostrum, funicle with joint 2 scarcely longer than 3; prothorax scarcely narrower than the broadest part of the elytra; elytra broadest near base, strongly acuminate behind, each elytron with a minute apical spine; body with erect setæ; tarsi with joint 1 nearly as broad as 3 6. *Xynœa*, Pasc. (Australia.)
12. (11.) Antennæ inserted near apex of rostrum, funicle with joint 2 much longer than 3; prothorax much narrower than elytra; elytra broadest about middle, without apical spines; body with no erect setæ; tarsi with joint 1 much narrower than 3.. 2. *Bicodes*, gen. nov. (S. Africa.)
13. (4.) Scape of antennæ not exceeding anterior margin of eye; claws connate.
14. (15.) Rostrum long and strongly curved, narrower at the base than the space between the eyes; scrobe not deflected, but continued right up to the eye; funicle with the two basal joints equal, joint 7 as long as broad.—Elytra with erect setæ..... 7. *Synaptonyx*, Waterh. (Australia.)
15. (14.) Rostrum deflected, but almost straight, evidently broader at the base than the space between the eyes; scape strongly deflected, passing far below the eye; funicle with joint 1 longer than 2, 7 strongly transverse.

16. (17.) Rostrum distinctly narrowed from base to near apex, the apical margin dilated and with a short recurved process on each side; eyes lateral; prothorax only slightly narrower at apex than at base; elytra very broadly ovate, with subdepressed setæ. 8. *Euonyx*, gen. nov. (S. Africa.)
17. (16.) Rostrum parallel-sided, the apical margin not dilated, nor reflexed; eyes dorsal or subdorsal; prothorax much narrower at apex than at base; elytra elongate, with short erect setæ 9. *Synaptocephalus*, Fst. (Africa.)
18. (1.) Corbels of posterior tibiæ open.
19. (20.) Scape not exceeding anterior margin of eye.—Claws connate; funicle with joint 1 longer than 2; elytra narrowly marginate at base 10. *Aosseterus*, Schh. (S. Africa.)
20. (19.) Scape exceeding anterior margin of eye.
21. (42.) Rostrum continuous with the head.
22. (39.) Eyes dorsal or subdorsal, the space between them not broader than that between the bases of the antennæ.
23. (26.) Tarsal claws connate at base.
24. (25.) Femora unarmed; tarsi with joint 1 evidently narrower than 3 12. *Haptomerus*, Fst. (Europe & Africa.)
25. (24.) All the femora with a distinct tooth; tarsi with joint 1 almost as broad as 3 11. *Myorrhinus*, Schh. (Europe.)
26. (23.) Tarsal claws free.
27. (28.) Head subglobose; eyes almost circular, situated quite close to the anterior margin of prothorax. 13. *Anathresa*, gen. nov. (S. Africa.)
28. (27.) Head elongate; eyes elongate, depressed and longitudinal, situated at extreme apex of head, the space between the posterior margin of eye and the apical margin of prothorax equal to, or greater than, the length of the eye.—Base of rostrum as broad as the head across the eyes.
29. (38.) Elytra ovate, without any humeral angle.
30. (31.) Intermediate coxæ contiguous; tarsi with joint 1 as broad as 3.

- Antennæ inserted about middle of rostrum 14. *Stereorrhynchus*, Lac. (S. Africa.)
31. (30.) Intermediate coxæ separated; tarsi with joint 1 narrower than 3.
32. (37.) Basal margin of prothorax not bisinuate, truncate in middle; funicle with joint 1 longer than 2; elytra ovate.
33. (34.) Scrobes elongate, produced shallowly backwards; antennæ inserted about middle of rostrum. Rostrum longer than the head. 15. *Umzila*, gen. nov. (S. Africa.)
34. (33.) Scrobes foveiform, subapical; antennæ inserted nearer apex of rostrum.
35. (36.) Rostrum not longer than the head (measured to anterior margin of eye); episternal suture of metasternum obsolete 16. *Malosomus*, Fst. (India, Arabia, Abyssinia.)
36. (35.) Rostrum evidently longer than the head; episternal suture of metasternum distinct and complete. 17. *Atmesia*, Pasc. (Australia.)
37. (32.) Basal margin of prothorax deeply bisinuate, sharply angulate in middle; funicle with joint 2 longer than 1; elytra globose. —Femora with a small tooth; elytra without setæ 18. *Opseorrhynchus*, Fst. (India.)
38. (29.) Elytra suboblong, with a distinct humeral angle.—Rostrum not longer than head; funicle with joint 2 slightly longer than 1; elytra without erect setæ. 19. *Euphalia*, Pasc. (Australia.)
39. (22.) Eyes lateral, the space between them always broader than the space between the bases of the antennæ.
40. (41.) Tarsal claws free; femora armed with a small tooth; posterior coxæ broader than the abdominal intercoxal process 20. *Tanyrrhynchus*, Schh. (S. Africa.)
41. (40.) Tarsal claws connate at base; femora unarmed; posterior coxæ not broader than the abdominal intercoxal process 21. *Eremnodes*, gen. nov. (Madagascar.)
42. (21.) Rostrum separated from head by a transverse impressed line.—Eyes compressed, subdorsal, the space

between them about as broad as that between the antennæ; the latter inserted close to apex, long and slender, the scape exceeding the anterior margin of the prothorax; scrobes continued broadly right up to the eyes; femora unarmed.

43. (44.) Tarsal claws connate; funicle with joint 1 much longer than 2; second tarsal joint narrowly elongate 22. *Ephimerostylus*, Fst. (Africa.)
44. (43.) Tarsal claws free; funicle with joint 2 much longer than 1; second tarsal joint broadly triangular 23. *Nastomma*, gen. nov. (S. Africa.)

1. SYMPIEZORRHYNCHUS, Schh.

Sympiezorrhynchus, Schh. Gen. Curc. vii. 1, p. 170 (1843).—Type *S. camelus*, Boh.

Synopsis of Species.

1. (4.) Prothorax with a broad dorsal elevation.
2. (3.) Eyes depressed, subdorsal, the space between them narrower than the diameter of the eye and bearing a deep frontal furrow; rostrum with a narrow, almost parallel-sided, dorsal elevation from antennæ to base, the space between the scrobes scarcely broader than the base of the scape; basal margin of prothorax strongly rounded; elytra globose 1. *S. camelus*, Boh.
3. (2.) Eyes convex, lateral, the space between them much broader than the diameter of the eye and with only a shallow frontal impression; dorsal elevation of rostrum narrowest behind the antennæ and strongly dilated towards the base, the space between the scrobes much broader than the base of the scape; basal margin of prothorax subtruncate; elytra ovate 2. *S. pulvinatus*, sp. n.
4. (1.) Prothorax not elevated dorsally, simply convex.
5. (6.) Eyes lateral, the space between them hardly narrower than the base of the rostrum 3. *S. signatus*, Boh.
6. (5.) Eyes subdorsal, the space between them much narrower than the base of the rostrum 4. *S. infectatus*, Boh.

1. *Sympiezorrhynchus camelus*, Boh., Schh. *l. c.* p. 171.

NATAL: Malvern (*C. N. Barker*), Isipingo (*G. A. K. M.*).
TYPE in the Stockholm Museum.

2. *Sympiezorrhynchus pulvinatus*, sp. n.

Long. $4\frac{1}{2}$, lat. $2\frac{1}{2}$ mm.

Pallide viridis, fronte et prothoracis elevatione brunneis, elytrorum interstitiis 2 et 4 pallide brunnescentibus.

Caput convexum, oculis lateralibus, fronte lata, in medio minus profunde impressa. Rostrum a capite impressione profunda separatum, in dorso elevatum, elevatione versus basin valde ampliata et supra canaliculata. Prothorax transversus, postice subtruncatus, lateribus paulo rotundatus, prope basin latior, intra apicem leviter constrictus, supra late pulvinato-elevatus, gibbo rugoso inæquali. Elytra late ovata, ad basin conjunctim sinuata, subtiliter punctato-striata, interstitiis latis subplanis, setis brevissimis squamiformibus obsitis.

CAPE COLONY (*coll. Fry*).

TYPE in the British Museum.

3. *Sympiezorrhynchus signatus*, Boh., Schh. *l. c.* p. 173.

CAPE COLONY.

TYPE in the Stockholm Museum.

4. *Sympiezorrhynchus inafectatus*, Boh., Schh. *l. c.* p. 172.

CAPE COLONY: Grahamstown (*coll. Fry*).

TYPE in the Stockholm Museum.

2. BICODES, gen. nov.

Caput breviter subconicum, cum rostro continuum. Rostrum capite longius, subparallelum, leviter arcuatum, subtus rotundatum et squamosum, scrobibus supernis, postice late sed parum profunde ad oculos continuatis. Antennæ sat validæ, prope apicem rostri insertæ, scapo leviter arcuato, ad apicem gradatim parum ampliato, funiculi articulo secundo quam primo perpaulum longiore. Prothorax postice bisinuatus, antice truncatus, nec pone oculos lobatus, intra apicem levissime constrictus. Elytra ovata, tenuiter punctato-striata, ad basin conjunctim emarginata, humeris nullis, setis vix perspiciendis. Pedes sat validi; femora mutica; tibiæ intus non crenulatæ, posticæ corbulis valde cavernosis; tarsi articulo primo quam tertio multo angustiore, secundo evidenter transverso, unguiculis ad basin connatis. Abdomen segmento primo postice truncato, segmento 2=3+4. Coxis posticis elytra attingentibus; metasternum suturâ episterni omnino obsoletâ.

TYPE *B. vittatus*, sp. n.

This genus is extremely similar to *Sympiezorrhynchus*, but in this latter the head is separated from the rostrum by an impressed line, the episternal suture of the metasternum is quite distinct in the basal half, the posterior coxæ do not reach the elytra, the apical margin of the first abdominal segment is slightly sinuate, and finally the scrobe is continued backwards as a narrow curved furrow, quite distinct from the broad lateral impression of the rostrum.

The following is the only species at present known:—

1. *Bicodes vittatus*, sp. n.

Long. 3-4½, lat. 1½-2½ mm.

Piceus, læte viridi- aut aureo-viridi-squamosus; prothorax vittis duabus fuscis dorsalibus latis male definitis; elytra interstitiis 1 et 4 et 5 a basi ultra medium fusco-squamosis.

Caput convexum, fronte lata, in medio stria minuta instructa, oculis lateralibus convexis. Rostrum dorso subelevatum, supra fere planum, nec carinatum nec canaliculatum. Antennæ ferrugineæ, viridi-squamosæ. Prothorax paulum latior quam longior, lateribus leviter rotundatus, prope basin latior, antice attenuatus; supra convexus, punctis parvis confluentibus (a squama densis omnino conditis) undique obsitus, sed margine antico glabro impunctato. Elytra ovata, lateribus fortiter rotundata, prope medium latiora, punctato-striata, interstitiis latis subplanis sub squamositate nitidis et subtiliter coriaceis. Pedes ferruginei, viridi-squamosi.

NATAL: Frere (*G. A. K. M.*).

TYPE in the British Museum.

3. LIPOTHYREA, Pasc.

Lipothyrea, Pasc. Ann. & Mag. N. H. (5) ix. p. 375 (1882).

This genus was placed by Pascoe in the Leptopides, but it entirely lacks the mandibular scar, which is very well developed in the typical members of that group. It is certainly in a far more natural position among the Tanyrrhynchinae. There is only one species.

1. *Lipothyrea chloris*, Pasc. *l. c.*

AUSTRALIA: Port Bowen.

TYPE in the British Museum.

4. ZEUGORYGMA, Mshl.

Zeugorygma, Mshl. Proc. Zool. Soc. 1906, ii. p. 923.—Type *Z. hirta*, Mshl.

Ann. & Mag. N. Hist. Ser. 8. Vol. i.

Synopsis of Species.

1. (2.) Scrobes foveiform, not continued posteriorly; rostrum not carinate; funicle with joints 3 and 4 equal 1. *Z. hirta*, Mshl.
 2. (1.) Scrobes continued posteriorly for some distance, their upper margin bearing a distinct carina; funicle with joint 3 longer than 4 2. *Z. orangiæ*, Mshl.

1. *Zeugorygma hirta*, Mshl. *l. c.* p. 924.

NATAL: Estcourt (*A. E. Haviland*), Frere (*G. A. K. M.*).
 TYPE in the British Museum.

2. *Zeugorygma orangiæ*, Mshl. *l. c.* p. 924.

ORANGE COLONY: Bothaville (*Dr. H. Brauns*). CAPE COLONY: Port Elizabeth (*Dr. Brauns*).
 TYPE in the British Museum.

5. GONIORRHINUS, Faust (*emend.*).

Goniorhinus, Fst. D. e. Z. 1889, p. 142.

Faust states that in this genus the intermediate coxæ are contiguous; such, however, is not the case. These coxæ are narrowly separated as in all other genera of Tanyrrhynchinae except *Stereorrhynchus*, Lac.

1. *Goniorrhinus erinaceus*, Fst. *l. c.* p. 143.

TRANSVAAL.

TYPE in the Dresden Museum.

6. XYNÆA, Pasc.

Xynæa, Pasc. Journ. Ent. ii. p. 419 (1865).

1. *Xynæa saginata*, Pasc. *l. c.* p. 420, pl. xvii. fig. 2.

AUSTRALIA: Gawler.

TYPE in the British Museum.

7. SYNAPTONYX, Waterh.

Synaptonyx, Waterh. Tr. Ent. Soc. Lond. 1853, p. 187.

In the Munich Catalogue this genus is erroneously attributed to Wollaston.

1. *Synaptonyx ovatus*, Waterh. *l. c.* p. 187.

AUSTRALIA.

TYPE in the British Museum.

8. EUONYX, gen. nov.

Caput breve transversum, cum rostro continuum, oculis depressis distantibus lateralibus. Rostrum capite triplo longius, a basi versus apicem valde attenuatum, sed in ipso apice lateraliter reflexo-dilatatum, subtus compressum nudum nitidum; scrobes ad apicem tantum subdorsales, mox infra fortiter deflexi, longe sub oculis desinentes. Antennæ breves, in medio rostri insertæ, scapo marginem anticum oculi vix excedente, funiculi articulo primo quam secundo multo longiore, articulis apicalibus brevissimis transversis, clava late ovata. Prothorax antice et postice subtruncatus, nec pone oculos lobatus, nec ad apicem constrictus. Elytra late ovata, humeris nullis, tenuiter punctato-striata. Pedes mediocres, femoribus muticis, tibiis interne non crenulatis, corbulis posticis subcaavernosis, tarsorum articulo tertio quam primo latiore, unguiculis parvis connatis. Coxæ posticæ elytra attingentes. Episternum metasternale parvum subtriangulare, postice angustatum et abbreviatum.

TYPE *E. sulcirostris*, sp. n.

The chief characters which distinguish this genus are the anterior narrowing of the rostrum, with its recurved apical margin, and the structure of the episterna of the metasternum. The sharp lateral deflection of the scrobes is also a striking character, which is otherwise only to be found in *Synaptocephalus*.

1. *Euonyx sulcirostris*, sp. n.

Long. $2\frac{1}{4}$ – $3\frac{1}{4}$, lat. $1\frac{1}{4}$ –2 mm.

Brunneus aut piceus, pallide cervino- et cæσιο-squamosus, reflexione submetallica.

Caput convexum, fronte lata, stria media angusta instructa.

Rostrum unisulcatum, sulco in medio latiore, versus basin et apicem angustato, supra (velut in capite) setis brevibus suberectis dense obsitum. Antennæ ferruginæ, pallido-setosæ. Prothorax transversus, antice quam ad basin paulo tantum angustior, lateribus rotundatus, in medio latior, supra convexus, levis, dense squamosus et setis parvis suberectis obsitus. Elytra late ovata, in medio latiora, convexa, subtiliter punctato-striata, interstitiis latis, fere planis, setis albis parvis subdepressis seriatim dispositis. Pedes ferruginei, pallido-squamosi.

TRANSVAAL.

TYPE in the Dresden Museum.

9. SYNAPTOCEPHALUS, Faust.

Synaptocephalus, Fst. S. e. Z. 1890, p. 185.—Type *S. kolbei*, Fat.

Synopsis of Species.

1. (6.) Eyes dorsal or subdorsal, forehead much narrower than the rostrum; prothorax with no trace of an ocular lobe or vibrissæ.
2. (3.) Rostrum tricarinate dorsally, not impressed laterally in front of the eye; scrobes continued right beneath the rostrum and almost meeting at its base 1. *S. helleri*, sp. n.
3. (2.) Rostrum not carinate, with a more or less distinct central furrow and with an evident basal subtriangular impression just in front of the eye; scrobes shorter, ending on the side of the rostrum and not continued beneath it.
4. (5.) Eyes very close together, forehead not broader than the apex of the scape; base of elytra truncate, its external angles not projecting 2. *S. kolbei*, Fst.
5. (4.) Eyes further apart, the forehead much broader than the apex of the scape; base of elytra broadly sinuate, its external angles projecting slightly forwards 3. *S. fausti*, sp. n.
6. (1.) Eyes entirely lateral, forehead much broader than the rostrum; prothorax with a faint lateral lobe and distinct postocular vibrissæ 4. *S. jekeli*, Fst.

1. *Synptocephalus helleri*, sp. n.

Long. $4\frac{1}{4}$ – $5\frac{3}{4}$, lat. $1\frac{3}{4}$ – $2\frac{1}{2}$ mm.

Niger, viridi- aut subaureo-squamosus, squamis fuscis intermixtis; prothorax vittis tribus latis subdenudatis notatus.

Caput subconicum convexum, oculis subdorsalibus depressis approximatis, fronte quam clava antennarum angustiore. Rostrum rectum parallelum, longitudini prothoracis æquale, supra leviter tricarinatum, carinis antice abbreviatis; scrobes valde profundi, subtus ad basin rostri continuati et ibi approximati. Prothorax transversus subconicus, ad basin latior, antice valde angustatus, lateribus rotundatus, basi apiceque truncatus, antice ad latera nec lobatus nec fimbriatus, supra convexus, undique punctis parum profundis subconfluentibus instructus. Elytra ad basin leviter conjunctim sinuata, angulis externis non projectis, fortiter punctato-striata, interstitiis parum convexis.

MASHONALAND: Salisbury (*G. A. K. M.*).

TYPE in the British Museum.

In general facies this species is extremely like *S. kolbei*, Fst.

2. *Synptocephalus kolbei*, Fst. S. e. Z. 1890, p. 186.

ZANZIBAR (*Müller*). GERMAN E. AFRICA: Usaramo, Mwiansi (*F. Stuhlmann*).

TYPE in the Dresden Museum.

3. *Synptocephalus fausti*, sp. n.

Long. $6\frac{1}{4}$, lat. $2\frac{3}{4}$ mm.

Niger, squamulis densis pallide virescentibus undique obsitus.

Caput subconicum convexum, oculis sublateralibus depressis, fronte quam clava antennarum latiore, in medio tenuiter canaliculata. Rostrum rectum parallelum, prothorace brevius, ad latera ante oculos triangulariter impressum, supra planum, canaliculo tenui antice abbreviato instructum; scrobes non sub rostro continuati, in ipso latere desinentes, postice minus profundi. Prothorax omnino similis ac in *S. helleri*, sed paulum latior et margine basali leviter sinuato. Elytra etiam velut in *S. helleri*, sed angulis externis baseos prominulis, squamositate densiore et pallidiore.

WHITE NILE (*Richter*).

TYPE in the Dresden Museum.

This species stood in Faust's collection under the MS. name of *S. viridis*, Fst. It quite resembles *S. kolbei*, Fst., in general facies.

4. *Synptocephalus jekeli*, Fst.

Aosseterus jekeli, Fst. Berl. ent. Zeit. 1886, p. 101.

N.W. RHODESIA: Leshumo (*Holub*), Zambesi River (*Dr. Bradshaw*).

TYPE in the Dresden Museum.

The exact position of this species is doubtful, but it appears to me to have more characters in common with *Synptocephalus* than with *Aosseterus*, and it has certainly quite the distinctive facies of the former. In the following characters, which distinguish these two genera, *jekeli* agrees with *Synptocephalus*:—

Synptocephalus.—Corbels of posterior tibiæ narrowly cavernous; lateral margin of elytra with a small emargination near base for the reception of the head of the metasternal episternum; the suture of this episternum only visible at the extreme base; prothorax broadest at base, much narrower at apex; elytra not constricted at base.

Aosseterus.—Corbels of posterior tibiæ open; elytra not emarginate laterally near base; suture of metasternal episternum complete and distinct; prothorax scarcely narrower at apex than at base, its sides strongly rounded and broadest at middle; elytra shallowly constricted at base.

10. AOSSETERUS, Schh.

Aosseterus, Schh. Mant. Sec. Fam. Curc. p. 75 (1847).—Type *A. argentatus*, Fähr.

Synopsis of Species.

1. (2.) Eyes subcompressed, nearer together, the space between them narrower than that between the antennæ; apical lateral margin of prothorax without vibrissæ. 1. *A. strigirostris*, Fähr.
2. (1.) Eyes entirely lateral, convex, the space between them about twice as broad as that between the antennæ; prothorax with distinct vibrissæ.
3. (4.) Head with a fine central stria which is continued nearly to apex of rostrum; scrobe continued broadly up to the eye; size $5\frac{1}{2}$ – $6\frac{1}{2}$ mm. 2. *A. argentatus*, Fähr.
4. (3.) Head without a stria; rostrum with a fine stria on the apical half only; scrobe narrower, curved more downwards, and ending far from the eye; size 3 mm. 3. *A. melancholicus*, Fähr.

1. *Aosseterus strigirostris*, Fähr. Öfv. K. Vet.-Ak. Förh. 1871, p. 11.

Aosseterus cinerascens, Fähr. *l. c.* p. 12.

S.E. AFRICA.

TYPE in the Stockholm Museum, also the type of *cinerascens*.

After a careful examination of the type specimens I can find no character to warrant the recognition of *cinerascens* as a good species; it differs from the typical form only in its smaller size and more grey colouring.

2. *Aosseterus argentatus*, Fähr. *l. c.* p. 11.

TRANSVAAL (*Dr. Chew, A. Böttcher*).

TYPE in the Stockholm Museum.

3. *Aosseterus melancholicus*, Fähr. *l. c.* p. 12.

S.E. AFRICA.

TYPE in the Stockholm Museum.

11. MYORRHINUS, Schh.

Myorhinus, Schh. Disp. Meth. p. 213 (1826).—Type *M. albolineatus*, F

Synopsis of Species.

1. (2.) Funicle with joint 1 much shorter than 2; femora only slightly clavate. 1. *M. albolineatus*, F
2. (1.) Funicle with the two basal joints equal; femora strongly clavate. 2. *M. subvittatus*, Fairm.

1. *Myorrhinus albolineatus*, F. (*Curculio*) Ent. Syst. i. 2, p. 490 (1792); Oliv. Ent. v. 83, p. 423, pl. 23. fig. 322 (1807); Gyl., Schh. Gen. Curc. iii. p. 531 (1836).

Myorrhinus steveni, Gyl. l. c. p. 530.

EUROPE.

TYPE (?).

2. *Myorrhinus subvittatus*, Fairm. Ann. Soc. Ent. France, 1866, p. 267.

ASIA MINOR.

TYPE (? in coll. Lédérer).

12. HAPTOMERUS, Faust.

Haptomerus, Fst. D. e. Z. 1889, p. 142.—Type *H. lepidus*, Brullé.

Synopsis of Species.

- | | |
|---|-----------------------------------|
| 1. (10.) Elytra without erect setæ; forehead not sulcate between the eyes; rostrum more slender, gradually dilated towards apex. | |
| 2. (5.) Second joint of funicle longer than first. | |
| 3. (4.) Third joint of funicle not longer than fourth; elytra more globose, the punctures coarser, the intervals narrower and more convex. | 1. <i>H. siculus</i> , Kraatz. |
| 4. (3.) Third joint of funicle longer than fourth; elytra more elongate, the punctures less coarse, the intervals broader and almost plane | 2. <i>H. lepidus</i> , Brullé. |
| 5. (2.) First joint of funicle longer than second. | |
| 6. (7.) Scrobes sublateral, only partly visible from above, their lower edge not continued in front of the antennæ. Eyes situated apparently on the base of the rostrum. | 3. <i>H. schneideri</i> , Kirsch. |
| 7. (6.) Scrobes dorsal, entirely visible from above, their lower edge continued almost to apex. | |
| 8. (9.) Eyes on vertex of head, their diameter being much longer than the space between them and the margin of the thorax; rostrum tricarinate basally, apical part bare, shiny, and with no central furrow; first joint of funicle elongate, simply clavate. | 4. <i>H. mashunus</i> , sp. n. |
| 9. (8.) Eyes apparently on base of rostrum, their diameter being less than the | |

- space between them and the thorax; rostrum not carinate basally, apical part squamose and with a distinct central furrow; first joint of funicle triangular . . .
10. (1.) Elytra with long erect setae; forehead with a short furrow between the eyes; rostrum very stout, parallel-sided. The two basal joints of funicle subequal; rostrum with a distinct furrow from base to apex. 5. *H. limis*, Gyl.
6. *H. natalis*, sp. n.

1. *Haptomerus siculus*, Kraatz (*Myorhinus*), B. e. Z. 1859, p. 56.

SICILY.

TYPE in the German National Entomological Museum.

2. *Haptomerus lepidus*, Brullé, Expéd. Mor. iii. p. 246.

E. EUROPE.

TYPE (?).

3. *Haptomerus schneideri*, Kirsch (*Myorhinus*), Verh. nat. Ver. Brünn, 1879, p. 32.

CAUCASUS: Kiptschakh (*Oscar Schneider* and *Hans Leder*).

TYPE (?).

This species is unknown to me.

4. *Haptomerus mashunus*, sp. n.

Long. $2\frac{1}{2}$ –4, lat. $1\frac{1}{5}$ – $2\frac{1}{4}$ mm.

Nigro-piceus, squamulis pallidis submetallicis parcis, versus dorsi marginem densioribus, indutus, macula parva pallida basali in interstitio elytrorum tertio; setis vix perspicendis.

Caput breviter subconicum, oculis magnis dorsalibus approximatis, prope marginem thoracis sitis. Rostrum elongatum minus crassum, versus apicem paulo ampliatur, valde arcuatum, supra post antennas tenuiter tricarinatum, antice glabrum nitidum subtiliter punctulatum; scrobes dorsales, pæne ad oculos minus profunde extensi. Prothorax transversus, antice posticeque truncatus, lateribus rotundatus, in medio lator, versus apicem parum angustatus, supra confertim subtiliter granulatus et æqualiter sparse squamosus. Elytra breviter ovata, humeris rotundatis, ante medium latiora, late et profunde punctato-striata, interstitiis angustis, marginibus inflexis omnino nudis.

MASHONALAND: Salisbury (*G. A. K. M.*).

TYPE in the British Museum.

5. *Haptomerus limis*, Gyl. (*Myorhinus*), Schh. Gen. Curc. iii. p. 532 (1836).

Myorhinus incisirostris, Gyl. l. c.

Myorhinus setarius, Fähr. op. cit. vii. 2, p. 421 (1843).

CAPE COLONY.

TYPES of all three forms in the Stockholm Museum.

After a prolonged examination of the unique type specimens I have failed to find any characters by which *incisirostris* and *setarius* can be distinguished from *limis*. The structural characters cited by Gyllenhal in the case of *incisirostris* arise simply from the fact that the type is entirely denuded of scales; while *setarius* differs from *limis* only in its much smaller size.

6. *Haptomerus natalis*, sp. n.

Long. $1\frac{3}{5}$ – $1\frac{3}{4}$, lat. 1 – $1\frac{1}{5}$ mm.

Niger, squamis cinereis densis undique indutus, in clytris setis longis erectis parce obsitus.

Caput elongatum, antice productum, oculis depressis subdorsalibus approximatis, a thorace distantibus, inter se a sulco brevi separatis. Rostrum capite longius crassum arcuatum parallelum, ad basin non angustius quam caput ad oculos, supra a basi ad apicem evidenter unisulcatus; scrobes latissime sed parum profunde ad oculos continuati. Prothorax transversus, antice posticeque truncatus, lateribus leviter rotundatus, pone medium latior, versus apicem multo angustatus, supra convexus, dense æqualiter squamosus. Elytra breviter ovata, ad basin truncata, prope medium latiora, dense squamosa et tenuiter striata, sed in exemplo detrito evidenter punctato-striata, interstitiis latis nitidis impunctatis. Pedes breves validi dense squamosi, tarsi rufescentibus.

NATAL: Estcourt (*G. A. K. M.*).

TYPE in the British Museum.

13. ANATHRESA, gen. nov.

Caput breve, oculis subdorsalibus depressis approximatis. Rostrum elongatum arcuatum subparallelum, subtus nudum subcompressum; scrobes variabiles, aut subfoveiformes, aut ad oculos plus minus profunde continuati. Antennæ prope medium rostri insertæ, scapo fere recto, gradatim clavato, quam funiculo evidenter brevior, marginem posticum oculi attingente, funiculi articulis duobus basalibus subæqualibus, aut primo longiore. Prothorax transversus, antice truncatus et angustior. Elytra breviter ovata, punctato-striata. Pedes femoribus inermibus. corbulis tibiæ posticarum apertis, tarsorum articulo primo subquadrato, quam tertio angustiore, unguiculis liberis.

TYPE *Myorrhinus globulosus*, Fähr.

The only essential character which distinguishes this genus from *Haptomerus* is the free tarsal claws.

Synopsis of Species.

1. (4.) Curvature of the forehead on the same level as that of the rostrum; scrobes continued backwards right up to the eye; first joint of funicle not longer than second; base of rostrum much narrower than the width of the head across the middle of the eyes.
2. (3.) Elytra without erect setæ; scrobes very deep posteriorly 1. *A. calva*, sp. n.
3. (2.) Elytra with dense erect setæ; scrobes shallow posteriorly 2. *A. longstaffi*, Mshl.
4. (1.) Forehead more or less elevated above the level of the rostrum; scrobes evanescent posteriorly; first joint of funicle longer than second; base of rostrum about as broad as the head across the middle of the eyes. Elytra with erect setæ.
5. (6.) Rostrum stouter, gibbous at the insertion of the antennæ, with a narrow central furrow (sometimes obsolete near the base), which is broader and deeper near the apex. 3. *A. globulosa*, Fähr.
6. (5.) Rostrum more slender, not gibbous at the insertion of the antennæ, convex above and without any central furrow. 4. *A. crenulosa*, Fähr.

1. *Anathresa calva*, sp. n.

Long. $4\frac{1}{2}$, lat. $2\frac{1}{5}$ mm.

Niger, cinereo-viridi-squamosus, setis brevibus albis depressis obsitus.

Caput subglobosum, fronte supra rostrum non elevata. Rostrum supra planum, nec sulcatum nec carinatum; scrobes ante antennis anguste ad apicem continuati, postice late et profunde ad oculos extensi. Antennæ articulis funiculi duobus basalibus subæqualibus. Prothorax postice truncatus, lateribus valde rotundatus, in medio latior, supra subtilissime confertim punctatus. Elytra late ovata, ad basin truncata, postice acuminata, humeris rotundato-productis, supra tenuiter punctato-striatis, interstitiis latis subplanis. Pedes piceo-ferruginei, squamis et setis pallidis induti.

TRANSVAAL (*A. Böttcher*).

TYPE in the British Museum.

This species may be distinguished from all its congeners

by its larger size, its more roundly prominent shoulders, its very deep scrobes, and, finally, by the absence of erect setæ. The only specimen I have seen was kindly given to me by Dr. Walter Horn, of Berlin.

2. *Anathresa longstaffi*, Mshl. (*Myorrhinus*) Proc. Zool. Soc. 1906, ii. p. 932 (1907).

CAPE COLONY: East London (*Dr. G. B. Longstaff*).
TYPE in the Oxford Museum.

3. *Anathresa globulosa*, Fähr. (*Myorhinus*) Öfv. K. Vet.-Ak. Förh. 1871, p. 221.

Myorhinus setipennis, Fähr. l. c.

MATABELELAND: Buluwayo (*G. A. K. M.*).

TYPE in the Stockholm Museum; also the type of *setipennis*.

After a careful comparison of the types I am satisfied that *setipennis* is merely the male of *globulosa*. Wahlberg's specimens were probably taken in the Transvaal.

4. *Anathresa crenulosa*, Fähr. (*Myorhinus*) l. c. p. 222.

CAFFRARIA (*Wahlberg*).

TYPE in the Stockholm Museum.

I have seen only the unique type.

14. STEREORRHYNCHUS, Lac.

Stereorrhynchus, Lac. Gen. Col. vi. p. 371 (1863).

Stenocephalus, Schh. Mant. sec. Curc. 1847, p. 77 (nom. præocc.).

1. *Stereorrhynchus setipennis*, Fähr. Öfv. K. Vet.-Ak. Förh. 1871, p. 220.

TRANSVAAL (*A. Böttcher*).

TYPE in the Stockholm Museum.

15. UMZILA, gen. nov.

Caput antice elongatum, oculis dorsalibus approximatis longitudinalibus, quasi in basi rostri positis. Rostrum capite longius, parallelum, arcuatum, subtus nudum nitidum: scrobes dorsales, antice producti, postice parum profunde continuati. Antennæ subvalidæ, in medio rostri positæ, scapo fere recto, gradatim clavato, oculos superante, funiculi articulo primo quam secundo longiore, articulis apicalibus transversis. Prothorax transversus, antice et postice truncatus, lateribus rotundatus. Elytra late

ovata, evidenter punctato-striata, hispida. Pedes validi, femoribus muticis, corbulis tibiæ posticarum apertis, tarsorum articulo primo quam tertio angustiore, unguiculis liberis. Abdomen segmento primo postice emarginato, 2=3 et 4 simul sumptis. Sutura episternalis metasterni ad basin tantum videnda.

TYPE *Umzila swynnertoni*, sp. n.

This genus most nearly approaches *Malosomus*, Fst., from which it differs in the structure of the scrobes, the greater length of the rostrum as compared with the head, and the much shorter and thicker legs and antennæ.

1. *Umzila swynnertoni*, sp. n.

Long. $3\frac{3}{4}$, lat. $1\frac{3}{4}$ mm.

Niger, dense viridi-squamosus, unicolor, setis pallidis erectis confertim obsitis, abdomine cinereo-squamoso.

Caput convexum, fronte inter oculos evidenter striata. Rostrum supra dense squamosum, convexum, nec sulcatum nec carinatum. Antennæ piceo-ferruginæ, pallido-squamosæ. Prothorax lateribus rotundatus, antice posticeque angustatus, in medio lator, supra confertim evidenter punctatus. Elytra late ovata, ad basin truncata, humeris rotundatis; supra fortiter punctato-striata, interstitiis subplanis, setis brevibus erectis dense seriatim obsitis. Pedes picei, squamis cinereo-virescentibus induti.

GAZALAND: Chirinda Forest (*C. F. M. Swynnerton*).

TYPE in the British Museum.

I have much pleasure in dedicating this species to my friend Mr. Swynnerton, who has made a very valuable collection of the animals and plants which occur in the highly interesting and isolated patch of primeval forest at Chirinda.

16. MALOSOMUS, Faust.

Malosomus, Fst. D. e. Z. 1898, p. 279.—Type *M. lineatus*, Fst.

Synopsis of Species.

- | | |
|---|-------------------------------|
| 1. (2.) Femora with a small tooth; each elytron with two bare black stripes. Elytra narrowly elongate; body with fine long erect hairs. | 1. <i>M. lineatus</i> , Fst. |
| 2. (1.) Femora unarmed; elytra with uniform scaling. | |
| 3. (4.) Prothorax with only a few widely scattered punctures; elytra elongate, oval, with long erect setæ throughout. | 2. <i>M. andrewesi</i> , Fst. |
| 4. (3.) Prothorax closely and distinctly punctured; elytra broadly ovate, the setæ in the basal half short and depressed. | |

5. (6.) Elytra with brownish-grey scaling and with short erect setæ on the declivity; posterior tibiæ very finely serrate internally; rostrum with a shallow central furrow in the apical half 4. *M. abyssinicus*, sp. n.
6. (5.) Elytra with green scaling, the setæ minute and depressed throughout; posterior tibiæ not serrate internally; rostrum with only a shallow fovea between the antennæ 3. *M. arabicus*, sp. n.

1. *Malosomus lineatus*, Fst. D. e. Z. 1898, p. 279.

S. INDIA: Belgaum (*H. E. Andrewes*).
TYPE in the Dresden Museum.

2. *Malosomus andrewesi*, Fst. l. c. p. 280.

S. INDIA: Belgaum (*H. E. Andrewes*).
TYPE in the Dresden Museum.

3. *Malosomus arabicus*, sp. n.

Long. $2\frac{3}{4}$, lat. $1\frac{1}{4}$ mm.

Piceus, squamulis viridibus undique vestitus, setis paucis minutis depressis obsitus.

Caput valde elongatum, oculis quasi in rostro sitis, dorsalibus subcontiguis depressis longitudinalibus, fronte canaliculo parvo pone oculos insculpta. Rostrum capite non longius, ad basin non angustius quam caput ad oculos, supra convexum, nec carinatum nec sulcatum, subtus nudum nitidum. Antennæ valde tenues, rufo-piceæ; funiculi articulus primus secundo multo longior. Prothorax transversus, basi apiceque truncatus, lateribus rotundato-ampliatum, in medio latior, supra confertim punctatus, linea media levior. Elytra ovata, ad basin subtruncata, humeris obliquis, fortiter punctato-sulcata, interstitiis latis subplanis. Pedes flavo-rufi, squamis pallidis parce induti, tibiis posticis interne non serratis.

ARABIA: Yemen (*coll. Fry*).
TYPE in the British Museum.

4. *Malosomus abyssinicus*, sp. n.

Long. $3\frac{3}{4}$, lat. $1\frac{3}{4}$ mm.

Nigro-piceus, squamulis fusco-cinereis undique vestitus, in elytris setis brevibus, versus basin depressis, versus apicem erectis, obsitus. Caput et rostrum ut in *M. arabico*, sed hoc sulco parum profundo versus apicem instructum. Prothorax etiam ut in *M. arabico*, sed punctis majoribus minus approximatis instructus.

Elytra late ovata, ad basin leviter emarginata, humeris rotundatis, evidenter punctato-striata, interstitiis latis subplanis. Pedes rufo-picci, cinereo-squamosi, tibiis posticis interne subtiliter serratis.

ABYSSINIA (*coll. Bowring*).

TYPE in the British Museum.

17. ATMESIA, Pasc.

Atmesia, Pasc. Journ. Linn. Soc. x. p. 438 (1870).—Type *A. marginata*, Pasc.

Synopsis of Species.

1. (2.) Rostrum with a very fine central stria; sides of prothorax scarcely narrowed behind middle, the posterior angles strongly produced backwards; elytra with sparse erect setæ; colour pale sandy with a metallic reflection, pronotum with three black stripes, the elytra variegated dorsally with irregular black markings 1. *A. marginata*, Pasc.
2. (1.) Rostrum with a broad central furrow; sides of prothorax strongly narrowed behind middle, the posterior angles not produced; elytra with minute scale-like setæ; colour uniform greenish-grey throughout. 2. *A. glaucina*, Pasc.

1. *Atmesia marginata*, Pasc. *l. c.* p. 469, pl. xviii. fig. 3.

S. AUSTRALIA: Gawler.

TYPE in the British Museum.

2. *Atmesia glaucina*, Pasc. *op. cit.* xi. p. 446 (1872).

W. AUSTRALIA: Nicol Bay.

TYPE in the British Museum.

18. OPSEORRHINUS, Fst. (*emend.*).

Opseorrhinus, Fst. D. e. Z. 1898, p. 280.

1. *Opseorrhinus globulus*, Fst. *l. c.* p. 281.

INDIA: Belgaum (*H. E. Andrewes*), Kanara (*T. Bell*).

TYPE in the Dresden Museum.

19. EUPHALIA, Pasc.

Euphalia, Pasc. Journ. Linn. Soc. x. p. 467 (1870).

1. *Euphalia pardalis*, Pasc. l. c. p. 468.

W. AUSTRALIA: Nicol Bay.

TYPE in the British Museum.

20. TANYRRHYNCHUS, Schh.

Tanyrrhynchus, Schh. Disp. meth. p. 212 (1826).—Type *T. strigirostris*, Sparrm.

Owing to the unfortunate lack of adequate material, I am unable to give a synopsis of the species of this difficult genus. Of the fifteen species described by Boheman the types of no less than six have been lost. I have seen no example of *T. asiaticus*, Ménétr., from Turkestan, or *T. viridis*, Fst. (D. e. Z. 1889, p. 144), from India; but it is probable that they do not really belong to the genus, for all the remaining species are entirely confined to Cape Colony. *T. costirostris*, Boh., and *T. biguttatus*, Boh., belong to the genus *Stramia*, Mshl. With these exceptions the list of species given in the Munich Catalogue remains unaltered.

21. EREMNODES, gen. nov.

Caput subglobosum, oculis lateralibus depressis. Rostrum a capite non separatum, thorace paulum longius, arcuatum, subtus nudum nitidum subcompressum, supra simpliciter convexum et squamosum; scrobes sub dorsales, late et profunde ad apicem continuati, postice angustati et minus profundi, oculos vix attingentes. Antennae longae, scapo oculum superante, funiculi articulo secundo quam primo duplo longiore, articulis apicalibus non transversis, clava magna elongata. Prothorax transversus, antice et postice truncatus, prope apicem leviter constrictus. Elytra ovata, ad basin truncata, humeris nullis, leviter punctato-striata. Pedes sat validi, femoribus inermibus, corbulis tibiatarum posticarum apertis, tarsorum unguiculis connatis. Abdominis segmentum primum postice truncatum, 2=3+4; epimeron mesosternale vix perspicendum; episternum metasternale angustum, sed distinctum.

TYPE *Tanyrrhynchus? pusillus*, Fst.

1. *Eremnodes pusillus*, Fst. D. e. Z. 1889, p. 144.

MADAGASCAR (*Dr. Pipitz*).

TYPE in the Dresden Museum.

22. EPHIMEROSTYLUS, Fst.

Ephimerostylus, Fst. S. e. Z. 1894, p. 146.—Type, *E. theryi*, Fst.

Synopsis of Species.

- | | |
|--|-------------------------------|
| 1. (2.) Colour piceous, without scaling, but with thin, brown, recumbent pubescence; elytra without erect setæ | 1. <i>E. theryi</i> , Fst. |
| 2. (1.) Colour shining black, with dense green or golden scaling, the elytra with the intervals 1, 4, and 5 more or less denuded; elytra with long, erect, pale setæ | 2. <i>E. elegans</i> , sp. n. |

1. *Ephimerostylus theryi*, Fst. l. c. p. 147.

ABYSSINIA: Alitiena, Erytrea (*Thery*).

TYPE in the Dresden Museum.

2. *Ephimerostylus elegans*, sp. n.

Long. 5–5½, lat. 2–2½ mm.

Niger, squamis viridibus aut aureis dense indutus, elytrorum interstitiis 1, 4 et 5 plus minus denudatis micantibus; in elytris setis longis erectis pallidis obsitus.

Caput elongatum subconicum, fronte inter oculos leviter impressa aut striata, oculis subdorsalibus approximatis parum convexis.

Rostrum capite longius, parallelum, supra squamosum, inter scrobes indistincte tricarinatum, subtus nudum nitidum impunctatum; scrobes antice elongato-foveiformes, sed postice late et sat profunde ad oculos continuati, undique viridi-squamosi. Antennæ prope apicem insertæ, valde tenues et elongatæ, ferrugineæ. Prothorax transversus, antice et postice truncatus, lateribus rotundatus, in medio latior, supra subcoriaceus, granulis parvis depressis obsitus, in medio baseos interdum longitudinaliter impressus. Elytra elongato-ovata, ad basin subtruncata, evidenter punctato-striata, interstitiis subplanis vix acieulatis. Pedes elongati, nigri, dense viridi- aut aureo-squamosi, tibiis subtus pilis longis fimbriatis.

♂ angustior, tibiis anticis longioribus tenuioribus magis curvatis, tibiis posticis interne sinuatis et complanatis, tibiaram pilis multo longioribus; ♀ tibiis posticis interne subtiliter serratis.

MASHONALAND: Salisbury (*G. A. K. M.*); Gwibi River (*H. Dobbie*).

TYPES, ♂ ♀, in the British Museum.

23. NASTOMMA, gen. nov.

Caput subquadratum, antice paulo attenuatum, oculis lateralibus depressis. Rostrum a capite stria transversa angulata separatum,

thorace vix brevius, versus apicem paulo angustius, subtus fere nudum, fortiter punctatum; scrobes dorsales, antice profundi curvati, apicem fere attingentes, postice late et minus profunde ad oculos continuati ibique squamosi. Antennæ prope apicem insertæ, elongatæ, scapo curvato clavato, apicem thoracis superante, funiculi articulo secundo quam primo multo longiore, articulis apicalibus elongatis. Prothorax transversus, antice posticeque truncatus. Elytra ovata, humeris nullis, ad basin subtruncata, evidentè punctato-striata. Pedes sat validi, femoribus clavatis inermibus, tibiis fere rectis, apice inermibus, corbulis posticis apertis, tarsorum articulo primo lato (tertio fere æquali), secundo angustiore sed lato triangulari, unguiculis liberis. Abdominis segmentum primum postice truncatum, secundum brevius quam 3+4; sutura episterni metasternalis ad basin tantum perspicienda.

TYPE *Sciobius squamulosus*, Boh.

The species upon which this genus is founded cannot remain in *Sciobius*, because the mandibular scar is entirely wanting. The maxillæ are not exposed laterally, but the palpi are partially visible beyond the apex of the mentum.

1. *Nastomma squamulosa*, Boh. (*Sciobius*), Schh. Gen. Curc. vii. 1, p. 194 (1843); Marshall, Proc. Zool. Soc. 1906, i. p. 274.

CAPE COLONY: Grahamstown.

TYPE in the Stockholm Museum.

III.—*The Collections of William John Burchell, D.C.L., in the Hope Department, Oxford University Museum.*

- IV. *On the Lepidoptera Rhopalocera collected by W. J. Burchell in Brazil, 1825-1830.* By CORA B. SANDERS, of Lady Margaret Hall, Oxford.

[Continued from ser. 7, vol. xiii. p. 371.]

IV. MORPHINÆ.

THE following paper contains an account of the Morphinæ and Brassolinæ collected by Burchell in Brazil. The notes of habits and modes of flight are not only of the deepest interest on account of their early date, but even more from their intrinsic value and the precision conferred by the

association of each record with a particular specimen. In checking the data in the manuscript I have had much kind and efficient help from Mr. J. C. Moulton, of Magdalen College. The probability of error is so high in a work of this kind, that the task of verification is both prolonged and laborious. The manuscript of all papers on this Brazilian collection requires the most careful comparison with the data on the specimens themselves, with those contained in Burchell's two manuscript note-books, and in Professor Westwood's list, while the inevitable occasional inconsistencies between these sources demand the utmost attention.

Professor Westwood's manuscript Catalogue of "Burchell's Morphides" contains both *Morphinæ* and *Brassolinæ* grouped under 27 numbers, some of which were afterwards united by a bracket. With one or two exceptions the material is entirely unnamed. The list itself, which is neatly written in a clerk's hand, contains several errors, of which the probable corrections are indicated below. A note and two suggested names in Professor Westwood's handwriting are seen opposite three of the species separated out by him. A single number in the list "M. 21" refers to a Nymphaline butterfly (a *Prepona*) accidentally included and afterwards detected by Professor Westwood; while one Brassoline butterfly was accidentally placed in the Catalogue of *Hipparchia* (H. 5) and two of the same group in the Catalogue of Nymphalines (N. 18 and N. 20*).

The following arrangement of numbers and dates is carefully explained in Ann. & Mag. Nat. Hist. ser. 7, vol. xiii., April 1904, pp. 309, 310. Notes, other than numbers and dates, written on labels attached to the specimens are placed between inverted commas immediately after the numbers in heavy type, and immediately before the locality. They are found on relatively few specimens. When a specimen bears a number only, the date, recovered from Burchell's note-book, is placed between square brackets. "a." and "p." associated with the date stand for "A.M." and "P.M."

E. B. POULTON.

Morpho laertes, Drury.

- Bz. + 23. 2. 26. = **355**. Organ Mountains. Near Frechal,
near R. Pacaqué.
19. 3. 26. = **356**. Rio de Janeiro. "In the valley of
Catombí."
22. 3. 26. = **357**. Rio de Janeiro. "Along the [Carioca]
Aqueduct to the head of the valley of Laranjeiros."

3. 4. 26. = **358**. Rio de Janeiro. "Along the Carioca Aqueduct."
 4. 3. 27. = **359-361**. Near S. Paulo. "Morumbý: over the hilly pastures E^d of the house."
Bz. 4. 3. 27. = **362**. "Lente volans, secus marginem sylvæ." Near S. Paulo. As **359-361**.
 12. 3. 27. = **363**. "In silvis et silvaticis." Near S. Paulo. "Morumbý. Walk to old house."
 16. 3. 27. = **364**. "Between Morumbi and S. Páulo."
 Westwood's list, which also includes no. **365**, agrees, save for the statement that two specimens were captured 16. 3. 27.

Morpho catenarius, Perry.

4. 3. 27. = **365**. Near S. Paulo. (As **359**.)

Morpho perseus, Cram.

- Bz.* + 2. 6. 29. = **366**. "Picked up floating dead on the river." R. Tocantins, just below Baião: "Sitio das Pedras."
 Westwood's list agrees.

Morpho anaxibia, Esp.

1067. 3. 4. 26. ♂ = **367**. Rio de Janeiro. "Along the Carioca Aqueduct. *Papilio*. 'O. Imperador?' Above entirely metallic blue, beneath a plain brown."

Westwood's list agrees, but does not include the following specimen.

6. 3. 27. ♂ = **368**. "Hab. in densis sylvarum volatu lento altiore in cursu subrecto." Near S. Paulo; "Morumbý. Road N.N.W. of house."

The following passage in the Brazilian note-book almost certainly refers to this species:—"6. 3. 27. *Papilio*—at Morumbý. In the interior of the forest. Flies slowly and steadily; generally high."

[Three wings of this specimen with Burchell's MS. label fortunately still attached, were found, Feb. 2, 1904, among insects of entirely different orders.—E. B. P.]

Morpho adonis, Cram.

28. 10. 25. ♂ = **369**. Minas Geraës. "In the Forest on the West and on the East side of S. João de Nêpomucéna."
 29. 10. 25. 2 ♂ = **370, 371**. Minas Geraës. "In the forest on the S.E. side of S. João de Nêpomucéna."

29 or 30. 10. 25. ♂ = **372**. Two labels affixed to one specimen. Minas Geraës. (As **370** or **373**.)

30. 10. 25. 2 ♂ = **373, 374**. Minas Geraës. " (In the forest.) On the N.E. side of the Arraial of São João de Nêpomucéna."

23. 2. 26. ♂ = **375**. Organ Mountains. (As **355**.)

Westwood's list gives another individual with the data 8 p. 15. 2. 26, and also indicates that the two labels on no. **372** were placed upon two individuals at the time when the Catalogue of Morphides was written. Burchell was near the R. Pacaqué in the Organ Mountains on Feb. 15, 1826. His Geographical Catalogue reads "along the road, 1½ mile S. of the house."

Morpho cytheris, Godt., = *portis*, Hübn.

11. 2. 26. ♂ = **376**. Organ Mountains. "By the River Pacaqué." "In a walk to the Ipé trees."

Bz. + 20. 2. 26. ♂ = **377**. Organ Mountains. Near R. Pacaqué. "Near a Rivulet East of the house."

Westwood's list agrees.

Morpho menelaus, Linn., f. *terrestris*, Butl.

Bz. + 23. 7. 29. = **378**. Pará. "Between my house and the City."

Westwood's list agrees. He placed this and the following under the same catalogue no.

Morpho menelaus, Linn., f. *menelaus*, Linn.

23. 7. 29. = **379**. Pará. (As **378**.)

Westwood's list agrees.

Morpho menelaus, Linn., f. *nestor*, Linn.

Bz. 1367. + Bz. 22. 4. 29. Sylva mas et fœm. + 22. 4. 29. 1367 fœm. ♀ = **380**. R. Tocantíns, Porto Real [Naçãoale]. The specimen bears two Brazilian labels and one English.

Westwood's list agrees, save that by a clerical error 1376 is written for 1367. The corresponding label of the male associated with **380** is probably misplaced upon a female specimen of *M. achilles*, no. **404**.

Morpho achilles, Linn., f. *achilleana*, Hübn.

Bz. 308. [14. 10. 25.] ♂ = **381**. Minas Geraës. Burchell was at Parahiba on Oct. 12 and "at the Discobérto do

Antonio Velho" on Oct. 15. "*Papilio*. Magna. Supra cœrulea, margine lato nigro, punctis (albis in anterioribus, et rubris in posterioribus) marginalibus. Macula alba in margine anteriore alarum anteriorum. Subtus fusca ocellis pluribus." "This inhabits thick forests and hovers along alleys and openings in the woods, and is difficult to catch, although it flies generally near the ground."

- Bz.* 576. [21. 10. 25.] ♀ = 382. Minas Geraës. "*Papilio*. In a rossa at Discoberto, and along a channel (on the margin of the forest) which conducts water to the house." Westwood's list gives "567,"—almost certainly a clerical error.
29. 10. 25. ♀ = 383. Minas Geraës. (As 370.)
4. 11. 25. ♂ = 384. Minas Geraës. Near Nêpomucéna at Francisco Manoel's. "4th. Some tropeiros from the rancho seeing me catching Papilionidæ, caught a few also for me. I afterwards ascended the hill into the forest northward of our Rancho and took insects, till wet through in a thunder shower."
7. 11. 25. ♂ = 385. Minas Geraës. Near Nêpomucéna. On Nov. 6th Burchell was at Capitão Leite's."
15. 2. 26. 2 ♂ = 386, 387. Organ Mountains, near R. Pacaquê. "Along the road, 1½ miles S. of the house."
- Bz.* + 28. 2. 26. ♀ = 388. Organ Mountains. "On the Rio Magé."
7. 3. 26. ♂ = 389. Rio. "At Catombí."
- Bz.* 10. 3. 26. ♂ = 390. Rio.
10. 3. 26. ♀ = 391. Rio.
12. 3. 26. ♂ = 392. Rio. Carioca Aqueduct.
- Bz.* a 13. 3. 26. ♂ = 393. "From Magé." Rio.
- Bz.* 19. 3. 26. ♂ = 394. Rio. "In the valley of Catombí."
19. 3. 26. ♂ = 395. Rio. "In the valley of Catombí."
- Bz.* 20. 3. 26. ♂ = 396. Rio. "Along the Carioca Aqueduct."
20. 3. 26. 2 ♂ & ♀ = 397, 398. Rio. "Along the Carioca Aqueduct."
21. 3. 26. 3 ♀ = 399, 400, 401. Rio. "Along the Carioca Aqueduct."
- Bz.* 1. 4. 26. ♀ = 402. Rio. "In the valley of Catumbi."
1. 4. 26. ♂ = 403.
1367. 22. 4. 29. ♀ = 404. "Mas." Porto Real [Naçionale], R. Tocantins. Although the word "Mas" is written upon the label, the specimen is a distinct female.
- In addition to the clerical error noted under no. 382,

Westwood's "Morphides 1" includes one more individual captured 10. 3. 26 and another bearing the date "14. 1. 26 Laranjeiros." The Brazilian note-book shows that Burchell visited the valley on 14. 1. 26 and that his captures were "omnia insuper plantas." Furthermore the data of no. 404 appear under the next number of Westwood's Catalogue, while those of no. 405 appear under no. 404, as though there had been an accidental transposition at some later date. Error in the data of no. 404 is also rendered probable from the fact that all the other examples of the *achilleana* form were captured at or in the neighbourhood of Rio, while 22. 4. 29 indicates a locality much further north. The possibility of Burchell mistaking the females of two allied species for male and female of a single species must, however, also be borne in mind.

Morpho achilles, Linn., f. *helenor*, Cram.

31. 10. 27. ♂ = 405. "In sylva opaca." E. of Goyaz : Sapezal to Campo Alegre.
 1247. 5 p. 7. 9. 28. ♂ = 406. Between Jaragua and Cavalcante ; near Rio Maranhao : Fe Guarda Mor. Burchell slept that night at Fe Guarda Mor. "*Papilio*. This species hovers low among the brushwood in shady deep forests and is not easy to catch."
 Bz. + 6. 4. 29. ♂ = 407. Porto Real (Nacionale).
 6. 4. 29. ♂ = 408. " "
 Bz. + 7. 4. 29. ♂ = 409. " "
 Bz. + 3. 6. 29. ♂ = 410. Rio Tocantins : N. of Sitio das Pedras and Baiao.
 7. 7. 29. ♀ = 411. Para. "Eastward of my house."
 Bz. + 29. 7. 29. ♀ = 412. Para. Westwood's label on this specimen refers to M (Morphides) no. 5 of his Catalogue, which reads 27. 7. 29, doubtless a mistake in copying.
 Bz. + 31. 7. 29. ♂ = 413. Para.
 7. 8. 29. ♂ = 414. Para.
 6. 9. 29. ♂ = 415. Para, S. Jose. "Walk [to] a rocinha near the Nazareth Church."
 15. 12. 29. ♂ = 416. Para : "suburbane."

In addition to the points mentioned after no. 404 and the clerical error in the case of 412, Westwood's list also differs in containing a specimen dated 1. 7. 29, when Burchell was at Para and took a "walk to the Caza de Pao." Westwood arranged the specimens under four numbers, Morphides 2-5, but subsequently bracketed all except 5 (containing only

no. 412), and noted of them, "Similar to No. 1, but fascia more distinct and reaching nearly to hind margin of h. w."

V. *BRASSOLINÆ*.

Dasyophthalma creusa, Hübn.

9. 2. 26. ♂ = 417. Organ Mountains. "By the river Pacaqué."

9. 3. 26. ♀ = 418. Rio.

No data. ♂ = 419.

Westwood's list agrees, but he separated the males and the female under different numbers.

Dasyophthalma rusina, Godt.

8. 2. 26. 2 ♂ = 420, ♀ = 421. Organ Mountains, near head of R. Pacaqué. "In a ride to the Cattle Pounds and the Milho Roça."

"♀? vel var. fasc. alar. ant. antea recurva." Westwood's note.

9. 2. 26. ♂ = 422. Organ Mountains. (As 417.)

11. 2. 26. 2 ♂ = 423, 424. Organ Mountains. "By the River Pacaqué." "In a walk to the Ipé trees."

On 424 Westwood's note reads "*Dasyophthalma Rusina* God G D L 56. *Lycaon* Lucas pl. 78." The reference is to Doubleday's and Westwood's 'Genera of Diurnal Lepidoptera,' London, 1850-2, vol. ii. pl. lvi. fig. 1 (*Pavonia rusina*).

14. 2. 26. ♂ = 425. Organ Mountains. Near R. Pacaqué. No data. 3 ♂ = 426-428.

Westwood's list gives another specimen captured 14. 2. 26, and three more specimens without data.

Eryphanis polyxena, Meerb., = *automedon*, Cram.

1054. [17. 3. 26.] ♂ = 429. Rio de Janeiro. "Along the Carioca Aqueduct, and descending the high hill (mentioned 31. 1. 26 ["the high hill N.W. of and close to Carioca Aqueduct"]) into the valley of Catombi." "Both these Papiliones were caught in the forest down the hill." The other "*Papilio*" was the Satyrine *Taygetis virgilia*, Cram., no. 350.

Westwood's list agrees: "*Opsiophanes*?" is written opposite the Catalogue number.

Caligo beltrao, Hübn.

10. 3. 26. ♂ = 430. Rio.

1066. 1. 4. 26. ♀ = 431. Rio. "In the valley of Catumbi." "*Papilio*. This is one of the twilight tribe, but flies

also by day, in the woods: whereas the other species nearly resembling it, flies only during twilight. The chrysalis of this (1066) is ovate and of a green hue, and hangs at one end. I saw many at the house of a collector for sale: and their form was thus [rough sketch inserted here] but larger (2 inches?)."

Westwood's list agrees.

Caligo teucer, Linn.

31. 10. 27. ♂ = 432. "In sylva opaca." E. of Goyaz.

Westwood's list agrees.

Caligo ilioneus, Cram.

31. 12. 25. ♂ = 433. Rio. "Excursion to the summit of the Corcovado; from Catete and up the valley of Laranjeiros."

Bz. + 18. 1. 26. ♂ = 434. Rio. "In a walk to S. Christovão and Eugénho Velho."

10. 3. 26. ♂ = 435. Rio. Westwood's note reads "var. fascia al. ant. magis distincta."

Bz. + 4. 7. 29. ♂ = 436. Pará.

Nos. 434 and 436 form Westwood's "Morphides 9"; the other two are included in his "Morphides 10."

Caligo eurylochus, Cram.

Bz. + 1032. 10. 1. 26. ♀ = 437. Rio. "Praia Grande and S. João de Carahy." "*Papilio*. Flies only in the first part of the twilight, and makes its first appearance about 10 or 15 minutes after the sun has set. I never saw it by day. It frequents woods and woody places, flying within 6 feet of the ground. I have seen [it] at Rio in all the months, and once I saw one flying in Rua Quitanda."

The Rua Quitanda is one of the principal streets of Rio.

Bz. + 11. 1. 26. ♀ = 438. Rio. "At Laranjeiros."

Bz. 10. 3. 26. ♂ = 439. Rio.

Bz. + 18. 3. 26. ♀ = 440. Rio. "Along the Carióca Aqueduct."

Nos. 437 and 440 form Westwood's "Morphides 6," opposite which is written "*M. Eurylochus*?" The two remaining specimens fall into "Morphides 10," which also includes two missing specimens. Both bore the same data, viz. "1032. 14. 1. 26." The number 1032 evidently refers to the habits described for a different specimen and date under no. 437. On Jan. 14, 1826, Burchell collected ("omnia insuper plantas") in the Valley of Laranjeiros, Rio.

Opsiphanes batea, Hübn., = *didymaon*, Feld.

- Bz. + 21. 2. 26. ♂ = 441. Organ Mountains; near the R. Pacaqué. "Along the road by the Rancho for 1½ mile from the house."
 12. 3. 27. ♂ = 442. "In silvis et silvaticis." Near S. Paulo; "Morumbý: walk to old house." The specimen has lost the abdomen and the pencil of hairs on the hind wing; but the scar and the base of the tuft are distinct.

Westwood's list omits no. 441.

[I do not think that *didymaon* can be kept specifically distinct from *batea*. In no. 442 the black margin is wider and extends nearly to the cell of the fore wing, so that this specimen would be called *didymaon* by those who separate the two species.—E. B. P.]

Opoptera (Opsiphanes) syme, Hübn.

17. 3. 26. ♀ = 443. Rio. (As 429.)

Westwood's list agrees.

Catoblepia (Opsiphanes) berecynthia, Cram.

- Bz. + 14. 6. 29. ♀ = 444. Pará.
 1399. 24. 7. 29. ♂ = 445. Pará.

Westwood's list gives the first date as 14. 6. 27,—doubtless a copyist's error. Both are placed as no. 5 of his Catalogue of *Hipparchia*, thus clearing up one of the difficulties in that part of the list (see Ann. & Mag. Nat. Hist. ser 7, vol. xiii., May 1904, p. 370).

Opsiphanes inviræ, Hübn.

- Bz. 10. 3. 26. ♂ = 446. Rio.
 9. 9. 29. ♂ = 447. Pará: S. José.
 6. 1. 30. ♀ = 448. Pará.

Westwood's data agrees, but he fuses *inviræ* with *crameri* and places both as no. 18 of his Catalogue of Nymphalinæ. He also includes an additional specimen of *crameri* with the data of no. 450.

Opsiphanes cassiæ, Linn., = *crameri*, Feld.

- Bz. 1033. + Bz. 11. 1. 26 + 1033. 11. 1. 26. ♂ = 449. Rio: "at Laranjeiros." "*Papilio*. This has exactly [the] same habits as the preceding," namely *Caligo eurymachus*, no. 437.

1033. 14. 1. 26. ♂ = 450. "Laranjeiros." Rio: "brought from and collected in the Valley of Laranjeiros. Omnia insuper plantas."

Burchell's 1033 attached in his notebook to the date 11. 1. 26 evidently refers to the habits, stated under no. 449 to be the same as those of 437.

Brassolis astyra, Godt.

Bz. 25. 11. 26. ♂ = 451. "Mrs. Whitaker." Santos.

The data correspond to those given by Westwood, but the species was placed as no. 20* of his Catalogue of Nymphalinae.

Dynastor darius, Fabr.

3. 6. 27. ♂ = 452. "Antennæ sensim incrassatæ." Near S. Paulo.

Bz. + 5. 9. 27. ♀ = 453. "Cachoeira." Between Rio Pardo and Rio Gránde.

Westwood's list agrees. The specimens are placed as no. 23 of his Catalogue of Morphides.

IV.—Notes on the Forficularia.—X. A Revision of the Nesogastrinae. By MALCOLM BURR, B.A., F.L.S., F.E.S.

THIS subfamily is characterized by the slender tarsi, with short third segment, by the antennæ as in the genus *Labia*, but the segments never cylindrical, by the strongly and sharply carinate elytra, and by the thickened femora.

The colour is usually some shade of deep chestnut or wine-colour, varied with red or with yellow.

The wings and elytra are sometimes abbreviated and abortive, sometimes perfectly developed, the two forms occurring often in the species.

The group is confined to the Malay Archipelago, New Guinea, and Australasia.

I cannot think why Verhoeff placed this group among the Forficulidæ, with which I can find no affinities. In the structure of the tarsi and of the antennæ they more nearly approach *Labia*, in which genus the known species have been hitherto included.

Table of Genera.

- | | |
|---|---------------------------------|
| 1. Pronotum supra elytra haud producta;
elytra abbreviata; scutellum liberantia. . . | 1. <i>Nesogastrella</i> , Verh. |
| 1.1. Pronotum supra elytra productum; scutello
nullo | 2. <i>Nesogaster</i> , Verh. |

Genus 1. NESOGASTRELLA, Verhoeff.

1902. Zool. Anzeig. no. 665, p. 192.

I only know this genus from Verhoeff's description. It appears to differ from *Nesogaster* in the purely rudimentary elytra, which gape along the suture and expose a triangular scutellum; the pronotum does not extend so far over the elytra. The pygidium, in the ♀ at least, is prominent, with triangular points on each side, with two blunt processes.

It is known only from a single female from Borneo, with which scanty material Dr. Verhoeff did not hesitate not only to describe a new species, but even to found a new genus!

Genus 2. NESOGASTER*, Verhoeff.

Antennæ 12-segmentatæ; segmentis 4 quam 3 multo breviori, 5 quam 4 sublongiori, pyriformibus; corpus glabrum, lævissimum, nitidum; pronotum subquadratum, postice quam antice paullo latius; elytra postice truncata; carina externa acuta instructa; alæ sæpius abbreviatæ, rarius perfecte explicatæ; femora, præsertim antica, incrassata; tarsi longi, graciles, tibiae fere æquantes, segmento 1 quam 3 longiori: abdomen depressum ac sat latum, parallelum, vel medio subdilatum; segmentum ultimum dorsale rectangulare, quadratum; ♀, subangustatum; segmentum penultimum ventrale ♂ ♀, magno, margine postico late rotundato. Pygidium ♂ prominens; ♀ breve vel longum; forcipis brachia ♂ gracilia, elongata; ♀ brevia, robusta.

Body brilliantly shining, smooth, hairless: antennæ with 12 segments; first stout and clubbed; third long, somewhat clubbed at the apex; fourth about half as long as third, rather stout and spindle-shaped; fifth distinctly longer than fourth, but shorter than third, pear-shaped or spindle-shaped; each succeeding segment longer than the preceding, distinctly pear- or spindle-shaped.

Head smooth and globose, sutures obsolete. Pronotum quadrangular, all sides truncate, slightly broader posteriorly than anteriorly; median longitudinal suture distinct; prozona not distinctly separated from metazona; central region

* Does this mean "island-bellied"?

somewhat tumid, the sides broadly flattened, this flat part especially broad posteriorly; lateral margins themselves reflexed, well produced over the elytra. Elytra perfectly developed and long, or, more frequently, abbreviated, and square; posterior margin truncate, external sharp and well defined, extending the whole length of the elytra.

Wings generally abortive; occasionally perfectly developed.

Femora, especially the anterior pair, strongly incrassate: tibiæ rather short; tarsi long and slender, almost as long as the tibiæ, first segment longer than the second and third united, the second small and cylindrical.

Abdomen depressed, parallel or somewhat dilated about the middle; lateral tubercles on segments 2 and 3 present; last dorsal segment ♂ rectangular, broad, posterior margin depressed and thickened; ♀ somewhat narrowed; penultimate ventral segment ♂ ♀ nearly quadrangular, posterior margin broadly rounded, ample, completely covering the last segment.

Pygidium ♂ very prominent and long, or rather short but distinct; ♀ minute.

Forceps ♂ generally long and slender, gently sinuate, rather thicker than the base, generally armed with teeth; in the ♀ short, thick, generally toothed.

This genus is well characterized by the smooth almost oily lustre, by the sharp keel of the elytra, and the thick femora. The form of the pygidium and forceps is very characteristic in each species.

Table of Species.

- | | |
|---|-------------------------------|
| 1. Pygidium ♂ haud valde prominens. | |
| 2. Forcipes bracchia ♂ valde elongata, depressa, paullo vel haud dilatata; (elytra brunnea, haud maculata; alæ abortivæ). | |
| 3. Femora annulata; forcipes bracchia ♂ margine interno haud laminata. | |
| 4. Caput fuscum; statura mediocri (long. corp. 7 mm., forc. 6 mm.); forcips unidentatus | 1. <i>dolichus</i> (Burr). |
| 4.4. Caput rufum; statura parva (long. corp. 4.75 mm., forc. 1.5 mm.); forcips unidentatus | 2. <i>wallacei</i> , sp. n. |
| 3.3. Femora unicoloria; forcipes bracchia ♂ margine interno prope basin laminata. | 3. <i>tristis</i> (Borm.). |
| 2.2. Forcipes bracchia ♂ minus elongata, gracilia, arcuata, haud depressa | 4. <i>pulchripes</i> (Borm.). |
| 1.1. Pygidium ♂ valde prominens; (elytra brevia vel perfecte explicata). | |

2. *Pygidium* ♂ *angustum, acutum*; (elytra unicoloria) 5. *aculeatus* (Borm.).
- 2.2. *Pygidium* ♂ *linguæforme, apice haud acuminatum*.
3. *Statura* minore; forceps dente acuto armatus; elytra flavo-maculata; pronotum unicolor nigrum 6. *amœnus* (Stål).
- 3.3. *Statura* majore; forceps inermis; elytra unicoloria nigra; pronotum flavo-bimaculatum 7. *ruficeps* (Erichs.).

1. *Nesogaster dolichus* (Burr).

Labia dolicha, Burr, 1897, Ann. & Mag. Nat. Hist. (6) xx. p. 311; Bormans, Tierreich, Forf. p. 71 (1900); Kirby, Cat. Orth. i. p. 26 (1904).

Nesogaster Fruhstorferi, Verhoeff, 1902, Zool. Anzeig. no. 665, p. 191; Kirby, Cat. Orth. i. p. 35 (1904).

Nesogaster dolichus, Burr, Ann. & Mag. Nat. Hist. (7) xvi. p. 495 (1905).

S. Celebes: Bua Kraeng, 5000 feet (taken by Fruhstorfer in 1896: type in coll. mea) (c.m., B.M. Mus. Berol.).

Easy to recognize by the long sinuous forceps and generic characters.

2. *Nesogaster wallacei*, sp. n.

Statura parva; *N. dolicho*, Burr, vicinus; ab eo differt *statura* minore, capite rubro, elytris angulo postico interno rotundato, forcipis brachiis ♂ brevioribus, dente uno valido acuto armatis. ♂.

Long. corporis 4.75 mm.
 „ forcipis 1.5 „

Celebes (*Wallace*).

The type of this species is a unique male in the Hope Museum, Oxford; it was taken in the Celebes by Wallace in 1861; it is labelled in blue paper, in what appears to be Westwood's handwriting, "Celebes, Wallace, Dr. Dohrn, 1861."

It closely resembles *N. dolichus*, also from the Celebes, but differs in the points mentioned above.

3. *Nesogaster tristis* (Bormans).

Labia tristis, Borm. apud Burr, 1903, Ann. & Mag. Nat. Hist. (7) xi. p. 240.

New Caledonia.

I have not examined a specimen of this species; but de Bormans's description, together with a sketch in my possession, leaves no doubt whatever that it is referable to this genus. It is apparently allied to *N. dolichus*.

4. *Nesogaster pulchripes* (Bormans).

Labia pulchripes, Bormans, apud Burr, 1903, Ann. & Mag. Nat. Hist. (7) xi. p. 236; Burr, Res. exp. Sci. néerl. N. Guinea, Derm. p. 10 (1906).

Northern Australia (coll. Dohrn, teste Borm.).

I have not examined this species, but de Bormans's description and a coloured drawing in my possession, together with its resemblance to *N. amænus*, render it probable that its true position is in this genus.

5. *Nesogaster aculeatus* (Bormans).

Labia aculeata, Borm. 1900, Ann. Mus. Civ. (2) xx. p. 456 (1900); Kirb. Cat. Orth. i. p. 27 (1900).

British New Guinea (Mus. Gen.).

6. *Nesogaster amænus* (Stål).

Forficula amæna, Stål, 1855, Öfv. Vet. Ak. Förh. xii. p. 350.
Labia amæna, Dohrn, Stett. ent. Zeit. xxv. p. 425 (1864); Dubr. Ann. Mus. Civ. Gen. xiv. p. 363 (1879); (*amæna* incorr.) Borm. C. R. Soc. ent. Belg. p. lxxi (1880); id. Tierreich, Forf. p. 67, figs. 29 a, b (1900); Burr, Ann. & Mag. Nat. Hist. (7) iv. p. 258 (1899); id. Termesz. Füz. xxv. p. 481 (1902); Kirby, Cat. Orth. i. p. 26 (1904).

Malay Archipelago: New Guinea; Java; Celebes; Philippines.

7. *Nesogaster ruficeps* (Erichs.).

Forficula oceanica, Blanchard (nec Gouillon), Voy. Pôle Sud, iv. p. 352, Orth. t. i. fig. 4 (♀) (1853).
Forficula ruficeps, Erichson (nec Burmeister, 1838), in Arch. f. Naturg. viii. (1) p. 246 (1842).
Apterygida ruficeps, Borm. Tierreich, Forf. p. 118 (1900).
Forficula erichsoni, Borm. C. R. Soc. ent. Belg. p. lxxiii (1880).
Apterygida erichsoni, Dohrn, Stett. ent. Zeit. xxiii. p. 231 (1862).
Sphingolabis erichsoni, Kirb. Journ. Linn. Soc., Zool. xxv. p. 529, pl. xx. figs. 11, 11 a (1896); id. Cat. Orth. i. p. 45 (1904).

Tasmania (Mus. Brus.); Australia; Vavau.

This well-known species is easy to recognize by the long simple forceps, coloration, and long tongue-shaped pygidium. It has been previously placed in *Forficula* and *Apterygida*, but its affinities are undoubtedly with *Nesogaster*, though, on account of its more conical antennæ, it may later require a new genus.

ADDENDUM.

Since writing the above I have had the opportunity of examining Verhoeff's type of *Nesogastrella ruficeps* in the

Berlin Museum. It is nothing more or less than the female of *Nesogaster amœnus* (Stål), so that the name must fall as a synonym of that species. Dr. Verhoeff was misled by the fact that the elytra are partly opened out, perhaps by the former insertion of a pin, so that the generic characters of the elytra, as set forth by him, do not hold good.

V.—*Notes on the Forficularia.*—XI. *On new and little-known Species and Synonymic Notes.* By MALCOLM BURR, B.A., F.L.S., F.E.S.

Forcipula jacobsoni, sp. n.

Statura minore: colore fusco-castaneo; pedes testacei; abdominis segmenta 3-6 tuberculis tenuibus singulis utrinque armatis: forcipis brachia gracilia elongata, apicem versus sensim arcuata, inermia. ♂.

Long. corporis 15 mm.
 ,, forcipis 8 „

Size small; colour dark chestnut; antennæ with 20 segments, third long and cylindrical, 4-6 very short, the rest gradually lengthening.

Head black, with yellowish pubescence, the sutures distinct. Pronotum nearly square, posterior margin rounded.

Elytra black, of coarse texture, the lateral keel not very prominent. Wings black, tipped with yellowish at the apex of the suture.

Feet uniform testaceous.

Abdomen parallel, slender, black; segments 3-6 with slender, sharp, gently recurved, spine-like tubercles projecting on each side. Dorsal surface finely granulated, the posterior margin of each segment milled. Last dorsal segment ample, quadrate, smooth, with a deep median longitudinal furrow; posterior margin straight, with a nearly obsolete tubercle over the insertion of the forceps.

Ventral surface very finely punctulate, clothed with yellowish pubescence on the margins of the segments.

Penultimate ventral segment rounded. Pygidium very short, tumid, and obtuse. Forceps with the branches elongate and slender, nearly straight, gently incurved at the apex, with a few obsolete denticulations along the inner margin. ♂.

N. Java, Samarang (*Jacobson*).

This species closely resembles *F. walkeri*, Kirby, from Hong Kong in size and appearance. It differs in the form of the forceps: when seen from above, the branches are laterally undulating in that species; in this they are simply and gently incurved: the denticulation is more pronounced in *F. walkeri*; the abdomen is finely punctulate in *F. walkeri*, granulose in this species; finally, the slender abdominal spines are quite straight in *F. walkeri* and gently recurved in this species.

I have pleasure in dedicating it to its discoverer, Mr. Edward Jacobson, of the Hague.

Labia nigroflavida, Rehn.

Description of the Male.

Agrees perfectly with Rehn's description, with the exception of characters which are purely sexual.

The last dorsal segment is ample, rather tumid, nearly square, smooth, with a few shallow punctulations; the median sulcus is faint; depressed posteriorly; the posterior margin itself truncate, with a row of minute tubercles above; on each side over the roots of the forceps there is a pair of elevated longitudinal ridges.

Penultimate ventral segment large, covering the last segment, obtusely rounded, slightly emarginate at the apex itself.

Pygidium not visible.

Forceps with the branches remote at the base, triquetrous, stout, and dilated at the base itself, this dilation terminated by a short sharp tooth in the inferior margin, then suddenly attenuated and excavated along the inner margin for nearly half their length; at this point thickened to a sharp conical tooth, where the curvature is lessened; beyond this point gently incurved, the apex sharp and crossing. Seen from above the branches appear nearly straight, gradually converging. Viewed from the side gently sinuate downwards, then upwards.

Long. corporis	10.5 mm.
„ forcipis	3 „

Hab. Queensland: Cairns (in the type, a ♀, U.S. Nat. Mus., Rehn). Kuranda, in North Queensland (1 ♂ taken by Mr. H. W. Simmons, in my collection).

Labia nigroflavida, Rehn, Proc. U.S. Nat. Mus. xxix. p. 507, fig. 5 (1905).

This species is apparently allied to *L. grandis*, Borm., but the form of the forceps of the male is quite distinctive, possessing many features in common with those of certain *Anechura*—for instance, the situation in a vertical plane and the thickening at the antepical tooth; it is, perhaps, worthy of note that another somewhat similar species at present ranged in *Labia*, namely *L. papua*, Borm., is recorded from New Guinea. Perhaps a new genus will be required eventually for their reception.

The Genus Strongylopsalis, Burr.

In 1880 de Bormans described a female earwig from Peru under the name *Labia cheliduroides*; in 1883 he described a male from Mexico as being that of the same species. Now these insects are incapable of flight, and it is to be expected that the specimens from Mexico and those from Peru are specifically distinct. It appears now that there is no doubt that this is the case. In 1900 I sent de Bormans a pair of *Strongylopsalis inca* from Peru. On April 25th, 1900, he replied that my specimens were undoubtedly identical with his *Labia cheliduroides*. On June 7th of the same year* he wrote withdrawing this opinion, remarking that my specimens were undoubtedly distinct, so I accordingly published the description of *S. inca*, which was then in manuscript.

I have since compared my types of *S. inca* with syntypes of *L. cheliduroides* ♀, and they are indistinguishable: de Bormans had first compared the females only, and was therefore correct in his first opinion; later, on comparing the males, he was instantly struck by the entire dissimilarity of the forceps, and so altered his opinion. The undoubted explanation of this confusion lies in the fact that his males from Mexico were distinct from his Peruvian females.

It is therefore necessary to regard *Strongylopsalis inca*, Burr, from Peru, as synonymous with *Labia cheliduroides*, Borm., ♀, from Peru, while *Labia cheliduroides*, Borm., ♂, from Mexico, is a distinct species and requires a new name.

The genus *Strongylopsalis* was originally placed by me near to *Carcinophora*, but the structure of the feet and of the antennæ show without doubt that it is more closely allied to *Labia*, from which it is at once distinguished by the sharp keel of the elytra:

* This was the last letter I ever received written in his own handwriting; a few weeks later my old friend was struck down by the illness which so soon proved fatal.

The synonymy is as follows:—

1. *Strongylopsalis cheliduroides* (Borm.).

Labia cheliduroides, Borm. 1880, An. Soc. Esp. H. N. ix. p. 509 (♀)
(nec Borm. Ann. Soc. ent. Belg. xxvii. p. 74, pl. ii. fig. 12, 1883);
id. Tierreich, Forf. p. 72 (1900); Kirby, Cat. Orth. i. p. 27 (1904)
(ex parte, ♀ only).

Strongylopsalis inca, Burr, Ann. & Mag. Nat. Hist. (7) vi. p. 80 (1900)
(♂ ♀); Sem. Rev. russe d'Ent. ii. p. 102 (1902); Kirb. Cat. Orth.
i. p. 15 (1904).

Peru (*Borm., Burr.*).

2. *Strongylopsalis cornuta*, n. n.

Labia cheliduroides, Borm. (nec 1880, An. Soc. Esp. H. N. ix. p. 509),
1883, Ann. Soc. ent. Belg. xxvii. p. 74, pl. ii. fig. 12 (♂); id.
Tierreich, Forf. p. 72 (1900) (♂); Kirby, Cat. Orth. i. p. 27 (1904).

Mexico (*Borm.*).

In *S. cheliduroides* the forceps of the male are slender, remote at the base, simple, arcuate, and unarmed. In *S. cornuta* they are elongate, depressed, and armed with a vertical blunt process on the upper surface.

Psalis doriæ (Borm.).

I have a syntype of *Psalis guttata*, Borm., from Mentawai, which I have been able to compare with the type of *Forficula doriæ*, Borm., from the Genoa Museum, kindly lent me by Signor Gestro. There is no doubt that the two species are identical.

Chatospania borneensis (Borm.).

Signor Gestro has kindly lent me the types of *Sphingolabis borneensis*, Borm., from the Genoa Museum. I have compared them with the types of *Chatospania confusa*, Burr, which was originally misplaced by de Bormans with *C. feæ*, Borm. There is no doubt that *C. confusa* is identical with *S. borneensis*, although the type is somewhat smaller and paler; the pygidium is partly hidden in the type of *C. confusa*, and consequently very deceptive in appearance. *Chatospania stella*, Burr, is also probably identical.

The synonymy is consequently as follows:—

Sphingolabis borneensis, Dubr. Ann. Mus. Civ. Gen. xiv. p. 381 (1879).

Chatospania confusa, Burr, Ann. & Mag. Nat. Hist. (7) xvi. p. 489 (1905).

Chatospania stella, Burr, Termes. Füzetek, p. 483, pl. xx. fig. 6 (1902).

Chaetospania bongiana (Borg).

When I described *Chaetospania escalerae* from Biafra (Mem. Soc. Españ. II. N. i. p. 294, 1906) I had not seen the description of *Sparatta bongiana*, Borg (Arkiv for Zool. i. p. 573, pl. xxvi. fig. 3, 1904), from the Cameroons. Professor Sjöstedt has since kindly sent me authentic syntypes of the latter from the Stockholm Museum, and I see that the two species are identical. The name is therefore *Chaetospania bongiana* (Borg).

This genus, with the allied *Sparatta* and *Platylabia*, requires a thorough revision.

Spongiphora assiniensis, Bormans.

A careful comparison of the descriptions of *Spongiphora assiniensis*, Borm. (apud Bolivar, Ann. Soc. ent. Fr. vol. lxii. p. 170, 1893), of *Spongiphora ochracea*, Borg (Arkiv f. Zool. i. p. 569, pl. xxvi. fig. 6, 1904), and *Spongiphora robur*, Burr (Mem. Soc. Españ. II. N. i. p. 293, 1906), leaves no doubt in my mind that all these species are identical, and they are all recorded from West Africa.

VI.—Notes on the Forficularia.—XII. Note on the Genus *Apachys*, Serv. By MALCOLM BURR, B.A., F.L.S., F.E.S.

Apachys corticinus, sp. n.

Statura minore: corpus minus depressum: colore fusco-castaneo: pronotum subquadratum, antice et postice truncatum; elytra et alæ typica; pedes typici, tarsorum segmento primo brevi: abdomen minus depressum, læve; segmentum ultimum dorsale magnum, quadratum, punctis impressis crebris ac sat fortibus punctatum; segmentum penultimum ventrale valde acuminatum: processus analis obtuso-lanceolatus, margine postico obtusangulo: forcipis l racchia a basi sensim angulata, incurva. ♂.

Long. corporis sine processu anali 10 mm.
 „ forcipis cum „ „ 1.5 „

Colour dark fuscous; size small; body less compressed than is usual in this genus.

Antennæ typical: 27 segments, first long and thick; 2 minute, almost globular; 3 long, cylindrical; 4 and 5 short and subconical, together not longer than 3; 6-9 slightly

longer, subconical; the remainder more elongate, nearly cylindrical; segments 1-3 testaceous, the rest fuscous.

Head triangular, a trifle broader than long; eyes not very prominent, sutures distinct; posterior margin not abruptly truncate.

Pronotum nearly square; anterior and posterior margins truncate; prozona occupied by a triangular tumid elevation; sides almost parallel, rather broadly reflexed; posterior angles rounded.

Scutellum obtusely triangular.

Elytra ample, smooth.

Wings very long, exposed portion quite as long as elytra; dull fuscous, with apical testaceous spot; inner exposed folds cream-coloured.

Feet typical; femora rather broad and compressed; tibiæ slender; tarsi short, third segment longer than the first.

Abdomen not very strongly depressed; dorsal surface smooth and shining, with obsolete punctulations; ventral surface smoother and paler; last dorsal segment ample, square, with dense and deep pittings.

Penultimate ventral segment large, densely punctulate, produced posteriorly into a long, sharp-pointed, narrow lobe.

Anal process almost parallel at the base; posterior margin obtusangular, the margin itself finely crenulate.

Forceps depressed; with a rounded lobe on the inner margin at the base, scarcely visible from above; the branches straight at first, then slightly angled inwards, straight and hooked at the apex. ♂.

Ceylon: Peradeniya (type in coll. mea).

This specimen was sent me by Mr. Green. It is unfortunately somewhat bleached by spirits and the feet are rather crushed; but it is a very distinct species, which will eventually require a new genus for its reception. The antennæ have somewhat fewer segments than the normal number for *Apachys*, the body is less strongly depressed, and the head more tumid and not truncate posteriorly; in the form of the feet, organs of flight, abdomen, anal process, and forceps it agrees entirely with *Apachys*, but differs notably in the nearly square pronotum.

Apachys murrayi and *A. reichardi*.

I can find no difference either of colour or form between *A. murrayi*, Dohrn (Stett. ent. Zeit. xxiv. p. 44, 1863), and *A. reichardi*, Karsch. Both occur in Central Africa. The only distinction which I can find, and the only distinction

which is given by de Bormans, is the size. In the description of *A. reichardi* (Berl. ent. Zeit. xxx. p. 85, 1886) Karsch distinguishes it from *A. murrayi* only by the greater size and testaceous pronotum. This is surely insufficient. The colour of the pronotum is utterly untrustworthy, and consequently I am convinced that the two are but size-varieties of one and the same species.

The dimensions of *A. reichardi* given by Karsch are long. corp. 26·8 mm., ♂.

A male in my collection measures 23 mm.

A. murrayi measures only 17 mm. in the male. I have two males which measure 18 mm. including the forceps.

We must, I maintain, therefore consider *A. murrayi* as a dwarfed race of *A. reichardi* until advanced knowledge shows better reasons for discriminating them.

Apachys beccarii and *A. javanus*.

These two species appear to be very nearly allied, although Verhoeff (Zool. Anz. no. 665, p. 200, 1902) calls *A. javanus* a very well-characterized species. I have a pair of the latter from Java which agree entirely in colour with the description and figures of *A. beccarii* given by Dubrony (Ann. Mus. Civ. Gen. xiv. p. 349, figs., 1879). The only points of distinction—apart from the fact that *A. beccarii* is a native of New Guinea and the other species inhabits Java, and that the former measures from 18–22 mm., whereas the latter varies from 12·5 mm. to 17·5 mm. in total length—lie in the form of the anal process. In *A. beccarii* ♂ this is distinctly pentagonal, emarginate at the sides. In *A. javanus* ♂ the sides are parallel; the posterior border is similar in the two species. In *A. beccarii* ♀ the anal process has the posterior border—that is, the part beyond the lateral points—rounded; in *A. javanus* ♀ it is triangular, so that the whole lobe is lanceolate. Dubrony described the last dorsal segment as “pointillé” in *A. beccarii*; this is true also of the male of *A. javanus*, but in the female it is strongly granulose in the posterior half.

Apachys chartaceus and *A. depressus*.

There are two other species which are almost indistinguishable in form. These are *A. chartaceus*, Haan, and *A. depressus*, Pal.-Beauv., but in this case the colour is different: the former species is a native of the Malay Archipelago and the latter inhabits West Africa; so they are not likely to be confused, and must surely be specifically distinct. Probably

when I have examined more material I shall be able to detect some structural difference.

The following table of species may be useful :—

Table of Species of Apachys.

1. Pronotum ellipticum, lateribus convexis, antice angustatum.	
2. Processus analis ♂ haud rotundatus; ♀ lanceolatus vel rotundatus, angulis externis acutis.	
3. Processus analis ♂ lateribus emarginatus; ♀ margine postico rotundato.	1. <i>beccarii</i> , Dubr.
3.3. Processus analis ♂ lateribus parallelis; ♀ lanceolatus	2. <i>javanus</i> , Verh.
2.2. Processus analis ♂ subrotundus; ♀ acuminatus.	
3. Processus analis ♂ rotundato-pentagonalis; ♀ lanceolatus. (Statura maxima, 46-50 mm.)	3. <i>fecæ</i> , Borm.
3.3. Processus analis ♂ rotundatus, ♀ subrotundus, medio subacutus.	
4. Elytra testacea, fusco-limbata. (Species Africana.)	4. <i>depressus</i> , P.-B.
4.4. Elytra unicoloria fusca.	
5. Pronotum fuscum. (Species Africana.)	5. <i>murrayi</i> , Dohrn.
5.5. Pronotum testaceum. (Species Sundaica.)	6. <i>chartaceus</i> , Haan.
1.1. Pronotum fere quadratum	7. <i>corticinus</i> , n.

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- A. pascoei*, Kirb. Journ. Linn. Soc., Zool. xxv. p. 521, pl. xx. fig. 1, ♂ (1896), = *A. fecæ*, Borm. (1894).
A. reichardi, Karsch, Berl. ent. Zeit. xxx. p. 85, pl. iii. fig. 3, ♂ (1886), = *A. murrayi*, Dohrn (1863).
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VII.—Description of some new Species of Tabanidæ, with Notes on some Hæmatopota. By GERTRUDE RICARDO.

Pangonia elongata, ♀, sp. n.

A new species from Kilimanjaro (*Hannington*), 85. 60.

Type (female) and another female.

This species belongs to the group of South African *Pangonia* (*Rondani*) with white bands on the abdomen, and is nearly related to *P. scæfasciata*, Wlk., from which it may

be distinguished by the narrower abdomen and by the presence on the underside of four narrow white bands, whereas in the Walker species there are only two white bands; the palpi are slenderer and tapering to a longer point and the wings have a dark apex. From *P. conjuncta*, Wlk., it may be distinguished by the narrower abdomen and by the greater number of white bands.

Black. Abdomen with four white bands. Wings brownish, yellow on the fore border, the first posterior cell closed, pedunculated, with an appendix on the fork of the third longitudinal vein.

Face dull black, covered with grey tomentum, the cheeks shining black, the tomentum is, however, continued to the base of the eyes as a narrow yellowish border, the few hairs on the face are white; forehead covered with yellowish tomentum above the antennæ, posteriorly to the vertex deep black, furrowed, with some whitish pubescence which becomes yellow on the vertex; ocelli present. Antennæ and palpi black, the latter long and slender, the second joint tapering to a long point. Beard abundant, white; hairs round the head white. Proboscis shorter than the thorax. Eyes bare. Thorax black, somewhat shining, with very short yellow pubescence and some grey tomentum on the sides; scutellum more densely covered with the yellow pubescence, the breast-sides brown with dull yellowish hairs. Abdomen long and rather narrow; the first segment with some faint yellowish pubescence on the posterior border; the white band on the second segment entire, broader than the others, with its greatest width at the sides; on the third, fourth, and fifth it is entire but much narrower and the same width throughout; on the sixth segment there is a narrow border of yellow pubescence, and on the sides of the fifth and sixth some yellow hairs; the pubescence on the dark-coloured part of the abdomen is black; the underside is black, with four narrow white bands. Legs blackish brown, some yellow pubescence on the middle and posterior femora and tibiæ and orange hairs on the underside of the first joint of the posterior tarsi. Wings with the yellow fore border only continuing as far as the stigma and to the base of the discal cell; veins yellow on fore border, elsewhere brown.

Length 16 mm.

Corizoneura distincta, ♀, sp. n.

A new species from Voi, British East Africa, 15. iv. to 13. v. 97 (*C. S. Betton*), 98. 12.

Type (female) and three other females.

This species is distinct in colouring from any species of *Pangonia* from Africa known to me as yet.

Blackish-brown species, with dull yellowish-grey bands on the abdomen; palpi and antennæ reddish.

Face short, shining, black, with a centre band of grey tomentum, which also covers the cheeks and lower part of the face, so that the shining black portion appears as a large oval spot on each side. Forehead long, obscurely black, covered with dense yellowish tomentum, which, however, is more or less absent in the middle of the forehead and at the vertex. Antennæ bright reddish yellow, the first two joints duller in colour, with a few yellowish hairs. Palpi reddish yellow, long and slender, the first joint longer than the second, which is wide at base, curved, and tapering to a moderately long point, furrowed on the upper surface, with some black pubescence. Proboscis nearly as long as body. Eyes bare. Beard white. Thorax brown, densely covered with short fulvous pubescence; sides and breast with yellowish hairs, the scutellum the same. Abdomen blackish; the first segment slightly red at the sides, densely covered with dull dirty grey tomentum, with some scattered whitish hairs; on all the remaining segments a narrow band of the same-coloured tomentum is present on the posterior borders, extending in the middle as a triangular spot, which last is most distinct on the second segment, where the band is slightly broader; the pubescence at the sides is whitish, on the grey bands are a few scattered white hairs; underside blackish, with short grey pubescence, the extreme side-borders of the sixth and seventh segments are reddish. Legs light reddish, hind legs brownish. Wings hyaline, veins reddish brown, the first posterior cell narrowed but open; a long appendix on the fork of the third vein.

Length 17 mm.

Corizoneura obscura, ♀, sp. n.

A new species from Blantyre, British Central Africa, Nov. 1904 (*Dr. J. E. S. Old*).

Type (female).

This species is probably related to *P. chrysopila*, Macq., and *P. nobilis*, Wied., both authors apparently describing one and the same species, in which case Macquart's name must be merged as a synonym of *P. nobilis*, Wied. Both descriptions speak of the face and forehead as being reddish,

whereas in this species the face and forehead are both black and the gold bands on the abdomen are absent.

A black species with brownish wings, some golden pubescence on the thorax and on the sides of the abdomen. Legs yellow, femora black.

Face black, shining, the cheeks dull black, the pubescence black, a few yellow hairs being intermixed. Forehead black, obscurely red near the antennæ, with light half-moon circles round their base; from the base of the frontal heart-shaped callus proceed three short furrows on each side, from its apex spring the beginnings of four raised lines which resolve themselves at once into the broad shining frontal stripe; on the vertex is a large red, oblong, ocelligerous tubercle. Antennæ dull red; palpi red, large, the second joint twice as long as the first, broad at its base, tapering gradually to a point, with a furrow on its basal half. Proboscis as long as the thorax, which is dull black with golden pubescence on the shoulders, on the sides of the suture extending halfway across the dorsum and on the posterior border, and a tuft at base of wings; the scutellum has traces of similar pubescence on its posterior border. Abdomen black, somewhat shining, very obscurely red on the sides of the second segment, with yellowish-white pubescence on the sides of the first and second segments and traces of similar pubescence on the third and fourth; the fifth, sixth, and seventh are red on their extreme lateral margins; the dorsum of the abdomen is finely punctuate, apparently devoid of pubescence; the underside is black, shining, with fine white hairs on the sides of the segments, most noticeable on the second one. Legs yellowish, the femora reddish brown, the apices of the tibiæ and tarsi dull red. Wings hyaline, brown at the apex; veins red on the fore border and at base, elsewhere brown, with an appendix; the first posterior cell is open, but very narrow where it attains the border.

Length 18 mm.

Hæmatopota cilipes, ♀, Bigot, Nouv. Archiv. Mus. Hist. Nat. Paris, 1890, vol. ii. p. 205.

The type came from Laos, a district of Siam, and was seen by me in the Paris Museum after my paper on *Hæmatopota* had gone to the printers.

It should go in the table published on p. 114 of the Ann. & Mag. Nat. Hist. (7) xviii. (August 1906), under the heading "15" preceding *H. lata*, Ricardo, thus:—"Black

species, with all the tibiæ densely fringed and the posterior femora with white hairs on their lower border." The hind tibiæ have a very thick black fringe, and with the white-haired femora should easily distinguish the species. The antennæ are long, the first joint being longer than the second and third together and is a little incrassate; the second is very small, the third rather long and slender. The wings are of the ordinary type and have three distinct rosettes, the apical band reaching across the apex; the appendix is long. The frontal callus is large, reddish, with the black paired spots above.

Hæmatopota singularis, ♀, sp. n.

Type (female) from Nhatrang, Annam, 22. x. 1905 (*Dr. Vassal*).

This species I had placed under *H. cilipes*, Bigot, in my paper on *Hæmatopota* in *Ann. & Mag. Nat. Hist.* (7) xviii. (August 1906) p. 126; but since that was published I have had the opportunity of examining the type of *H. cilipes* in the Paris Museum, and find this is quite a different species, not previously described; it is related to *H. rubida*, Ricardo, from Burmah, in the wings and also in the fringed incrassate hind tibiæ, but differs from it in having all the femora and tibiæ fringed, in this resembling *H. cilipes*, Bigot, and *H. lata*, Ricardo, with which it should be placed in the table on p. 114. It is a handsome small black species with densely hairy legs, and is immediately noticeable by the pale streak across the brown wings, which have no rosettes apparent, thus differing with *H. rubida* considerably from the other described species of *Hæmatopota* from the Oriental Region. In the shape of the antennæ it resembles *H. rubida*, with the long incrassate first joint, the very small second joint, and the broad basal division of the third joint, the last division being small and short.

Face grey, the whole upper part deep black, the lower half grey, with white hairs; the beard and underpart of head also with white hairs. Palpi yellow, with short black pubescence and some longer white hairs. Frontal callus black, shining, narrow, almost reaching the eyes; forehead brownish, with grey markings surrounding the two black spots and continued across the forehead; there is a tuft of white hairs on each side of the forehead on the outer border of the black spot and reaching the frontal callus; on each side of the forehead bordering the eyes there is a narrow grey border of tomentum. Antennæ yellow, in shape as described above, with long black

pubescence on the first and second joints; the third is bare. Thorax black, with three short grey stripes, the centre one shortest, none reaching the posterior border; the sides grey; the posterior border of thorax is fringed with white hairs; the pubescence on the dorsum black, short, with some white pubescence on the stripes and on the sides; above the root of the wings there is a black tuft of hairs, with some long white hairs below. Scutellum appears yellowish, bordered with a fringe of white pubescence. Abdomen deep black, the second, third, and fourth segments with white segmentations; the pubescence black, with white hairs on the sides of the dorsum of second segment, on the white segmentations, and on the sides of the first segment, on the sides of the other segments chiefly black; underside the same, but more hairy. Legs all with fringes of black hairs, which are least thick on the middle femora; they are brown in colour, with two yellow rings on the middle and posterior tibiæ, and the base of the fore tibiæ is yellow; the middle and posterior femora are largely yellow; the fore tibiæ and femora with wholly black fringes, long on each border of the femora, long on the outer border and short on the inner border of the tibiæ; the middle femora with whitish pubescence forming a scanty fringe on their lower borders, with some thick black hairs at apex; the middle tibiæ with a fringe of coarse black hairs on each border and white and black pubescence on the dorsum; hind femora with very thick black and white pubescence; the hind tibiæ broad, flat, with fringes of short black hairs on their borders and black and white pubescence on the dorsum; tarsi with short black pubescence; the middle and posterior tarsi are almost wholly yellow. Wings dark brown, the pale streak is continuous from the round pale spot above the stigma to beyond the apical cell; the pale markings of the apex and the external border are so placed that, viewed by the naked eye, a second pale streak is seen divided from the first by a brown parallel band, with a few brown markings on it, but no rosettes are apparent.

Length 8 mm.

Hæmatopota pachycera, ♀, Bigot.

This type from Cambodia (the description gives Laos) is also in the Paris Museum.

This species would come under heading "15" in my table of Indian and Ceylon species next to *H. lata*, Ricardo, from which it is distinguished by the hind tibiæ not being fringed, and the third joint of the antennæ is wider and shorter. It

resembles *H. rubida*, Ricardo, in the antennæ. Bigot seems to have overlooked the second joint, which is very small, and described the third joint as the second one; the first joint is long, cylindrical, and the third joint very wide, the basal division being large and swollen, the remaining divisions very small. The abdomen is black, with the segmentations grey; the two rows of spots mentioned by Bigot are hardly noticeable. The legs have two rings of light colour on the middle and posterior tibiæ, and the base of the fore tibiæ is yellowish. The wings have two indistinct rosettes.

VIII.—*New Eastern Lepidoptera.*

By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family Satyridæ.

Genus LYELA, nov.

Fore wing triangular; costa arched, apex somewhat rounded, hinder angle much rounded, lower margin straight; hind wing with the costa and outer margin evenly curved; venation of both wings as in typical *Cænonympha*. Palpi very hairy, third joint long, with the long hairs of the other joints extending beyond the tips; antennæ slender, about half the length of the costa, the club large, oval, spatulate, and very flat. No secondary sexual characters.

Type *L. macmahoni*, nov.

Erebia myops, Staud., belongs to this genus and has similar antennæ and shape. Dr. T. A. Chapman, in his "Review of the Genus *Erebia*," based on the examination of the male appendages, in *Trans. Ent. Soc.* 1898, p. 233, states that he places *myops* by itself.

Lyela macmahoni, nov.

♂ ♀. Palpi blackish brown above, white beneath; antennæ above black, with broad white rings, below white, with narrow black rings, the club white beneath; head and body black above and below; eyes black, white beneath, with a white spot behind; legs blackish brown above, greyish ochreous white beneath. Wings of a uniform blackish brown, nearly black in some males, always darker below than above: fore wings with a large, blackish, subapical, round spot, with a broad dull orange ring round it; in two examples (a male

and a female) there is a minute white dot within the black spot, on the right wing only. The female is like the male, but the wings are slightly longer, and therefore comparatively rather narrower, and the colour above and below is uniformly paler.

Expanse of wings $1\frac{6}{10}$ inch.

Quetta, Beluchistan; several examples of both sexes, sent to me by Col. Sir A. H. McMahon.

Family Nymphalidæ.

Cyrestis subobscurus, nov.

♂. Antennæ black; palpi with first joint white, second and third black above, white beneath; body and wings purplish blackish brown; the ground-colour of the wings in most parts is really purplish grey, but there are ten dark purplish-brown transverse bands across both wings, packed so closely together as to give the wings a blackish appearance: on the fore wings there is a white band between the fifth and sixth dark bands, a large white spot with square upper and lower ends in the middle of the next band, a small white dot above it near the costa, and an orange semi-square spot with a black dot in it at the hinder angle, and some thin white transverse streaks before the outer margin: on the hind wings most of the narrow spaces between the dark bands are more or less white, the whitest being in the middle, the first inner space next to it, one near the abdominal margin, a short streak below the apex, and another very thin one submarginal; the anal lobe and space above it has a large orange patch, rounded on its upper side, with three or four black spots in it. On the underside the wings are very similarly marked, but the bands are dark and white alternately, the dark bands thin and much paler than they are above; body and legs white.

Expanse of wings $2\frac{1}{10}$ inches.

Sitoli, Nias; one example.

Allied to *C. mænalis*, Erichson, and *C. seminigra*, Grose-Smith: it is not referred to by Dr. Ludwig Martin in his monograph of the genus ('Iris,' 1903, p. 71); it belongs to his No. 2 Nivea-Gruppe Sykophages.

Family Sphingidæ.

Genus PENTATEUCHA, nov.

* Proboscis fully developed; palpi upturned, slender,

* I owe this diagnosis to Sir George Hampson.

reaching about middle of frons, the second joint fringed with long hair in front, the third short; frons with tuft of hair; antennæ of female ciliated; thorax clothed with long spatulate hair; tibiæ fringed with long hair, the hind tibiæ with two pairs of spurs, the fore tarsi with three large curved claws on first joint; abdomen clothed with long rough hair; frenulum present. Fore wing with the apex rounded, the outer margin evenly curved, crenulate; vein 3 from well before angle of cell; 5 from middle of discocellulars; 6 from upper angle; 7, 8, and 9 stalked; 10 and 11 from cell: hind wing with vein 3 from well before angle of cell; 5 from well above angle; 6 and 7 from upper angle; 8 approximated to 7 beyond the cell.

Pentateucha curiosa, nov.

♀. Head and thorax clothed with deep red-brown hair tipped with white; pectus and legs rufous, the tarsi blackish; abdomen blackish mixed with grey-white, forming obscure segmental bands, the anal tuft and ventral surface rufous: fore wing clothed with dark red-brown hairy scales mixed with white; some rufous at base of inner area; faint traces of a dark antemedial line, an oblique, elliptical, white discoidal spot; postmedial line with oblique dark bar from costa, then very indistinct, recurved to vein 3, then incurved; subterminal line indistinct, double, oblique, waved, bent inwards to costa, where there is a white mark on it, a dentate line beyond it arising from apex, white and prominent to vein 6, then indistinct and forming white points on the veins; cilia rufous, with whitish points at the veins: hind wing bright rufous, the inner area whitish, cilia with some white scales at tips. Underside of both wings rufous; fore wing with indistinct pale discoidal spot, an obliquely curved postmedial band and prominent dentate white band from apex to above vein 6: hind wing suffused with white to beyond middle; an oblique, slightly waved, medial rufous line and indistinct postmedial line, bent outwards to just above the anal angle, the terminal area irrorated with whitish.

Expanse of wings 4 inches.

Khasia Hills; one example of this very curious Sphinx.

Family Syntomidæ.

Syntomis aurea, nov.

♂ ♀. Antennæ black; head, thorax, and abdomen golden orange; a small black patch immediately behind the base of

the antennæ; a transverse black line behind the neck, three longitudinal black lines running down from it on the thorax; abdomen with five thin segmental black bands, the extremity shot with metallic green. Wings hyaline, with the veins black: fore wings with the base yellow, the costal line black, the space between the costal line and subcostal vein yellow, and the basal half of the hinder margin smeared with dull yellow, and some yellow irrorations here and there on all the veins; a black bar across the interno-median interspace a little before the middle, a thin black band on the outer margin, thickened into a square spot on the extremities of veins 2 and 3, and expanding at the apex, the space between veins 5 and 6 filled up with black, though in some specimens this band does not quite extend to the outer margin: hind wings with some yellow at the base and along the abdominal margin; the costa and outer margins with a thin black band, expanding into a spot below vein 2, but not at the apex: legs black, tarsi with the upper half whitish.

Expanse of wings, ♂ $1\frac{3}{10}$, ♀ $1\frac{5}{10}$ inch.

Khasia Hills; many examples of both sexes.

There are two examples in the B. M. from the Khasia Hills with *S. fervida*, Walker, from Moulmein, but it is not *fervida*; that species has no black bar in the interno-median interspace of the fore wings and the space between veins 5 and 6 is quite clear, and there are many other differences. I have before me seventeen examples, and all of them are constant in the characters given above.

Family Deilemeridæ.

Deilemera formosana, nov.

♂. Antennæ black; head and body above and below yellow; palpi with the second and third joints black, tips of the former yellow; a large black spot on the frons, one on the top of the head, a pair on the collar and another pair behind them, a spot on the hind part of thorax; abdomen with paired dorsal and lateral black spots on each segment: fore wings brownish mouse-colour; a wedge-shaped white streak from the base; a large white discal patch which nearly touches the costa, expands downwards, has dentated sides, is joined in the middle to the outer margin by a band with a large brown spot in it, and a small one on the margin, is rounded below the median vein, has a tooth on the inner side, with a large brown spot in it, opposite the basal wedge-shaped streak; a white subapical spot: hind wings white, with a broken mouse-coloured marginal border.

Expanse of wings $1\frac{9}{10}$ inch.

Formosa; one example.

Veins 6 and 7 of the hind wings on a short stalk, palpi long, antennæ with long pectinations; hind wings as in *D. carissima*, Swinh., with an excavation before the anal angle, which is produced. Belongs to Section II. of my monograph of the genus (Trans. Ent. Soc. 1903, p. 53).

Family Zygænidæ.

Isbarta padanga, nov.

♂ ♀. Palpi white, last joint black; antennæ, head, body, and wings black; two white spots behind the head, two on the thorax in front, white dorsal and lateral spots on each segment of the abdomen, and white bands beneath: fore wing with a white basal spot, all the markings white; a thin streak on the basal half immediately below the costal line, a short thin streak immediately below this not reaching the base; a streak on the subcostal vein, extending from the middle to the end of the cell, thickened in its centre; an oval spot at the lower end of the cell, continued a short distance in a fine line on the vein inwards; two thick streaks below the cell from near the base to the middle, a thinner streak on the hinder margin from near the base for three fourths its length; an oval spot beyond the end of the cell, two above it in a triangular shape, two in the disk a little below and outside, a longer spot below and a little inwards, and another similar spot below this towards the hinder margin not far from the angle; a submarginal row of spots rather close to the margin, but curving inwards below the apex: hind wings with streaks on the cell-veins, reaching the base, the upper one not reaching the end of the cell; a curved row of discal elongated spots, a submarginal row of seven smaller spots; three streaks below the cell, extending from the base and running into the submarginal spots; a broader streak on the abdominal margin. On the underside the markings on the wings are as above, but the streaks are broader and the spots larger; thorax spotted with white; legs streaked with white.

Expanse of wings, ♂ $2\frac{9}{10}$, ♀ $3\frac{1}{10}$ inches.

Padang, Sumatra; one pair.

Pompelon affinis, nov.

♂. Frons white, with pale blue reflections; antennæ black; head, body, and wings dark blackish brown; a crimson line behind the head; abdomen with the anal tuft

and underside crimson, with lateral black spots on each segment: fore wings above with dull pale purplish reflections on the costa and outer veins, the costal reflections expanding somewhat towards the apex: hind wings with similar reflections on the apical portions. Underside dull brown; fore wings with a large dull ochreous spot at the upper end of the cell; blue reflections on the costa, subcostal vein, the veinlet within the cell, and on all the outer veins; hind wings without any reflections; the brown colour on all the wings pale towards the outer margins; pectus and thorax crimson; legs black.

Expanse of wings $2\frac{7}{10}$ inches.

Padang, Sumatra; one example.

Nearest to *P. amplicatum*, Butler, from the Celebes; differs in the nature of the reflections above and is very different beneath.

Family Lymantriidæ.

Dasychira albiplaga, nov.

♂ ♀. Antennæ with the shafts whitish, pectinations greyish brown; palpi brown above, greyish white beneath; head and fore part of thorax greyish white; thorax greyish brown; abdomen greyish white: fore wing greyish brown, smeared in parts with whitish, more prominently so in the female; a broad, almost straight, whitish stripe from the base to the apex, through the upper part of the wing, more or less obsolescent in one of the females; an antemedial dentated whitish line, lined with brown on its outer side; a postmedial, dentated, and recurved similar line, lined with brown on its inner side, curving inwards above the hinder margin close to the antemedial line; a submarginal lunular whitish thin band, which also curves inwards above the hinder margin; a marginal row of brown lunules, margined on each side with whitish; cilia white, with brown patches; most of these lines are almost invisible in the male, but quite distinct in the female: hind wings pale brown in the male, almost white in the female: body, legs, and wings grey; a discal, nearly straight, grey, thin band across the fore wing and indicated on the upper portion of the hind wing.

Expanse of wings, ♂ $1\frac{1}{10}$, ♀ $1\frac{7}{10}$ inch.

East Java; one male and five females.

In Ann. & Mag. Nat. Hist. (7) xviii. p. 405 (1906), I described this female erroneously as the female of *Orgyia nebulosa*, Walker, with which I originally received it; the

venation being almost identical, I thought it must be the female of that species, but a closer examination with the *Dasychira* male now received with a female showing similar markings leaves no doubt of my error.

Family *Quadrifidæ*.

Nyctipao superba, nov.

♀. Blackish brown, the outer half the darkest and nearly pure black, the ocellus broader than in *caprimulgus*, Fabr., the dull orange ring tinged with blue, and with pale blue-white markings as in *jaintiana*, Swinh.; a discal pure white complete band across both wings, not quite touching either costa or abdominal margin, sinuous throughout, with two blunt outward projections before and above the middle on the fore wings, and commencing with two almost square spots below the costa on the hind wings. On the underside the wings are paler, especially towards the base and hinder margin of fore wings, where it has a red tinge; the white band as above, except that on the fore wings it commences with three lunular blunt spots below the costa; cilia of both wings black: body above and below blackish brown; antennæ, palpi, breast, and legs black.

Expanse of wings $4\frac{1}{10}$ inches.

Khasia Hills; one example.

A very handsome insect.

Family *Geometridæ*.

Thalassodes viridifascia, nov.

♂ ♀. Palpi above and antennæ ochreous; palpi below, head, body, and wings above and below white; thorax mostly green, and green dorsal bands on the abdomen. Wings thinly clothed, sparsely striated with green: fore wing with the costal line ochreous, the base green; two straight, slightly oblique, broad green bands, ante- and post-medial, neither quite reaching the costa; apex green, this colour narrowing down the outer margin: hind wings with a broad, straight, medial green band in continuation of the antemedial band of the fore wings; some green on the outer and abdominal margins; marginal lines of both wings dark; cilia white, with a pale green inner band. Underside whitish, without markings; legs ochreous.

Expanse of wings 2 inches.

N. Borneo; one pair.

Belongs to the group of which *orthdesma*, Lower *, from Queensland, *albifusa*, Warren, from Fergusson Island, and *nivestrotta*, Warren, from N. Guinea, are examples.

Dysphania fannitta, nov.

♂ ♀. Yellow, of the colour of *militaris*, Linn.; palpi black at the sides, tips yellow, last joint black; antennæ black, a black stripe down the middle of the frons, a black stripe between the antennæ, one on the neck, one on the shoulders, and one before the middle; the abdomen above and below pure yellow, without any markings, except for a black stripe at the base above corresponding to the black stripe across the base of the hind wing, which runs up into the fore wing, expands on the interno-median interspace, is there excavated on its outer side, then is bent straight inwards on to the costa at one fourth from the base; costal line black; a thick streak from the base on the median vein, coming to a point on the bent band; outer third of the wing black, with discal and subapical bands of nearly white semihyaline square spots, the spot above vein 3 being long and narrow; the yellow space between the outer black portion and the inner bent band limited to four large yellow spots divided by the veins: the hind wings are marked much as in *subrepleta*, Walker, but the outer veins are thickly streaked with black and the outer margin has a lunular black line; the hind wings are more ample than usual and project a little between veins 3 and 4.

Expanse of wings $3\frac{2}{5}$ inches.

Nias; one male and two females.

Dysphania jessica, nov.

♂ ♀. Of the same yellow colour as *militaris*, Linn., but smaller, uniformly not larger than *subrepleta*, Walker, = *bellonaria*, Guen.; markings somewhat similar to the former, but the black subbasal band outside the basal spots is continuous and bent round, being very slightly angled outwardly on the median vein, and there is an elongated spot with square sides on vein 1 attached to the outside of the band which is reduced to a small spot usually in the female; the black basal stripes are broken, and not even and regular as in *militaris*; in the hind wing the discal black transverse band is continuous.

Expanse of wings $3\frac{2}{10}$ inches.

* Tr. Roy. Soc. S. Austral. 1894, p. 86; Nov. Zool. iii. p. 203, and x. p. 365.

Nancoury, Nicobars; three males and two females (type).

Pt. Blair, Andamans; one male and two females.

Bassein, Burma; one female.

There are a good many examples from the Nicobars and Andamans in the B. M., and all that I have seen are perfectly constant in the above-mentioned characters.

Pareumelea rostrata, nov.

♂ ♀. Antennæ, body, and wings dark ochreous olive; the apex of fore wings broadly and the outer margins of both wings more narrowly clear ochreous yellow; the olive colour thickly striated with dark brown, and a band of this colour extends below the apex of fore wings nearly to the outer margin, then the yellow marginal band narrows downwards, but on the hind wings it is fairly uniform in width and is somewhat angled in the middle, as in *P. hortensiata*, Guen. On the underside the wings are olive-brown without striations, the band as above; body and legs yellow.

Expanse of wings $2\frac{5}{16}$ inches.

Menado, Celebes; one pair.

It lacks the upper discal large yellow spot of *hortensiata* and the yellow marginal band is of a different formation.

IX.—*Two new Mammals from Asia Minor.*

By GERRIT S. MILLER.

THE British Museum contains specimens of a shrew and dormouse from Asia Minor, neither of which appears to have been hitherto described.

Neomys teres, sp. n.

1906. *Neomys fodiens*, Thomas, P. Z. S. 1905, ii. p. 522 (April 1906).

Type.—Adult male (skin and skull). B. M. no. 5. 10. 4. 17. Collected at edge of brook in mountains (altitude 7000 feet) 25 miles north of Erzeroum, Turkey in Asia, July 8, 1905, by R. B. Woosnam. Presented by Col. A. C. Bailward. Original number 53.

Diagnosis.—Similar to *Neomys anomalus*, Cabrera *, and

* Ann. & Mag. Nat. Hist. ser. 7, xx. p. 214 (September, 1907). San Martin de la Vega, Province of Madrid, Spain.

N. milleri, Mottaz *, but larger, skull more heavily built, and teeth more robust.

Colour.—Upperparts a mixture of very dark vandyke-brown and slate-grey, the hairs with silvery reflections, which produce a noticeable "pepper-and-salt" appearance, more evident in certain lights than in others. Head and anterior half of body tinged with hair-brown. Underparts sharply defined pale cream-buff, irregularly darkened by slate-grey bases of hairs. An elongated buffy-white spot, 5 mm. in greatest diameter, immediately behind eye. Feet buffy grey, the toes dusky. Tail everywhere covered with short silvery-white hairs, those of pencil dusky-tinged, the dark skin appearing more noticeably at surface above than below.

Skull and teeth.—Aside from its larger size the skull does not differ appreciably from that of *Neomys milleri* and *N. anomalus*, except in the relatively deeper, broader, anterior portion of rostrum. Teeth not peculiar, except in their uniformly greater size and robustness.

Measurements.—Head and body 88 mm.; tail 58; hind foot 18·5; ear 5. Skull: condylo-basal length 22·4 (20·2) †; greatest breadth of brain-case 11·4 (10·6); depth of brain-case 6·0 (6·0); mandible, including incisor, 14·4 (13·4); maxillary tooth-row 10·4 (9·4); mandibular tooth-row 9·4 (8·8).

Specimen examined.—The type.

Remarks.—This species is readily distinguishable by its large robust skull. In colour the type is not so dark as average specimens of the European forms, a character which may or may not prove to be of importance. By the discovery of *Neomys teres* the known range of the round-tailed group of water-shrews is greatly extended to the eastward.

Muscardinus trapezius, sp. n.

Type.—Adult male (skin and skull). B.M. no. 6. 5. 1. 40. Collected at Khotz, near Trebizond, Turkey in Asia, February 10, 1906, by A. Robert. Presented by Oldfield Thomas. Original number 2407.

Diagnosis.—Similar to *Muscardinus avellanarius*, but skull with audital bullæ noticeably smaller and more nearly circular in outline.

Colour.—Upperparts uniform buffy slate-colour, lightening

* Mém. Soc. Zool. de France, xx. p. 22 (September, 1907). Alpes Vaudoises, Switzerland. Altitude 1230 m.

† Measurements in parentheses are those of an adult male *Neomys anomalus* from Santo Domingo de Silos, Province of Burgos, Spain (no. 7292 G. S. M.).

to ochraceous-buff on muzzle and cheeks, and with a faint brownish wash along middle of back; underparts between buff and cream-buff, slightly darkened by the slaty under-colour, the line of demarcation along sides of body rather well defined; throat and median region of chest white to base of hairs; whiskers blackish; upper lip whitish buff except in region of muzzle; feet dull greyish buff; tail obscurely bicolor, similar to back above, though rather conspicuously darkened by a brownish suffusion through terminal third, light buffy below, though not so pale as belly.

Skull and teeth.—The skull resembles that of *Muscardinus avellanarius*, except that the audital bullæ are circular in outline and much smaller, owing chiefly to the absence of the inflated region between paroccipital process and bullæ proper. This inflation is always present in *M. avellanarius*, destroying the circular outline of the bullæ when viewed from the side. Teeth as in *M. avellanarius*.

Measurements.—Head and body 80 mm.; tail-vertebræ 66; hind foot 17; ear from meatus 10; ear from crown (dry) 5·8. Skull: condylo-basal length 21·2; zygomatic breadth 13; mastoid breadth 10·6; interorbital breadth 3·4; nasal (along median suture) 7; diastema 5·6; mandible 12·4; upper tooth-row (alveoli) 4·4; lower tooth-row (alveoli) 4.

Specimen examined.—The type.

Remarks.—In all respects, except for the small circular audital bullæ, this species so exactly resembles *Muscardinus avellanarius* that I can detect no other characters by which it may be recognized. While the Turkish dormouse is represented by the type specimen only, the series of skulls of the European animals is sufficient to show that the outline of the bullæ is constant enough to be of much importance in distinguishing between closely related forms.

X. — *A Survey of the Species and Varieties of Pupa, Draparnaud (Jaminia, Risso), occurring in South Africa.*
By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY, F.Z.S.

[Plates I. & II.]

WHEN Mr. Henry C. Burnup visited England recently, we pointed out to him that several so-called species of *Pupa* appeared to be insufficiently defined, suggesting that he would, perhaps, feel inclined, on his return to S. Africa, to

give special attention to the genus. This he at once promised to do, and to him alone belongs the full credit of the survey now instituted. He has, with most infinite pains and patience, succeeded, firstly, in unravelling the majority of the difficulties arising from insufficient delineation or description, and, secondly, in weighing each form separately in the balance and judging as to its specific or varietal value.

It is not surprising that, in the careful examination of hundreds of specimens, collected from widely distant localities, his observations should have led him to take a broader view than had heretofore been possible, enabling him to correct many erroneous conclusions. He has now entrusted to us his valuable notes and drawings with full permission to use them. Indeed, without his aid this revision could not possibly have been attempted, and well has he merited, not our own thanks only, but the gratitude of every student of the South-African molluscan fauna.

1. *Pupa crawfordiana* (M. & P.).

Fauxulus crawfordianus, Melvill & Ponsonby, Ann. & Mag. Nat. Hist. ser. 7, vol. xii. (1903) p. 605, pl. xxxi. fig. 5.

A fine species, allied to *P. layardi*, Bens., with a cylindrical contour, attenuate towards the apex. It was described as a dextral *Fauxulus*, but seems better included in *Pupa* proper.

Alt. 8, lat. 3·75 mm.

Hab. Mossel Bay (*J. Crawford*).

2. *Pupa cryptoplax*, M. & P. (Pl. I. figs. 1, 2.)

Pupa cryptoplax, Melvill & Ponsonby, Ann. & Mag. Nat. Hist. ser. 7, vol. iv. (1899) p. 198, pl. iii. figs. 11, 11 a.

We give two of Mr. Burnup's drawings, taken from a juvenile and mature specimen respectively, and in these will be seen:—

(a) the deep-seated and much inwardly extending parietal plait, with

(b) a plait, occasionally duplicated, encircling the columella, and

(c) a broad, apparently transverse, labial plica; while

(d) there exists on the young shell an evident septum.

We quote Mr. Burnup's remarks *in litt.*, as follow:—

“Observing some strange-looking plaits or septa in some young shells, I made an internal examination, to see how far in the growth these were continued. Two plaits are shown

in the young through the translucent shell, and one example showed three. Two more mature specimens that I opened up exhibit none of these plicæ. Have they been absorbed as the shell grew?"

In external form and size *P. cryptopla* does not appear to vary much, being always somewhat conically pyramidal or turbinate, deeply umbilicate, with whorls $7\frac{1}{2}$ to 8 in number, lip slightly elongate, oblique, reflexed, white.

Alt. 3.12, lat. 1.85 mm. (sp. min.).

„ 3.76, „ 2.15 „ (sp. maj.).

Hab. Kragga Kamma, Port Elizabeth.

3. *Pupa dadion*, Bens. (Pl. I. fig. 3.)

Pupa dadion, Benson, Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. (1864) p. 495; Pfeiffer (*Pupilla*) Nomencl. Helic. Viv. (1881) p. 354; Melv. & Pons. P. Malac. Soc. vol. iii. (1898) p. 176; Sturany, Südafrik. Moll. (1898) p. 70.

This interesting species never having as yet been figured, we take pleasure in reproducing an admirable delineation of Mr. Burnup's, drawn from a specimen collected by the author, Mr. W. H. Benson, in the collection of J. H. P., the exact measurements of this specimen being, as compared with the type:—

Alt. 3.10, lat. 1.76 mm.

(Type) „ 3.50, „ 2.0 „

Hab. Simons Bay, behind the Admiralty House, also at Paradise, Table Mountain (*E. L. Layard*); Bedford, Cape Colony (*Ponsonby & Farquhar*); Umvoti County, Natal (*Lightfoot*).

Specimens from these last two localities confirmed and identified by Mr. H. C. Burnup.

4. *Pupa damarica*, Ancey.

Pupa damarica, Ancey, Le Naturaliste (1888), p. 200.

“Testa subcylindræo-oblonga, sat gracilis, parva, tenuiuscula, perforata, subnitida, obliquè confertimque striatula, apicem versus levior; spira parva, attenuata, summo magno, obtusissimo. Anfr. $5\frac{1}{2}$, regulariter accrescentes, convexi, sutura profunda distinctèque obliquè separati, usque ad peristoma paulatim sed vix diametro crescentes, ultimus latere convexus, parum attenuatus, propè aperturam subascendens. Apertura ovalis, parum lunata, ferè recta, intus 5-dentata, dente uno columellari parvo acuto; parietali maximo, lamellifero, torto, intrante propè angulum superiorem aperturæ: subbasali parvo, et denticulis 2 in interiore marginis exterioris, primo antè, secundo post medium (hoc majore

et profundius sito). Perist. expansum, marginibus callo junctis, albidulum ad basin et columellam, dilatatum, patulum.

“ Long. $2\frac{1}{4}$, diam. $1\frac{1}{8}$, long. apert. $\frac{2}{3}$, lat. $\frac{1}{2}$ mm.

“ Disappointment Key, Ovampoland (Damara).

“ Cette petite espèce appartient au même groupe que les *P. rupicola*, Say, *pellucida*, Pfr., *tripunctum*, Morelet, &c.”
(C. F. Ancey.)

The journal in which this species was described not being very accessible, we copy the particulars above. No figure has been given, nor do we know where the type is located, but some points of affinity to *P. ovampoensis* appear to exist.

5. *Pupa dysorata*, M. & P. (Pl. I. fig. 4.)

Pupa dysorata, Melvill & Ponsonby, Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 20, pl. iii. fig. 4; emend. vol. xii. (1893) p. 111; Sturany (*dysorota*), Südafrik. Moll. (1898) p. 71.

Shell very small, oblong, smoothish, minutely obliquely striate, apex obtuse; whorls $5\frac{1}{2}$, swollen, ventricose; body-whorl short (in type), almost straight; aperture squarely ovate, lip white, slightly reflexed, columellar tooth (in the type specimen) obsolete.

Alt. 1.43, lat. 0.90 mm. (Mr. Burnup's figure).

Hab. Griqualand East.

Var. *intradentata*, Burnup, nov. (Pl. I. figs. 5, 6.)

Shell minute, rimate, subcylindrical, elliptic, thin, translucent, shining, very pale brown; spire turbinate, with greater width at the fourth whorl; sutures impressed, apex very obtuse; whorls $5\frac{1}{2}$, very convex, closely transversely striate, excepting the first $1\frac{1}{2}$, which are smooth, the last compressed round the umbilical region; aperture nearly erect, rounded, nearly $\frac{1}{3}$ the height of the shell. Peristome slightly thickened and reflexed, more so at the collumellar margin, scarcely paler than the rest of the shell, with labrum slightly straightened about the middle. Columella arcuate, the only tooth being conspicuous, white, rounded, and remote; it is situated inside, about midway between the last suture and the base, and about half a turn from the labium.

Alt. 1.47, lat. 0.79 mm. (maj.).

„ 1.40, „ 0.74 „ (min.).

Hab. Pretoria (Farquhar & Ponsonby).

“ A pretty little shell, one of the smallest of the South-African group, and of a paler colour than usual. As compared with *perplexa*, Burnup, sp. n., which is its nearest ally,

perhaps, both having the remarkable deep-seated postlabial tooth, this species is smaller, smoother, paler, and less cylindrical, is only rimate instead of umbilicate, has the peristome less deflexed, and is destitute of the postcolumellar and parietal plaits. It would appear that *intradentata* and *dysorata* have the same general appearance; indeed, I suppose that it must be considered a toothed variety of it, and that the typical specimen of *dysorata* neglected to develop the tooth." (H. C. B.)

6. *Pupa farquhari*, M. & P. (Pl. I. fig. 7.)

Pupa farquhari, Melvill & Ponsonby, Ann. & Mag. Nat. Hist. ser. 7, vol. ii. (1898) p. 128, pl. vii. fig. 7.

We would add to our original description that the outer lip, as well as the columellar margin, is somewhat thickened within. We refigure from one of Mr. Burnup's drawings.

Alt. varies from 3·93 to 4·24 mm.

Hab. Elandsberg Mountain, Cradock (*Farquhar*).

Mr. Burnup writes to us in reference to this:—"Good species; very near to *P. dadion*, Bens., but distinguishable. I think that *dadion*, occurring so near to *farquhari*'s habitat, as well as at the extremes, Simon's Bay, and Umvoti Co., Natal, without the slightest variation, tends to support its distinctness as an inhabitant of the intermediate locality, Cradock." (H. C. B.)

7. *Pupa fontana*, Kr.

Pupa fontana, Krauss, Südafrik. Moll. p. 80, pl. v. fig. 6; Pfeiffer (*Vertigo, Alæa*), Nomencl. Helic. Viv. (1881) p. 358; Morelet, Journ. de Conch. xxxviii. p. 19; M. & P. Proc. Malac. Soc. vol. iii. (1898) p. 176; Sturany, Südafrik. Moll. (1898) p. 69.

Since we first undertook the description of South-African Mollusca, nearly twenty years ago, an immense quantity of this species has been gathered by several collectors, from widely different localities, showing extraordinary range of variation. Under *fontana*, indeed, we must now place the following:—

- (a) *amphodon*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. xviii. (1896) p. 317, pl. xvi. figs. 6, 7.
- (b) *charybdica*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 94, pl. i. fig. 13.
- (c) *custodita*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 93, pl. i. fig. 9.
- (d) *elizabethensis*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. ix. (1892) p. 19, pl. v. fig. 13.
- (e) *endoplax*, M. & P. Ann. & Mag. Nat. Hist. ser. 7, vol. viii. (1901) p. 319, pl. ii. fig. 10.

- (f) *frustillum*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 94, pl. i. fig. 14.
 (g) *keræa*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 94, pl. i. fig. 12.
 (h) *omicronaria*, M. & P. Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 93, pl. i. fig. 11.

Here we quote from Mr. Burnup *in litt.*:—"Judging from the number and diversity of the specimens submitted to me from so many different localities, this, the first described of the South-African *Pupæ* or *Jaminia*, would appear to be the commonest, most variable, and most widely distributed species. Specimens now in my hands have been collected at Johannesburg (*McBean & Johnson*); Pretoria (*Ponsonby, Wotton, & McBean*); Potchefstroom and Heidelberg (*Miss Livingston*); Prieska (*Lightfoot*); Cradock (*Ponsonby & Farquhar*); Port Elizabeth (*Ponsonby, Crawford, Farquhar, Lightfoot*); Kowie (*Ponsonby*); Karkloof, Natal (*McBean*).

"Specimens also in Mr. Ponsonby's collection from Abyssinia can in no way be distinguished from those from South Africa.

"The following measurements of a few of the specimens examined will give some idea of its extreme variability, both in size and form:—

"Alt. 2·07, lat. 1·28 mm.

" 2·22, " 1·45 "

" 3·67, " 1·66 "

" 3·75, " 1·67 "

"In colour, too, it varies from the brownish horn-colour of the type, or even darker, through pale brown and straw-colour, to white, the first being the commonest, and white the next—the intermediate shades are rarer. The tooth-processes also vary, not only in development, but also in number, and it seems probable that some of the kindred forms described under different names belong properly to this species.

"The words 'anfr. supremo extus scrobiculum formante' in Krauss's original description seem erroneous: the sulcus on the outer side of the labium corresponds with the lower labial tooth or plait, not the upper, as may be inferred from Krauss's own figure." (*H. C. B.*)

With regard to the forms (originally deemed of specific rank) now necessarily merged in *fontana*, we would merely remark that:

(a) *amphodon* has the dentition, particularly the inner plaits, peculiarly strongly developed.

(b) *charybdica* possesses a much incrassate lip, and dental processes deep-seated.

(c) *custodita*, in addition to the usual columellar, parietal, and two internal labial plicæ, possesses a third labial, the uppermost of the three in situation, very deep-seated, and often obscure.

(d) *elizabethensis*. Nearly all the specimens seen by us are albino, giving a distinctive appearance.

(e) *endoplax*. This may possibly be synonymic with Jickeli's var. *globosa* (Afr. Moll. t. 5. f. 11), also mentioned in Nomencl. Hel. Viv., but we have not seen the typical specimen.

(f) *frustillum*. This form is more elongate than the type, while

(g) *keræa* is cylindric in shape.

But we are now inclined to agree with Mr. Burnup, that these names are hardly worth while perpetuating.

8. *Pupa griqualandica*, M. & P. (Pl. I. figs. 8-10.)

Pupa griqualandica, Melvill & Ponsoy, Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 22, pl. iii. fig. 9; Šturany, Südafrik. Moll. (1898) p. 71.

Shell very minute, umbilicate, ovato-conical; brown, whorls 5, ventricose, much compressed, uniformly, closely, longitudinally, finely striate, the body-whorl often dorsally contracted and sulcate behind the peristome; aperture oval or roundly ovate, lip thickened, with five plaits, a sixth being visible in some specimens likewise, this is probably always present, but so deep-seated in some cases as not to be observed, as it is wholly internal. These plaits are disposed as follows:—Two parietal plaits, running parallel to each other, both recurved and deeply penetrating; a third runs inwards from the labial sinus; a fourth, small in the type and co-type, large in specimens since collected, is basal and dentiform; the fifth, the columellar plait, is acinaciform, thin, and deep-seated; the sixth process, so often invisible externally, is basal and almost entirely internal.

The measurements vary as follows:—

Alt. 1.6 to 1.65, lat. 0.87 to 0.94 mm.

Hab. Cradock (*e coll. Rogers*); Port Elizabeth (*Ponsoy*); Botanic Garden, Maritzburg (*Burnup*); Heidelberg; Dargle, Natal (*Miss Livingston & Burnup*); Dukuduku, Zululand (*Toppin*); Pretoria (*Farquhar*); Griqualand (*coll. Sykes*).

We figure a few of the more conspicuously interesting forms of this wonderful and complicate shell, selected from the many excellent drawings of the species executed by Mr. Burnup, in substitution of the original figure and Latin description, both of which were insufficient in detail.

9. *Pupa haploa*, M. & P.

Pupa haploa, Melvill & Ponsonby, Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 21, pl. iii. fig. 7; Sturany, Südafrik. Moll. (1898), p. 70.

A small simple-mouthed species, of which the type only occurred, unfortunately mislaid soon after description, fifteen years ago. No example has since come to hand. Seemingly allied to *P. pretoriensis*, M. & P.

Alt. 1.70, lat. 0.75 mm.

Hab. Pretoria.

10. *Pupa iota*, M. & P. (Pl. I. fig. 11.)

Pupa iota, Melvill & Ponsonby, Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 93, pl. i. fig. 10; Sturany, Südafrik. Moll. (1898) p. 70.

"Shell very small, rimate, subcylindrical, elongate, thin, translucent, shining, pale brown; spire slightly narrowing upwards, the greatest width being at the fifth and sixth whorls, sutures impressed. Apex obtuse; whorls $7\frac{1}{2}$, very convex, closely lirate transversely, excepting the first $2\frac{1}{2}$, which are smooth, the last whorl compressed round the umbilical region, and flattened near the middle of the labium; aperture straight, subangularly rounded, about $\frac{1}{4}$ the height of the shell, peristome reflexed, widely so at the columellar margin, slightly thickened, pale, untoothed, with labium somewhat incurved about the middle, columella straight.

"Alt. 2.17, lat. 0.92 mm. (maj.).

" 2.10, „ 0.88 „ (min.).

"Hab. Pretoria, Transvaal (*Collier, McBean, & Farquhar*); Heidelberg (*Miss Livingston*); Dukuduku Forest, Zululand (*Toppin*).

"A slender cylindrical form which seems to be quite distinct from all described species, though seemingly comparable with *P. quantula*, M. & P., which is less tapering upwards, broader in comparison to its length, and fine in sculpture, and also with *P. pentheri*, Stur., a more conical shell, with smoother sculpture, the whorls particularly ventricose, and shallower sutures." (*H. C. B.*)

The original type (from Pretoria) is slightly smaller in dimensions than those given above, and is not in very perfect condition.

Var. *livingstonæ*, nov., Burnup, MS. (Pl. I. fig. 12.)

Shell very similar to the typical form, eight-whorled, cylindrical, impressed at the sutures, somewhat coarsely

longitudinally striate; aperture simple, with one internal tooth opposite to the mouth, very obscurely designated in some specimens, which are therefore intermediate between this variety and the type.

Alt. 2·02, lat. 0·84.

Hab. Pretoria (*Connolly* in coll. Burnup).

11. *Pupa layardi*, Bens. (Pl. II. fig. 13.)

Pupa layardi, Benson, Ann. & Mag. Nat. Hist., December 1856; id. *ibid.* ser. 3, vol. xiii. (1864) p. 496; Melv. & Pons. Proc. Mal. Soc. Lond. (1898) p. 177; Pfeiffer, Mon. Helic. Viv. iv. p. 674, vi. p. 318; id. (*Vertigo*, *Alcea*) Nomencl. p. 358.

We treat this dextral species as a *Pupa*, relegating the sinistral forms alone to the subgeneric *Fauxulus* (= *Faula*, H. & A. Ad., 1858*, præocc.).

In Mr. W. H. Benson's revised description (*l. c.* p. 496) a var. *minor* is alluded to, about which some uncertainty exists. What is *P. stoaphora*, Benson, and when described? Can this be a synonym of the var. *minor*? Neither we nor Dr. R. Sturany † can trace the species.

Alt. $5\frac{1}{2}$ –7, lat. 2–3 mm. (*Benson*).

Hab. Bredasdorp.

The figure is taken from a shell received by J. H. P. from Mr. Benson.

12. *Pupa noltei*, Bttg. (Pl. II. figs. 14, 15.)

Pupa noltei (*Microstete*), Böttger, Ber. Senckenb. naturf. Ges. (1886) p. 26, pl. ii. figs. 4 a–c.

Hab. S. Kalahari.

We have not seen this species; the following is a copy of the original description:—

“Testa minima, punctato-rimata, cylindrato-turrita, solida, corneo-lutea, spira elongata, turrita, apex perobtusus. Anfractus 6, lentissimè accrescentes, sat convexi. Sutura profunda disjuncti, leviter obliquè striatuli, ultimus penultimo vix major, $\frac{1}{4}$ altitudinis testæ æquans, basi angulatus, versus aperturam parum ascendens, albidus, dorso distinctè planatus, et circum rimam gibbus. Apertura parva, circulari-ovalis, basi parum recedens, 4-dentata. Peristoma acutum, planè latèque expansum, album, marginibus convergentibus callo ad insertionem marginis dextri tuberculifero

* Gen. Recent Mollusca, ii. p. 171.

† Sturany, Südafrik. Moll. p. 68, giving only as reference Paetel's Catalog. Samml. ii. p. 305.

· junctis, dextro supra angulatim curvato, basali et sinistro regulariter arcuatis. Dentes 4 profundi, 1 parietalis pliciformis, columellaris 1 validus, palatales gemini, punctiformes in faucibus. "Alt. $3\frac{3}{4}$, diam. max. $1\frac{1}{2}$, alt. apert. 1, lat. 1 mm." (*Böttger*.)

A copy of the original figure is given.

13. *Pupa ovampoensis*, M. & P. (Pl. II. fig. 16.)

Pupa ovampoensis, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 22, pl. iii. fig. 9; Sturany, Südafrik. Moll. (1898) p. 71.

Pupa ridibunda, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 7, vol. viii. (1901) p. 320, pl. ii. fig. 11.

Shell minute, rimate, thin, brown; whorls $5\frac{1}{2}$, the apical depressed, glassy, the rest very ventricose, impressed suturally, microscopically finely obliquely striate, in the more typical form almost smooth; occasionally lirate longitudinally; aperture round, lip pale brown, continuous, especially thickened at the columellar margin, furnished with the following processes: a thickened, often bifid, parietal plait; two labial (the lower one, as a rule, the larger), sometimes situated more deeply back; a prominent obtuse basal tooth; and columellar plait, broad, flat, occasionally bifid, deep-seated.

In the form *ridibunda* the parietal plait is very conspicuously bifid and the basal tooth usually acute, but every intermediate occurs.

Alt. 2.25, lat. .97 mm. (maj.).

„ 2.3, „ .86 „ (min.).

Hab. Ovampoland (*E. L. Layard*); Prieska (*Dr. Gibbons*); Port Elizabeth (*Farquhar*); Rustenberg (*McBean*), lirate variety; Potchefstroom (*Miss Livingston*); Elandsberg Mts. (*Farquhar*), "*ridibunda*."

We thank Mr. Burnup for having cleared up the distribution of this species, of which the type came from the remote Ovampoland. A variable shell in the disposition of its peristomatal processes, but to be recognized by its round continuous lip, long cylindrical form, with very ventricose whorls. *P. damarica*, Ancy, may possibly be identical; see our remarks under that species, which has never been figured.

We may add that *Bifidaria quadridentata*, Sterki, from the Capitan Mountains, U.S.A., and a Mauritius species very doubtfully referred to *P. lienardiana*, Crosse, on the authority of Dr. Penther, come near our species, though both differ slightly in form and in disposition of dental arrangement.

14. *Pupa pentheri*, Stur.

Pupa pentheri, R. Sturany, Anz. k. Akad. Wissensch. Wien, 1898, no. xvi. Rep. p. 8; id. Catal. Südafrik. Moll. 1898, p. 70, Taf. ii. figs. 34-36.

A very minute, elongate-cylindrical, seven-whorled species, with simple mouth, containing no processes whatsoever. An extension of its range has been made by Mr. Toppin's discovery of its existence at Dukuduku, Zululand.

Alt. 1·85, lat. 0·78 mm. (maj.).

15. *Pupa perplexa*, Burnup, sp. n. (Pl. II. figs. 17, 18.)

Shell very small, umbilicate, cylindrical, thin, translucent, shining, pale brown; spire cylindrical, rounded above, sutures impressed, apex obtuse; whorls 6, very convex, closely transversely lirate excepting the first two, which are smooth, the fourth, fifth, and sixth of nearly equal width, the last half-whorl acquiring its greatest width a little below the suture and then being flattened below, forming an infra-sutural angle, the last whorl compressed towards the umbilicus; aperture rounded, nearly $\frac{1}{3}$ the height of the shell; peristome reflexed, especially at the columellar margin, thickened, connected by a slight callus, whitish, furnished with a small white parietal plait running inwards, and there becoming strong, and a strong white postcolumellar plait also running inwards, in addition to which there is a profoundly postlabial tooth or plait hidden by the columella; labium slightly incurved about the middle; columella straight.

Alt. 1·72, lat. 0·82 mm.

„ 1·74, „ 0·80 „

„ 1·80, „ 0·77 „

Hab. Cradock, Cape Colony (*Farquhar*); Johannesburg, Transvaal (*McBean*); Pretoria (*Collier & Ponsonby*); Port Elizabeth (*Farquhar*); Potchefstroom (*Miss Livingston*).

A very pretty and interesting little species, much like *iota*, M. & P., in colour, sculpture, and ventricosity of whorls, but differing in being shorter, more cylindrical, and umbilicate instead of rimate, and in having a more thickened and reflexed peristome, fewer whorls, and an armature of tooth-processes of which the other is, *typically*, destitute.

The arrangement of the peristomatal and other processes in this species is very elusive, some examples viewed from the front showing no plaits, others one, some two, and a few all three; but in most specimens they can all be seen under a strong lens by turning the shell round. Such specimens

as show in a front view only the columellar plait, or only the postlabial tooth, are easily confused with *P. intradentata*, Burnup, which, however, is more abbreviate, with rounder aperture and finer sculpture.

16. *Pupa pretoriensis*, M. & P.

Pupa pretoriensis, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 21, pl. iii. fig. 8; Sturany, Südafrik. Moll. p. 71.

A minute simple-mouthed species, with particularly broad apex, much flattened.

Hab. Pretoria, Transvaal.

17. *Pupa psychion*, M. & P.

Pupa psychion, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xiv. (1894) p. 93, pl. i. fig. 8; Sturany, Südafrik. Moll. p. 70.

Slightly more ventricose than the last, which it resembles in its simple mouth, untrammelled by any processes whatsoever. The types of both these species are, unfortunately, no longer in existence, having been accidentally broken.

Hab. Pretoria, Transvaal.

18. *Pupa quantula*, M. & P. (Pl. II. fig. 19.)

Pupa quantula, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 20, pl. iii. fig. 5; Sturany, Südafrik. Moll. p. 70 (1898).

Hab. Port Elizabeth.

Evidently a rare species. We refigure it from a drawing by Mr. Burnup of a co-type, which gives a better representation than did the original figure. The measurements of this specimen are:—

Alt. 1·87 mm.; lat. 4th, 5th, and 6th whorls 0·84, 6th whorl to labium 0·91.

19. *Pupa sykesii*, M. & P.

(Pl. II. fig. 20; var. *inconspicua*, fig. 21.)

Pupa sykesii, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 21, pl. iii. fig. 6, vol. xii. (1893) p. 111; Sturany, Südafrik. Moll. p. 70.

Pupa inconspicua, Burnup, M.S.

Hab. Griqualand East (*e coll. Sykes*).

We refigure this species, the original description and representation being faulty. The "teeth of the peristome, which with difficulty are distinguished," are found not to have any real existence, the mouth of the type having been clogged with certain foreign particles.

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There can be no doubt that this is identical with a form of which Mr. Burnup had drawn up a description under the name *inconspicua*, and we take leave to introduce it here, as being more accurate and exhaustive than the original:—

“Shell very small, rimate, subeylindrical, elongate-oval, very thin, subhyaline, shining, brown; spire slightly convexly narrowing upward above the fifth whorl, sutures impressed, apex obtuse; whorls $7\frac{1}{2}$, convex, nearly smooth, faintly striate, with very fine microscopic, irregular, transverse cuticles, becoming stronger towards the base, last whorl not much impressed around the umbilical region; aperture slightly oblique, rounded, nearly $\frac{1}{4}$ of the altitude of the shell; peristome reflexed, especially at the columellar margin, slightly thickened, connected by a thin callus, pale, untoothed, straightened near the middle of the labrum; columella arcuate.

“Alt. 2·05, lat. 0·72 mm. (maj.).

” 1·94, ” 0·77 ” (min.).

“Hab. Dargle, Natal (*Miss Livingston*); Grahamstown, Cape Colony (*Farquhar*).

“A very delicate, minute, and rather characterless shell, long and narrow, but varying a good deal in size and proportions of height to width. It is so thin and transparent that in a side light the whole range of the columella can be viewed.

“Its nearest ally among South-African shells appears to be *P. pentheri*, Sturany, whose sculpture is very similar, but in form quite distinct, more conical, and with flatter whorls and shallower sutures. The rima or umbilical slit is, moreover, deeper.

“It is also comparable with *P. livingstonæ* (*iota*), much resembling it in form, though it narrows above more gradually. But the comparatively coarser sculpture and more angular aperture readily distinguish it.” (*H. C. B.*)

20. *Pupa tabularis*, M. & P. (Pl. II. fig. 22.)

Pupa tabularis, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xi. (1893) p. 20, pl. iii. fig. 3.

A new figure is very necessary, the conspicuous parietal tooth not having been done justice to. A certain bulimoid resemblance exists in the character of the whitish reflexed peristome. *P. dadion*, Bens., is its nearest ally.

Alt. 3·93 mm. (maj.).

” 3·4 ” (min.).

Hab. Near Cape Town (*R. M. Lightfoot*).

§ VERTIGO, Müll.

21. *Pupa (Vertigo) sinistrorsa*, Crav. (Pl. II. fig. 26.)

Pupa (Vertigo) sinistrorsa, A. E. Craven, Proc. Zool. Soc. 1880, p. 618, pl. lvii. fig. 8.

Vertigo thaumasta, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. viii. (1891) p. 239, vol. ix. (1892) p. 94, pl. vi. fig. 7; Sturany, Südafrik. Moll. p. 68.

Alt. 3, lat. $1\frac{1}{2}$ mm.

Hab. Algoa Bay, &c.; widely distributed.

We consider *thaumasta* and *sinistrorsa* identical, though they are still left separate by Dr. Sturany (*l. c.* p. 68), who also mentions Dr. Penther having collected a form distinct from either of these in its tooth-processes, but concerning which we know no more at present.

§§ FAUXULUS, Schaufuss.

22. *Pupa (Fauxulus) capensis* (Kurr).

Pupa capensis, Kurr, Küster, Conch.-Cab. p. 10, pl. i. figs. 19, 20.

Var. *kurri* (Krauss).

Pupa ovularis, Kurr, Küster, Conch.-Cab. p. 10, pl. i. figs. 16-18.

Var. *pottebergensis* (Krauss).

Pupa pottebergensis, Krauss, Küster, Conch.-Cab. p. 17, pl. ii. figs. 20-22.

Hab. Cape Colony.

23. *Pupa (Fauxulus) fryana* (Bens.).

Pupa fryana, Benson, Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. (1864) p. 495.

Evidently a *Fauxulus*, being *sinistrorse*. Discovered at Bredasdorp, at the southern shore of Swellendam, by Mr. John Fry. Mr. W. H. Benson lays stress upon the deep umbilicus, extending to the summit. We regret not having been able to figure this species.

24. *Pupa (Fauxulus) glanvilleana* (Ancey).

(Pl. II. fig. 23.)

Pupa glanvilleana, Ancey, Le Naturaliste, 1888, p. 200.

Hab. Cape Colony.

We append a figure of this hitherto unfigured species, with a copy of the original description:—

“*T. ovato-subconioidea*, longe rimata sed imperforata, tenuis, nitidula, albida, pellucida, sinistrorsa. Spira conoideo-subventricosa, ambitu convexa, ad summum parvum obtusiuscula et lævigata. Anfr. $8\frac{1}{4}$ – $8\frac{1}{2}$, regulariter et paulatim lenteque crescentes, vix convexiusculi, sutura simplice haud profunda separati, oblique arcuatim regulariterque striati, ultimus major convexus, attenuatus, antice circa umbilici locum compresso-carinatus, striis in medio anfractus subito abruptis, infra tamen perspicuis, spatio mediano angulum exilem mentienti. Apert. recta irregularis, valde ringeus, superne ascendens, subrhombica, albida, lamellis obstructa et fere clausa, scilicet—parietali 1 intranti valida: palatalibus 4, supra magna prope angulum superum, obliqua et a cæteris lobo intus quasi tubulato, extus prominente separata: 2 et 3 subæqualibus, infera valida contorta; columellaribus 3 validis subæquidistantibus. Perist. incrassato-subexpansum, lamellis marginem attingentibus, margine externo superne lobulato, postea fere recto, et ante basin leviter angulato, deinde iterum recto, basali valde angulato, columellari longo, plane recto: margines callo parietali appresso continui.

“Long. 4, diam. 2, alt. apert. $1\frac{1}{2}$ mill.

“East London (District oriental de la colonie du Cap, près de la Cafrerie anglaise).

“Cette espèce, si curieuse par la forme toute particulière de son ouverture extrêmement grimaçante et resserrée par de nombreux plis, ne peut être comparée à aucune autre espèce du Cap. L’espèce la plus voisine paraît être la *P. fryana*, Bens.

“La diagnose ci-dessus, où je me suis efforcé de mentionner toutes les particularités de ce joli *Pupa*, me paraît suffisante pour la connaissance de cette espèce, dédiée à Miss M. Glanville.” (*C. F. Ancey*.)

25. *Pupa (Fauxulus) mcbeaniana* (M. & P.).

Fauxulus (Anisoloma) mcbeanianus, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 7, vol. viii. (1901) p. 319, pl. ii. fig. 9.

Hab. Karkloof Bush, near Pietermaritzburg, Natal (*J. McBean*).

26. *Pupa (Fauxulus) pamphorodon*, Bens.
(Pl. II. fig. 24.)

Pupa pamphorodon, W. H. Benson, Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. (1864) p. 495.

Hab. Near Simonstown (*E. L. Layard*).

Through the kindness of Mr. Edgar Smith we are enabled to give a figure of this species from a specimen in the Nat. Hist. Museum.

27. *Pupa (Fauxulus) pereximia* (M. & P.).
(Pl. II. fig. 25.)

Pupa (Faula) pereximia, Melv. & Pons. Ann. & Mag. Nat. Hist. ser. 6, vol. xix. (1897) p. 638, pl. xvii. fig. 3.

Hab. Buffalo River.

A beautiful species, of the same character as *P. glanvilleana* (Ancey), but larger in all its parts.

28. *Pupa (Fauxulus) ponsonbyana*, Morelet.

Pupa ponsonbyana, Morelet, Journ. de Conch. vol. xxxvii. (1889) p. 9, pl. i. fig. 5.

Hab. Port Elizabeth &c. A species of very wide distribution.

This is apparently the type of Ancey's section *Anisoloma* *.

We may add, in conclusion, that we concur with Dr. H. A. Pilsbry (Man. Conch. ser. 2, vol. xviii. p. 336) in removing what he rightly terms the monotypic genus *Cœliaxis* (sp. *C. leyardi*, Ad. & Ang. P. Z. S. 1865, p. 54, pl. ii. fig. 1: *Hab.* Cape Colony) to a place among the Achatinidæ, subfam. Cœliaxinæ, in company with the little-known genera *Cryptelasmus*, Pilsb., from Trinidad, *Thomea*, Gir., and *Pyrgina*, Greef, from I. St. Thomé, and likewise the Lower Eocene genus *Distachia*, Crosse, from the Paris basin.

EXPLANATION OF THE PLATES.

PLATE I.

- Figs.* 1, 2. *Pupa cryptoplax*, M. & P.
Fig. 3. — *dadion*, Bens.
Fig. 4. — *dysorata*, M. & P.
Figs. 5, 6. — —, var. *intradentata*, Burnup, nov.
Fig. 7. — *farquhari*, M. & P.
Figs. 8-10. — *griqualandica*, M. & P.
Fig. 11. — *iota*, M. & P.
Fig. 12. — —, var. *livingstone*, Burnup, nov.

* *Vide* Journ. de Conch. vol. xlix. (1901) p. 141.

PLATE II.

- Fig. 13. *Pupa layardi*, Bens.
 Figs. 14, 15. — *noltei*, Bttg.
 Fig. 16. — *ovampoensis*, M. & P.
 Figs. 17, 18. — *perplexa*, Burnup, sp. n.
 Fig. 19. — *quantula*, M. & P.
 Fig. 20. — *sykesii*, M. & P.
 Fig. 21. — —, var. *inconspicua*, Burnup, nov.
 Fig. 22. — *tabularis*, M. & P.
 Fig. 23. — (*Fauxulus*) *glanvilleana*, Anc.
 Fig. 24. — (—) *pamphorodon*, Bens.
 Fig. 25. — (—) *pereximia*, M. & P.
 Fig. 26. — (*Vertigo*) *sinistrorsa*, Crav.

XI.—*New Deep-sea Fishes from the South-west Coast of Ireland.* By E. W. L. HOLT and L. W. BYRNE.

[Plate III.]

THE fishes described below were taken by Messrs. Farran and Kemp in the course of fishery investigations carried out in the 'Helga' on behalf of the Fisheries Branch of the Department of Agriculture and Technical Instruction for Ireland. All occurred in depths of less than 1000 fathoms and, consequently, within the British and Irish marine area.

Gadidæ.

Genus *LÆMONEMA*, Günther.

The definition of this genus appears to require revision and should read as follows:—

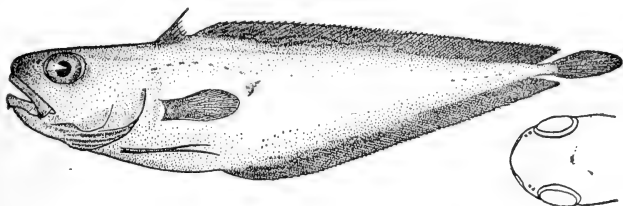
"Body of moderate length, covered with small scales. Fins scaleless, their bases sometimes clothed with loose skin. Two dorsal fins and one anal, anterior dorsal with 5 or 6 rays. Caudal separated by a short interval from posterior dorsal and anal. Ventrals apparently reduced to a single long ray, bifid at its extremity; other rays, if present, minute and closely apposed to the large ray. Bands of villiform teeth in jaws; a small group of vomerine teeth usually present. Chin usually with a small barbel."

Læmonema seems, as Günther (1887) has remarked, to scarcely deserve generic separation from *Phycis*. The most obvious distinction lies in the first dorsal fin, which in *Phycis* has 8-12 rays and in *Læmonema* 5 or 6. The presence or absence of a barbel has no necessary generic value in Gadidæ;

for instance, *Gadus merlangus* always has a small barbel when young, very rarely when adult. Vomerine teeth also may disappear with age, as in *Gadiculus argenteus*.

Læmonema latifrons, sp. n.*

Form rather massive anteriorly, compressed behind the shoulders; body distinctly elevated at the nape, highest at origin of second dorsal, and thence tapering to a very slender caudal peduncle. Head broad and somewhat depressed, but less broad than high, its length about equal to or slightly less than greatest height of body and about $4\frac{1}{4}$ in total length without caudal fin. Snout obtuse in vertical, broadly rounded



Læmonema latifrons. $\times \frac{2}{3}$ ca.

in horizontal profile, about $1\frac{1}{2}$ times in horizontal diameter of eye, which is itself contained 3 to $3\frac{1}{4}$ times in length of head and is slightly less than the width of the interorbital space. Height of caudal peduncle about $\frac{1}{3}$ of the horizontal diameter of the eye. Barbel minute. Gape rather oblique, angle of jaw not extending beyond centre of eye, upper jaw somewhat protruding; small teeth in bands in the jaws and in a small patch on the vomer. First dorsal, arising about opposite the

* Absence of material of other Atlantic species of a comparable size makes it impossible to construct a useful key to the genus, but the following brief notes may be of assistance:—

In comparison with *L. latifrons*:

L. barbatula, Goode and Bean, has a much smaller head, narrower interorbital space, and shorter ventrals;

L. globiceps, Gilch., has fewer and much larger scales;

L. melanurum, Goode and Bean, has a narrower interorbital space, smaller scales, and much longer barbel;

L. robustum, Gthr., has fewer fin-rays, much longer ventrals, and a less broadly rounded snout;

And *L. yarrelli* (Lowe) has larger and fewer scales and a comparatively narrower interorbital space.

pectoral, with five rays, the longest about equal to the horizontal diameter of the eye and half as long as the pectoral. Second dorsal and anal respectively with about 67-70 and about 59-65 rays, their bases clothed, especially in their anterior parts, with loose scaleless skin. Ventrals consisting of a single long divided ray, extending to or slightly beyond the origin of the anal, and of one or more minute rays closely apposed to the long ray. Scales small, at least 140 transverse series crossing the lateral line, about 14 or more in a vertical series between the first dorsal and the lateral line, about 35 in the ventral continuation of the same series. Lateral line indistinct posteriorly; about 20 modified scales can be detected on the anterior five-sixths of the body.

Coloration apparently uniform dark brown (most of the head and body is now scaleless and pale); fins blackish brown, without perceptible white border.

Loc. S.R. 489, 4. ix. 07, 51° 35' N., 11° 55' W., 720 fath.; trawl.

Two, 137 and 168 mm.

Dimensions of Type Specimens.

	mm.	mm.
Total length.....	168	137
" " without caudal fin	151	124
Length of head	35	29
" snout	8	6.5
Horizontal diameter of eye	11.5	9
Width of interorbital space	13.25	11
Snout to first dorsal fin	40	34
" second dorsal fin.....	47	41
" anus	49	42
" anal fin	59	51
Height of body at commencement of second dorsal fin	37	28
Height of caudal peduncle.....	3.5	3
Length of longest ray of first dorsal fin ..	11.5	11
, pectoral fin	23	16
" ventral fin	27+	25

Zeidæ.

Genus *CYTTOSOMA.*

An examination of such examples of Gilchrist's recently described species as are in the British Museum and of the type of *C. helgæ*, below described, has convinced us that the genus *Cyttosoma*, Gilch. (1904), requires redefinition in such manner as to comprehend both that genus as originally defined and *Neocyttus*, Gilch. (1906). While regarding

Boulenger's suggestion (1903) that *Cyttosoma* is merely the adult form of *Oreosoma*, C. & V., as highly probable, we prefer not to apply the latter name to the genus now under consideration until further material is available.

For present purposes the genus may be defined as follows:—

CYTTOSOMA (Gilch.).

? *Oreosoma*, C. & V.

Cyttosoma, Gilch. (1904 & 1906), + *Neocyttus*, Gilch. (1906).

Form compressed and elevated, more or less rhomboidal; body and parts of head covered with moderate or small ctenoid scales. Rows of bony scutes or tubercles sometimes * present on belly and sides. No bony scutes or tubercles along bases of dorsal and anal fins. Dorsal and anal fins similar, their spinous and articulated rays continuous but separated by notches. Dorsal spines VI–VII, anal III–IV. Upper jaw protrusible. Small teeth in the jaws and usually on vomer.

Oreosoma atlanticum, C. & V., is known from two young specimens only (the largest 68 mm. long) in which the bony tubercles on the sides of the body are relatively enormous; there is nothing to definitely connect these with any known adult form, but they may, as suggested by Boulenger (1903), prove to be the young of some fish closely allied to *C. verrucosum*.

Of *Pseudocyttus maculatus*, Gilch. (1906), we have seen no specimen, and the figure referred to in the original description is as yet unpublished. The species is imperfectly characterized, but is stated to have two anal spines only and cycloid scales, and therefore does not fall within the definition of *Cyttosoma* above suggested.

The characters which may prove to be valid for the distinction of species of *Cyttosoma* at all stages are somewhat uncertain. No reliance can be placed on the lines of bony tubercles which occur in the young of some and, perhaps, of all species, since, while in *C. verrucosum* they persist in large examples, they disappear at a comparatively early stage in *C. boops* and are not present in any of the hitherto observed stages of the other species. The scales probably maintain their number, but it is not improbable that they become smoother with age and their asperities are rather easily rubbed off, as, for instance, in the type of *C. helgae*, of which

* Probably always in young, but some species are known only from specimens of a size at which the scutes have already been lost in others.

the anterior parts were certainly rougher when first observed than at present, after several journeys between Dublin and the British Museum.

The shape of the back, dependent on the degree of elevation of the body at the origin of the dorsal fin, will probably be a good character in all but the youngest stages, the genus being divisible into forms in which the profile between eyes and dorsal fin is concave and those in which the profile is either straight or slightly convex. The pattern of the inter-orbital area, depending on the relative form and positions of the frontal and prefrontal bones, and the consequent outline of the scale-clad area overlying the ethmoid region, probably also offers a constant character.

In the development of the dorsal and anal spines, relative to the size of the individual, *C. boops* is intermediate between *C. verrucosum* and the other species; but while this character has no doubt a constant specific value, its application at different phases of growth requires considerable caution, because the length of the spines, relative to that of the individual and of the longest articulated rays in the same fin, no doubt undergoes considerable reduction as the fish increases in size.

So far as our knowledge at present extends, the species of *Cyttosoma* may be distinguished as follows:—

1. Dorsal spines VI, anal III, all comparatively feeble and (in a specimen 200 mm. long without caudal) much shorter than the longest articulated rays. Dorsal profile from back of head to origin of dorsal fin straight or slightly convex. Tubercles on sides of belly persistent at a length of 200 mm. (without caudal). L. l. ca. 95 .. 1. *C. verrucosum*, Gilch.
2. Dorsal spines VI-VII, anal III-IV, one or more in each fin thickened and produced. Dorsal profile from back of head to origin of dorsal fin more or less concave.
 - A. Second, third, and fourth dorsal spines (in specimens of 95 and 150 mm. without caudal) moderately stout and produced, but shorter than longest articulated rays of same fin, second or third the longest, the third but little longer than fourth. Tubercles on sides of belly obsolescent at 95 mm., absent at 150 mm. L. l. ca. 100. A conspicuous horizontal ridge on operculum 2. *C. boops*, Gilch.
 - B. Second dorsal and first anal spines (in specimens of 108 to 200 mm. without caudal) much longer and stouter than others, and as long as succeeding articulated rays. (*Neocyttus*, Gilch.)

- i. L. l. ca. 102. Interorbital area overlying ethmoid region and bounded by prefrontals and frontals, almost rectangular. No tubercles on belly at 108 mm. (without caudal)..... 3. *C. rhomboidalis* [(Gilch.).
- ii. L. l. ca. 80-85. Interorbital area overlying ethmoid region and bounded by prefrontals and frontals, lanceolate. No tubercles on belly at 200 mm. (without caudal)..... 4. *C. helgæ*, sp. n. (*infra*).

Cyttosoma helgæ, sp. n. (Pl. III.)

Head moderately, body greatly elevated and compressed; greatest width in opercular region; anterior profile from above eyes to origin of dorsal fin concave; bases of dorsal and anal fins nearly straight. Length of head without jaws* about 3 in total length (without jaws* and caudal fin), about twice in distance from origin of second dorsal spine to origin of ventral spine, and about $2\frac{1}{5}$ in distance from origin of second dorsal spine to origin of first anal spine. Snout (without jaws) about twice in horizontal diameter of orbit † and nearly $4\frac{1}{2}$ times in head (without jaws). Vertical diameter of orbit about $\frac{4}{5}$ of horizontal diameter and about equal to width of interorbital space. Caudal peduncle about as long as orbit; its length about double its depth and three times its width.

Median area of interorbital space lying between the rather broad frontals and prefrontals and bounded posteriorly by the frontals, lanceolate, slightly convex, and covered with small very rough scales. All the exposed bones of the head and gill-cover granular or rugose, with their exposed margins finely but bluntly and irregularly denticulated. No distinctly projecting ridge on operculum. Maxilla extending to below front of eye, with a central rugose area not extending to its edges. Mouth protrusible, when completely closed projecting but little (about $\frac{1}{3}$ horizontal diameter of eye) beyond pre-orbitals. Both jaws with a few small and obsolescent teeth; vomer toothless. Suborbital wide, its vertical measurement below centre of eye about $\frac{1}{3}$ vertical diameter of orbit.

Dorsal fin originating slightly behind vertical from ventrals, VII 34; the second spine very stout, longitudinally striated, and as long as horizontal diameter of eye; articulated rays

* It seems best to adopt this standard of length, as the jaws are often protruded in preserved specimens and cannot be closed without risk of injury. The front edge of the preorbital is always well defined.

† The marked bulging of the eyes in some species of this genus is plainly, in part at least, caused by circumstances attending capture in deep water.

unbranched. Anal fin originating below fifth spine of dorsal, IV * 30; its first spine similar in all respects to second dorsal spine and its articulated rays unbranched. Pectoral fin broadly ovate and as long as eye, with 19 unbranched rays. Ventral fins inserted rather close together, each with one spine, similar in all respects to second dorsal spine, and 6 † branched rays. Longest articulated rays of dorsal, anal, and caudal as long as second dorsal and first anal spines.

Lateral line with a bold anterior curve passing into the straight posterior part without any approach to an angle, composed of about 82 modified scales, including about 4 which overlie the base of the caudal fin, and crossed by about the same number of transverse series of scales. About 16 scales in a transverse series between the second dorsal spine and the highest part of the lateral line and about 18 between the bases of pectoral and ventral fins. Scales ctenoid, those on the posterior part of the body of moderate size; nearly smooth, with finely denticulate margins, which form a fairly regular net-like pattern, the exposed parts of scales being much higher than wide; scales wider on the caudal peduncle, where there are 3 above and 3 below the lateral line in a lateral view; a row of somewhat enlarged scales, forming a bead-like pattern at the bases of the dorsal and anal fins, the number of scales approximately corresponding to the number of rays. Scales smaller and crowded on the anterior parts of the sides.

On the upper part of the body in front of the origin of the dorsal fin, on the belly and isthmus, and on the scale-clad parts of the head, the scales are covered with asperities (which are somewhat easily rubbed off), and these portions of the head and body are consequently much rougher than the remainder of the body. There is no trace of any series of bony scutes or tubercles.

Coloration ‡ grey, mouth-parts and gill-membranes bluish black; fin-membranes dark purplish brown or black, and articulated rays dark brownish grey.

* The fourth ray has been broken and is now a mere stump, but appears to have undoubtedly been a spine.

† The two distal articulated rays originate together and may be fairly regarded as either a single bifid or two rays (*i. e.* either five or six in all). We follow what seems to have been the general practice in describing allied forms in reckoning them as two rays.

‡ "Pale grey, bluish on gastric region, dark bluish grey on caudal, dorsal, ventral, and anal. Branchiostegal membrane deep black, showing beyond operculum. Iris black, pupil transparent (black), mouth black" (Note taken at time of capture by Mr. Kemp). Since its capture the specimen has been stained a reddish yellow by the colouring-matter extracted from some echinoderms preserved in the same vessel.

Length of specimen 239 mm., 201 mm. without caudal fin.

Loc. S.R. 487, 3. ix. 07, 51° 36' N., 11° 57' W., 540-660 fath.; trawl.

The above diagnosis is based on a single specimen, which has the following dimensions:—

Total length (with mouth closed)	mm.
.....	239
" " without jaws* or caudal fin.....	198*
Length of head without jaws*	65*
" snout " "	15*
Horizontal diameter of orbit	29
Vertical " "	23
Interorbital breadth	22
Vertical height of body at origin of dorsal	131
Distance from second dorsal to first anal spine..	148
Depth of caudal peduncle	15
Width of head at gill-cover	35
" caudal peduncle	10
Length of second dorsal spine.....	31
" first anal "	31.5
" ventral "	30

Ceratiidæ.

Oneirodes megaceros, sp. n.

Body ovoid and compressed, covered with smooth skin, its greatest height about $1\frac{2}{5}$ in total length without caudal fin; belly tumid. Head very large, somewhat compressed, its length (to hind edge of gill-opening) about $1\frac{3}{5}$ in total length. Frontal and mandibular spines well developed; breadth of head between tips of former about twice and between tips of latter about $1\frac{1}{5}$ times in its length; distance from tip of frontal spine to tip of mandibular spine about $1\frac{1}{5}$ in length of head. Snout blunt, lower jaw slightly projecting, gape nearly horizontal. Eyes minute, lying vertically below frontal spines. Teeth in jaws slender, curved, of unequal size, and depressible; a few similar teeth on either side of vomer. Caudal peduncle very short, its height about 4 times in length of head. D. I, 1, 6; anterior spine situate far forward on head and developed into a tentacle which is longer than the head; second spine vestigial and reduced to a small tubercle midway between the anterior spine and the articulated rays, which are feebly developed and opposite the anal. A. 4, feebly developed. The tentacle is jointed at about $\frac{2}{3}$ of the distance from its origin to its tip, which is clavate and bears on its upper edge anteriorly a short digitiform limb with

* To include jaws (with mouth closed) 3 mm. should be added to these measurements.

several short branches; behind this a tuft of very slender filaments, followed by a luminous organ in the form of a backwardly directed truncated cone, and posteriorly a rather stout filament a little longer than the clavate head of the tentacle (the whole apparatus resembling that of *O. eschrichtii*). Pectoral above and in front of gill-opening with 14 feeble rays, the longest about a quarter as long as the head. Caudal with 8 rays, the longest more than half as long as head.

Coloration dense black, fin-membranes and tip of tentacle with its appendages colourless. Stalk of tentacle (in present condition of specimen and perhaps normally) pale.

Loc. S.R. 497, 10. ix. 07, 51° 2' N., 11° 36' W., 775-795 fath.; ooze, trawl.

Dimensions of Type.

	mm.
Total length, including lower jaw and caudal fin ..	89
" without caudal fin	67
Length of head (tip of snout to hind edge of gill-opening)	41
Tip of snout to base of pectoral fin-rays	36
" " eye (between verticals)	ca. 12
" " angle of jaw (between verticals) ..	ca. 19
Horizontal diameter of eye	ca. 3
Breadth between tips of frontal spines	20
" " mandibular spines*	34
Distance from tip of frontal to tip of mandibular spine (actual)	31
Greatest height (a little anterior to gill-opening) ..	47
Height of caudal peduncle	10

It is with some hesitation that we treat our specimen as specifically distinct from *O. eschrichtii*, Lütke (1871), which is at present known from a single specimen, about 8 inches long, taken off Greenland. The two species agree in all essential particulars, and the only obvious differences lie in the lengths of their respective tentacles (that of *O. eschrichtii* being less than half as long as the head and that of *O. megaceros* longer than the head) and in the reduction of the second dorsal spine (which in *O. eschrichtii* is as long as the tentacle) to a mere vestige in *O. megaceros*. It is possible that these differences may be of a developmental or sexual nature only, as the type of *O. megaceros* is less than half the length of that of *O. eschrichtii*. We have, however, no evidence of any reduction in length of the tentacle of Ceratiids with growth, and the tentacle of *O. megaceros* is actually about a third as long again as that of *O. eschrichtii*. Moreover, in the very small known specimens of *O. niger*, Brauer,

* This dimension can be reduced by slight pressure.

and *O. glomerosus*, Alcock, the tentacles are relatively very short. The tubercle representing the second dorsal rays in *O. megaceros* is certainly not the result of any recent absorption of a large ray. A row of similar tubercles is apparently present on the fore part of the back of *O. niger*, and is shown in Brauer's figure but not mentioned in the text.

To the other species formerly referred to *Paroneiroides*, Alcock (1890), and *Dolopichthys*, Garman (1899), but now included by Alcock (1899) and Brauer (1906) in *Oneiroides* (the original definition of which must in consequence be modified by omitting all reference to the number and position of the dorsal spines), *O. megaceros* shows no very close affinity.

References.

- ALCOCK. (1890.) Cat. Deep-sea Fishes in Indian Museum.
 BOULENGER. (1903.) C. R. Ac. Sci. cxxxvii. 523.
 BRAUER. (1906.) 'Valdivia' Deep-sea Fishes.
 GARMAN. (1899.) 'Albatross' Expedition Fishes.
 GILCHRIST. (1904.) Marine Investigations S. Africa, iii.
 —. (1906.) Marine Investigations S. Africa, iv.
 GÜNTHER. (1887.) 'Challenger' Deep-sea Fishes.
 LÜTKEN. (1871.) Overs. K. Dansk. Vidensk. Selsk. Forh. 56.

EXPLANATION OF PLATE III.

Cyttosoma helgæ, type, $\times \frac{1}{2}$ ca., based on a photograph.

XII.—Description of a new Genus and Species of Cleridæ. By C. J. GAHAN, M.A.

DIEROPSIS, gen. nov.

Eyes with a deep subtriangular emargination in front, from which a line passes backwards almost up to the hind border, dividing each eye into two parts: a more finely faceted upper part and a more coarsely faceted lower part. Antennæ rather short, 11-jointed, the last three joints dilated and compressed, forming a somewhat triangular club. Labrum distinct, transverse, with a more or less deep sinuate emargination in front. Last joint of maxillary and labial palpi triangular. Prothorax with a more or less strongly developed tubercle at the middle of each side. Elytra elongate, somewhat parallel-sided, obtusely rounded at the apex. Legs moderately stout, subequal in length in the female, the front pair greatly elongated in the male; the hind femora much shorter than the abdomen; tarsi moderately long, with the first joint very short, the second a little shorter than the two succeeding joints united; the claw-joint rather broad,

only slightly narrowed towards the base, the claws simple, widely divergent, with a rather distinct setose onychium showing between them at their base; the second, third, and fourth joints lamellate beneath, the lamellæ truncate at the apex. Metasternum produced anteriorly about halfway between the middle coxæ, and furnished on the intercoxal process with a more or less prominent tubercle. Fifth ventral segment of the abdomen semicircularly emarginate at the apex in the male, rounded at the apex in the female.

The male of this genus is readily distinguishable from the female by the very long front legs; the tibiæ of these legs are furnished at the apex on the posterior side with an obtuse process, and the tarsi are rather densely fringed on each side with long hairs. A sexual difference is also to be found in the form of the last joint of the palpi; in the female this joint is short and very broad, in the male more elongate.

The genus is to be placed in the subfamily Clerinæ. In its general form and in the structure of its antennæ it shows an affinity with *Trichodes*, Herbst, but differs from the latter by its tuberculate prothorax, the peculiar character of its eyes, the somewhat differently formed tarsi, and the tuberculated intercoxal process of the mesosternum.

Dieropsis quadriplagiata, sp. n.

Nigra, hirta; prothorace utrinque tuberculo eburneo munito; elytris dense fortiterque punctatis, utrisque fasciis duabus flavo-testaceis, ornatis—una prope basin, secunda angustiore pone medium.

Long. ♂ 26, lat. 9 mm.; long. ♀ 25-30, lat. 8-10 mm.

Hab. British Central Africa: Kondowe (*A. Whyte*), Niomkolo (*A. Carson*), and Fwambo (*W. H. Nutt*).

Black; the head, prothorax, base of elytra, body beneath, and legs rather densely covered with long black hairs. Head and prothorax thickly punctured, the latter furnished on each side with a smooth ivory-yellow tubercle of somewhat variable size (in the male type from Kondowe it is scarcely prominent, whereas in the female example from Fwambo it is quite prominent and in form conical). Elytra very closely and strongly punctured, except on the posterior third or fourth part; each with two transverse testaceous-yellow bands, which extend from the lateral border to within a short distance of the suture; the anterior band is considerably the wider of the two, but narrows towards its inner end, its hind border being nearly straightly transverse, while the anterior border is oblique or slightly curved.

XIII.—The Recent Voles of the *Microtus nivalis* Group.

By GERRIT S. MILLER.

ALTHOUGH probably once more generally distributed, the voles of the *Microtus nivalis* group are at the present day rather strictly confined to the mountains of the Mediterranean—Black Sea region. They are known to occur in the Pyrenees, Alps, Apennines, Carpathians, and Caucasus*, as well as at considerable altitudes in Asia Minor and Palestine; while at only a single locality in Southern France has a living species been found in the plains. The supposed occurrence of a member of the group in Kashmir † is the result of a misdetermination of generic characters ‡; and there seems to be no sufficient reason to regard *Microtus strelzowi*, Kashstchenko §, from Central Altai, as anything but a somewhat aberrant *Alticola*. The seven forms represented in the collection of the British Museum show that the group is sufficiently extensive and well-defined to be recognized as a distinct subgenus:—

CHIONOMYS, subgen. nov.

1858. *Paludicola*, Blasius, Säugethiere Deutschlands, p. 334 (part.).
Not of Wagler, 1830.
1847. *Praticola*, Fatio, Les Campagnols du Bassin du Léman, p. 34 (part.). Not of Swainson, 1837.
1896. *Microtus*, Miller, North Amer. Fauna, no. 12, p. 62 (part.) (July 23, 1896).

Type species.—*Arvicola nivalis*, Martins.

Characters.—Like the subgenus *Microtus*, but third upper molar with only two re-entrant angles on each side, as in *Arvicola* and some forms of *Pitymys*; skull with broad, rather flat, smooth brain-case and wide interorbital region, the temporal ridges low and inconspicuous; posterior termination of palate essentially as in *Microtus*, but with the elements usually less well defined.

* Satunin, Zool. Jahrb. ix. p. 302 (1896). Dagestan.

† *Microtus imitator*, Bonhote, Ann. & Mag. Nat. Hist. 7th ser. xv. p. 197 (February 1905).

‡ The structure of the palate shows that the animal is an *Alticola*. The teeth are peculiar in their somewhat generalized form, as compared with those of the previously known members of the genus.

§ Results of the Altai zoological expedition of 1898, p. 50 (Russian text), pl. ii. figs. 2 & 3 (1899); Annuaire du Mus. Zool. de l'Acad. Imp. des Sci. de St. Pétersbourg, iv. p. 37 (Russian text), figs. 2*b* & 3*b*. See especially figure of molar teeth in original description, and side view of skull in later account (where the species is made type of the new subgenus *Platycranus*).

Key to the Members of the Subgenus Chionomys.

- Pterygoids with inner faces not parallel; width of mesopterygoid fossa anteriorly much greater than distance from edge of fossa to alveolus of m^3 .
- Ear about 16.5 mm.; molars with salient angles unusually acute. (Northern Asia Minor; Caucasus?) *Microtus pontius.*
- Ear about 13.6 mm.; molars with salient angles not unusually acute. (Palestine.)..... *M. hermonis.*
- Pterygoids with inner faces parallel (vertical); width of mesopterygoid fossa anteriorly never more than equal to distance from edge of fossa to alveolus of m^3 . (Europe.)
- Hind foot in adult less than 20 mm.; back clear light grey or with very slight brownish tinge; tail always white *M. lebrunii.*
- Audital bullæ large and strongly inflated (normal); back with slight brownish tinge. (Basses-Alpes.) *M. l. leucurus.*
- Audital bullæ small and flattened; back clear light grey. (Gard.)..... *M. l. lebrunii.*
- Hind foot in adults 20 mm. or more; back decidedly brownish; tail often not entirely white.
- Posterior border of palate with median ridge sharply defined, its width less than that of deep lateral pit; back strongly clouded with blackish; tail usually dark above *M. ulpius.*
- Posterior border of palate with median ridge seldom sharply defined, its width always at least equal to that of shallow lateral pit; back slightly or not clouded with blackish; tail usually not dark above *M. nivalis.*
- Anterior loop of first lower molar with postero-external salient angle usually narrow and sharply pointed, never obsolete. (Alps.) *M. n. nivalis.*
- Anterior loop of first lower molar with postero-external salient angle usually broad and rounded, sometimes obsolete. (Pyrenees.)..... *M. n. aquitanus.*

Microtus nivalis (Martins).

(Synonymy under subspecies.)

Geographical distribution.—Pyrenees, Alps (except extreme south-western portion), Apennines, and Tyrol.

Characters.—Size large (hind foot 20 to 22 mm., condylo-basal length of skull in adults 28 to 30.4 mm.). Skull with pterygoids vertical, their inner surfaces parallel; mesopterygoid fossa narrow, its width anteriorly never more than equal to distance between fossa and alveolus of third

molar; posterior border of palate with median ridge usually flattened and ill-defined, its width at least equal to that of shallow lateral pit. Colour smoke-grey above, strongly washed with bistre on back, and usually tinged with pale buff along sides; underparts dull white, irregularly clouded by the slaty under-colour; feet and tail whitish, the tail usually (in about two-thirds of the skins examined) tinged with brown above, but apparently never sharply bicolor.

Microtus nivalis nivalis (Martins).

1842. *Arvicola nivalis*, Martins, Revue Zoologique, p. 331. (Faulhorn, Switzerland.)
 1843. *Arvicola alpinus*, Wagner, Schreb. Säugth., Suppl. iii. p. 576. (Andermatt, Switzerland.)
 1845. *Arvicola nivicola*, Schinz, Synops. Mamm. ii. p. 236. (Highest Swiss Alps; probably near Andermatt.)
 1853. *Hypudæus petrophilus*, Wagner, Münch. Gelehrt. Anzeiger, p. 307 (March 28, 1853). (Obersdorf, near Sonthofen, Allgäu, Bavaria.)

Type locality.—Faulhorn, Switzerland.

Geographical distribution.—Alps, Apennines, and Tyrol. (Probably includes more than one geographical race.)

Characters.—Anterior loop of first lower molar tending to assume an arrow-head-like outline, owing partly to the general narrowness of the loop, but more especially to the form of the postero-external salient angle, which is usually narrow and sharply pointed, and rarely if ever* obsolete.

Remarks.—The form of the anterior loop of the first lower molar appears to be characteristic of the Alpine race of *Microtus nivalis*, as the specimens that I have examined are immediately recognizable by this character alone. In two skulls from the type locality of *Hypudæus petrophilus*, kindly placed at my disposal by Dr. C. I. Forsyth Major, and in the single specimen in the British Museum from the Apennines † (Mt. Cimone, collected by Dr. Major), this loop is of the broadly crescentic form characteristic of the Pyrenean race. The Mt. Cimone specimen also appears to have the rostrum unusually robust. The material is, however, insufficient for satisfactorily determining the exact status of *petrophilus* and the Apennine animal.

Microtus nivalis aquitanius, subsp. n.

Type.—Young adult male (skin and skull) collected near

* Never in the material thus far examined.

† See also the figures of Apennine specimens published by Hinton, Proc. Geol. Assoc. xx. pt. 2, pl. i. figs. 1-4 (1907).

l'Hospitalet, Ariège, France, altitude 4800 feet, August 27, 1906, by G. S. Miller. Original number 7082.

Geographical distribution.—Pyrenees; at present known from the eastern half of French side only (Pyrénées Orientales, Ariège, and Hautes Pyrénées).

Characters.—Similar to *Microtus nivalis nivalis*, but anterior loop of first lower molar broadly crescentic in outline, the posterior external salient angle broad and rounded, occasionally obsolete.

Measurements.—Type: head and body 111 mm.; tail 59; hind foot 21; ear from meatus 16. Skull: condylo-basal length 28; zygomatic breadth 17.4; interorbital constriction 4.27; occipital breadth 14; occipital depth (median) 7.8; nasal 8.6; diastema 9.2; mandible 18.6; maxillary tooth-row 7.0; mandibular tooth-row 7.0.

Remarks.—Among the fourteen skulls examined there is not a specimen which shows any near approach to the characters of the typical Alpine race. As already pointed out, the form of the anterior loop of the first lower molar in the Pyrenean animal is essentially duplicated in specimens from Tyrol and the Apennines.

Microtus ulpius, sp. n.

Type.—Adult female (skin and skull). B.M. no. 3.2.2.48. Collected at altitude of 2000 feet near Hatszeg, Hunyad, Eastern Hungary, November 20, 1902, by C. G. Danford. Original number 13.

Geographical distribution.—Known only from the vicinity of the type locality, but probably occurring throughout the Transylvanian Alps, and perhaps in the true Carpathians also.

Characters.—Similar to *Microtus nivalis*, but colour darker and tail usually brown above (often distinctly bicolor throughout); posterior border of palate with median ridge sharply defined, its width less than that of deep lateral pit; anterior loop of first lower molar as in *M. nivalis aquitanus*.

Measurements.—Type: head and body 131 mm.; tail 58; hind foot 20; ear 17. Skull: condylo-basal length 30.4; zygomatic breadth 18; interorbital constriction 4.4; occipital breadth 15; occipital depth (median) 7.4; nasal 8.0; diastema 9.2; mandible 19.4; maxillary tooth-row 7.2; mandibular tooth-row 7.0.

Remarks.—This species is well differentiated from *Microtus nivalis* by the peculiar form of the palate and by the dark colour of the upperparts. Among the thirteen skins examined all show traces of brown on the upper surface of the

tail, while in seven (including the type) the tail is distinctly bicolor throughout.

Microtus lebrunii (Crespon).

(Synonymy under subspecies.)

Geographical distribution.—South-eastern France (Departments of Gard and Basses-Alpes).

Characters.—Like *Microtus nivalis*, but smaller (hind foot less than 20 mm.; condylo-basal length of skull in adults less than 28 mm.) and paler, the tail always pure white throughout; the back a light grey without conspicuous brownish suffusion.

Remarks.—This species, although described more than sixty years ago, has remained of very doubtful status until within a few months. Mr. Charles Mottaz, of Geneva, Switzerland, has recently visited the Departments of Gard and Basses-Alpes in the interests of the British Museum, and, thanks to his successful work, it is now possible to form some definite opinion as to the animal's relationships.

Microtus lebrunii lebrunii (Crespon).

1844. *A[rvicola] lebrunii*, Crespon, Faune Méridionale, i. p. 77.

1857. *Arvicola nivalis*, b. *Arvicola leucurus*, Blasius, Säugethiere Deutschlands, p. 359 (part.).

Type locality.—Neighbourhood of Nimes, Gard, France. Altitude about 550 feet.

Geographical distribution.—Known only from the type locality.

Characters.—Back a clear, very pale smoke-grey, without evident wash of wood-brown. Skull with audital bullæ small and flattened, noticeably different in both form and relative size from those of *Microtus nivalis*; other cranial characters as in *M. nivalis*, except for the smaller general size of the skull; teeth rather smaller than those of *M. nivalis*, the anterior loop of the first lower molar resembling that of *M. nivalis aquitanus*.

Measurements.—Adult male, no. 5519 (*Mottaz*): head and body 122 mm.; tail 66; hind foot 18·8; ear 14. Skull: condylo-basal length 27·4 (ca.); zygomatic breadth 15 (ca.); interorbital constriction 4·6; occipital depth (median) 7·4; nasal 8; diastema 8·2; mandible 18; maxillary tooth-row 6·4; mandibular tooth-row 6·2.

Remarks.—The typical form of *Microtus lebrunii* is easily recognizable by its small size, pale colour, and flattened

audital bullæ. It is, however, remarkably similar to *Microtus nivalis*, when one considers the peculiarities of its habitat in the midst of the vine and olive region of the Mediterranean coast.

Microtus lebrunii leucurus (Gerbe).

1852. *Arvicola leucurus*, Gerbe, Revue Zoologique, 2nd ser. iv. p. 260 (June 1852).

1857. *Arvicola nivalis*, b. *Arvicola leucurus*, Blasius, Säugethiere Deutschlands, p. 359 (part.).

Type locality.—Barcelonnette, Basses-Alpes, France. Altitude about 4000 feet.

Geographical distribution.—South-western Alps.

Characters.—Back a pale smoke-grey, slightly but evidently washed with wood-brown. Skull with audital bullæ large and well-inflated, essentially as in *Microtus nivalis*, with which the other cranial characters agree.

Measurements.—Adult female topotype, no. 5623 (*Mottaz*): head and body 120 mm.; tail 68; hind foot 19; ear 14·8. Skull: zygomatic breadth 16 (ca.); interorbital constriction 4·6: nasal 8·0; diastema 8·8; mandible 18; maxillary tooth-row 7·0; mandibular tooth-row 6·8.

Remarks.—The two topotypes secured by Mr. Mottaz show that this animal resembles *M. lebrunii lebrunii* in its small size and pale colour, but that the skull remains essentially as in *M. nivalis*. The specimens were taken among rocks near water in a locality which seemed perfectly adapted to the needs of *Microtus nivalis*.

Microtus pontius, sp. n.

Type.—Adult male. B.M. no. 5. 10. 4. 53. Collected at altitude of 7000 feet, about 25 miles north of Baibort, Turkey in Asia, July 21, 1905, by R. B. Woosnam. Original number 62. Presented by Col. A. C. Bailward.

Geographical distribution.—The species is known from the type locality only.

Characters.—Size about as in *Microtus lebrunii*. Skull with pterygoids inclined outward, their inner surfaces not parallel; mesopterygoid fossa broad, its width anteriorly much greater than distance between fossa and alveolus of third molar; posterior border of palate and form of audital bullæ as in *M. nivalis*; general outline of skull rather more slender than in the other members of the group; teeth peculiar in the small size and very marked alternation of the triangles in the upper molars and the unusual slenderness

and acuteness of all salient angles, though the actual number of elements is in no way abnormal; anterior loop of first lower molar in the single known specimen essentially as in *M. nivalis aquitanicus*; general colour above a pale buffy grey, the middle of back rather strongly tinged with dull buff; tail and feet dull white. Underparts white, irregularly clouded by the slaty under-colour.

Measurements.—Head and body 112 mm.; tail 67; hind foot 19; ear 16.5. Skull: condylo-basal length 28.6; zygomatic breadth 16; interorbital constriction 4.2; occipital breadth 12.6; occipital depth 7.0; nasal 8.0; diastema 8.6; mandible 18; maxillary tooth-row 6.6; mandibular tooth-row 6.4.

Remarks.—This species, though represented by the type specimen only, is strikingly characterized by the peculiarities of the mesopterygoid fossa resulting from the unusual tilting outward of the pterygoids. The light buffy colour is also different from that in any other known form.

Microtus hermonis, sp. n.

1884. *Arvicola nivalis*, Tristram, Survey of Western Palestine, Fauna and Flora, p. 13.

Type.—Adult male (in alcohol). B.M. no. 64. 8. 17. 31. Collected on Mount Hermon, Palestine, by the Rev. H. B. Tristram.

Geographical distribution.—Known from the type locality only.

Characters.—Differs from *Microtus pontius*, its nearest geographical ally, in the decidedly shorter ear (13.6 mm. instead of 16.5 mm.) and the less acute, less strongly alternating triangles of the upper molars. Distinguishable from the European members of the group by the narrower, more elongated outline of the third upper molar. Structure of palate not known.

Measurements.—Tail 56 mm.; hind foot 19; ear 13.6; upper tooth-row 6.2.

Remarks.—Nothing remains of the skull of the type and only known specimen except the right upper tooth-row. It is therefore impossible to decide whether the pterygoids resemble those of *Microtus pontius* or of the European members of the subgenus. On geographical grounds the former seems the more probable, though the latter alternative is not impossible in view of the general character of the teeth.

XIV.—*An Erroneous Echinodermal Identification.* Corrected by W. B. BENHAM, D.Sc., F.R.S., Otago University, New Zealand.

NEARLY thirty years ago, some specimens of a sea-urchin were received from Stewart Island, New Zealand, at the Otago University Museum, and were identified by the late Capt. Hutton as "*Salmacis globator*, Agassiz," and briefly described in the *Trans. N. Z. Inst.* xi. p. 306.

I was recently engaged in identifying specimens of Echinoderms handed to me by Mr. Edgar Waite, who had collected them during an experimental trawling-trip off the New Zealand coast, and having read Mr. Farquhar's note in the current volume of the '*Transactions N. Z. Institute*' (xxxiv. p. 130), wherein he suggests that our "*Salmacis*" may probably belong to Bell's species *S. alexandri* (P. Z. S. 1880, p. 431), I proceeded to look into the matter, with the result that I find that our New Zealand urchin does not belong to the genus *Salmacis*, nor even to the family Temnopleuridæ, but is a member of the family Echinidæ. In fact, it is a species of *Pseudechinus*, Mortensen, 1903, of which the genotype is *P. albocinctus*, Hutton (*Cat. Ech. N. Z.* 1872), which he later regarded as a synonym of *Echinus magellanicus*, Philippi (*Trans. N. Z. Inst.* ix. p. 362).

Although I have not been able to refer to Mortensen's work, yet the diagnosis of this given in Bronn's '*Class. und Ordn. d. Thier-reichs*,' by Otto Hamann, enabled me to place it in that genus at once—not only by the arrangement of the pores, but also by the character of the "globiferous pedicellariæ."

Pseudechinus huttoni, sp. n.

(= *Salmacis globator*, Hutton, non Agassiz.)

"The test is white with pink tubercles; the integument pale brownish yellow. The spines in the upper portion are reddish purple with white tips; on the lower portion they are white, getting yellow towards the base" (*Hutt. Tr.* xi. p. 307).

The specimens thus briefly described by Hutton are still mounted on a tablet and labelled in his handwriting; they are two in number, one with spines, the other denuded.

The former measures 52 mm. in diameter and 35 mm. in height; the latter 42 and 34 respectively.

In the latter the interambulacrum at the ambitus measures

18 mm., the ambulacrum 9 mm., and the poriferous zone 1.5 mm. The tubercles are nearly all of the same size, and arranged in transverse rows occupying the entire width of the plate, usually a single row in each plate, and are pinkish orange in colour.

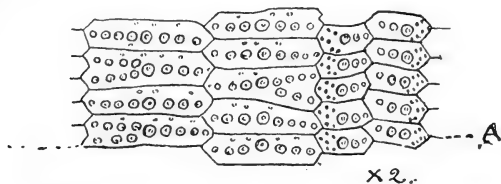


Fig. 1.

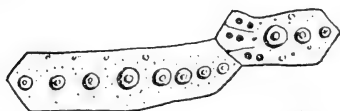


Fig. 2.

Pseudechinus huttoni.

Fig. 1.—Portions of ambulacrum and interambulacrum, showing arrangement of tubercles at the ambitus (A) and immediately above. $\times 2.$

Fig. 2.—An ambulacral and an interambulacral plate. $\times 4.$

The form is more or less globular, with a slight tendency for the apical region to be subconically elevated; at the same time I have specimens which are distinctly depressed, so as to be somewhat bun-shaped.

Interambulacrum.—In each plate the tubercle situated in the middle of the plate is rather larger than the rest, and may be termed a primary; on each side of this are three slightly smaller ones, which may be termed secondaries. In some instances a fourth secondary occurs near the external (ambulacral) margin—so that at the ambitus there are usually seven tubercles in a row, less usually eight.

In about every alternate plate this row is duplicated on the ambulacral side of the primary.

Near the abactinal region the number of tubercles decreases rather suddenly: the upper five or six plates bearing less than seven; the topmost having only one or two secondaries in addition to the primary.

Above the chief row is a short imperfect and irregular row of quite small tubercles (tertiaries)—about six at the ambitus and below it, irregularly spaced, but rapidly diminishing above to three, two, and one. The miliaries are not at all well marked and are few in number.

Ambulacrum.—Each ambulacral plate carries a single primary situated immediately within the poriferous zone, with two secondaries, of nearly the same size, forming a transverse row on its mesial side. Below the ambitus the second secondary soon disappears, and close to the actinostome only the primary remains.

Above the ambitus the reduction occurs at about the fifth or sixth plate from the abactinal circle, while in the two uppermost plates only the primary remains.

Thus, while the interambulacral tubercles form distinctly transverse rows, the ambulacrals form a vertical series, all the tubercles being of nearly the same size.

The poriferous zone is somewhat depressed, and this gives the appearance to the narrow ambulacra of being raised above the general level of the plates.

(In a large specimen, 67×41 mm., the interambulacra are very noticeably swollen, while the ambulacra appear as flat depressions.)

As Mortensen's diagnosis of the genus states, each ambulacral plate bears three couples of pores, which are arranged in a slightly zigzag line—the inner pore of the middle couple being vertically below the outer pore of the upper couple, while the outer pore of the lower couple is vertically below the inner pore of the upper couple.

The spines are short, the longest 5 mm. in length—fine, pointed, grooved and coloured as described by Hutton (though in other specimens they are uniformly white).

In the apical ring the oculars are excluded from the periproct; the madreporite is prominent; the genital pores large; and a row of secondary tubercles occurs near the apical margin of each of these plates.

The actinostome is nearly circular, the notches being very slight, wide, and shallow.

In addition to these two specimens which served for Hutton's brief description, and one of which serves as type of the new species, I have received several others, the largest of which is 70 mm. by 50 mm. Some of them are paler than the type, the spines being a dirty white, but all have the tubercles pinkish orange. In the larger ones the number of tubercles at ambitus is 9–10 in a transverse row, and the

difference in size between "primary" and "secondary" is scarcely recognizable.

In others from Cromarty, Preservation Inlet, N.Z., which are white, though the size is about the same as the type (46×35 mm.), the number of tubercles is less; for in the interambulacrum only five tubercles occur in a transverse row, at the ambitus, and this soon becomes three above and below; while on the ambulacrals two occur at ambitus, but only one over the greater part of test.

This species is readily distinguished from *P. albocinctus* by the small size and transverse arrangement of the many tubercles on the interambulacral plates, as well as by the colour of the test.

Pseudechinus albocinctus, Hutton.

I do not know whether *P. albocinctus* has been described in detail by Mortensen. But my specimens, some of which were labelled by Hutton (as *E. magellanicus*), agree in general with the above, but the tubercles are larger and fewer; the colour of shell purple; the primary more conspicuous than

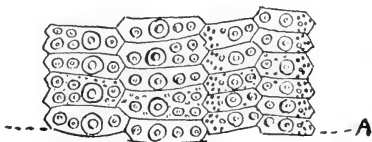


Fig. 3

$\times 2$

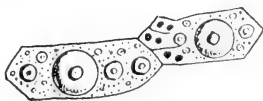


Fig. 4.

$\times 4$

Pseudechinus albocinctus.

Fig. 3.—Portions of ambulacrum and interambulacrum at the ambitus (A) and immediately above it. $\times 2$.

Fig. 4.—An ambulacral and an interambulacral plate. $\times 4$.

in *P. huttoni*. The miliaries are larger and more numerous, while in the ambulacrum there are only two tubercles at ambitus, &c.

A specimen labelled by Hutton, denuded of spines, measures 34 mm. in diameter, 22 mm. in height. The interambulacrum, at the ambitus, measures 12 mm., the ambulacrum 8 mm., and the poriferous zone 1.5 mm.

Hutton's account of the type in the Colonial Museum, Wellington, will be found in 'Catalogue of the Echinodermata of New Zealand,' 1872, p. 12. As this publication may not be widely accessible I quote it:—

"Height $\frac{3}{4}$ of the diameter; pores forming a rather irregular zigzag row of single pairs; ambulacral plates with one primary tubercle; interambulacral with three on the lower half, but near the apex with one central tubercle surrounded by smaller ones on the edge of the plate; ambulacra narrow; tubercles moderate; spines tapering, longitudinally grooved; grooves much broader than the ridges. Shell brownish purple; spines reddish purple, broadly tipped with white.

"Diameter 1 inch."

It may be as well to give details of this co-type now before me. Each interambulacral plate at the ambitus bears one primary, of a diameter nearly equal to the height of the plate; on the mesial side one secondary; and on the ambulacral side two secondaries, of about half the size of the primary: *i. e.* four tubercles in a row. Every alternate plate bears two horizontal rows of two secondaries on the ambulacral side of the primary.

The tertiaries and miliaries are numerous. Above the ambitus the secondaries decrease in size and lose the linear arrangement, so that near the abactinal ring each plate bears only one primary.

Each ambulacral plate bears one primary, rather smaller than that in the interambulacrum and situate about the middle of the plate. On each side a secondary, the mesial being the larger; above the ambitus that on the side of the poriferous zone becomes much smaller, while the other secondary also decreases in size towards abactinal ring, to be replaced ultimately by a miliary. The pores are arranged much as in *P. huttoni*.

I have other specimens of larger size than this, the greatest being 50 mm. diameter \times 30 mm. high. They all agree in colour of test and spines, though the extent of the white tip varies, and the colour of the base is rather red than reddish purple.

The general form is that of a depressed spheroid.

Dunedin,
November 6, 1907.

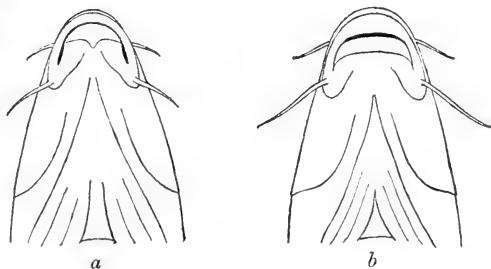
XV.—Descriptions of Three new Freshwater Fishes from China. By C. TATE REGAN, M.A.

[Plate IV.]

THE fishes described below were collected by Dr. Martin Kreyenberg, and have been received from Dr. W. Wolterstorff, of Magdeburg.

Gymnostomus kreyenbergii. (Pl. IV. fig. 1.)

Pharyngeal teeth hooked, slightly compressed, 5, 3, 2—2, 3, 5. Depth of body $3\frac{2}{3}$ in the length, length of head 4. Breadth of head $1\frac{3}{4}$ to 2 in its length, length of snout $2\frac{1}{2}$ to $2\frac{3}{4}$, diameter of eye 4 to 5, interorbital width 3 to $3\frac{1}{3}$. Snout not projecting beyond the upper lip. Width of mouth slightly more than $\frac{1}{3}$ the width of head; horny covering of the lower jaw with evenly rounded anterior edge; folds of the lower lip separated anteriorly by a narrow interspace; 4 barbels, the anterior $\frac{3}{5}$ as long as the posterior, which are as long as the eye. 41 or 42 scales in a longitudinal series, $5\frac{1}{2}$ in a transverse series from origin of dorsal to lateral line, $3\frac{1}{2}$ between lateral line and base of ventral fin. Dorsal III 8, not or scarcely higher than long; origin nearly equidistant from tip of snout and base of caudal; third simple ray not enlarged, articulated in its distal half, more or less distinctly serrated, especially in the young; free edge of fin slightly



Heads of *Gymnostomus kreyenbergii* (a) and *G. styani* (b), seen from below.

concave. Anal III 5. Pectoral $\frac{5}{8}$ to $\frac{7}{8}$ the length of head, extending $\frac{3}{4}$ to $\frac{5}{8}$ of the distance from its origin to that of the ventral, which is below the second branched ray of the dorsal. Caudal forked. Caudal peduncle $1\frac{1}{2}$ as long as deep.

Olivaceous, silvery below, the edges of the scales darker;

membrane of dorsal fin dusky. Young with a dark longitudinal lateral band and 5 dark vertical bars on the back.

Hab. Nankancho, near Tinghsiang.

Two specimens, 90 and 160 mm. in total length.

I have compared these with the types of *G. styani*, Blgr. (*Crossochilus styani*, Bouleng. Proc. Zool. Soc. 1901, i. p. 268, pl. xxiii. fig. 1), from Ning Po, three specimens measuring 100 to 130 mm. in total length.

In these the anterior edge of the horny sheath of the lower jaw is nearly straight, the folds of the lower lip are separated anteriorly by a wider interspace, and the mouth is wider, $\frac{1}{2}$ the width of the head. The snout is considerably shorter than the postorbital part of the head in *G. styani*, whereas in *G. kreyenbergii* it is equal to it in length. Other slight differences are the somewhat shorter head, shorter pectoral, and different coloration of *G. styani*.

G. fasciatus, Sldr. (*Crossochilus fasciatus*, Steind. Denkschr. Ak. Wien, lix. 1892, p. 372, pl. iv. fig. 2), from Shanghai, is very similar to *C. styani*.

Other Chinese species of *Gymnostomus* are *G. macrolepis*, Blkr., from the Yang-tse-kiang, and *G. lepturus*, Blgr., from Hainan; in these barbels are absent.

Gobio wolterstorffi. (Pl. IV. fig. 2.)

Pharyngeal teeth compressed, hooked, 5, 3—3, 5. Depth of body $4\frac{1}{2}$ in the length, length of head $4\frac{1}{5}$. Snout a little shorter than eye, the diameter of which is $2\frac{1}{5}$ in the length of head; interorbital width $4\frac{1}{2}$ in the length of head. Mouth subterminal, extending to below the nostrils; barbel as long as the eye. Dorsal II 7; origin nearer to tip of snout than to base of caudal; longest ray a little shorter than the head; free edge slightly concave. Anal II 6. Pectoral $\frac{3}{4}$ the length of head; origin of ventrals a little in advance of the middle of the dorsal. 33 scales in a longitudinal series, $3\frac{1}{2}$ in a transverse series from origin of dorsal to lateral line, $2\frac{1}{2}$ between lateral line and base of ventral fin. Brownish; a silvery lateral stripe; upper scales with dark edges; fins pale.

Hab. Nankancho, near Tinghsiang.

A single specimen, 90 mm. in total length.

This species is nearest to *G. nitens*, Gthr., from Shanghai, in which barbels are absent and the eye is smaller.

Glyptosternum sinense. (Pl. IV. fig. 3.)

Depth of body $5\frac{1}{2}$ in the length, length of head $3\frac{4}{5}$. Breadth of head $1\frac{1}{4}$ in its length; snout as long as the post-

orbital part of head; interocular width 3 times the diameter of eye and twice the distance between the nostrils; maxillary barbel extending a little beyond the base of pectoral. Skin of head and anterior part of body covered with small tubercles. Dorsal I 6; spine not serrated, $\frac{1}{2}$ the length of head; length of adipose fin $1\frac{1}{2}$ in its distance from the dorsal. Anal 12. Pectoral as long as the head, nearly reaching the ventral, its spine $\frac{3}{4}$ as long, and with 8 or 9 strong serrations on the inner edge. Caudal deeply notched. Caudal peduncle $2\frac{1}{2}$ as long as deep. Olivaceous; two broad dark brownish transverse bands, one below the dorsal, the other below the adipose fin; dorsal with an intramarginal series of dark spots; anal and pectorals with similar but less distinct spots; small dark spots on the caudal.

Hab. Tunting.

A single specimen, 65 mm. in total length.

This is the first Chinese species of the genus *Glyptosternum* to be described. Of the Indian species with which I have compared it, it is nearest to *G. botia*, Ham. Buch.

EXPLANATION OF PLATE IV.

Fig. 1. *Gymnostomus kreyenbergii*.

Fig. 2. *Gobio wolterstorffi*.

Fig. 3. *Glyptosternum sinense*.

XVI.—*Descriptions of new South-American Reptiles.*

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

Lepidoblepharis peracca.

Upper parts and throat covered with uniform very small granules, smallest on the back of the head and on the throat, largest on the snout*; lower parts and tail covered with large, imbricate, cycloid, smooth scales (18 across the middle of the body). Rostral and symphyisial shields large, the former with short median cleft above, the latter with two clefts behind; four upper and three lower labials, first very large. Upper eyelid and limbs as in *L. festa*, Peracca. Dark brown above, paler brown beneath, blackish on the upper part of the sides; a whitish streak on each side, from the eye to the base of the tail, where it unites with its fellow; upper surface of head with dark symmetrical markings.

* In *L. festa*, of which one of the types has been entrusted to me for comparison by Count Peracca, the largest granules are on the back. The specimen from Chimbo, N.W. Ecuador (Coll. Rosenberg), in the British Museum, differs in having the dorsal granules unequal in size

	mm.
Total length	40
Head	7
Width of head	4
Body	16
Fore limb	7
Hind limb	9
Tail	17

A single specimen of this new species, named in honour of the founder of the Eublepharid genus *Lepidoblepharis*, was obtained at Los Mangos, S.W. Colombia, altitude 300 m., by Mr. M. G. Palmer.

Anolis palmeri.

Head twice as long as broad, slightly shorter than the tibia; forehead concave; no frontal ridges; upper head-scales small, rugose or feebly keeled; scales of the supraorbital semicircles feebly enlarged, keeled, separated by three or four series of scales; supraocular scales small, the larger distinctly keeled; occipital enlarged, nearly as large as the ear-opening, separated from the supraorbital scales by five or six series of scales; canthus rostralis angular, canthal scales five; loreal rows five; five upper labials to below the centre of the eye; ear-opening moderate, oval. Gular appendage large; gular scales small. Body scarcely compressed; no dorso-nuchal fold. Scales on the back and sides minute, granular; ventrals much larger, juxtaposed, rather strongly keeled. The adpressed hind limb reaches between the ear and the eye; digital expansions moderate; 16 or 17 lamellæ under phalanges ii. and iii. of the fourth toe. Tail rounded, covered with keeled scales, without enlarged dorsal series. Male with enlarged postanal scales. Uniform green above, whitish below.

	♂.	♀.
	mm.	mm.
Total length	165	167
Head	14	14
Width of head	7	7
Body	38	38
Fore limb	25	24
Hind limb	40	40
Tail	113	115

Two specimens, male and female, from Los Mangos, S.W. Colombia, collected by Mr. M. G. Palmer.

Resembles *A. chloris*, Blgr.

Anolis scapularis.

Head not quite as long as broad, slightly shorter than the tibia; forehead concave; frontal ridges distinct; the larger upper head-scales strongly keeled; scales of the supraorbital semicircles enlarged, separated by two series of small scales; about twelve enlarged, strongly keeled supraocular scales; occipital large, larger than the ear-opening, separated from the supraorbital scales by three series of scales; canthus rostralis sharp, canthal scales four; loreal rows six; seven upper labials to below the centre of the eye; ear-opening moderate, oval. Gular appendage large; gular scales small. Body compressed; no dorso-nuchal fold. Scales granular, very minute on the sides, larger and keeled on the vertebral region, larger still and smooth on the belly. The adpressed hind limb reaches the posterior border of the eye; digital expansions moderate; 14 lamellæ under phalanges ii. and iii. of the fourth toe. Tail slightly compressed, with keeled scales, the median dorsal series of which is enlarged. Male without enlarged postanal scales. Pale golden, with bright yellow gular appendage; a brown cross-band between the eyes, some dark blotches on the back, and an oval blackish spot above the insertion of the arm; tibia with dark and light oblique bars.

	mm.
Total length.....	110
Head.....	12
Width of head.....	7
Body.....	31
Fore limb.....	18
Hind limb.....	31
Tibia.....	10
Tail.....	77

A single male specimen from the Province Sara, Eastern Bolivia, altitude 600 metres. From the collection of Mr. J. Steinbach.

Allied to *A. ortonii*, Cope.

Polychrus liogaster.

Agrees in most respects with *P. marmoratus*, L., but ventral scales smooth or very faintly keeled. Dorsal scales feebly uni-, bi-, or tricarinate; gular crest very distinct in the male, less so in the female. 10 to 12 femoral pores on each side. Male green, with a broad reddish-brown vertebral band; females olive or reddish brown with angular darker cross-bars on the back; two black lines from the eye to the neck,

widening behind, the upper passing above, the lower below the ear-opening; a black longitudinal streak on each side of the throat.

	♂. mm.	♀. mm.
Total length	505	520
Head	31	33
Width of head	18	20
Body	104	117
Fore limb	54	62
Hind limb	70	78
Tail	370	370

Three specimens (male, female, and young) from the Province Sara, Eastern Bolivia, altitude 750 metres, collected by Mr. J. Steinbach, and two (females) from Chancamayo, Eastern Peru, collected by Mr. C. Schunke. The female from Bolivia laid ten white eggs with parchment-like shell, regularly elliptical in shape; longitudinal diameter 29 mm., transverse diameter 14.

Polychrus acutirostris, Spix, is also represented in Mr. Steinbach's collection from the Province Sara.

Liophis opisthotenia.

Eye moderately large; snout short. Rostral broader than deep, visible from above, internasals broader than long, shorter than the præfrontals; frontal once and two thirds as long as broad, longer than its distance from the end of the snout, a little shorter than the parietals; loreal deeper than long; one præocular (exceptionally divided) and two postoculars; temporals 1+2; seven upper labials, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are a little shorter than the posterior. Scales in 17 rows. Ventrals 149-151; anal divided; subcaudals 64-66. Olive above, bluish grey on the sides, with or without black and light spots; a black, light-edged lateral streak along the posterior part of the body and the tail; upper lip white, edged with a blackish line above, which may expand into a nuchal spot; lower parts white.

Total length 395 mm.; tail 95.

Two specimens from Merida, Venezuela, 1600 m., from Sr. Briceño's collection.

Atractus melas.

Snout pointed. Rostral small, a little broader than deep, just visible from above; internasals small, as long as broad; præfrontals longer than broad; frontal as long as broad, as

long as its distance from the end of the snout, much shorter than the parietals; loreal three times as long as deep; no præocular; two postoculars; temporals 1+2; seven upper labials, third and fourth entering the eye; a single pair of large chin-shields, in contact with the symphyisial and, on each side, with four lower labials. Scales in 17 rows. Ventrals 146; anal entire; subcaudals 25. Uniform black.

Total length 235 mm.; tail 25.

A single female specimen from Los Mangos, S.W. Colombia, altitude 300 m., by Mr. G. Palmer.

Leptognathus schunkii.

Body slender, strongly compressed. Eye large. Rostral broader than deep, just visible from above; internasals about half as long as the præfrontals; frontal as long as broad or a little broader than long, as long as its distance from the end of the snout, much shorter than the parietals; nasal divided; loreal as long as deep or a little deeper than long, bordering the eye; a præocular above the loreal; two or three postoculars; temporals 1+2; eight or nine upper labials, third, fourth, and fifth, or fourth, fifth, and sixth entering the eye; first lower labial in contact with its fellow behind the symphyisial; three pairs of chin-shields, anterior longer than broad. Scales in 15 rows, vertebrales much enlarged but not twice as broad as long. Ventrals 177-188; anal entire; subcaudals 90-102. Black, with whitish irregular annuli, which may be interrupted on the back and belly; these annuli may be speckled with black, and the black specks may become so crowded on the posterior part of the body as to reduce the white annuli to mere outlines; head black above, with yellowish spots or dots and a yellowish line across the snout; sides of head yellowish, spotted with black; a whitish band dotted with black across the nape.

Total length 920 mm.; tail 240.

Three specimens from Chanchamayo, E. Peru, collected by Mr. C. Schunke.

Apparently closely allied to *L. boettgeri*, Werner, from the same locality.

Mr. Schunke's collection from Chanchamayo also contains a snake agreeing in every respect with Tschudi's *Liophis taniurus*, as figured by Jan. This shows that the species must be referred to the genus *Aporophis*, as proposed by Cope. The specimens referred by me to *Liophis taniurus* in the 'British Museum Catalogue of Snakes' cannot be separated from *L. albiventris*, Jan.

XVII.—*Descriptions of Two new Forms of Papilio in the Collection of Mr. Grose-Smith.* By H. GROSE-SMITH, B.A., F.E.S., F.Z.S., &c.

Papilio pandorus.

Male.—*Upperside.* Black as in *P. pandion*, Feld., with the grey rays on the anterior wings towards the apex less pronounced. Posterior wings with a lemon-yellow band in place of the white band of *P. pandion*, a lunular mark of blue scales above the anal angle, and indistinct markings of grey scales beneath the band between the median nervules.

Underside. Anterior wings as in *P. pandion*, but the apical grey rays rather shorter. Posterior wings with band of markings on the disk as in *P. pandion*, the upper row of lunules yellow; a yellow indistinct bar between the first and second median nervules, about halfway between the band and the outer margin.

Expanse of wings $5\frac{1}{2}$ inches.

Hab. Astrolabe Bay, German New Guinea.

Described from two specimens; in the posterior wings of the second specimen there are no grey scales beneath the band on the upperside, and the bar towards the anal angle is represented by a minute spot of yellow scales.

Parnassius nivalis.

Male.—*Upperside.* Anterior wings white, devoid of scales at the apex and along the outer margin; a broad irregular grey band from a little beyond the middle of the costal margin, extending across the wings to a little below the third median nervule. Posterior wings with a minute grey spot about the middle of the costal margin, a black spot at the end of the cell, smaller than in *P. nubilosus*, Christoph., and a grey bar across the wings from the second median nervule, where it is narrow, becoming broader on the first median nervule and thence to the inner margin; the base and basal portion of the inner margin densely covered with grey scales, but not reaching the grey bar. The veins on both wings across the disk are white, the ends of which towards the cell and the median nervure are black.

Underside as above, but all the veins are black.

Expanse of wings $2\frac{3}{4}$ inches.

Hab. Tsian Shan, Turkestan.

The specimen was a single one among a large number of *P. nubilosus*. It appears to be intermediate between *P. mnemosyne*, Linn., and *P. felderi*, Brem.

XVIII.—Some Notes concerning the Male of *Dexamine thea*, Boeck. By ALEXANDER PATIENCE.

Plate V.]

Family Dexaminidæ.

Genus DEXAMINE, Leach, 1814.

Dexamine thea, A. Boeck.

1860. *Dexamine thea*, Boeck, Forhl. ved. de Skand. Naturf., 8 mǫde, p. 658, ♀. (1.)
1862. *Dexamine tenuicornis* (err., non *Amphithoë tenuicornis*, II. Rathke, 1843!), Bate & Westwood, Brit. Sess. Crust. vol. i. p. 240 f, ♀. (2.)
1870. *Dexamine thea*, Boeck, Crust. Amphi. bor. et arct. p. 107, ♀. (3.)
1881. *Dexamine dolichonyx*, Nebeski, Beiträge zur Kenntniss der Amphipoden der Adria, p. 35, fig. 40, ♂ ♀. (4.)
1885. *Dexamine thea*, J. S. Schneider, Ein Beitrag zur Kenntniss der Amphipoden der arktischen Norwegens, p. 20, t. 2, ♀. (5.)
1887. *Dexamine dolichonyx*, Chevreux, Assoc. Franç. pour l'avance. des Sciences, p. 2 (separate copy), ♂ ♀. (6.)
1888. *Dexamine dolichonyx*, Chevreux, Bull. de la Société d'études sci. de Paris, 11^e année, 1^{er} semestre, p. 8 (separate copy), ♂ ♀. (7.)
1888. *Dexamine thea*, Robertson, Cat. Amphi. & Iso. of Firth of Clyde, Glasgow Nat. Hist. Soc. p. 34 (separate copy), ♀. (8.)
1895. *Dexamine thea*, Sars, Crustacea of Norway, vol. i. p. 168, fig. 1, p. 477, ♀. (9.)
1906. *Dexamine thea*, T. Scott, Crust. of River Forth & Est., Proc. Roy. Phys. Soc. Edin. vol. xvi. p. 161, ♀. (10.)
1906. *Dexamine thea*, Stebbing, Das Tierreich, Amphipoda Gamma-ridea, p. 516, ♀. (11.)

Tritata gibbosa (Bate).—The male of this species which has the hand of the first gnathopod incised on the front margin, and is in fact very like the same organ in *D. thea* ♂, has been regarded by northern authors hitherto erroneously as the *D. dolichonyx* of Nebeski. From the following references it would seem that Mr. Stebbing first fell into the mistake and has been followed by others. This male of *Tritata gibbosa* has been figured by Walker (13) and by Sars (15).

1888. *Tritata gibbosa* (Bate), ♂ as = *dolichonyx*, Nebeski, Stebbing, Rep. Voy. 'Challenger,' pp. 520, 941, 945. (12.)
1890. *Tritata dolichonyx*, A. O. Walker, Report Higher Crustacea of Liverpool Bay taken in 1889, Trans. Biol. Soc. Liverpool, vol. iv. p. 249, pl. 16, figs. 4-6, ♂. (13.)
1892. *Tritata gibbosa* (Bate), ♂ as = *dolichonyx*, Nebeski, Robertson, 2nd Contr. Amphi. & Iso. of Firth of Clyde, Glas. Nat. Hist. Soc. p. 16 (separate copy). (14.)
1895. *Tritata gibbosa* (Bate), ♂ as = *dolichonyx*, Nebeski, G. O. Sars, Crust. Norway, vol. i. p. 698, Supp. pl. viii. fig. 1. (15.)

1895. *Tritæta gibbosa* (Bate), ♂ as = *dolichonyx*, Nebeski, A. O. Walker, Rev. Amphi. L. M. B. C. p. 306 (separate copy). (16.)
 1906. *Tritæta gibbosa* (Bate), ♂ as = *dolichonyx*, Nebeski, Stebbing, Das Tierreich, Amphi. Gam. p. 518. (17.)
 1906. *Tritæta gibbosa* (Bate), ♂ as = *dolichonyx*, Nebeski, Norman & Scott, Crustacea of Devon & Cornwall, p. 77. (18.)

While examining lately some Amphipoda I had taken in the Firth of Clyde last summer I came across some specimens of *Dexamine thea*, Boeck, in which the propodal joint of the first gnathopods was peculiarly constructed, having a deep sinus on the upper margin, and in this respect showing an approach to the structure of the same joint of the first gnathopods of the male of *Tritæta gibbosa* (Bate). This peculiarity I found to obtain in the male sex only.

Boeck, in his descriptions of the species (1, 3), makes no mention of this sexual character, the male evidently not having come under his observation. Nebeski (4) seems to have been the first to observe the peculiar formation of the hand of the first gnathopods in *D. thea*, but evidently being unaware of Boeck's description of this species, he redescribed it under the name of *Dexamine dolichonyx*, n.s. The Rev. Thos. R. R. Stebbing (12), having in view the peculiar hand-formation of the male of *Tritæta gibbosa*, assumed that Nebeski was in error in referring *dolichonyx* to the genus *Dexamine*, and remarks: "The deep narrow cavity in the back of the hand of the second gnathopod was only found in the two male specimens, not in the females. A specimen of this curious species, from the Clyde, sent me by Mr. David Robertson, of Glasgow, shows in the peræopods a short hand and wrist preceded by a very long joint, which is characteristic of Boeck's genus *Tritæta*. The species should, I think, be named *Tritæta dolichonyx*." Nebeski's figure, however, of the extremity of the second peræopod (fig. 40) makes it clear that he was right in ascribing the species to *Dexamine*. Moreover, a reading of the text "das 2., 3. und 4. Segment des Abdomens am dorsalen Hinterrande in einem spitzen Zahn ausgezogen," which Stebbing himself quotes, puts the matter, I think, beyond doubt. The tooth on the first segment of the metasome is rarely nearly obsolete, especially in the male, and this probably accounts for Nebeski having failed to notice it on that segment.

Mr. Stebbing has as lately as 1906 (17) included "*Dexamine dolichonyx*, Nebeski," in his synonymy of *Tritæta gibbosa* (Bate).

Mr. A. O. Walker (13) has also erred in this matter. He records "*Tritæta dolichonyx*, Nebeski," from Puffin Island and Port Erin, Isle of Man (p. 241), and in a note (p. 249),

under the heading of "*Tritæta dolichonyx*, Nebeski," he states: "I have little doubt that this is the adult male of *T. gibbosa* (Bate). Only the males appear to have the characteristic excavation in the anterior edge of the hand of the second gnathopods, and both Mr. D. Robertson and myself have taken them associated with *T. gibbosa*." Again, he observes in referring to *Tritæta gibbosa* (Bate) (16): "It is remarkable that the emargination of the propodos of the first gnathopod in the adult males of this species, *which caused Nebeski to make a distinct species of it (T. dolichonyx)*—the italics are mine,—should have escaped the notice of so many carcinologists, including even so careful and accurate an observer as Professor G. O. Sars." Sars, in describing *D. thea* in the first part of his great work (9), makes no reference to the male sex; but in his Supplement (15), where he describes the male of *T. gibbosa* (Bate), he evidently accepts Walker's view, for he observes: "According to Mr. Walker, this peculiar sexual character has given rise to the establishment of a spurious species, viz. *T. dolichonyx* (Nebeski), which is nothing but the male of *T. gibbosa*."

Both Nebeski and Chevreux have made a rather curious mistake in observation in ascribing the peculiar formation of the hand to the *second* gnathopods, whereas it really occurs in the *first*. Nebeski (4) says "das breite Handglied des *zweiten* Gnathopodenpaares beim Männchen am Oberlande tief ausgebuchtet." Chevreux (6), in recording *D. dolichonyx*, Neb., from the coast of France, observes: "Le mâle se reconnaît immédiatement à l'échancrure si caractéristique du bord antérieur de la main des pattes de la *seconde* paire"; and again (7) he says: "Cette forme a peut-être été quelquefois confondue avec *D. thea*, Boeck, dont elle se rapproche par l'absence d'une dent au premier article des antennes supérieures. Les mâles relativement peu nombreux se distinguent au premier coup d'œil de ceux de l'espèce voisine par l'échancrure si caractéristique du bord antérieur de la main du *deuxième* gnathopod, échancrure qui n'existe pas chez les femelles. L'espèce est bien nettement caractérisée par les dentelures qui bordent les épimères des quatre premières paires."

Walker has made a similar mistake in observation (13), but subsequently (16) he rightly ascribes the peculiar formation of the hand to the first gnathopods.

Robertson (14) drew attention to Nebeski's error in this connection, but, curiously enough, he also regarded Nebeski's species as identical with the male of *T. gibbosa* (Bate). He remarks: "The Clyde specimens of *T. gibbosa* agree with

Dexamine dolichonyx, Nebeski, in having the peculiar incision in the upper or front margin of the hand of one of the gnathopods, but according to our experience the peculiarity belongs to the first gnathopods, not to the second to which Nebeski ascribes it."

Neither Schneider (5) nor Scott (10) makes any reference to the sexual character of the male here referred to, although the former has fully described and figured the species.

In endeavouring to clear up this matter I sent males of *D. thea* to Professor G. O. Sars, Rev. T. R. R. Stebbing, and Canon Norman, and enquired whether they were aware of the peculiarity of the incised gnathopod in that sex, but it had not been observed by any of them. Professor Sars, however, having examined his specimens, kindly sent me the two sexes from Norway, and Canon Norman wrote that on examination he now found the characteristic male in his collection from several British localities, including the two extremes Shetland and Jersey, and also among his last Finmarkian gatherings; and that the male was evidently the true *Dexamine dolichonyx*, as was evident by Nebeski's description of the spines on the metasome and his figure of the extremity of the second pereopod; and therefore those English authors who have regarded Nebeski's species as the male of *Triteta gibbosa* have been in error. Subsequently to this he has informed me that in answer to his request M. Chevreux had sent him specimens of what he had called *D. dolichonyx*, and that these also were the males of *Triteta gibbosa*. A reading of Chevreux's text (7), however, in which he says "L'espèce est bien nettement caractérisée par les dentelures qui bordent les épimères des quatre premières paires," leads one to the belief that he had then under examination *D. thea*, the characters of which he had rightly appreciated. Thus all references to Nebeski up to the present time, with probably the doubtful exception of Chevreux's, have been erroneous.

The two genera here under consideration comprise three British species: *Triteta gibbosa* (Bate), *Dexamine thea*, Boeck, and *D. spinosa* (Mont.). The following short synoptic table may be useful for the discrimination of these genera and species:—

- | | | |
|----|--|-----------------------------|
| 1. | } Peræopods 1-5, 4th joint longer than 5th
and 6th combined | 1. <i>Triteta gibbosa</i> . |
| | | |
| 2. | } Peræopod 5, 2nd joint sublinear | 2. <i>Dexamine thea</i> . |
| | | |

Remarks on the Male of D. thea.

The body is much more slender than in the female and also somewhat more compressed. The eyes are comparatively very slightly larger, the pigment being very dark brown with a lighter coating. Both pairs of antennæ are comparatively more slender and elongated. Antenna 1, flagellum 14-16-jointed. Antenna 2, ultimate joint of peduncle subequal to penultimate, flagellum slightly longer than peduncle and 11-12-jointed. The propodos of the first pair of gnathopoda* is peculiarly modified, having on the upper margin a somewhat deep sinus. Although somewhat resembling the propodos of the first pair of gnathopods of the male of *Tritæta gibbosa* (Bate), yet it appears to differ in one or two points. The notch in the hand of the last-named species appears to be deeper, and the upper margin is not so much rounded as in *D. thea*, while the disposition of the setæ is somewhat different, and these setæ are also more numerous than in the just-named species. The 3rd to 5th peræopods are of similar construction to those we find in the female, although they are not so setous, while the uropoda are not so spinous as in the opposite sex. The telson is cleft nearly to the base, each half with three lateral spines, one subdorsal and one on each finely serrated apex.

Colour yellowish, semipellucid, mottled with pink and orange.

Length 2.5 to 3.5 mm.

The reason why the male had not been previously known is probably due to the facts: 1st, that the male is always apparently of smaller size than the female, and thus might be passed by as younger specimens; and 2nd, because the first gnathopod, when not in use, seems to be habitually tucked away among the mouth-organs and is not visible without dissection.

It may be interesting to state that I have taken *T. gibbosa* from the outer integument of *Ascidia mentula*, O. F. M.,

* Robertson (14) has drawn attention to the occurrence of this notch in the female of *Tritæta gibbosa* (Bate). He states: "Moreover it has been observed in female specimens, so that probably the unnotched form of the hand belongs to individuals not adults, unless the species *gibbosa* and *dolichonyx* are distinct." Stebbing (17) observes, "occasionally also in ♀, perhaps a copulatory feature." In my investigations among the Clyde Crustacea during the past twelve years, I have come across two female specimens of this species where the propodos of the first gnathopods had a slight notch only (Pl. V. fig. *gn.* 1. ♀), but the hand was of the normal structure otherwise, and unlike that of the male. I have not come across this peculiarity in the female of *Dexamine thea*.

from Kames Bay, Loch Fyne, 10/25 fathoms. Walker (12) also records this species from Puffin Island and Port Erin, "encysted in the outer integuments of ascidians."

Both *T. gibbosa* and *D. thea* are widely distributed throughout the Clyde sea-area in depths up to 35 fathoms.

While preparing this paper, I have been much indebted to Canon Norman, F.R.S., who kindly gave me assistance and advice and put at my disposal some of the literature on the subject, which was not otherwise available to myself.

EXPLANATION OF PLATE V.

- C. Cephalon and antennæ of male of *Dexamine thea*, Boeck.
 gn. 1. ♂. First gnathopod of male of ditto.
 gn. 1*. Part of first gnathopod of male of ditto (greatly enlarged).
 gn. 2. ♂. Second gnathopod of male of ditto.
 gn. 1. ♀. Propodal joint of first gnathopod of female of *Tritata gibbosa* (Bate), showing abnormal structure.
 gn. 1. Tg. Part of first gnathopod of male of *T. gibbosa*.
 prp. ♂, 3, 4, 5. 3rd, 4th, and 5th pereopods of male of *Dexamine thea*, Boeck.
 ep. 3. ♂. 3rd epimeral plate of male of ditto.
 up. 3. ♂. 3rd uropod of male of ditto.
 T. Telson of male of ditto.

XIX.—*The Species of the Genus Dactylopsila.*

By OLDFIELD THOMAS.

A RENEWED examination of the specimens in the British Museum hitherto referred to *Dactylopsila trivirgata* shows that they may be readily separated into three species by the coloration of the hands and feet, as indicated in the following synopsis of the genus:—

- A. Fourth finger rather longer than others.
 a. Hands and feet wholly white. (N.W. New Guinea and neighbouring islands.) 1. *D. trivirgata*, Gray.
 b. Hands and feet not wholly white.
 a². Hands and feet wholly black. (S.E. New Guinea.) 2. *D. melampus*, sp. n.
 b². Metapodials and toes black, fingers and a band across ankles white. (N. Queensland.) 3. *D. picata*, sp. n.
 B. Fourth finger enormously longer than others 4. *D. palpator*, M.-Edw.

DESCRIPTIONS OF THE NEW SPECIES.

Dactylopsila melampus.

General characters as in *D. trivirgata*, but in all the

members of this genus there is a certain amount of variation in the details of the colour-pattern. Cheeks and upper lips varying, either white in continuation of the white belly-colour, or black owing to the broadening downwards of the lateral dark facial stripe. Chin and interramia black, not divided mesially by a light line. Fore limbs with the dark band that runs down from the lateral dorsal line continued on to and including the whole of the hands, though there may be a few light hairs near the tips of the fingers. Hind feet similarly black, except that the fine hairs of the hallux are generally light. Tail with or without a white tip.

Skull apparently quite like that of *D. trivirgata*, except that the muzzle is rather broader and stronger, not so sharply and narrowly pointed.

Dimensions of the type (taken from skin):—

Head and body 285 mm.; tail 330; hind foot 45.

Skull: upper length 60; basal length 54; greatest breadth 41; three anterior molariform teeth 8.9.

Hab. South-eastern British New Guinea. Type from Kokoda, Mambare R., alt. 1000'. Others from Tamata, Mambare R. (*Stalker*); Albert Edward Ranges, Central B. N. G. (*Rohu*), and Owgarra, Angabunga R. (*Meek*).

Type. Old female. B.M. no. 7.2.1.14. Collected 12th July, 1906, and presented by C. A. W. Monckton, Esq. Seven specimens examined.

Dactylopsila picata.

Most like *D. melampus* in general characters and skull, but the dark patch on the chin and interramia is smaller, and the colour of the hands and feet is not so completely black. On the fore limb the dark band which runs down its front narrows abruptly on the upper side of the wrist, so as to leave two white patches on each side of it, then broadens again so as to cover the metacarpal region, and then comes to an end, leaving the upper side of the fingers inconspicuously whitish. On the hind limb a white band passes across the upper side of the tarsus, separating the black of the leg from that of the metatarsals, the latter dark patch, however, continuing on to the upper surface of the toes, the hallux remaining, as usual, white. Tail white-tipped in both examples.

Skull apparently as in *D. melampus*, or the tooth-row a little longer.

Dimensions of the type (measured in skin):—

Head and body 275 mm.; tail 320; hind foot 44.

Skull: upper length 59; greatest breadth 42; length of three anterior molariform teeth 9.6.

Hab. Cape York, N. Queensland. Type from Port Albany.

Type. Old female. B.M. no. 66. 4. 23. 1. Collected by Mr. Coxen. Two specimens examined.

BIBLIOGRAPHICAL NOTICE.

Wild Life on a Norfolk Estuary. By ARTHUR H. PATTERSON. *With a Prefatory Note* by Her Grace the DUCHESS OF BEDFORD. London: Methuen & Co., 1907. 10s. 6d. net.

THIS latest of Mr. Patterson's books is most certainly his best. He has, in fact, provided us with a most delightful series of word-pictures of scenes and men of bygone times, the likes of which we shall never see again.

As a storehouse of facts concerning the bird-life of his district, Mr. Patterson's book will long be treasured. His remarks are almost entirely confined to observations on that ornithologists' paradise, "Breydon Water"—an area, of no inconsiderable size, of mud-flats and water, bounded on all sides by "ronds," whereon grow coarse grass, sanfoin, "southern-wood," and Michaelmas daisies. It is traversed by the river Yare, so that at high tide it becomes transformed into a great but shallow lake, and at low water into a series of more or less extensive mud-islands, whereon, even to-day, a rich variety of wading-birds and water-birds generally are constantly to be met with. And of these the author may claim to possess an almost unique knowledge, for he has haunted this happy hunting-ground for years. Happily gifted with very considerable powers of observation, infinite patience, and an innate, unflinching instinct for selecting the right facts for his chronicles, we may turn to his pages confident that much that is new will be found therein, though the facts may not be startling in their novelty.

It has not fallen to the lot of many men during the last thirty years or so to watch flocks of Avocets and Spoonbills, yet this Mr. Patterson has done, and in leisurely fashion too, on more than one occasion, on his beloved Breydon Water. But it is not his account of the habits of these rarities—though they were once common enough here—that will be treasured so much as his faithful and vivid descriptions of more common frequenters of this favoured spot.

The author, more than once, deploras the thirst for killing which possesses the meaner spirits who hunt this water-way. And in this we join him, especially in regard to the use of that barbarous

and unsportsmanlike weapon, the "punt-gun": on one occasion, he remarks, no less than 285 Dunlin and 5 Wigeon fell to one shot! And this in the name of Sport!!

The illustrations, which are numerous, are drawn by the author himself, and are really the most admirable and spirited pen-and-ink sketches which we have seen for a long time. In a word, this is a book to read and a book to keep.

W. P. PYCRAFT.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 19th, 1907.—Aubrey Strahan, Sc.D., F.R.S., Vice-President, in the Chair.

The following communications were read:—

1. 'The Inferior Oolite and Contiguous Deposits of the Bath-Douling District.' By Linsdall Richardson, F.G.S.

In this paper a detailed description is given of the Inferior Oolite of the country between Douling and Bath. The beds have been studied at different localities within the area by several geologists, but in most cases only the actual facts observable were recorded—there was little or no attempt at correlation. Now it is shown that there is within the area no Inferior-Oolite deposit of earlier date than the Upper *Trigonia*-Grit—a deposit of *Garantiana* hemera. In the hills south of the Avon Valley at Bath, and as far south as a line drawn east and west through Carnicote, near Timsbury, this deposit rests upon the Midford Sands. South of this line, and between it and one similarly orientated about half-a-mile farther south, it rests upon the local Cephalopod-Bed: here of greater antiquity than the 'Sands' (Midford); not younger, as in the case of the Cotteswold Cephalopod-Bed. South of the latter line, the Upper *Trigonia*-Grit, often conglomeratic, rests upon the non-arenaceous Liassic deposits, until in the more immediate neighbourhood of the Mendip Hills it is overstepped by the Douling Stone, which rests directly upon the well-planed, bored, and oyster-strewn surface of the Rhaetic White Lias and the Carboniferous Limestone. On the south side of the Mendip Hills the Upper *Trigonia*-Grit comes in again.

The Fullers' Earth at Midford, at least the lower part, is of *zigzag* hemera. The intervening Inferior Oolite between it and the Upper *Trigonia*-Grit may be thus divided, dated, and compared:—

Fullers' Earth.....	(zigzag).		
Inferior Oolite.	{ Doulting Beds. { I. Rubbly Beds. } { II. <i>Anabacia</i> -Limestones. } (inter-zigzag - <i>Truelli</i> .) } { III. Doulting Stone. } } <i>Clypeus</i> -Grit of the { IV. Upper Coral-Bed (<i>Truelli</i>) } { Mid and North } { V. Dundry Freestone } { Cotteswolds. } { VI. Upper <i>Trigonia</i> -Grit (<i>Garantiana</i> .) } = 'Coralline Beds' } { } { of Dundry. } { } { (Usually absent.) }		
(Non-Sequence) Lias.			

In one appendix Mr. S. S. Buckman indicates the deposits in Dorset equivalent to the above; in another the late Mr. J. F. Walker and Mr. Richardson deal with the Brachiopoda of the Fullers' Earth, naming seven new species; and in a third, Mr. Richardson describes a new *Amberleya* and *Spirorbis*. The micro-fauna of the Upper Coral-Bed is dealt with by Mr. C. Upton, who obtained from material furnished him from Midford and Timsbury Sleight most of the micro-brachiopoda such as were found by Charles Moore at Dundry Hill.

2. 'The Inferior Oolite and Contiguous Deposits of the District between the Rissingtons and Burford.' By Linsdall Richardson, F.G.S.

This paper is presented with the preceding, because there are several points of similarity between the two districts described. Both are near lines of country along which movements of upheaval were frequent during the time of formation of the Inferior-Oolite rocks.

In the Bath-Doulting district, above the Upper *Trigonia*-Grit (which rests upon the Upper Lias) over a restricted area is the Dundry Freestone, and over a greater the Upper Coral-Bed. Then come the Doulting Beds. The Doulting Beds are equivalent to the *Clypeus*-Grit of the district here dealt with: the Rubbly Beds to the Rubbly Beds, and the *Anabacia*-Limestones, plus the Doulting Stone, to the 'Massive Beds' of the *Clypeus*-Grit. The basal portion of the Fullers' Earth in the neighbourhood of Midford is of zigzag hemera. There is no reason for assigning the thin clay-bed, with its median band of *Ostrea-acuminata* Limestone at Great Rissington, to any other hemera. Whatever is the case elsewhere, there is no deposit in the Rissington district between the *Clypeus*-Grit and the Fullers' Earth.

3. 'The Flora of the Inferior Oolite of Brora (Sutherland).' By Miss M. C. Stopes, D.Sc., Ph.D., Lecturer in the Victoria University of Manchester.

This paper is to place on record the discovery of a bed containing impressions of plants, which represent a flora bearing a strong likeness to that of the Inferior Oolite of the Yorkshire coast. Previously,

but one species and a second doubtful one were known from these coal-bearing beds. The bed in which the plants were found was a thin shale-band cropping out below high-tide level on the coast, about $1\frac{1}{4}$ miles south of Brora. According to Prof. Judd's mapping, this reef would come within the boundary of the Lower Oolite, although from the more recent Geological-Survey map it appears to come in the position of the Middle Oolite. It forms a band 2 or 3 inches thick in a barren grey shale, and the impressions are fragmentary except in the case of *Ginkgo*, some of the leaves of which are practically perfect and show the veining of the lamina, and in some cases (after suitable treatment) the minute detail of the epidermis. Seven species of plants are identified, one of them being new, and four other species admitting of generic identification; and most of these species are identical with those obtained from the Inferior Oolite of Yorkshire. The minute structure of the leaves of *Ginkgo* is compared with those of *G. biloba*, and proves the species to be quite distinct. The plants found are those of a land-area, probably with firm ground surrounding pools or shallow water, as indicated by the fact that *Ginkgo* and *Equisetites* are the two commonest forms.

MISCELLANEOUS.

Altum's Squirrel Names. By GERRIT S. MILLER.

DR. ERNST HARTERT has called my attention to some overlooked names for squirrels proposed more than thirty years ago by Altum, in the second edition of the 'Forstzoologie.' The technical account of *Sciurus vulgaris* occupies pages 73-75 of the volume on mammals, and, as the typical red German form is considered too well-known to need special description, is chiefly concerned with a detailed account of the peculiar varieties or special colour-phases of the species. Three of these phases occur in Central Germany together with the red form, while three others are considered as definite geographical subspecies. All are technically named in a short table on page 75:—

- | | | |
|-----|------------------------------|--|
| (a) | [<i>Sciurus vulgaris</i>], | var. <i>fuscoatra</i> , tief castanienbraun [Harz, Schlesien]. |
| (b) | [„] | „ <i>nigrescens</i> , die schwärzlichen in Fichtenrevieren [Schlesien]. |
| (c) | [„] | „ <i>brunnea</i> , erdig graubraun ("græca, alpina") [Elsass-Lothringen]. |
| (d) | [„] | „ <i>quadricolor</i> , die ibenhorster Form [Ibenhorst, Ostpreussen]. |
| (e) | [„] | „ <i>cinerea</i> , die westsibirischen, hellgrau mit röthlicher Rückenmitte [Kasan]. |
| (f) | [„] | „ <i>atrocinerea</i> , die tiefgrauen ostsibirischen [äussersten Osten]. |

The names *fuscoatra*, *nigrescens*, *brunnea*, *græca*, and *alpina* (the last two cited as a dealer's catalogue names for specimens of *brunnea*) all refer to the common bright red squirrel of Central Europe, which I described, in the 'Annals and Magazine of Natural History' for November 1907, as *Sciurus vulgaris rutilans*. The full synonymy of this form, so far as at present known, will be as follows:—

Sciurus vulgaris fuscoater, Altum.

1804. *Sciurus vulgaris*, var. *cinerea*, Hermann, Observ. Zool. p. 65.
Not *Sciurus cinereus*, Linnaeus, 1766.
1876. [*Sciurus vulgaris*] var. *fuscoatra*, Altum, Forstzoologie, 2nd ed. i. p. 75.
1876. [*Sciurus vulgaris*] var. *nigrescens*, Altum, Forstzoologie, 2nd ed. i. p. 75.
1876. [*Sciurus vulgaris*] var. *brunnea*, Altum, Forstzoologie, 2nd ed. i. p. 75.
1876. [*Sciurus vulgaris*] *græca*, Altum, Forstzoologie, 2nd ed. i. p. 75.
1876. [*Sciurus vulgaris*] *alpina*, Altum, Forstzoologie, 2nd ed. i. p. 75.
Not *Sciurus alpinus*, F. Cuvier, 1842.
1899. *Sciurus vulgaris rufus*, Barrett-Hamilton, P. Z. S. p. 5. Not of Kerr, 1792.
1907. *Sciurus vulgaris rutilans*, Miller, Ann. & Mag. Nat. Hist. 7th ser. xx. p. 426 (November, 1907).

The name *quadricolor* is based on a peculiar geographical form, specimens of which from Poland are in the British Museum collection. These have been referred by Mr. Barrett-Hamilton to the *Sciurus vulgaris varius* of Kerr. It seems probable that the Polish East Prussian animal may prove to be distinct from true *varius* of Northern Scandinavia, in which event Altum's name would be available for it.

The name *cinerea* is antedated by the *Sciurus cinereus* of Linnaeus and the *S. vulgaris cinereus* of Hermann. It should be placed in the synonymy of *S. vulgaris argenteus*, Kerr.

The status of Altum's *atrocinerea* cannot be satisfactorily determined until the identity of the squirrel whose skins are brought by the Siberian fur trade from the "most extreme East" is definitely known. This animal has recently* been referred to *Sciurus vulgaris calotus* (Hodgson), in the synonymy of which *atrocinerea* may for the present remain.

* Barrett-Hamilton, P. Z. S. 1899, p. 6; Allen, Bull. Amer. Mus. Nat. Hist. xix. p. 134 (March 31, 1903).



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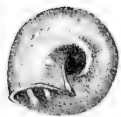
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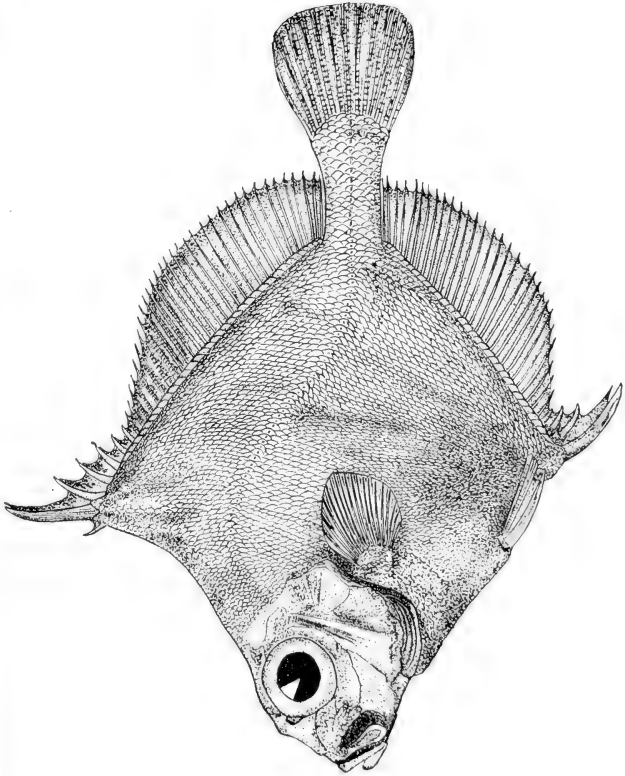


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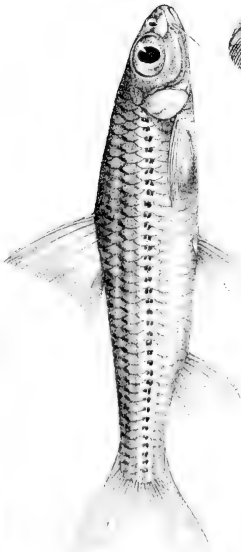
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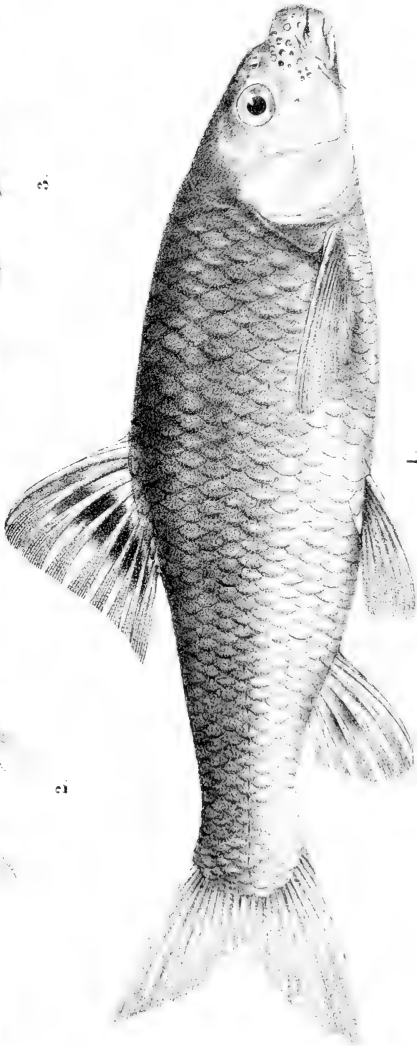




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1. GLYPTOSTERNUS KIKUYI HIRAZUMI 2. GOBIO WATTEI ST. GRIFF. 3. GLYPTOSTERNUM SINENSE.
J. Green del et lith.







THE ANNALS

AND

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XX. — *Descriptions of Nine Terrestrial Mollusca from South Africa.* By JAMES COSMO MELVILL, M.A., F.L.S., and JOHN HENRY PONSONBY, F.Z.S. *Including Anatomical Descriptions of Two proposed new Genera (Afrodonta, M. & P., and Peltatus, G.-A.),* by Lt.-Col. H. H. GODWIN-AUSTEN, F.R.S.

[Plates VII. & VIII.]

DURING the past year a good many interesting forms of land-mollusks have been submitted to us by various correspondents, notably Mr. H. C. Burnup, enabling us to offer a further (the twentieth) paper on this extensive and varied fauna.

As might, perhaps, have been expected, a few fresh *Ennea* have thus come under our notice, and, amongst the Helicoids, two very extraordinary, though minute species, both nearly allied, for which it appears necessary to propound a new genus (*Afrodonta*). Col. H. H. Godwin-Austen, F.R.S., with his customary kindness, has examined the anatomical details and allowed us to incorporate the results of his investigations in the following pages. The family Endodontidae, to which they both belong, has not, till now, been known in this region, excepting in the form of the simple-mouthed *Phasis*, Albers, and *Trachycystis*, Pilsbry.

Col. Godwin-Austen has likewise requested us to include in this paper his description of *Peltatus*, gen. nov., proposed for "*Helix*" *hudsoniae*, Benson*, a not uncommon, but variable mollusk, with peculiar anatomical organization †.

* Ann. & Mag. Nat. Hist. ser. 3, vol. xiii. (1864) p. 493.

† Op. cit. ser. 6, vol. vi. (1890) p. 467.

Ennea darglensis, sp. n. (Pl. VII. fig. 1.)

E. testa parva, rimata, obtusa, cylindrica, pellucida, alba, delicata; anfractibus ad 6, quorum tres apicales fere læves, cæteris longitudinaliter suboblique tenuistriatis, ad suturas impressis, ventricosulis; apertura ovata, fere clausa; peristomate incrassato, albo, nitido, quatuor plicis dentibusve prædito; plica parietali prominula, acuta, dente labiali bifido, incrassato, basali obtuso; plica columellari sinuosa, duplice, multum intrante.

Alt. 2.55, diam. 1.20 mm.

Hab. Dargle, also Richmond, Natal (*Burnup*).

Framed upon a smaller scale than the variable *E. isipingoensis*, Sturany, which in some points it resembles. The columellar plait is, however, more prominent and remarkably sinuous, rectangularly projecting below the front margin, and the labial tooth more decidedly bifid. The measurements of *E. isipingoensis* average over 3.00 mm. in altitude.

Ennea kosiensis, sp. n. (Pl. VII. fig. 2.)

E. testa cylindrica, breviter rimata, pellucida, lævissima; anfractibus 7, quorum apicalis obtusus, cæteris apud suturas impressis, ventricosulis, omnino lævibus; apertura ovata; peristomate albo, nitido, dentibus plicisve 4-5 munito; plica parietali acinaciformi, magna, acuta, intrante; dentibus labialibus 2, interdum connexis, interdum separatis, acutis, quorum superior major, dente basali acuto; plica columellari omnino interna, mammæformi.

Alt. 5, diam. 2 mm.

Hab. Kosi Bay, Zululand (*Burnup*).

A very pleasing little species, smooth, as is the characteristic of so many Zululand species, and allied to *E. obovata*, Pfr., from Natal, from which it differs in some peristomatal details.

Ennea vitreola, sp. n. (Pl. VII. fig. 3.)

E. testa perminuta, translucida, nitida, tenui, obtuso-ovata; anfractibus 5½, deplanatis, haud multum ad suturas impressis, infra, juxta suturas, delicatissime at breviter striatulis, striis mox evanidis, aliter undique lævissimis; apertura parva, ovato-sinuata; peristomate albo, nitido, quatuor dentibus plicisve munito; plica parietali prominula, magna, intrante; dente labiali bifido, intus marginem extenso, basali obtuso; plica collumellari conspicua, multum intrante.

Alt. 1.87, diam. 0.94 mm.

Hab. Hilton Road, Natal, December 1905 (*Burnup*).

A particularly minute *Ennea*, with a peculiarity of form that renders it at once recognizable. It is completely

smooth and shining, save for a slight sutural rim of fine striae, which soon disappears. For the size of the shell, the peristomatal processes are unusually well developed.

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On *Peltatus*, gen. nov. Zonitidarum: Type *P. hudsoniae* (Benson). By Lt.-Col. H. H. GODWIN-AUSTEN, F.R.S.

I have very recently received for examination from Mr. John Ponsonby a single minute South-African shell, preserved in spirit, and my best thanks are due to him, for it is an interesting little endodontine form. This has led me to turn again to another larger South-African species he was good enough to send me, I am sorry to say, now many years back. The animals were not in the very best state for dissection, but I made some drawings in the hope of getting better material at some time or other. The shells and slides were put on one side—in truth, I had been puzzled to know in what genus to locate it. I now find, after reference to Mr. John Ponsonby, that in 'The Check-list of Non-Marine Mollusca of South Africa' it is placed in the genus *Helicarion*, but it cannot be retained there, and had best be separated under the generic name of *Peltatus*, G.-A.

Peltatus hudsoniae (Benson).

Locality. Neighbourhood of Port Elizabeth, Cape Colony. Three specimens (*Mr. John Ponsonby*).

Shell (Pl. VIII. fig. 1) globose, not umbilicated, thin, rather glassy surface, smooth, crossed by transverse lines of growth; no longitudinal striation under high power. Colour pale horny; spire depressedly conoid; apex blunt; suture moderately impressed. Whorls 4, the last much expanded; aperture semioval, oblique; peristome simple, thin; columellar margin vertical, neither thickened nor reflected.

Size: major diam. 13, minor 12, alt. axis 7 mm. Largest specimen 15 mm. in major diameter.

Animal. Has a mucous pore at the extremity of the foot, with a long overhanging pointed lobe. The right neck-lobe is small, the left narrow in front, widening behind; there is a small tongue-shaped right shell-lobe on the body-side of the aperture, and a small left shell-lobe which in the living animal evidently extends back over the outer margin of the peristome.

The genitalia (Pl. VIII. fig. 1 a).—The penis has a long tapering kale-sac close to the junction of the vas deferens;

it is bent on itself as extracted and mounted, and contained a spermatophore (fig. 1 *b*) in a nearly complete stage of formation. The spermatheca is rather short with a globular termination. There is no amatorial organ. The oviduct is of large tube-like form, with a covering very dark in colour, which, under high power, has a granulate appearance. The spermatophore is very interesting; it consists of a large sac or capsule set on one side with rows, at intervals, of short blunt projections, which possibly mature into sharp spines, as in other species. I show a row of these spinules much enlarged (fig. 1 *c*). Towards the distal end of the calc-sac the capsule decreases in diameter and merges into a long tube filling the calc-sac (*k*) up to the extreme end. It may be compared with the spermatophore of *Ariophanta* (*Xestina*) *tranquebarica*, Fabr. (Moll. Ind. ii. p. 135, pl. xciv. figs. 5-5 *e*), also to that of *Euplecta binoyaensis*, G.-A. (pl. xcvi. figs. 1 *b*, 1 *c*).

In the radula (fig. 1 *d*) the centre and admedian teeth are on narrow plates, both have outer basal cusps; the laterals are bicuspid, the inner points the longest, many of these are seen to have serrated edges below the outer points. The formula is 35. 17. 1. 17. 35, or 52. 1. 52.

Jaw (fig. 1 *e*) is concave on the cutting-edge, without any central projection. This radula is quite characteristic of the family Zonitidæ. Comparing the animal with those of other genera, I was led at first, by the presence of shell-lobes and general form of the teeth of the radula, to consign this species to the Macrochlamyinae, but recent and closer examination of the generative organs shows that these differ much from what characterizes that subfamily—in fact, they are distinct from any I have seen hitherto.

In three characters certainly, perhaps four—viz.: (1) the radula, which has the same formula as *Xestina*; (2) the short, small spermatheca; (3) the spermatophore; (4) the presence of a straight cæcum of the retractor muscle of the penis (not satisfactorily seen, *vide* dotted part (*r.m.p.*) fig. 1 *a*),—this species approaches the form of similar parts in the subfamily Ariophantinae. The absence of the amatorial organ is opposed to this. I have never found this organ absent in any of the Indian species of the subfamily. However, I can point to dissimilarity of a like kind occurring in species of the Macrochlamyinae—for instance, in *Macrochlamys splendens*, *prona*, *cacharica*, and *kala*. The most important character is the form of the oviduct and the junction of the vas deferens near where the albumen-gland would be situated. This would indicate an ovoviviparous habit of the animal not met with in any genus of the above-mentioned subfamilies. The

habit occurs in some genera of the Zonitidæ—such as *Microcystis*, in *myops* and *ambæ* for instance,—and in a dry climate such as South Africa it would very likely be brought about.

Although dealing with a single specimen, scanty and poor material to go by, there is enough to show it cannot remain in *Helicarion*. The characters now described will be sufficient to indicate it, and we must wait for further material to clear up the doubtful points and what local forms in South Africa approach it.

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Helicarion vitalis, sp. n. (Pl. VII. fig. 4.)

H. testa pertenui, vitrea, vivide ochracea, rimata, globoso-conica; anfractibus $4\frac{1}{2}$, apice ipso obtuso, cæteris ad suturas impressis, ultimo rapide acrescente; apertura rotundo-lunari; peristomate papyraceo, tenuissimo, apud regionem umbilicarem paulum incrassato et reflexo.

Alt. 12, diam. 15 mm.

Hab. Port Shepstone, Natal (*Burnup*).

A very beautiful globose, transparent shell, tinted with pale ochre, which seems distinct from all the species hitherto enumerated from this region.

Kaliella euconuloides, sp. n. (Pl. VII. figs. 5, 5 a, 5 b.)

K. testa parva, anguste perforata, delicata, pellucida, cornea, nitida, conica; anfractibus ad 6, apicalibus obtusis, cæteris ventricosulis, ultimo apud peripheriam subangulato, basi convexa; apertura anguste lunari, peristomate tenui.

Alt. 2·19, diam. 2·57 mm.

Hab. Dargle, Natal (*H. C. Burnup*).

A shining, smooth, horny, and glassy species, with very small and narrowly perforated umbilicus, base convex and brilliantly glossy; the last whorl subangled at the periphery. Some resemblance to *Euconulus fulvus*, Drap., a European and British species, exists; but the general form approximates rather to *Kaliella* than *Euconulus*, conchologically speaking only, the animal not having yet been examined, though we hope shortly to be able to do so.

AFRODONTA, genus novum Endodontidarum.

Testa parva, cornea, tenuis, late et profunde umbilicata, depresso-conica, vel planorbula; anfractus 4-5, apud suturas impressi, ventricosi; apertura lunaris, fauce bi- vel trilamellata, lamella

vel plica altera marginem ad medium columellarem, altera basaliter, tertia (in unâ specie) plica crassiuscula, extensa, interna, pone labium contra aperturam extensa.

Afrodonta bilamellaris, sp. n. (Pl. VII. fig. 6.)

A. testa uti supra, conico-depressa, tenui, cornea, profunde umbilicata, microscopicè longitudinaliter striatula; anfractibus 5, ventricosulis, angustis; apertura lunari, peristomate tenui, bilamellata, lamella vel plica altera marginem apud columellarem in medio valde intrantem, altera basali, conspicua, dentiformi.

Alt. 0·84, diam. 1·48 mm.

Hab. Dargle, Natal; Edendale Falls, June 29, 1907 (*H. C. Burnup*).

Afrodonta trilamellaris, sp. n. (Pl. VII. figs. 7, 7 a, 7 b.)

A. testa charact. uti supra, minuta, cornea, late umbilicata, planorbula; anfractibus $4\frac{1}{2}$, ventricosulis, undique microscopicè longitudinaliter tenuistriatis; apertura lunari; peristomate tenui, tribus lamellis plicisve prædito, altera obscura ad basin, interdum incrassata, extensa, interdum dentiformi, altera collumellarem apud marginem medium, longe intrante, tertia interna, incrassata, contra aperturam extensa.

Alt. 0·80, diam. 1·39 mm.

Hab. Dargle, Natal, January 1907 (*H. C. Burnup*).

Two of the most noteworthy discoveries in the South-African molluscan fauna made during recent years, and both due to Mr. Burnup, who is much, on this account, to be congratulated. Both species are, conchologically, very nearly allied, differing only slightly in form and arrangement of whorl. The chief distinction lies in the second species described possessing an extra lamella or peristomatal appendage, internal, extending a little distance behind the outer lip, while the basal tooth-like plait is not always distinct (as seems to be the case in *A. bilamellaris*), though Mr. Burnup, who has examined many specimens, is convinced the three lamellæ are always present, though not always equally developed in individual specimens.

As already mentioned in our prefatory remarks, the new genus it has been considered necessary to establish will find a place among the Endodontidæ, a family of Helicoids abundant in many parts of the world, but hitherto not known to occur in South Africa, excepting in the form of the somewhat solid xerophilous *Phasis*, Menke, to which the delicate, horny, simple-mouthed *Trachycystis*, Pilsbry, is at present considered subgeneric*. We may mention that we recently

* *Man. Conch.* ix. p. 37.

described under this latter name, as *Tr. rotula*, a very minute species, remarkable for a broad spiral groove on the centre of the body-whorl. This merits more study, and, though not, probably, an *Afrodonta*, it may have to be removed from *Trachycystis*.

Notes on the Anatomy of *Afrodonta*, M. & P.: Type *A. bilamellaris*, M. & P. By Lt.-Col. H. H. GODWIN-AUSTEN, F.R.S. (Pl. VIII. figs. 2-2 c.)

Locality. Edendale Falls, South Africa.

Animal. The foot of the animal showed no detail on its surface; the extremity was not very pointed, but no gland could be made out; there was indication of a peripodial groove close to the edge of the foot. The radula was got out complete; it is 0.43 mm. in length, long and narrow. The central teeth are all of the same form and size, on quadrangular plates, a central oblong cusp with small cusps at the base on either side; the lateral teeth are on narrow oblong plates, with irregular minute cusps, but they are so small it was very difficult to see much of their shape. The formula is 7.9.1.9.7 or 16.1.16, in 85 rows. The jaw was indistinct, and composed of narrow plates set side by side. The two otoliths were observed, touching each other. The form of the jaw and teeth of the radula recall those of genera of the Endodontinæ.

Trachycystis ordinaria, sp. n. (Pl. VII. figs. 8, 8 a, 8 b.)

T. testa parva, ovato-conica, profunde et anguste umbilicata, rufo-cornea, undique periostraco tenui vestita; anfractibus $4\frac{1}{2}$, apicali nitido, laevi, obtuso, cæteris ad suturas impressis, undique tenuissime longitudinaliter obliquistriatis; apertura ovato-lunari, peristomate tenui, marginem apud collumellarem triangulatim paululum extenso.

Alt. 2, diam. 3.05 mm.

Hab. Potchefstroom, Transvaal, Nov. 24, 1906 (*Miss Livingston*).

Only a third of the size of *T. simplex**, M. & P., but agreeing with it in some details.

Trachycystis rutilans, sp. n. (Pl. VII. figs. 9, 9 a, 9 b.)

T. testa conico-depressa, parva, late et profunde umbilicata, omnino corneo-rutilante; anfractibus $4\frac{1}{2}$, apice ipso mamillato,

* Aun. & Mag. Nat. Hist. ser. 7, vol. xii. (1903) p. 604, pl. xxxii. fig. 7.

obtusio, cæteris multum ad suturas impressis, tumidulis, irregulariter sed arcte liratis; apertura ovata, peristomate tenui.
Alt. 1·53, diam. 2·65 mm.

Hab. Alexandra Park, Maritzburg, Natal, November 1906
(*H. C. Burnup*).

A small species, with uniform corneous epidermis with decidedly ruddy tinge, closely longitudinally lirated, the liræ somewhat irregular. Allied to *T. ordinaria* (described in this paper), *T. liricostata*, *laticostata*, &c., and also possessing some affinity to *T. paula*, M. & P., described in January 1907*, from Johannesburg. From all of these, however, it can be differentiated very easily.

EXPLANATION OF THE PLATES.

PLATE VII.

- Fig. 1.* *Ennea darglensis*.
Fig. 2. — *kosiensis*.
Fig. 3. — *vitreola*.
Fig. 4. *Helicarion vitalis*.
Figs. 5, 5 a, 5 b. *Kaliella euconuloides*.
Fig. 6. *Afrodonta bilamellaris*.
Figs. 7, 7 a, 7 b. *Afrodonta trilamellaris*.
Figs. 8, 8 a, 8 b. *Trachycystis ordinaria*.
Figs. 9, 9 a, 9 b. — *rutilans*.

PLATE VIII.

Peltatus hudsoniæ (Bens.).

- Fig. 1.* Shell. × 1·4.
Fig. 1 a. Genitalia. × 3·7.
Fig. 1 b. The calc-sac, with spermatophore forming within it. × 11.
Fig. 1 c. Spinules, immature? × 53.
Fig. 1 d. Teeth of the radula. × 340.
Fig. 1 e. Jaw. × 8·4.

alg, albumen-gland, position of; *ep*, epiphallus; *crp*, cæcum of the retractor penis; *k*, calc-sac; *ov*, oviduct; *p*, penis; *mp*, retractor muscle of penis; *sp*, spermatheca; *vd*, vas deferens.

Afrodonta bilamellaris, M. & P.

- Fig. 2.* Shell, × 1·7; basal side, × 10.
Fig. 2 a. Shell from above with animal, drawn before it was broken to extract its radula.
Fig. 2 b. Teeth of the radula. × about 1000.
Fig. 2 c. Jaw. × 157.

* Ann. & Mag. Nat. Hist. ser. 7, vol. xix. (1907) p. 99, pl. vi. fig. 11.

XXI.—On a Collection of Mammals from the Batu Islands, west of Sumatra. By MARCUS W. LYON, Jun., United States National Museum.

I HAVE been asked by the authorities of the British Museum to work out and compare with the specimens obtained by Dr. Abbott a small series of mammals from the Batu Islands, which had been collected by Mr. Kannengieter and purchased by that Institution.

Dr. Abbott's specimens from the islands were described by Mr. Gerrit S. Miller, and most of the Kannengieter examples are referable to forms named by him. There is, however, among them a new species of flying-lemur.

Sciurus ictericus, Miller.

The adult female from Tana Massa and the adult male simply marked "Batu Islands" differ in no respects from the original series of *Sciurus ictericus*, Miller (Smithsonian Miscell. Coll. xlv. p. 12, November 6, 1903), the type of which came from Tana Bala.

Ratufa piniensis, Miller.

The two brown giant squirrels from Pulo Pini (or Pinie) are typical of *Ratufa piniensis*, Miller (Smithsonian Miscell. Coll. xlv. p. 8, November 6, 1903).

Ratufa massæ, Miller.

The pair of brown giant squirrels from Tana Massa are typical of *Ratufa massæ*, Miller (Smithsonian Miscell. Coll. xlv. p. 7, November 6, 1903).

Ratufa palliata, Miller.

The three specimens from Tana Massa are not quite typical, but too close to be separated satisfactorily. The hind feet (with claws 76–81 mm.) average somewhat smaller than they do in *R. palliata* (see table of measurements, Lyon, Proc. U.S. Nat. Mus. xxxii. p. 445, May 23, 1907), 80–90 mm., but have about the same size as they do in *R. lenata*, Miller (Proc. U.S. Nat. Mus. xxvi. p. 430, February 3, 1903), 72–79 mm. The skulls of the three Tana Massa specimens are a trifle shorter as to total length than skulls of similar age from Sumatra. The arrangement of the nasals and the premaxillæ is not different from that found in *Ratufa palliata*.

Petaurista batuana, Miller.

The three flying-squirrels, one from Pulo Pini and two from Tana Massa, I have identified as *Petaurista batuana*, Miller (Smithsonian Miscell. Coll. xlv. p. 27, November 6, 1903). There are probably two colour-phases in this species. The original series, seven from Tana Bala and one from Tana Massa, are all of a ferruginous colour, while the three Kannengieter specimens are almost seal-brown in colour, similar to specimens in the U.S. National Museum from Java. I can detect no differences between the skulls of individuals from the various islands of the Batu group. The original series was collected by Dr. W. L. Abbott in February, and they are evidently in an unworn pelage. No date appears on the Kannengieter labels, but the skins are evidently in an old pelage with a new and darker one coming in in places. The old pelage, while distinctly redder than the new, in no sense approaches the bright and ferruginous tints in Dr. Abbott's series of *Petaurista batuana*.

? *Arctogalidia inornata*, Miller.

No. 7. 6. 18. 7, a young male from Pulo Pini, probably represents a new species of *Arctogalidia*. The specimen is too young to determine definitely its characters and relations. In point of colour it is very similar to an adult female paratype of *Arctogalidia inornata*, Miller (Proc. Washington Acad. Sci. iii. p. 131, March 26, 1901), from the Natuna Islands (Bunguran), Cat. no. 104860 U.S. N. M. It differs mainly in being less tawny along the sides of neck, in having darker ears and feet, and in the possession of three stripes on the lower back. Although these stripes are absent on the adult female Natuna *Arctogalidia*, they are present on a very young specimen from the Natunas.

Tupaia cervicalis, Miller.

The tree-shrew from Tana Massa may be referred to *Tupaia cervicalis*, Miller (Smithsonian Miscell. Coll. xlv. p. 59, November 6, 1903), although it is not typical. The light colours of the neck are not so pronounced as in the type, nor do they extend so far back posteriorly. The sharply defined black area of the back, as well as all other points of coloration, are practically the same in the type and the Kannengieter specimen. The skulls of the two specimens are indistinguishable from each other. Were it not that a name has already been given to the tree-shrew from the Batu

Islands, I would hesitate to separate the Tana Massa specimen from *Tupaia tana*.

Cynocephalus tellonis, sp. n.

Type.—Skin and skull of adult female, no. 7. 6. 18. 2, British Museum. Kannengieter Collection, collected on Pulo Tello, Batu Islands, west coast of Sumatra.

Diagnostic characters.—A medium-sized flying-lemur, very similar to *Cynocephalus tuancus* (Miller) (Smithsonian Miscell. Coll. xlv. p. 53, November 6, 1903) of the Banjak Islands, north-west coast of Sumatra, but with the nasals more pinched up into a ridge on the rostrum and with the squamosal root of the zygoma deeper.

Colour.—The colour of the type and of a paratype, Cat. no. 7. 6. 18. 3, Brit. Mus., differs in no essential respects from that of flying-lemurs, in the grey pelage phase, from the Malay Peninsula. The skin of a male, Cat. no. 7. 6. 18. 4 Brit. Mus., is very dark and shows no essential differences in colour from a paratype, Cat. no. 114376 U.S. N. M., an adult male, of *Cynocephalus tuancus* (Miller) from the Banjak Islands. A young male, Reg. no. 7. 6. 18. 5 Brit. Mus., is almost uniformly cinnamon-rufous, very light on the underparts, darker about the fore limbs, antibrachial membrane, and head; the usual white flecks are found on the feet and legs and a few on the back.

Skull and teeth.—The skull and teeth of *Cynocephalus tellonis* are very similar to those of *C. tuancus*, the chief difference being that the new form has slightly larger teeth, nasals more pinched up into a ridge on top of rostrum, squamosal root of zygoma much deeper, 6–7 mm. instead of 4 mm. in *C. tuancus*. The mastoid inflation is much less in the Batu animal than in the Banjak specimen. The temporal ridges in the three Tello skulls are much more closely approximated than they are in the single adult skull from Pulo Tuangku, although the latter skull, as judged by the teeth, is the oldest. There is practically no difference in size between the skulls of the two sexes in *C. tellonis*, the two females measuring, greatest length, 70 and 69·3 mm., and the male 67 mm.

Measurements.—The three adults give the following measurements respectively (7. 6. 18. 2, female, type; 7. 6. 18. 3, female; and 7. 6. 18. 4, male):—Hind foot (measured from dried skin) 67, 66, 62 mm.; greatest length of skull 69·3, 70, 67; zygomatic breadth 44·5, 42·6 (!), 44·5; palatal length 32, 31·8, 32·4; width of rostrum at premaxillo-

maxillary suture 19·5, 20, 19·5; interorbital constriction 18·5, 18, 18·2; breadth of brain-case above roots of zygomata 24·6, 24·6, 24·3; mastoid breadth 29·9, 29·4, 29·8; upper tooth-row (all teeth) 34·3, 33·9, 33.

Specimens examined.—Four, three adults and one young, all from Pulo Tello.

Remarks.—The small size of *Cynocephalus tellonis* at once serves to distinguish it from its geographical ally, *C. saturatus* (Miller) (Smithsonian Miscell. Coll. xlv. p. 51, November 6, 1903), from Tana Bala and Pulo Pinie of the Batu Islands, of which it is a diminutive and lighter-coloured form. Its close resemblance to *C. tuancus* is probably fortuitous and does not indicate a phylogenetic relationship.

XXII.—Notes on North-American Longicornia, with Descriptions of some new Species. By C. J. GAHAN, M.A.

AMONG the better known of the North-American Longicornia are two species of Clytini, one of which is very injurious to the locust-tree (*Robinia pseudacacia*) and the other just as destructive to the hickory (*Carya alba* &c.). In reference to the second of these species, Packard, in his 'Forest Insects' (Fifth Report of the United States Entomological Commission, 1890), writes:—"Of the 170 species of insects which live at the expense of the hickory, the most annoying and common borer is the *Cyllene picta*, or common hickory borer." This species has, however, been wrongly identified by American entomologists as the *Leptura pictus* of Drury. It is described below as a new species under the name of *Cyllene caryæ*. For many years *Leptura pictus*, Drury, was correctly regarded as a synonym of *Leptura robiniaë*, Forst. It was only when the hickory borer was discovered to be a distinct species from the locust-tree borer (*Cyllene robiniaë*) and a separate name was required for it that it began to be known as *Cyllene picta*, Drury. How the mistake arose of giving it this name is difficult to understand, because Drury's figure and description are clearly those of the species previously described by Forster (the latter, in fact, quotes Drury's figure), and Drury distinctly states that he "received it from New York, where they are found on the locust-tree."

The synonymy of *Cyllene robiniaë*, the locust-tree borer, is as follows:—

Cyllene robiniae, Forst.

Leptura robiniae, Forst. Nov. Sp. Insect. p. 43 (1771).

Leptura pictus, Drury, Illust. Ex. Insects, i. p. 91, pl. xli. fig. 2; ii. Index (1773).

Callidium flexuosum, Fab. Syst. Ent. p. 191 (1775).

Callidium angulatum, Fab. Syst. Ent. p. 192, which was added to the above synonymy by Olivier (Encycl. Méth. v. p. 262), may or may not be identical with *C. robiniae*; but I have satisfied myself that it is not the species which I now describe.

Cyllene caryæ, sp. n.

= *Cyllene picta*, Horn (nec Drury), Tr. Amer. Ent. Soc. viii. p. 134.

= *Clytus pictus*, Packard, Guide to the Study of Insects, p. 497, fig. 485; id. Forest Insects, p. 287, fig. 112.

Dark brown above, marked with pale yellow or yellowish-white pubescent bands—two on the head, four on the prothorax, and seven on the elytra; the first thoracic band placed at the anterior border and very narrow; the first and second elytral bands almost directly transverse, the third **W**-shaped, the fourth and fifth angulated and interrupted, the sixth consisting of a rather strongly arcuated band on each elytron, the seventh forming a border to the apex; body beneath banded with yellowish pubescence; metathoracic episterna marked each with two yellow spots, the interval between which is of a dark brown colour and as wide as or wider than either of the spots; legs reddish; antennæ dark brown, sometimes more or less reddish in parts.

♂. Antennæ rather thick, extending past the apex of the elytra; third to sixth joints subdentate posteriorly at the apex; pronotum with a small punctate area on each side rather close to the anterior border; sides of prothorax very finely and densely punctate.

♀. Antennæ extending to the middle of the elytra, not quite so thick as in the male.

Length 10–22, breadth 3–7 mm.

Hab. N. America.

Although apparently very common in the United States and Canada, this species is not well represented by North-American specimens in the British Museum collection, and I am at present unable to study the whole extent of its variation. I have selected two specimens (♂ & ♀) from Virginia as types of the species, and the following variations from the type occur:—

Var. α.—The pubescent bands of an ashy white instead of a yellow colour. Pronotum of ♂ marked anteriorly with a small punctate area on each side of the middle line in addition to the lateral punctate areas.

Hab. Texas.

Var. β.—Pubescent bands ashy white or pale yellow in colour. Pronotum of ♂ marked anteriorly with a median subrotundate punctate area, which is joined by means of a transverse punctate band with each of the lateral punctate areas.

Hab. Mexico: Villa Lerdo, Durango (*Höge*).

From *C. robinæ*, Forst., which they greatly resemble in markings, *C. caryæ* and its varieties may be distinguished by the thicker, longer, and usually darker-coloured antennæ, by the two widely separated yellowish or whitish spots on each of the metathoracic episterna, the limitation of the sexual puncturation of the male pronotum to the anterior part, and in having the intercoxal process of the prosternum nearly parallel-sided.

In *C. robinæ* the antennæ are generally reddish brown in colour, somewhat slender, as a rule distinctly shorter (never longer) than the body in the male; the yellow pubescence forms an almost continuous band on each of the metathoracic episterna, when it is broken up into two spots the interval between the spots is always narrow; the intercoxal process of the prosternum widens out posteriorly, its sides being curved instead of almost parallel. The sexual puncturation of the pronotum of the male is much more extensive than in *C. caryæ*; it covers the greater part of each side, forms an anterior transverse band, and two bands running backwards on the disk diverging a little behind and dilating each into an oval or rounded spot between the middle and the base; it is similar in character to that occurring in the North-American species *C. decora*, Oliv., and the Brazilian *C. mellyi*, Chevr.

Obrium rufulum (Dej. Cat.), sp. n.

= *Obrium rubrum*, Leng (nec Newm.), Entom. Americana, ii. p. 28 (1886), i. pl. iii. fig. 6.

Entirely rufo-testaceous in colour. Eyes large, coarsely faceted, emarginate. Prothorax moderately densely punctate, obtusely tuberculate at the middle of each side. Elytra strongly and densely punctured, the punctures less strong

and less dense on the apical fourth part. Metathoracic episterna marked each with a deep longitudinal groove.

Length, ♂, 6-6½ mm.

Hab. North America.

The *Obrium rubrum* of Newman (Entom. Mag. v. p. 393, 1838), with which the above species had been identified by Leng, does not belong to the genus *Obrium*, but must be placed in the genus *Batyle* as a synonym of *B. suturalis*, Say, Journ. Acad. Phil. iii. p. 411 (1823).

Leptura zebra, Oliv., which is placed in the genus *Leptura* in Henshaw's 'List of North-American Coleoptera,' should be transferred to the genus *Typocerus*, Lec., to take the place of the name *zebratus*, Fab.

Leconte ('New Species of North-American Coleoptera,' pt. ii. p. 214) gave the synonymy of this species correctly, but unfortunately placed the names in the wrong order of priority. The right order is as follows:—

Typocerus zebra, Oliv.

Leptura zebra, Oliv. Entom. iv. no. 73, p. 19, pl. iii. fig. 33 (1795).

Leptura zebratus, Fab. Syst. El. ii. p. 364 (1801).

Leptura carolina, Weber, Observ. Entom. p. 91 (1801).

The genus *Methia*, Newm., together with three other genera—*Idomea*, Horn, *Styloxus*, Lec., and *Dysphaga*, Lec.—constitute the tribe Methiini in the classification of the Coleoptera of North America given by Leconte and Horn; and in reference to it the authors write:—"This tribe contains the lowest organized of the Lamiidæ; undifferentiated forms, which exhibit strong relationship to *Æme* and its allies among the Cerambycidæ." This view as to the position of the Methiini, although it received the sanction of Thomson and Lacordaire, is, in my opinion, an untenable one; and I think it well to repeat here my concurrence with the view of Professor Lamere, as thus expressed:—"Quant aux Lamiides, ils forment une unité systématique parfaite, si l'on en retire les Auxésides et les Méthiides qui n'ont rien de commun avec eux" ("Étude sur la Phylogénie des Longicornes," Ann. Soc. Ent. Belg. xlv. p. 315, 1901). The African Auxesides and the American Methiides, as I have already pointed out (Distant's 'Insecta Transvaaliensia,' pt. v. p. 108, 1904), agree completely with the Cerambycid group *Æmini*, and ought to be incorporated in that group. They are quite out of place in the Lamiidæ, and I can find no reason for regarding them as transitional groups between

the Cerambycidae and the Lamiidae. Equally erroneous, in my opinion, is the view expressed by Leconte and Horn that the Clytini show an affinity with the Lamiidae. There is a resemblance between some Clytini and certain genera of Lamiidae, but this is purely the result of convergence of characters and has nothing to do with affinity. The verticality of the front of the head, which is so prominent a feature of the Lamiidae, is frequently seen amongst the Cerambycidae, but it will be found in the latter that the insertion of the mandibles differs from that of the Lamiidae in being oblique instead of horizontal. This is readily seen by noting the lower margin of the gena, which is in nearly all cases strongly oblique in the Cerambycidae and forms a more or less acute angle behind the base of the mandible.

So far as I have been able to discover, there is no existing group of Longicorns that can satisfactorily be regarded as transitional between the Cerambycidae and the Lamiidae. At what point the Lamiidae have emerged, and how exactly related to other Longicorns, are questions still awaiting solution. In this connexion I should like to call attention to the very suggestive characters presented by the North-American genus *Atimia*, Hald. This genus has a strongly marked Lamiide facies, but, on the other hand, its characters are such that Leconte and Horn unhesitatingly placed it in the Cerambycidae, in juxtaposition with their Lepturoid series of that family. Their view of its position I find confirmed by an examination of its wing-venation. This is of an essentially Lepturine type, very much resembling that of *Oxymirus*, *Toxotus*, and *Rhagium*. In opposition to the views of my friend Prof. Lameere, I have long been of opinion that amongst existing Longicorns the Lepturinae, especially those of the *Toxotus* group, come nearest to the ancestral form. That form was probably, though not necessarily, provided, like the present-day Prioninae, with a sharp lateral margin to the prothorax. Such a form would differ but slightly in facies and structural characters from the ancestor of the Chrysomelidae. No genus of the latter family known to me shows any resemblance to *Parandra*, the genus which Prof. Lameere regards as the prototype of the Longicorns; but it is only fair to state that *Mysteria* and *Anoplo-derma*, which he derives almost directly from *Parandra*, do somewhat in facies resemble some of the more primitive Chrysomelidae. *Mysteria* especially has a facies which would agree well with that of my suggested Lepturo-Prionine prototype; but the reduced wing-venation, the fusion of the labrum with the clypeus, and the broad mentum and

submentum covering over the base of the maxillæ show that *Mysteria* is in some respects a very specialized genus and cannot be considered as ancestral.

One of the chief obstacles to my view of the matter has been the difficulty hitherto of showing how such forms as the Lamiidæ could be derived from Lepturoid ancestors. This difficulty is to a great extent removed when we see a genus like *Atimia*, which admittedly is closely related to the Lepturinæ, presenting so striking a resemblance in general form to the Lamiidæ.

The genus *Tenthras*, associated with *Atimia* both by Thomson and Lacordaire, is actually a Lamiid referable to the group Acanthocinides.

Cerambyx notatus, Drury, Illustrations of Exotic Insects, ii. p. 64, pl. xxxv. fig. 2, and Index (1773).

This species is omitted from the Catalogue of Gemminger and Harold, and appears to have escaped the notice of North-American entomologists. Drury's figure and description of it are so good as to leave no room to doubt that it is a North-American species of *Monohammus*, identical with *M. confusor*, Kirby. The latter name, being much later in date, must go as a synonym.

XXIII.—*The Genera of Stephanoceras and Allies.*

By S. S. BUCKMAN, F.G.S.

DR. ERICH MASCKE has lately published at Göttingen his "Inaugural Dissertation" under the title of "Die *Stephanoceras*-Verwandten in den Coronatenschichten von Norddeutschland." This paper shows great promise, and the very comprehensive work on the subject which is to follow will be awaited with much interest. The following abstract of and notes on the palæontological portion of his paper will, it is hoped, be of service.

Family *Otoitidæ*, Mascke.

Genus *OTOITES*, Mascke.

"Type, *Am. sauzei*, d'Orb."

17 species, of which 15 are new.

Ann. & Mag. N. Hist. Ser. 8. Vol. i.

Genus EPALXITES, Mascke.

"Type, *Am. contractus anceps*, Qu."

5 species, of which 4 are new.

Genus METAXYTES, Mascke.

"Type, *Met. intermedius*, n. f."

18 species, of which all are new.

Depressed, strong-ribbed Stephanoceratoids, with ears.

Genus NORMANNITES, Mun.-Chalm.

"Type, *Am. braikenridgii*, Sow."

54 species, of which all but 2 are new.

In placing *Am. braikenridgii*, Sow., as the type of this genus Mascke has disregarded Munier-Chalmas. That author ('Compte-rend. Soc. Géol. France, 1892, xiv. p. clxxii) specially mentioned *Am. braikenridgii*, d'Orb. The difference is very important, for Dundry, which is the type-locality of *A. braikenridgii*, Sow., possesses no strata at all which could yield *Am. braikenridgii*, d'Orb. The *Am. braikenridgii*, Sow., is from the *sauzei*-zone, and its lappets, being lateral, not latero-peripheral, indicate a species of the *sauzei* group; it belongs, therefore, to the genus *Otoites*, Mascke. There is indirect evidence for this conclusion—the specimens in the Bristol Museum labelled *Am. braikenridgii* were the species which has of late years been termed *A. sauzei*, d'Orb. It seems desirable that the confusion between the Sowerbyan and d'Orbignyian species of *Am. braikenridgii* should be prevented; and as for a long time the need of a distinguishing appellation for the latter species has been felt, the present opportunity may be taken to give the name

Normannites orbignyi, nov.

1846. *Ammonites braikenridgii*, d'Orb. (non Sow.), Pal. franç., Terr. jur., Ceph. pl. cxxxv. figs. 3, 4 only.

Therefore Munier-Chalmas's genus will read thus:—

Genus NORMANNITES, Mun.-Chalm.

Type, *A. braikenridgii*, d'Orb. (non Sow.), = *Normannites orbignyi*.

And in the genus *Otoites* there will be three named species to deal with:—*O. sauzei* (d'Orb.); *O. braikenridgii* (Sow.), thinner, less spinous; *O. contractus* (Sow.).

Genus GERMANITES, Mascke.

"Type, *Germ. latilobus*, n. f."

12 species, of which all are new.

Compressed, somewhat fine-ribbed *Stephanoceratoids* with ears.

Genus PARKINSONIA, Bayle.

"Type, *Am. parkinsoni*, Sow."

5 species, of which 4 are new.

These are only the species from the *Coronatenschichten* of North Germany. From higher beds in England and Wurtemberg the number of species is very large.

Genus STRENOCERAS, Hyatt.

"Type, *Am. niortensis*, d'Orb."

7 species, of which 2 are new.

Genus SPIROCERAS, Qu.

"Type, *Hamites bifurcatus*, Qu."

No further record.

Genus POLYPLECTITES, Mascke.

"Type, *Am. linguiferus*, d'Orb."

No further record.

Family *Stemmatoceratidæ*, Mascke.

Genus STEMMATOCERAS, Mascke.

"Type, *Am. humphriesianus coronatus*, Qu."

15 species, of which 13 are new.

Genus SKIRROCERAS, Mascke.

"Type, *Am. humphriesianus macer*, Qu."

15 species, of which 13 are new.

Genus TELOCERAS, Mascke.

"Type, *Am. blagdeni*, Sow."

19 species, of which 14 are new.

Genus BACULATOCERAS, Mascke.

"Type, *Am. baculatus*, Qu."
7 species, of which 4 are new.

Genus APSORROCERAS, Hyatt.

"Type, *Ham. baculatus*, Qu."
No record.

Family Stephanoceratidæ (Zittel), em. Mascke.

Genus EMILEIA, Buckm.

"Type, [*A.*] *brocchii*, Sow."
11 species, of which 7 are new.

Genus CHONDROCERAS, Mascke.

"Type, *Am. gervillei*, Sow."
41 species, divided into 6 groups, only 1 species yet described.

Genus SPHÆROCERAS (Bayle), em. Mascke.

"Type, *Am. brongniarti*, Sow."
7 species, of which 6 are new.

Genus STEPHANOCERAS (Waagen), em. Mascke.

"Type, *Am. Humphr. mutabilis*, Qu."
25 species, of which 21 are new.
The generic name is preoccupied for Rotifers.

Genus STEPHEOCERAS, Buckm.

"Type, *Am. humphriesi[anus]*, Sow."
16 species, of which 12 are new.

Genus GARANTIANA, Hyatt.

"Type, *Am. garanti[anus]*, d'Orb."
15 species, of which 13 are new.
This genus is really new. Hyatt cited it as Siemiradzki's, but that author did not name it. Mascke gives the history of its origin.

Genus SUBPARKINSONIA, Mascke.

"Type, *Subp. divisa*, n. f."
3 species, of which all are new.

Garantiana-like forms with indistinct peripheral break of ribs; no definite break bordered by knobs as in *Garantiana*. Some species from the *niortensis*-beds of Osborne, Dorset, answer to this description.

The new species enumerated as belonging to these genera have not yet been described by Dr. Mascke, but they are promised in an important forthcoming work. Those who know how the present paucity of names for these fossils hampers geological and biological work will earnestly desire that its publication be not delayed.

Besides these genera, that of *Cadomites*, Munier-Chalmas, type *Am. deslongchampsii*, d'Orb., would certainly be added under Mascke's family *Stephanoceratidæ*. To this genus belongs *A. daubenyi*, Gemmellaro, a very rare species for Britain, which has been found in the *truellii*-beds of Burton Bradstock, Dorset; and there are other species not yet named.

It will be seen that Mascke arranges "*Stephanoceras* and allies," from the Coronatenschichten only, into 21 genera, of which 11 are new, and that he mentions 292 species, of which 253 are new—that is to say, that in a part only of what was a few years ago grudgingly regarded as one genus with some dozen species, he proposes to have 3 families, 21 genera, and some 300 species. Put in another way, it is, perhaps, more striking—the "good old species" "*A. humphriesianus*" is to be divided into 71 species, distributed among 4 genera, in 2 families.

These results are quite in accordance with the expectations of those who have studied the Inferior Oolite, and know by experience its remarkably prolific Ammonite fauna; but they will doubtless surprise those who have thought that the Inferior Oolite had been given too many species already, and that the best way to veil the fact of its Ammonite fecundity was to cause the discontinuance of the work on it. However, what is not to be accomplished in one country is evidently to be undertaken with vigour in another.

XXIV.—*Descriptions of new Freshwater Fishes from China and Japan.* By C. TATE REGAN, M.A.

Gymnostomus formosanus.

Depth of body $3\frac{1}{3}$ to 4 in the length, length of head 4 to $4\frac{1}{2}$. Snout shorter than postorbital part of head. Diameter of

eye $4\frac{1}{3}$ to 5 in the length of head, interorbital width $2\frac{4}{5}$ to 3. Width of mouth a little more than $\frac{2}{3}$ the width of head; sheath of lower jaw with rounded anterior edge; folds of lower lip separated anteriorly by an interspace which is about $\frac{1}{3}$ the width of mouth (rather more in the adult, less in the young); 4 barbels, the posterior longer than the anterior ones and nearly as long as the eye. Dorsal 11, with 8 branched rays; origin equidistant from end of snout and base of caudal or nearer the former; first branched ray the longest, as long as (adult) or a little longer than (young) the base of the fin. Anal 8, with 5 branched rays. Pectoral a little shorter than the head, not reaching the ventrals, which are inserted below the anterior part of the dorsal. 40 to 42 scales in a longitudinal series, $5\frac{1}{2}$ or 6 in a transverse series from origin of dorsal to lateral line, 3 or 4 between lateral line and base of ventral. Silvery, back darker; young with 6 or 7 blackish vertical bars; membrane of dorsal fin blackish; ventrals and anal usually more or less blackish.

Eight specimens, the largest 160 mm. in total length, from Lake Candidius, Formosa, collected by Herr Sauter.

Closely allied to the Chinese *G. styani*, Blgr., and *G. kreymborgii*, Regan, and intermediate between them in the structure of the mouth.

Ischikavia macrolepis.

Depth of body $3\frac{1}{3}$ in the length, length of head 4. Snout a little shorter than eye, the diameter of which is $3\frac{1}{4}$ to $3\frac{1}{2}$ in the length of head and less than the interorbital width. Mouth oblique. Dorsal 10, with 7 branched rays, its origin behind the ventrals and nearer to the base of caudal than to the end of snout. Anal 16-17, with 13 or 14 branched rays. Pectoral extending to the ventrals. 38 to 40 scales in a longitudinal series, 7 or 8 in a transverse series from origin of dorsal to lateral line, 3 between lateral line and base of ventral.

Three small specimens, the largest 60 mm. in total length, from Kagi, Formosa, collected by Herr Sauter.

This species is extremely similar to the Japanese *I. steenackeri*, Sauvage, which has much smaller scales.

Achilognathus smithii.

Depth of body $2\frac{1}{2}$ in the length, length of head 4. Diameter of eye 3 in the length of head and equal to the interorbital width. No barbels. Dorsal 13, with 10 branched rays. Anal 13. Pectoral extending to the ventrals. 33 scales in a

longitudinal series, 6 in a transverse series from origin of dorsal to lateral line, 4 between lateral line and base of ventral. Silvery, back darker; a dark blue lateral stripe commencing on the upper part of the side midway between the head and the origin of the dorsal fin and extending to the base of the caudal; a blackish stripe on the anterior part of the dorsal near the base.

A single small specimen, 38 mm. in total length, from the R. Nodogawa, Kioto, Japan, presented by R. Gordon Smith, Esq.

Allied to *A. cyanostigma*, Jord. & Fowl., which has a more slender body (depth 3 in the length), fewer fin-rays (dorsal and anal each with 8 branched rays), more scales (39) in the lateral line, and a shorter pectoral.

Clarias sauteri.

Depth of body $5\frac{1}{2}$ to $6\frac{1}{2}$ in the length, length of head $3\frac{1}{2}$ to 4. Breadth of head equal to its length without the snout. Head smooth or finely granulated above; occipital process obtuse (more acute in the young); eyes small. Præmaxillary band of teeth 4 times as long as broad; teeth on the palate obtuse, forming a crescentic band narrower than that of the præmaxillaries. Maxillary barbel extending to posterior part or end of pectoral. About 15 gill-rakers on the lower part of the anterior arch. Dorsal 57-64. Anal 40-45. Dorsal and anal fins free from the caudal, which is rounded. Pectoral spine entire or with fine serræ hidden beneath the skin, its length $\frac{2}{3}$ to $\frac{3}{4}$ that of the fin or $\frac{1}{3}$ to $\frac{2}{5}$ the length of head. Dark greyish, paler below; sometimes small pale spots on the sides.

Several specimens, 120 to 200 mm. in total length, from Kagi, Formosa, collected by Herr Sauter.

This species is close to the Chinese *C. fuscus*, Lacep., which differs notably in having villiform teeth on the palate.

Pseudobagrus brevianalis.

Depth of body 5 in the length, length of head 4 to $4\frac{1}{2}$. Head covered with smooth skin; snout broad, obtuse, $\frac{1}{3}$ the length of head; eye small, its diameter $\frac{1}{4}$ the interocular width, which is $2\frac{1}{4}$ to $2\frac{1}{3}$ in the length of head. Mouth sub-terminal; maxillary barbel extending to basal part of pectoral. D. I 7; adipose fin nearly equal to the anal and opposite to it. Anal 16-18; base shorter than the head. Caudal very slightly emarginate, with rounded lobes. Pectoral spine with

denticulated inner edge, $\frac{2}{3}$ to $\frac{5}{6}$ the length of the fin or $\frac{1}{2}$ to $\frac{2}{3}$ the length of head. Greyish.

Several specimens, measuring up to 115 mm. in total length, from Lake Candidius, Formosa, collected by Herr Sauter.

Allied to the Japanese *P. aurantiacus*, Schleg., which has a longer anal fin.

Liobagrus sugubii.

Depth of body $4\frac{2}{3}$ to 5 in the length, length of head $4\frac{1}{2}$ to $4\frac{3}{4}$. Head as broad as long; interocular width 2 to $2\frac{1}{2}$ in the length of head. Lower jaw shorter than the upper; præmaxillary band of teeth twice as long as broad; posterior mandibulary barbel extending to base of pectoral. Dorsal I 5; spine $\frac{1}{4}$ the length of head. Pectoral spine less than $\frac{1}{2}$ the length of the fin, which is $\frac{1}{2}$ to $\frac{2}{3}$ the length of head. Anal 15-16. Caudal rounded or subtruncate. Greyish brown; scattered pale spots on the side; lower fins pale; caudal with a narrow whitish edge.

Four specimens, 105 mm. in total length, from Lake Biwa, Japan, presented by H.E. Mr. Sugubi, Governor of Otsu.

Dr. Pappenheim has kindly informed me that the type of *L. reini*, Hilgendorf, is not preserved in the Berlin Museum. Hilgendorf's description is equally applicable to either Japanese species, but for the present the name *L. reini* may be restricted to the species described and figured under that name by Jordan and Fowler (Proc. U.S. Nat. Mus. xxvi. 1903, p. 909, fig. 2), which differs from the one described above in the more slender body, narrower interocular space, longer fin-spines, &c.

Liobagrus styani.

Depth of body 6 to 7 in the length, length of head 5. Head nearly as broad as long; interocular width $2\frac{3}{4}$ to 3 in the length of head. Lower jaw shorter than the upper; præmaxillary band of teeth $2\frac{1}{3}$ to 3 as long as broad; posterior mandibulary barbel extending to basal part of pectoral. Dorsal I 5; spine $\frac{1}{4}$ the length of head. Pectoral spine less than $\frac{1}{2}$ the length of the fin, which is $\frac{2}{3}$ to $\frac{3}{4}$ the length of head. Anal 18. Caudal rounded. Greyish; small pale spots on the sides; fins broadly edged with white.

Two specimens, 70 and 85 mm. in total length, from South Hupch, China, presented by F. W. Styan, Esq., in 1902.

Ctenogobius candidianus.

Depth of body 5 in the length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$. Snout decurved, nearly twice as long as the eye, the diameter of which is 5 in the length of head; jaws equal anteriorly; mouth little oblique. Opercles naked; nape covered with small scales. Dorsal VI, I 8. Anal I 8. None of the rays of the spinous dorsal produced; soft dorsal and anal rather low. Caudal rounded. Pectoral a little shorter than the head; ventrals extending less than $\frac{1}{2}$ the distance from their base to the origin of anal. 34 to 36 scales in a longitudinal series.

Ten specimens, the largest 80 mm. in total length, from Lake Candidius, Formosa, collected by Herr Sauter.

Very similar to the Japanese *C. hadropterus*, Jord. & Snyder, but with the scales on the nape and the anterior part of the body smaller. Some specimens show traces of markings on the head like those of *C. hadropterus*.

XXV.—*Descriptions of Four new Freshwater Fishes from British New Guinea.* By C. TATE REGAN, M.A.

THE freshwater fishes of New Guinea have recently been made the subject of an extensive memoir by Prof. Max Weber (Expéd. Sci. Néerland. Nouvelle-Guinée, v. Zool. 1907). A small series from British New Guinea brought home by Dr. Seligmann is of some interest, inasmuch as it contains examples of four species which appear to be new to science and of three others not included in Max Weber's list; the latter are *Sicydium cynocephalum*, C. & V., and *Eleotris tenuiptera*, Blkr., from the Wedau River, and *Eleotris compressa*, Kreffl., from Agajambo. The fishes are from four localities, those from the Wedau River and the Fly River having been presented to the British Museum by Major W. Cooke Daniels, those from Agajambo by C. A. W. Monckton, Esq., and those from Sogeri by Captain F. R. Barton.

Neosilurus bartoni.

Depth of body $6\frac{1}{2}$ in the length, length of head $5\frac{2}{3}$. Head much broader than deep, its breadth $1\frac{1}{3}$ in its length, diameter of eye $4\frac{2}{3}$, length of snout $2\frac{3}{4}$ -3, interorbital width $2\frac{1}{5}$ - $3\frac{1}{5}$. Lower jaw shorter than the upper. Nasal and inner mandibulatory barbels subequal, a little shorter than the head;

maxillary and outer mandibular barbels as long as the head. 12 or 13 gill-rakers on the lower part of anterior arch. Dorsal 15, the spine nearly $\frac{3}{5}$ the length of head, with a few weak denticulations anteriorly, nearly smooth or very finely denticulated posteriorly; procurent part of caudal commencing above the middle of anal, anteriorly very low and without distinct rays. Anal 85-90. Pectoral not extending to the base of ventrals, its spine similar to but a little longer than that of the dorsal; ventrals extending a little beyond the origin of anal. Uniformly greyish.

Two specimens from Sogeri, total length 122 mm., presented to the British Museum by Captain F. R. Barton.

The recently described *N. novæ-guineæ* from the northern part of the island is said to have the head as deep as broad, the diameter of eye $2\frac{1}{4}$ to $2\frac{1}{2}$ in the interorbital width ($1\frac{2}{3}$ in *N. bartoni*), the dorsal spine $\frac{1}{2}$ the depth of body ($\frac{3}{5}$ in *N. bartoni*) and longer than that of the pectoral.

The genus *Neosilurus*, Stdr., established in 1867 for *N. hyrtlii*, Stdr., includes also *Copidoglanis brevidorsalis*, Gthr., and *C. novæ-guineæ*, M. Weber. *Copidoglanis* differs in having the procurent part of the caudal fin well developed and similar to the anal.

None of the Siluridæ have more than one rayed dorsal fin, if we except those forms in which rays are developed in the adipose fin. The Plotosinæ have been described as having a long second dorsal fin, but this is really an extension forward of the caudal fin, as is proved by the structure, basalia (internurals) being absent. In quite a different group, the Chacinæ, the caudal extends forward some distance both above and below, so that the genus *Chaca* has been said to have two dorsal and two anal fins. *Clarias* has been wrongly associated with the Plotosinæ, for the long dorsal fin of this genus is supported by basalia and is the homologue of the short dorsal of the allied *Saccobranchus*.

Arius (Hemiaris) danielsi.

Depth of body $4\frac{1}{2}$ in the length, length of head $3\frac{3}{5}$. Breadth of head $1\frac{1}{4}$ in its length, length of snout 3, diameter of eye $7\frac{1}{2}$, interorbital width 2. Upper surface of head granulated; occipital process with median keel, $1\frac{1}{2}$ as long as broad, extending to the small basal bone of the dorsal spine. Lower jaw shorter than the upper; teeth on the vomer forming 2 small round separate patches, contiguous to the palatine bands, which are rather more than twice as long as

broad. Maxillary barbel extending to the extremity of the pectoral; outer mandibular barbels nearly as long. Dorsal I 7; the spine strong, $\frac{2}{3}$ the length of head, with an anterior and a posterior series of denticulations, which become small and indistinct inferiorly. Pectoral spine strong, as long as that of the dorsal, with a feeble outer and a strong inner series of denticulations. Anal 23 (VI 17). Ventrals extending a little beyond the origin of anal. Caudal forked, the longest ray 3 times as long as the middle ones. Caudal peduncle $1\frac{2}{3}$ as long as deep. Purplish above, silvery below; fins yellowish.

One specimen, 162 mm. in total length, from the Fly River, presented to the British Museum by Major W. Cooke Daniels.

This species resembles the Sumatran *A. stormi*, Blkr., in general appearance and in the dentition, but is distinguished by the longer barbels, much longer anal, less elevated dorsal, &c.

Rhombattractus weberi.

Depth of body $2\frac{2}{3}$ -3 in the length, length of head $3\frac{2}{3}$ -4. Snout as long or nearly as long as the eye, the diameter of which is $2\frac{2}{4}$ - $3\frac{1}{3}$ in the length of head, interorbital width about $2\frac{1}{3}$. Lower jaw shorter than the upper; maxillary completely hidden by the præorbital, extending to or nearly to the vertical from the anterior margin of eye. Scales 34-37/11. Dorsal V (VI), I 12-14; origin of spinous dorsal above first branched ray of anal, a little nearer to tip of snout than to base of caudal; first spine stout, as long as the postorbital part of head, the others slender and longer; second dorsal separated from the first by 2 scales, preceded by a stout spine which is nearly as long as the eye; soft rays gradually increasing in length posteriorly. Anal I 22. Pectoral $\frac{2}{3}$ - $\frac{3}{4}$ the length of head; ventrals $\frac{1}{2}$ - $\frac{2}{3}$ the length of head, extending a little beyond the origin of anal. Caudal emarginate. Caudal peduncle as long as or a little longer than deep. Olivaceous above, silvery below; a blackish band from the snout, through the upper part of the eye, to the base of the caudal, becoming gradually broader posteriorly, covering $2\frac{1}{2}$ series of scales on the caudal peduncle; a blackish blotch on the lower part of the side above the anal fin; vertical fins dusky at the base.

Six specimens, 65-110 mm. in total length, from Sogeri, presented to the British Museum by Captain F. R. Barton.

I have named this species after Prof. Max Weber, in recognition of his work on the fishes of New Guinea.

Perhaps the most nearly allied species is *R. goldii*, Macleay, from the same locality, which has been stated by both Macleay* and Perugia† to have six spines in the first dorsal fin, a number found in only one of the specimens described above; moreover, in *R. goldii* the black lateral band is said to run above and below the eye.

The skeleton is extremely similar to that of more typical Atherinidæ, and the skull, pectoral arch, and vertebral column present few features of special interest. The vertebrae number 35, 20 præcaudals and 15 caudals. The pelvic bones are suspended from the third and fourth pair of ribs; the last eleven pairs of ribs meet ventrally and support the basalia (interhæmals) of the anal fin, as in the Ophiocephalidæ.

Eleotris (Caulichthys) moncktoni.

Depth of body $3\frac{2}{3}$ in the length, length of head $4\frac{1}{4}$. Breadth of head 2 in its length. Snout a little shorter than eye, the diameter of which is $\frac{1}{2}$ in the length of head and a little less than the interorbital width. Mouth small, oblique, the lower jaw slightly projecting, the maxillary not extending to below the eye. Head covered with scales, which become much smaller anteriorly. Scales 29/12. Dorsal VI, I 8; origin of spinous dorsal equidistant from extremity of snout and base of last soft ray; second spine the longest, a little longer than the third and $\frac{2}{3}$ the length of head; soft fin highest anteriorly, the first branched ray a little more than $\frac{2}{3}$ the length of head, the last $\frac{1}{2}$ length of head. Anal I 10. Pectoral nearly $\frac{4}{5}$ the length of head; ventrals as long, not extending to the anal. Caudal truncate. Least depth of caudal peduncle twice in its length. Each scale of the body yellowish, with a broad dark brown margin; dark edges of the scales forming a narrow blackish bar on the base of pectoral; vertical fins blackish, the caudal with small light spots.

A single specimen, 73 mm. in total length, from Agajambo, presented to the British Museum by C. A. W. Monckton, Esq.

Closely allied to *E. guentheri*, Blkr., which has a longer snout and larger eye.

* Proc. Linn. Soc. N. S. Wales, viii. 1883, p. 269.

† Ann. Mus. Genov. (2) xiv. 1894, p. 548.

XXVI.—Some new Genera and Species of Blattidæ, with Notes on the Form of the Pronotum in the Subfamily Perisphæriinæ. By R. SHELFORD, M.A., F.L.S.

[Plates IX. & X.]

Subfam. *ECTOBIINÆ*.

Genus ANAPLECTA, Burm.

Anaplecta erythronota, sp. n. (Pl. IX. fig. 9.)

♀. Head and disk of pronotum rufous. Lateral margins of pronotum hyaline. Tegmina castaneous, with the marginal area hyaline; 10 costals, 3 longitudinal discoidal sectors. Wings infuscated, marginal area not dilated, radial vein with a humeral and discoidal branch; 6 to 7 costals, median vein obsolete at base; medio-discal field twice as broad as medio-ulnar and crossed by 7 transverse venulæ; medio-ulnar field distally crossed by 2 to 3 transverse venulæ, first axillary triramose; apical area parabolic, two fifths of total wing-length, base slightly obtusely angled, crossed below the middle by an oblique vein. Abdomen beneath, cerci, and legs testaceous; abdomen above castaneous, supra-anal lamina transverse, narrow.

Total length 8 mm.; length of tegmina 5.4 mm.

Maskeliya, Ceylon (*E. E. Green*). Type in the British Museum.

Close to *A. maculata*, mihi, but differs in the wing-venation as well as in the colour of the pronotum.

Subfam. *PHYLLODROMIINÆ*.

Genus ISCHNOPTERA, Burm.

Ischnoptera longstaffi, sp. n. (Pl. IX. fig. 8.)

♂. Testaceous. Head with a castaneous macula on the frons. Pronotum with two castaneous spots on the disk. Tegmina with radial vein bifurcated; 14 to 15 costals, 9 longitudinal discoidal sectors, the anterior ulnar vein being triramose. Wings hyaline, mediastinal vein triramose, radial vein bifurcated; 7 costals, the last two multiramose; ulnar vein with 3 complete branches and 3 or 4 incomplete branches going to the dividing vein, the more proximal minute. Sixth abdominal tergite with posterior border notched, a circular depression at base of seventh tergite marking the opening of

the scent-glands. Supra-anal lamina triangular; subgenital lamina irregularly produced, notched on the left side, with two slender styles. Front femora armed on anterior margin beneath with a complete row of spines, the distal shorter than the proximal; all the femora with genicular and apical spines.

♀. Similar, but supra-anal lamina more produced, subgenital lamina ample, semiorbicular.

♂ ♀. Total length 18-19 mm.; length of body 15 mm.; length of tegmina 15 mm.; pronotum 3.5 × 4.9 mm.

3 ♂♂, 2 ♀♀, Zambesi rain-forest (*Dr. G. B. Longstaff and Prof. T. Hudson Beare*).

Types in Oxford Museum.

The species is allied to *I. bimaculata*, Gerst., from E. Africa, but differs in the secondary sexual characters of the male.

Subfam. *BLATTINÆ*.

Genus *PROTAGONISTA*, nov.

Antennæ slightly incrassated. Position of antennal sockets variable. Pronotum as long as broad, quadrangular, with rounded angles, sides not deflexed. A fine erect pubescence covers both pronotum and tegmina. Tegmina and wings fully developed in the male. Tibial spines in two rows. Posterior metatarsus longer than the remaining joints, all the pulvilli apical. Arolia minute.

The genus is remarkable on account of the shape of the pronotum and the pubescence on pronotum and tegmina. In one of the species the eyes are closer together than the antennal sockets, in the other they are further apart; I doubt if this character is of much importance, and it hardly seems advisable to separate the New-World genera of Blattinæ from the Old-World genera on the strength of this character alone.

Protagonista lugubris, sp. n. (Pl. IX. fig. 1.)

♂. Piceous. Head finely punctate; labrum, clypeus, and palpi testaceous; ocelli * prominent, testaceous; eyes further apart than antennal sockets. Antennæ fuscous, slightly incrassated, pubescent, but not plumose, apical joints testaceous. Pronotum not covering vertex of head, coarsely reticulate-punctate, with some smooth interspaces and lines; a deep, wide, semilunar impression extending across the

* They appear to be true ocelli as in the subfam. Corydiinæ, and not fenestræ as in the other subfamilies.

anterior third and down the sides to near the posterior angles; a short transverse impression just behind the anterior margin. Tegmina exceeding the apex of the abdomen, semicorneous and seriatly punctate at base, marginal field deflexed at base and fimbriate, anal vein obsolescent. Abdomen with disk rufo-castaneous; supra-anal lamina subquadrate, posteriorly emarginate; subgenital lamina subquadrate, with a pair of long styles. Cerci moderate, rufous. Legs rufo-castaneous, the tibiæ with a fine recumbent pubescence. Front femora with a complete row of spines on front margin beneath, none on posterior margin; mid and hind femora somewhat rounded beneath and with only one spine on each margin. Tibial spines sparse, arranged in two rows. Posterior metatarsus very long, succeeding joints rather short.

Total length 25 mm.; length of body 23.5 mm.; length of tegmina 19 mm.; pronotum 5.9 × 6 mm.

Manson Mts., Tonkin (type in Oxford Museum); Yen-Bai, Central Tonkin (co-type in Paris Museum).

Protagonista borneensis, sp. n. (Pl. IX. fig. 2.)

♂. Head piceous, opaque, with a few scattered punctures, mouth-parts piceous; eyes closer together than antennal sockets. Antennæ with moniliform joints, shorter than the body, piceous, with a testaceous band near the apex. Pronotum opaque piceous, with scattered erect pubescence; a shallow transverse impression in anterior third and two oblique impressions in posterior third. Tegmina rufo-castaneous, exceeding the apex of the abdomen, narrow; marginal field narrow, deflexed; anal vein well-marked, reaching nearly halfway down the sutural margin. Abdomen piceous, with the basal segments rufescent above, testaceous below. Supra-anal lamina quadrately produced, posterior angles spiniform, posterior margin concave, exceeded by the subgenital lamina, which is semiorbicular, and provided with a pair of slender styles. Cerci long, acuminate, castaneous. Front legs castaneous, mid and hind legs with the coxæ (except at the base) and the femora (except at the apex) testaceous, otherwise castaneous. Front femora with a complete row of spines on anterior margin beneath, two or three on posterior margin; mid and hind femora with 5 to 7 spines on each margin. Tarsal arolia larger than in the preceding species.

Total length 25 mm.; length of body 20 mm.; length of tegmina 20 mm.; pronotum 4.8 × 4.1 mm.

Sarawak, Borneo (*Shelford*). Type in Oxford Museum.

Genus ARCHIBLATTa, Voll.

? *Archiblatta parva*, sp. n.

♀. Rufo-testaceous, all the segments margined and speckled with castaneous. Head castaneous, the vertex paler, finely punctate, nitid; antennæ and mouth-parts rufo-castaneous, antennæ slender, setaceous [mutilated]. Eyes further apart than antennal sockets. Upper surface of body scabrous, nitid. Pronotum trapezoidal, anteriorly truncate, posterior margin slightly obtusely angled; posterior angles of all the thoracic tergites slightly produced. Posterior angles of abdominal tergites not produced; supra-anal lamina subquadrate, posteriorly emarginate, angles rounded, dark castaneous in colour, margined with testaceous. Body beneath and legs uniform castaneous, abdominal sternites laterally scabrous; antepenultimate sternite with a large deep puncture on each side, bordering the subgenital valves. Cerci shorter than the supra-anal lamina. Front femora with a complete row of spines on anterior margin beneath, one on the posterior margin; mid femora with 4-5 spines on anterior, 2-3 on posterior margin; hind femora with 4 spines on anterior, 1 on posterior margin; all these spines very small. Tibial spines in three rows, but the middle row very incomplete. Posterior metatarsus equal to remaining joints; pulvilli large, occupying nearly the entire length of every joint.

Total length 23 mm.; pronotum 6 × 8.5 mm.

Towranna plains, W. Australia (*E. Clement*). Type in Oxford Museum.

I place this very curious insect provisionally in *Archiblatta*, but in many of its characters it does not conform to that genus, and eventually it may be necessary to erect a new genus for its reception.

Subfam. *CORYDIINÆ*.Genus *CARDAX*, nov.

♂. Minute, slender, with fine recumbent pubescence. Antennæ nearly as long as body, finely pubescent. Ocelli present. Head with vertex covered by the pronotum; eyes wide apart; frons slightly inflated. Lacinia of maxillæ slender. Pronotum trapezoidal, bent downwards, forming an angle with rest of body, a broad transverse impression at its base. Scutellum exposed. Tegmina extending considerably beyond apex of abdomen, delicate, membranous, hyaline, finely fimbriate, and with minute recumbent pubescence;

radial vein bifurcate from near base, costal veins absent, anterior ulnar simple, posterior ulnar simple or bifurcate, anal field much reduced, anal vein straight, oblique, one axillary vein. Wings similar in size, texture, and pubescence to the tegmina; posterior part of the wing reduced to a small lobe, not pubescent, with one obsolescent axillary vein; radial vein simple, no costal veins; median vein bifurcate from near base, its anterior branch bifurcating near apex; ulnar vein bifurcate. Vena spuria present in both tegmina and wings. Supra-anal lamina subquadrate, posterior border arcuately emarginate. Subgenital lamina rounded, slightly irregular, without styles. Cerci elongate, nine-jointed, apical joint acuminate. Legs slender, long; tibiæ sparsely spined, the spines on the posterior pair biserially arranged; femora with genicular spines; tarsal claws minute, without arolia; no pulvilli; posterior metatarsus longer than the remaining joints.

Cardax willeyi, sp. n. (Pl. IX. figs. 3-7.)

♂. Fusco-hyaline; tegmina with a slight iridescent sheen; legs testaceous. Front tibiæ with four apical spines, otherwise unarmed; mid tibiæ with two spines near the base and three apical spines; hind tibiæ with four spines along the outer border and three apical spines.

Total length 5.9 mm.; length of body 3.8 mm.; length of tegmina 5 mm.; greatest breadth of tegmina 2 mm.

Peradeniya, Ceylon (*A. Willey*); several specimens. Type in the British Museum; co-type in the Oxford Museum.

This is certainly one of the most remarkable cockroaches known. In general appearance it is far more like a small Neuropterous insect than like an Orthopteron, an effect brought about by the similar texture and pubescence of the tegmina and wings; this is a feature shown, to a limited extent, by the genus *Homopteroidea*, mihi, but by no other genera in the family. In the subfamily Corydiinæ the posterior part of the wing does not fold up in a fan-like manner, but merely doubles under the anterior part, which leads in some instances to a reduction in size of the posterior part, so that it becomes equal in size or even smaller than the anterior part. In *Cardax* the reduction has proceeded so far that the posterior part of the wing is represented merely by a small functionless lobe; and it is interesting to note that, correlated with this reduction, is a parallel reduction of the anal field of the tegmina. The anterior part of the wings is relatively much larger than is usual in Blattidæ. The venation of the

alar organs is much simplified and approximates to a radiate type, there being but little branching of the veins. The minute tarsal claws constitute another highly remarkable character. It is difficult to discover the affinities of a genus so aberrant as this; the biseriate arrangement of the tibial spines shows that it must be placed in the section of the subfamily which embraces *Latindia*, Stål, *Paralatindia*, Sauss., *Homopteroidea*, Shelf., &c.; but it cannot be regarded as closely related to any known genus.

Subfam. *PERISPHERIINÆ*.

The Form of the Pronotum in the Perisphæriinæ.

De Saussure and Zehntner, in their revision of the Perisphæriinæ (Rev. Suisse Zool. vol. iii. 1895), have traced the evolution of the complex type of pronotum of such genera as *Pilema* and *Cyrtotria* [= *Stenopilema*, Sauss.] from a simple type. A summary of their conclusions may be presented here, and I have added some diagrammatic figures as a help to its elucidation. In a typical Blattid pronotum two areas may be distinguished, the disk and the lateral wings, which project on either side beyond the outer limits of the prosternum; the disk covers the head and on the *underside* is more or less defined by a pair of carinæ, known as the typical carinæ. In transverse section this form of pronotum may be represented as in Pl. IX. fig. 10, A, where *a* represents the disk, *bb* the lateral wings, and *cc* the typical carinæ. In the genus *Pronaonota* (Pl. IX. fig. 10, B) the lateral wings are strongly bent downwards and an incomplete carina (*d*) on the deflected sides of the dorsal surface of the pronotum foreshadows the separation of the lateral wings from the disk. The separation is more or less complete in the genera *Pilema* and *Cyrtotria* (Pl. IX. fig. 10, C); the lateral wings in these genera now appear in side view as lateral bands bent down at a right angle, or at more than a right angle, to the disk of the pronotum, and their upper (morphologically inner) border is elevated, so that in dorsal view it appears as if the lateral borders of the pronotum had been simply reflected from below upwards. Such, however, is not really the case; the carina on the pronotum of *Pronaonota* is the morphological equivalent of the upper edge of the lateral band of *Pilema*, and the lateral margin of the pronotum of *Pronaonota* is the equivalent of the lower edge of the lateral band of *Pilema*. This lateral band is morphologically the lateral wing of the pronotum, which has become divided off from the disk,

rotated outwards through some degrees, and, owing to a greater or less elevation of its upper border, is now separated dorsally from the disk of the pronotum by a channel or groove of varying depth. Frequently, though by no means always, the development of the lateral bands is accompanied by a slight upward reflection of the anterior margin of the pronotum. The upper edge of this reflected border is continuous with the upper edge of the lateral bands; the lower edge, when seen from the ventral aspect, is occasionally continuous with the lower edge of the lateral bands, as in *Cyrtotria jallæ*, Gig.-Tos (Pl. X. fig. 19), in which case the lateral bands are connected anteriorly with each other, but more frequently the lower edge of the anterior reflection is not evident and the lateral bands are not connected with each other anteriorly (Pl. X. fig. 13).

In the species of the genus *Bantua* (Pl. IX. fig. 10, D), the rotation of the lateral bands has been carried still further, *i. e.* outwards, downwards, and then inwards, so that now the lateral bands form a very acute angle with the disk of the pronotum and lie underneath it; the gutter or channel is obliterated, just as a fold in a piece of cloth vanishes when the part of the cloth involving the fold is tightly wrapped round some solid object. The outer border of the pronotal disk is now the outer margin of the pronotum. A new species of *Pilema* and a new species of *Bantua* described below illustrate in a most striking and interesting manner the rotation of the lateral bands of the pronotum, with concomitant obliteration of the gutter separating the bands from the disk. Finally, in the genus *Derocalymma* (Pl. IX. fig. 10, E) the lateral bands are bent still further under the disk and lie in almost a parallel plane with it; at the same time the pronotum is broader, it has reverted to the primitive flattened shape, but its outer lateral margins are now not the morphological equivalents of the outer lateral margins of the primitive type, but the equivalents of the inner boundaries of the lateral wings of that.

The whole series of specimens illustrates admirably the evolution of a complex type of pronotum from a simple type, the former superficially resembling the latter. It is by no means often that the entomologist is supplied with such a series of gradations, and it is generally far easier to hazard a suggestion as to the value to the species of certain structures, than to elucidate their mode of origin. Here it is otherwise; we can see pretty clearly the steps whereby the pronotum of *Derocalymma* evolved from a more primitive type, but the value to the species of these variations in structure is by no

means evident at first sight. A knowledge of the habits of an animal should invariably precede all suggestions as to the value of any details of its structure, and I feel convinced that much of the mystery surrounding variations in structure which are spoken of as being merely of importance to the systematic naturalist will be dispelled as our knowledge of the life-histories of the animals exhibiting them increases. A clue to the use of the variations in pronotal structure of the cockroaches under notice is afforded by the observations, slight and incomplete though they are, on their habits. The vast majority of Blattidæ are insects of cryptic habits, spending most of their life hidden under stones or logs, in decaying vegetation, burrowing in rotten wood, and so forth, and the majority of species are flattened depressed insects. The species of *Pilema*, on the other hand, are convex and more or less cylindrical insects with a large heavy pronotum, the anterior border of which is often slightly reflexed and bounded laterally by the upwardly projecting lateral wings.

Mr. Distant, in his 'Insecta Transvaaliensia,' has recently published an interesting field-observation on the habits of a species identified as *Pilema thoracica*, Walk. A female accompanied by several larvæ was taken from the bottom of a neat round hole in the ground about 6 inches in depth; there were half a dozen such holes in about half an acre, and all contained families of this species. I have no doubt but that all the species of this genus have adopted this mode of life, and that the pronotum is the part of the body that is used in excavating the burrows, for on examining some specimens of *P. reflexa*, Walk., and *P. hebetata*, Sss. & Z., in the British Museum, I found that in these the channel between the pronotal disk and lateral bands was simply choked with earth. It is not unreasonable to assume that the heavy shovel-like pronotum of *Pilema* has been evolved in response to a change of habitat. Turning now to the other end of the series of cockroaches considered, we find that the species of *Derocalymma* are the most flattened members of the whole family, and in correspondence with this depressed form it is no surprise to learn that they live under heavy stones. The advantage of the flattened form, enabling the insects to slip through narrow crevices and to lie in security in a circumscribed shelter beneath a stone too heavy for any but a relatively powerful enemy to move, is obvious; and, again, it is not unreasonable to assume that the highly modified pronotum of *Derocalymma* is a result of a change of habitat. There is no information forthcoming as to the habits of *Bantua* and *Cyrtotria*; some species of the

latter genus have the pronotum well adapted for digging, but others have not, and it would be of the greatest interest to learn if the habits of the species vary in correlation with the form of the pronotum.

Bantua is intermediate in structure between *Cyrtotria* and *Derocalymma*; some specimens collected by Dr. Longstaff in S. Africa were taken from beneath a log, which means, I expect, that they were lurking in the rubbish immediately surrounding the log, as they are not adapted, like *Derocalymma*, for life beneath a heavy body, judging by their facies.

Finally, the question arises, has *Derocalymma* originated from a form like *Pilema*, passing in the course of its evolution through a *Bantua*-like stage? One is tempted to answer in the affirmative, for adaptation to life beneath stones could have been brought about by mere flattening of a generalized type of cockroach with a simple form of pronotum, as has indeed occurred in the Australian genus *Oniscosoma*, superficially similar to *Derocalymma*, but structurally widely different. The highly modified pronotum of *Derocalymma* has resulted from the flattening not of a simple form of pronotum, but of a complex form with lateral bands; the lateral bands in *Pilema* are the most essential parts of the excavating organ, the pronotum; but they can serve no useful purpose in species that do not burrow into the ground, and the manner of their modification in response to a different habit of life is shown in the genus *Bantua*, and especially in the new species of that genus described below, the final step in the process being exhibited by *Derocalymma*.

Genus BANTUA, nov.

Cyrtotria, Saussure and Zehntner (nec Stål), Rev. Suisse Zool. iii. p. 28 (1895).

Differs from *Pilema*, Sauss., and *Cyrtotria*, Stål, in the form of the pronotum, the lateral bands being bent under the disk and forming an acute angle with it; the margin of the pronotal disk forms the outer margin of the pronotum. In the female the posterior angles of the pronotum are more or less produced backwards. Differs from the genus *Derocalymma*, Burm., by the less complete bending under of the lateral bands of the pronotum, by the membranous tegmina of the male, and the backwardly produced posterior angles of the pronotum in the female.

Type of genus. *Perispheria dispar*, Burm.

Bantua ferox, sp. n. (Pl. X. fig. 25.)

♀. Piceous, nitid. Head cribrate-punctate; distance apart of eyes less than length of first antennal joint; antennæ castaneous; ocelli, labrum, and maxillary palpi rufo-testaceous. Pronotum rugose, lateral bands anteriorly deflected inwards, posteriorly strongly produced backwards, and bent downwards at a right angle to the disk of the pronotum; a broad channel dorsally separates the posterior part of the band from the disk; the disk of the pronotum anteriorly is tuberculate, posteriorly with a few deep punctures, posterior margin dentate. Mesonotum rugose, cribrate-punctate; posterior angles tumid, produced, anterior angles depressed and fitting beneath the posterior angles of the pronotum. Metanotum less deeply punctate; posterior angles tumid, produced. Abdomen rather wider than thorax, finely punctate above and beneath, a narrow anterior zone on each tergite and sternite impunctate; supra-anal lamina trapezoidal, posterior margin slightly reflected. Cerci testaceous.

Total length 27.8 mm.; pronotum 8 × 10 mm.

Nyika Mts., 6000–7000 feet, Nyasaland (*A. Whyte*, July 1896).

Type in the British Museum.

The pronotal structure of this species is of great interest, for whilst anteriorly the lateral bands lie under the disk, forming a very acute angle with it, as is characteristic of a typical *Bantua*, posteriorly they are vertical and form more or less of a right angle with the disk, as is characteristic of a typical *Pilema*. Correlated with this torsion of the lateral bands is the entire absence of the pronotal gutter or channel anteriorly, whilst posteriorly it is deep and plainly visible. The structure illustrates quite clearly that the bending under the disk of the lateral bands brings about the obliteration of the gutter; speaking rather metaphorically, the material of which the pronotum is composed is stretched taut by the rotation inwards of the lateral bands, so that the fold in the material disappears; where the rotation is of less extent there is enough material to form a fold or channel. A diagrammatic section through the front part of the pronotum of *B. ferox* will resemble Pl. IX. fig. 10, D, but a similar section through the hinder part will resemble Pl. IX. fig. 10, C.

Genus *PILEMA*, Sauss.*Pilema mombasæ*, sp. n. (Pl. X. figs. 22, 23.)

♀. Piceous, nitid. Head with face rugose and slightly

punctate; eyes very close together; antennæ and labrum castaneous, maxillary palpi rufo-testaceous; ocelli not visible. Pronotum above with disk rugose, punctate and anteriorly tuberculate; anteriorly obtusely carinate, anterior margin reflected slightly, lateral bands anteriorly deflected downwards, but not so much as in *Bantua ferox*; the channel between the disk and the lateral bands wide and shallow; posteriorly the lateral bands are produced as in *Pilema dentata*, Sauss. & Zehnt.; posterior margin dentate. Mesonotum and metanotum cribrate-punctate, with smooth interspaces and a median carina, posterior angles slightly produced. Abdomen not wider than thorax, obsoletely punctate above and beneath; an anterior zone on each tergite and sternite impunctate; supra-anal lamina trapezoidal. Cerci and legs castaneous.

Total length 28 mm.; pronotum 8.5 × 8.9 mm.

Mombasa (1 ♀).

Type in the British Museum.

The species is in its pronotal structure intermediate between *Bantua ferox* and typical *Pilema*.

Genus CYRTOTRIA, Stål.

Stenopilema, Sauss. Ann. Mus. Civ. Genova, xxxv. p. 87 (1895); Sauss. & Zehnt. Rev. Suisse Zool. iii. p. 25 (1895).

Thysanoblatta, Kirby, Ann. & Mag. Nat. Hist. (7) xii. p. 380 (1903).

The type of the genus is *C. gibbicollis*, Stål, and this species is undoubtedly congeneric with the species included in *Stenopilema* by de Saussure and Zehntner. *Thysanoblatta* was founded on a species characterized by an erect pubescence, but otherwise differing in small details only from typical species of *Stenopilema*; and I have no hesitation in sinking it as a synonym of *Cyrtotria*. There has been an excessive multiplication of genera in this subfamily of Blattidæ, and much confusion has resulted therefrom.

The species of *Cyrtotria* are very difficult to identify from descriptions, for it is not easy to express in writing the subtle differences in the form of the pronotum presented by the different species. I have examined nearly all the types, and have drawn up a synoptical key to the species, which, together with the figures, will I hope render the determination of the species easier than heretofore.

Two species of the genus, *C. latipennis*, Kirby, and *C. pallicornis*, Kirby, present a remarkable modification of the pronotum, which appears to have been overlooked by the describer. The disk of the pronotum on each side is perforated.

rated by three (*latipennis*) or two (*pallicornis*) pores of relatively large size and semilunar in shape; the tongue of chitin projecting into the crescentic pores is tuberculate in *pallicornis*, but simple in *latipennis*. It is difficult even to guess at the function of these pores. Since they occur in both sexes, it is evident that they are not secondary sexual structures; but it is just possible that they are connected with prothoracic repugnatorial glands, though such have not yet been shown to occur in the Blattidæ. The pronotal integument appears to be double in the region of these pores, and the pores appear to lead into a cavity existing between the upper and lower layers, and not to perforate the entire integument, for a bristle passed through one of them does not emerge on the ventral side of the pronotum. Without dissection it is not possible to be certain as to the relation of the parts, and the pores may be merely the entrances to invaginated cavities in the thickness of the pronotal chitin.

Key to the Species.

Males.

1. Pronotum and abdomen with erect pubescence. [E. Africa.]
 2. Pronotum with large lateral pores *latipennis*, Kirby. (Brit.)
 - 2'. Pronotum without large lateral pores. *macra*, Stål. (S. Africa.)
- 1'. Pronotum and abdomen not pubescent. [boon.]
 2. Posterior margin of pronotum dentate *scabricollis*, Gerst. (Ga-)
 - 2'. Posterior margin of pronotum not dentate.
 3. Tegmina scarcely exceeding the apex of the abdomen *gibbicollis*, Stål. (Natal.)
 - 3'. Tegmina considerably exceeding the apex of the abdomen.
 4. Small species (total length about 38 mm.) *poduriformis*, Walk. (S. Africa.)
 - 4'. Larger species.
 5. Tegmina pale testaceous, castaneous at base *capucina*, Gerst. (E. Africa, Somaliland.)
 - 5'. Tegmina uniform castaneous *marshalli*, sp. n. (Rhodesia.)

Females.

1. Body slender, elongate: species of small size. [Africa.]
 2. Pronotum much longer than broad *poduriformis*, Walk. (S.)
 - 2'. Pronotum scarcely longer than broad or as broad as long.
 3. Abdominal segments scabrous *graniger*, Sauss. & Zehnt. [(Somaliland.)
 - 3'. Abdominal segments smooth *nyasa*, sp. n. (Nyasa-land.)
- 1'. Body less slender, abdomen sometimes amplified: species of larger size.
 2. Pronotum distinctly broader than long.

3. Lateral bands of pronotum narrow,
no pores in pronotal channel *gibbicollis*, Stål.
3'. Lateral bands of pronotum broader,
two large pores in pronotal channel. *pallicornis*, Kirby. (Trans-
[vaal.]
2'. Pronotum as long as broad or longer
than broad.
3. Lateral bands of pronotum very [Zambesi, Port. E. Africa.]
broad, anterior margin reflected .. *jalle*, Gig.-Tos. (Upper
3'. Lateral bands narrower.
4. Lateral bands closely adpressed to
disk of pronotum *capucina*, Gerst.
4'. Lateral bands not closely adpressed
to disk of pronotum.
5. Lower border of lateral bands [desia.)
not dentate *marshalli*, sp. n. (Rho-
5'. Lower border of lateral bands [Africa.)
dentate *scabricollis*, Gerst. (West

Species of doubtful position.

Perisphæria fusca, Burm., and *P. gracilis*, Burm.

1. *Cyrtotria latipennis*, Kirby. (Pl. X. fig. 21.)

Thysanoblatta latipennis, Kirby, Ann. & Mag. Nat. Hist. (7) xii. p. 380 (1903).

The following may be added to the original description:—

♂. Eyes touching on vertex of head. Palpi, margin of labrum, ocelli, and base of antennæ testaceous. Head castaneous, punctate. Pronotum coarsely reticulate-punctate, with some smooth interspaces; lateral bands rather narrow, not closely adpressed to disk, channel wide and shallow; three large crescentic pores on each side of the disk; posterior margin slightly dentate, anterior margin slightly reflected; disk anteriorly carinate.

Length of body 20·8 mm.; length of tegmina 21 mm.; pronotum 6·1 × 6 mm.

British E. Africa.

Type in the British Museum.

2. *Cyrtotria macra*, Stål. (Pl. X. fig. 11.)

Ischnoptera macra, Stål, Öfv. Vet.-Akad. Förh. xiii. p. 165 (1856).

Derocalymma (Cyrtotria) macra, Stål, l. c. xxviii. p. 380 (1871).

Description of type.—♂. Head castaneous; eyes close together, their distance apart equal to the breadth of the first antennal joint. Pronotum reticulate-punctate, with a long erect scattered pubescence, pale testaceous in colour. Lateral bands of pronotum not very broad, closely applied to the disk, channel very narrow. Tegmina hyaline, castaneous at base.

Wings hyaline; ulnar vein 8-ramose, only three of the branches being complete. Abdomen castaneous, ventrally with scattered erect pubescence. Legs testaceous, with scattered erect hairs.

Total length 15.9 mm.; length of body 12 mm.; length of tegmina 11.8 mm.; pronotum 3.1 × 3 mm.

Hab. Caffraria (*J. Wahlberg*).

Type in Stockholm Mus.

This is one of the smallest species of the genus.

3. *Cyrtotria gibbicollis*, Stål. (Pl. X. fig. 12.)

Ischnoptera gibbicollis, Stål, Öfv. Vet.-Akad. Förh. xiii. p. 165 (1856).

Perisphæria elateroides, Walker, Cat. Blatt. Brit. Mus. p. 176 (1868).

Perisphæria linearis, Walker, *l. c.* p. 176 (1868).

Perisphæria cylindrica, Walker, *l. c.* p. 176 (1868).

Derocalymma (Cyrtotria) gibbicollis, Stål, *l. c.* xxviii. p. 380 (1871).

♂ (type). Head castaneous; eyes approximate; mouth-parts testaceous; antennæ infuscated, testaceous at base. Pronotum as broad as long, coarsely cribrate-punctate, with smooth interspaces; castaneous, anteriorly testaceous; lateral bands narrow, not very closely adpressed to disk, an anterior carina. Tegmina not exceeding the body by much, rufo-castaneous in basal third, remainder flavo-hyaline; veins testaceous. Wings clear hyaline; ulnar with ten branches, eight of which are incomplete. Abdomen castaneous, margined with testaceous; subgenital lamina irregular, with one style; cerci flavo-testaceous. Femora and coxæ rufo-castaneous; tibiæ and tarsi testaceous.

♀ (type). Piceous, nitid, sparsely punctate. Head piceous, mouth-parts and antennæ testaceous. Lateral borders of pronotum very narrow, scarcely elevated, closely adpressed to disk; no anterior carina. Abdomen slightly amplified; supra-anal lamina trapezoidal; cerci very short, flavid; legs rufo-castaneous.

♂. Total length 16.8 mm.; length of body 14 mm.; length of tegmina 14 mm.; pronotum 4.9 × 5 mm.

♀. Total length 13 mm.; pronotum 3.5 × 4.5 mm.

Caffraria (*J. Wahlberg*, types in Stockholm Museum); Natal (*elateroides*, *cylindrica*, and *linearis*, types in British Museum); Colenso (*G. Longstaff*, Oxford Museum).

I have compared the types of all the species enumerated in the synonymy, and though at first I was inclined to regard *cylindrica* as distinct, I have now come to the conclusion that it is a fully adult form, whereas *gibbicollis* was described from an incompletely mature form. I have had the

advantage of examining a very long series of *C. capucina*, Gerst., taken by Dr. Y. Sjöstedt in the Kilimanjaro district, and I am convinced that the shape of the abdomen (ampliated or not ampliated) is a character of no importance in discriminating between species of this genus, for it varies with the age of the insect and is largely affected by the way in which the specimens are dried or killed. Some of Dr. Sjöstedt's examples were almost completely cylindrical, others had the abdomen distinctly ampliated; yet there could be no doubt that all were referable to the same species. Similarly, apart from its size and the shape of the abdomen, *C. cylindrica*, Walk., differs in nowise from *C. gibbicollis*, Stål.

4. *Cyrtotria capucina*, Gerst. (Pl. X. fig. 13.)

Derocalymma capucina, Gerstaecker, Arch. Naturg. xxv. p. 207 (1861);
 Von der Decken, Reis. in Ost-Afrika, iii. (2) p. 8, pl. i. fig. 4 (1873).
Stenopilema somali, Saussure, Ann. Mus. Genova, xxxv. p. 88 (1895);
 Saussure and Zehntner, Rev. Suisse Zool. iii. p. 27 (1895).

To be distinguished from *C. gibbicollis*, Stål, by the antennæ testaceous at the base, by the proportions and shape of the pronotum, the lateral bands of which are broader and anteriorly are more separated from the disk. I have examined the type of *C. somali*, Sauss., which proves to be identical with Gerstaecker's species.

♀. Total length 18–18.5 mm.; pronotum 5 × 5 mm.

The male will be described in a forthcoming memoir on the Blattidæ of Mt. Kilimanjaro.

Hab. German East Africa, Mt. Kilimanjaro, and Somali-land.

Type of *capucina* in the Berlin Museum; type of *somali* in the Museo Civico di Storia Naturale, Genoa.

5. *Cyrtotria pallicornis*, Kirby. (Pl. X. fig. 16.)

Stenopilema pallicornis, Kirby, Ann. & Mag. Nat. Hist. (7) v. p. 290 (1900).

The following may be added to the original description:—

♀. Piceous, nitid, cribrate-punctate. Head and antennæ castaneous, mouth-parts rufo-castaneous. Pronotum slightly broader than long; lateral bands narrow, slightly elevated, not closely adpressed to disk; pronotal channel wide; two large crescentic pores, close together, on each side of the disk; posterior angles produced, disk anteriorly carinate. Abdomen less strongly punctate than the thorax. Coxæ and femora piceous; tibiæ rufo-castaneous; tarsi testaceous.

Total length 13 mm. ; pronotum 4.5×6 mm.

Pretoria (*W. L. Distant*); Zoutpansberg, Transvaal (*J. P. Cregoe*).

Type in the British Museum.

6. *Cyrtotria poduriformis*, Wlk. (Pl. X. fig. 14.)

Perisphæria poduriformis, Walker, Cat. Blatt. Brit. Mus. p. 175 (1868).

Perisphæria poduroides, Walker, l. c. p. 175 (1868) (larva).

Stenopilema macilenta, Saussure and Zehntner, Rev. Suisse Zool. iii. p. 26, pl. i. fig. 3 (1895).

I have compared the types of *poduriformis* and *macilenta*, and find them to be identical; *poduroides* is a larva. It is possible that the species is the same as *gracilis*, Burm., but I cannot be certain on this point without consulting Burmeister's type. The small size, narrow cylindrical shape, the somewhat flattened pronotum, much longer than broad and with the lateral bands adpressed to the disk at the base only, are the chief characters of this species. I append a description of what I consider to be the male of this species:—

♂. Rufo-castaneous. Head castaneous, distance apart of eyes equal to breadth of first antennal joint. Pronotum coarsely cribrate-punctate, with a few smooth interspaces, carinate throughout its length, lateral bands not closely adpressed to the disk; posterior angles not produced, anterior and posterior margin slightly reflexed. A very fine, short, erect pubescence on the disk of the pronotum. Tegmina considerably exceeding the apex of the abdomen, paler towards apex. Abdomen castaneous beneath, except at base, which is testaceous. Legs and cerci testaceous.

Total length 37.5 mm. ; length of body 15 mm. ; length of tegmina 15 mm. ; pronotum 4×3 mm.

Damaraland; Natal; Cape Colony.

♂ type in the Oxford Museum; ♀ type of *poduriformis* in British Museum; ♀ type of *macilenta* in Geneva Museum.

7. *Cyrtotria graniger*, Sauss. & Zehnt.

Stenopilema graniger, Saussure and Zehntner, Rev. Suisse Zool. iii. p. 26 (1895).

I do not know where the type of this species has been deposited; it is not in the Geneva Museum. The key to the species shows how *graniger* may be distinguished from its ally *poduriformis*.

8. *Cyrtotria marshalli*, sp. n. (Pl. X. fig. 15.)

♂. Castaneous. Head piceous; ocelli, basal joint of antennæ, and mouth-parts testaceous. Eyes approximated. Pronotum as long as broad, punctate and rugulose; anterior margin scarcely reflected; lateral bands narrow, not adpressed to the disk of the pronotum, posterior margin slightly elevated, posterior angles not produced. Tegmina not exceeding body by much, apical half hyaline suffused with castaneous; veins fuscous. Wings hyaline, anterior part suffused slightly with castaneous; ulnar vein with nine branches, only three of which reach the apex of the wing. Abdomen above testaceous at base, becoming castaneous towards apex, beneath castaneous; supra-anal lamina subquadrate, angles rounded, subgenital lamina produced, irregular, margined with testaceous; one style. [Cerci mutilated.] Legs rufo-castaneous.

♀. Piceous, nitid, cribrately punctate. Head piceous, mouth-parts castaneous. Pronotum with lateral bands moderately broad, not adpressed to disk of pronotum, anterior margin scarcely reflected, pronotal channel broad and shallow, posterior angles produced, disk anteriorly with a slight keel. Abdomen posteriorly slightly amplified. Coxæ piceous; femora and tibiæ castaneous.

♂. Total length 26 mm.; length of body 22.5 mm.; length of tegmina 20 mm.; pronotum 5 × 5 mm.

♀. Total length 22 mm.; pronotum 6 × 6 mm.

Salisbury, Rhodesia (*G. A. K. Marshall*), 3 ♂♂ and 1 ♀.

Types (♂ and ♀) in the Oxford Museum.

Allied to *C. poduriformis*, but differs, *inter alia*, by its much larger size.

9. *Cyrtotria nyasæ*, sp. n. (Pl. X. fig. 17.)

♀. Piceous, nitid, narrow and cylindrical. Head castaneous, with very few punctures; eyes wide apart; palpi and margin of labrum testaceous. Thorax cribrate-punctate, abdominal segments smooth. Pronotum rounded and very convex; lateral bands rather broad, closely adpressed to disk, slightly produced backwards, anterior margin not reflected; disk not carinate. Supra-anal lamina rounded; posterior margin reflected, punctate. Legs and cerci testaceous.

Total length 15 mm.; pronotum 4.2 × 4 mm.

Nyasaland (*A. Whyte*).

Type in the British Museum.

The blunt convex pronotum makes this an easily recognizable species.

10. *Cyrtotria jallæ*, Giglio-Tos. (Pl. X. fig. 19.)

Stenopilema jallæ, Giglio-Tos, Boll. Mus. Torino, xxii. no. 563, p. 4 (1907).

Upper Zambesi (*Jalla*); Portuguese East Africa (*Swynerton*); Rhodesia (Deutsche Ent. Nat. Mus.).

Type in the Turin Museum.

The species is distinguished by the strongly reflected anterior margin of the pronotum, which is continuous with the lateral bands, so that these are connected with each other, when viewed from the ventral side. The lateral bands of the pronotum are bent down anteriorly at more than a right angle to the disk.

11. *Cyrtotria scabricollis*, Gerst.
(Pl. X. figs. 18, 24.)

Derocalymma (Cyrtotria) scabricollis, Gerstaecker, Mitt. Ver. Vorpomm. xiv. p. 34 (1883).

Gaboon (*Buchholz*); Cameroons (*Conradt*).

This, the only West-African representative of the genus, can be distinguished by the rugose and tuberculate pronotum with reflected and dentate posterior margin in the male and the dentate lower margin of the lateral bands in the female.

The following is a description of the female:—

Piceous. Head castaneous, finely punctate. Antennæ testaceous at base, remainder castaneous. Pronotum coarsely tuberculate and punctate, anterior margin reflected; lateral bands finely tuberculate, rather broad, anteriorly bent down at more than a right angle to the disk, not closely adpressed to disk, the pronotal channel being wide and shallow, posteriorly produced, their lower border dentate; from the ventral aspect the lateral bands are seen to be in communication with each other anteriorly, as in *C. jallæ*, Gig.-Tos; disk carinate, posterior margin dentate. Meso- and metanotum carinate, punctate, and with a few tubercles. Abdomen very finely punctate.

Total length 16 mm.; pronotum 4.9 × 4 mm.; pronotum, ♂, 4.4 × 4 mm.

♂ type in Greifswald Museum; ♀ type in Deutsche Entomologische National Museum.

Genus PLATYSILPHA, nov.

Allied to *Derocalymma*, Burm., but much broader, pronotum about twice broader than long. ♂ with tegmina reduced, quadrate, extending to the middle of the second abdominal tergite, marginal field very broad. Wings rudimentary. Meso- and metanotum only half the breadth of the pronotum, and first abdominal segment narrower than second; subgenital lamina transverse; styles absent. ♀ very like ♀ of *Derocalymma*, but broader and oval.

Type. *Perisphæria murina*, Walk.

The male of this species, when the tegmina are removed, presents the remarkable outline shown in the figure, suggesting that the flattened broad insect has developed from a narrow form such as *Derocalymma porcellio*, Gerst., the mesonotum, metanotum, and first abdominal segment retaining the primitive narrowness. The marginal fields of the tegmina have broadened relatively much more than the discoidal field, and it is these which fill the gap between the posterior margin of the pronotum and second abdominal tergite; the tegmina are capable of only the most restricted movement outwards, and in the living insects are doubtless never moved at all.

In the female, owing to the absence of tegmina, the thoracic and abdominal segments are all equally broad; it is the broadening of the tegmina in the male which appears to have prevented the broadening of the segments that they cover.

Platysilpha murina, Walk. (Pl. X. fig. 20.)

Perisphæria murina, Walker, Cat. Blatt. Brit. Mus. p. 178 (1868).

♂. Fuscous, with fine scale-like pubescence above. Head and antennæ piceous; eyes approximated. Pronotum posteriorly truncate; posterior angles acute, disk cucullate, margins lamellar, anteriorly slightly carinate. Scutellum prominent. Tegmina castaneous, rugose, posteriorly emarginate, radial vein beneath prominent, keeled. Wings shorter than tegmina, infuscated. Eight abdominal tergites visible, first to sixth divided by a transverse suture into a broad anterior portion and a narrow posterior portion; posterior angles of all the tergites produced. Supra-anal lamina quadrate. Cerci very short. Abdomen beneath piceous, nitid; sternites failing to reach lateral margins owing to overlapping of the tergites; subgenital lamina transverse. Legs piceous.

♀. Similar to ♂, but with a rust-red pubescence above; mesonotum, metanotum, and first abdominal segment not coarctate. Subgenital lamina ample.

♂. Length of body 22 mm.; tegmina 7 × 7 mm.; pronotum 7 × 12 mm.

♀. Length of body 27 mm.; pronotum 9 × 18 mm.

E. Africa (British Museum) [type ♀]; Petauke, East Loangwa district, N.E. Rhodesia (Oxford Museum), 3 ♂♂, 4 ♀♀, S. A. Neave Coll.

I have no information as to the habits in life of this species, but I imagine that it, like the allied species of *Derocalymma*, is found under stones. This mode of life in numerous cases induces a flattened form with reduction of the tegmina; the broadening and flattening of the body may be observed, though to a less extent, in such species as *Temnopteryx phalerata*, Sauss., and *Heminauphæta sakalava*, Sauss. & Zehntn.; in these species also the tegmina are reduced and quadrate, and the constriction of the body in the middle has also occurred to a certain extent, and one may assume that it is correlated with the broadening of the reduced tegmina.

EXPLANATION OF THE PLATES.

PLATE IX.

- Fig. 1. Pronotum of *Protagonista lugubris*, sp. n. × 3.
 Fig. 2. Supra-anal lamina of ♂ of *Protagonista borneensis*, sp. n.
 Fig. 3. Right tegmen of *Cardax willeyi*, gen. et sp. n. × 10. *r*=radial vein; *u*=ulnar vein; *a.u*=anterior ulnar vein; *p.u*=posterior ulnar vein; *m*=median vein; *a*=anal vein; *ax*=axillary vein; *d*=dividing vein.
 Fig. 4. Right wing of ditto.
 Fig. 5. Mandible of ditto.
 Fig. 6. Maxilla of ditto.
 Fig. 7. Tibia (outer aspect) of ditto.
 Fig. 8. Apex of abdomen of *Ischnoptera longstaffi*, ♂ (dorsal view).
 Fig. 9. Wing of *Anaplecta erythronota*, sp. n.
 Fig. 10. Diagrammatic transverse sections through pronota of Blattidæ. A, typical Blattid; B, *Pronaonota*; C, *Pilema*; D, *Bantua*; E, *Derocalymma*. *a*=disk of pronotum; *b*=lateral wings or lateral bands; *c*=typical carinæ; *d*=dorsal carinæ.

PLATE X.

- Fig. 11. Pronotum of *Cyrtotria macra*, Stål, ♂, dorsal and lateral views. × 4.
 Fig. 12. Pronotum of *Cyrtotria gibbicollis*, Stål, ♀, dorsal and lateral views. × 4.
 Fig. 13. Pronotum of *Cyrtotria capucina*, Gerst., ♀, three-quarter, ventral, and lateral views. × 3.
 Fig. 14. Pronotum of *Cyrtotria poduriformis*, Wlk., ♀, dorsal and lateral views. × 4.
 Fig. 15. Pronotum of *Cyrtotria marshalli*, sp. n., ♀, three-quarter view. × 3.
 Fig. 16. Pronotum of *Cyrtotria pallicornis*, Kirby, ♀, three-quarter view × 3.

- Fig. 17. Pronotum of *Cyrtotria nyasæ*, sp. n., ♀, dorsal and lateral views. × 4.
 Fig. 18. Pronotum of *Cyrtotria scabricollis*, Gerst., ♂, dorsal and lateral views. × 4.
 Fig. 19. Pronotum of *Cyrtotria jallæ*, Gig.-Tos, ♀, ventral and three-quarter views. × 3.
 Fig. 20. *Platysilpha murina*, Walk., ♂, left tegmen removed and shown from beneath. × 1½.
 Fig. 21. Pronotum of *Cyrtotria latipennis*, Kirby, ♂, three-quarter view. × 3.
 Fig. 22. Pronotum of *Pilema mombasæ*, sp. n., ♀, dorsal view. × 3.
 Fig. 23. Ditto, ditto, lateral view. × 3.
 Fig. 24. Pronotum of *Cyrtotria scabricollis*, Gerst., ♀, dorsal and lateral views. × 4.
 Fig. 25. Thorax of *Bantua ferox*, sp. n., ♀, dorsal view. × 3.

XXVII.—*On a new Oribi obtained by Major Powell-Cotton in British East Africa.* By OLDFIELD THOMAS and R. C. WROUGHTON.

THE Natural History Museum has recently received from Major Powell-Cotton some specimens of *Oribi* for identification. Amongst them are several from the Guas-ngeshu Plateau, E. of Mt. Elgon, which appear to us to represent a new species.

The material available for comparison in the Museum, though scanty, seems to indicate that North-eastern Africa (*i. e.* north of Equator and east of 25°) contains four already-known forms, viz. :—(1) *O. montana*, Cretzschm., in Abyssinia and the Soudan, occupying the whole area down to 5° N. latitude, and distinguishable by its short slight horns; (2) *O. haggardi*, Thos., on the coast; (3) *O. kenyæ*, Meinerzh., round Mt. Kenya; and (4) *O. goslingi*, Thos. & Wrought., from the Welle Basin.

Of these *O. kenyæ*, by its black tail and narrow preorbital fossa, shows unmistakable affinity with the more southern form *O. hastata*, Peters, from Mozambique; and *O. haggardi* differs from all the rest by its shallow skull and by the compression of its horns posteriorly so as to make a more or less distinctly marked longitudinal ridge.

From *O. montana* the present species is at once separable by its long stout horns, while from *O. goslingi* it differs in wanting the black blaze on the face which is so characteristic of that animal.

Ourebia cottoni, sp. n.

About the size of *O. goslingi*.

Fur rather longer than in *O. goslingi* (25 mm. against 20 in the latter species).

General colour above paler and brighter, tawny fading to buff on the flanks, while in the western species it is a dark clay-colour fading to ochraceous. Individual hairs of the back drab for basal two thirds, buff for the remainder, with minute black tips; in *O. goslingi* they are pale smoke-grey below, dark brown distally, broken by a bright buff ring below the black point. The dark frontal blaze so characteristic of the latter species almost entirely absent in *O. cottoni*. Tail very short (30 mm.), less than one third the length of that of *O. goslingi*. Horns stout and well-ridged, as in the Welle species, but not equalling those of *O. haggardi*.

Skull broader and stouter, shorter in front of the orbits (nasals 60 mm., as compared with 70 mm. in *O. goslingi*).

Dimensions:—

“Height at shoulder 23'; girth 21"; total length, nostrils to tip of tail, 44½". Weight, whole, 38 lbs.”

Tail, dried, 30 mm.

Skull: greatest length 170 mm.; basilar length 146; greatest width 80; length of rostrum in front of orbit 89; length of nasals 60; length of frontals 50; interorbital breadth 57; bullæ 20.

Hab. Surgoi Rock, Guas-ngishu Plateau, 1° N. lat., 35° E. long. Alt. 7000'.

Type. Adult male. B.M. no. 7. 12. 29. 1. Original number 240. Killed 15th August, 1902. Collected and presented by Major P. H. G. Powell-Cotton.

XXVIII.—Notes on the Coleopterous Genus *Oniticellus* and Descriptions of some new Species from India. By GILBERT J. ARROW.

ALTHOUGH the Madagascan species are now excluded from the genus *Oniticellus*, its geographical distribution is still peculiar and many of the species are very abundant and wide-ranging. This is the case with several of the European species, whose correct nomenclature is in some disorder owing to the imperfect knowledge of their distribution and of the

original types of the species possessed by the authors of works dealing with the European Coleoptera. The recently published edition of Heyden, Reitter, and Weise's Catalogue enumerates five species of *Oniticellus*, viz., *O. festivus*, Steven, *pallipes*, Fabr., *pallens*, Oliv., *speciosus*, Costa, and *fulvus*, Goeze.

Mr. C. O. Waterhouse, in the Ann. & Mag. Nat. Hist. (7) ii. 1898, p. 75, expressed doubt as to the correct identification of *O. pallipes*, Fabr., and Mulsant had long before (Coléopt. de France, Lamell. 1842, p. 98) expressed a doubt whether the European species so long known as *O. pallipes* was correctly so called, but the question has never advanced beyond the stage of conjecture. A careful comparison establishes the entire distinctness of the two forms. *O. pallipes* was described from a specimen from Coromandel now in the British Museum and is a species which I have seen from all parts of India, but from nowhere outside that area. The European species has a general resemblance to it, but is decidedly larger, much more shining, and more strongly and closely punctured upon the prothorax. Its range is from Arabia, Persia, and Turkestan, by the northern shore of the Mediterranean to Italy and the south of France. It has many times been carefully described, but as no existing name is available, I propose to call it

Oniticellus nitidicollis, sp. n.

For my type I have selected a specimen from Sardinia in the British Museum.

The type specimen of *O. pallipes*, Fabr., is a male of a form of which I have seen only two other examples, one from Karachi and the other from Madura. In this form the three carinæ upon the head are less strong than in the ordinary form, the external one is at the extreme margin of the clypeus, and the innermost one is gently curved and not angulated. The specimens were taken in the same localities as males of the common form and are exactly like the latter in all other respects, so that I consider them to represent only a sexual aberration. In a later description in the Syst. Eleuth. p. 63, Fabricius has added, as male characters, a diagnosis of the horned form, which is really the female, an error which has been repeatedly made since.

O. speciosus, Costa, is described by its author as a rare Calabrian species. In the European Catalogue *O. nasicornis*, Reiche, is given as a synonym of it, but although I have seen no European specimens it is evident from the figure and description that it is not that species, but *O. intermedius*,

Reiche, which is often mistaken for it. *O. nasicornis*, Reiche (of which also we have the type), is a species which I have seen only from Abyssinia, but *O. intermedius* is abundant throughout a large part of Africa and may therefore cross the Mediterranean. Reiche's species, however, were described in 1847, while Costa's descriptions are dated 1849, so that the name of *speciosus* is a synonym of *intermedius*, Reiche. Mr. Péringuey, in his 'Catalogue of the Lamellicornia of South Africa,' has incorrectly described this species under the name of *O. nasicornis*, Reiche.

O. pallens, Oliv., ranges from N.W. India across Arabia to Somaliland, and thence through Northern Africa into Corsica.

O. fulvus, Goeze, has a wide distribution in Europe and extends as far east as Turkestan and as far south as Algeria.

O. festivus, Steven, is a rare and peculiar species found in Asia Minor and the Caucasus.

The Oriental *Oniticellus vertagus*, Fabr., has been many times described. The type of Fabricius's description is a female. The male was first described by Erichson as *O. bifurcatus* and again by White as *O. bifurcalis*. Overlooking all these earlier descriptions, Fairmaire described both sexes in 1891 as *O. pictisternum* and two years later as *O. tonkineus*, taking in the first case a well-developed male and in the second case an imperfectly developed one for his type.

The following new species of this genus are in the British Museum.

Oniticellus indicus, sp. n.

Niger; antennis, femoribus, prothoracis angulis anticis, elytrorum apicibus, pygidio corporeque subtus plus minusve testaceis; prothorace fortiter punctato, late canaliculato; elytris sulcatis, interstitiis modice convexis, minute irregulariter punctatis.

♂. Capite late carinato, carina medio obtusa, angulis acute dentata; prothorace medio elevato, antice obtuse trituberculato.

♀. Capite leviter bicarinato; prothorace antice obsolete carinato. Long. 7-10.5 mm.; lat. max. 4-6 mm.

Hab. S. India, Malabar, Anamalai Hills, Nilgiri Hills (3000-6000 feet).

Found in dung by Capt. A. K. W. Downing and Mr. H. L. Andrewes.

Black and moderately shining, with the lower surface, femora, antennæ, front angles of the pronotum, the apices of the elytra, and the pygidium more or less testaceous. The clypeus is punctured and its front margin barely sinuated.

The prothorax is transverse, rather strongly punctured and lightly channelled along the middle. The elytra are sulcate, with the interstices convex and finely irregularly punctured. The pygidium and lower surface of the abdomen are opaque.

♂. The head is armed with a transverse carina occupying the whole width between the eyes, produced a little upwards and outwards at each end and very obtusely toothed in the middle. The prothorax is elevated into a broad hump, nearly straight in front, but forming a blunt tubercle on each side and with the anterior declivity smooth and nearly perpendicular. There is a large rounded depression in each front angle.

♀. The clypeus is more strongly and closely punctured, there is a curved anterior carina and a nearly straight posterior one. The prothorax has a slight blunt carina a little behind the front margin.

This species is allied to *O. femoratus*, Illig., but larger and relatively broader, with the elytra less broadly and deeply sulcate and the intervals broader and more opaque. In the male the angles of the cephalic carina are much more pointed.

Oniticellus affinis, sp. n.

Niger; capite leviter ænescente, antennis, femoribus, prothoracis angulis anticis, elytrorum apicibus, pygidio corporeque subtus testaceis; clypeo prothoraceque crebre punctatis, hoc medio sulcato; elytris striatis, interstitiis convexis, minute et irregulariter punctatis; pygidio abdomineque opacis.

♂. Capite lato carinato, carinæ summa fere rectilinea, angulis extus acute productis; prothorace medio elevato, antice breviter obtuse producto.

♀. Capite bicarinato; prothorace antice vix carinato.

Long. 8-9 mm.; lat. max. 4.5-5 mm.

Hab. Manipur, Tavoy (Burma); Renong (Siam).

This species is black and moderately shining, with the head and anterior part of the prothorax slightly metallic, and the antennæ, the femora, the anterior angles of the pronotum, the apical margins of the elytra, the pygidium and lower surface of the body testaceous. The clypeus is very finely punctured, the prothorax strongly and closely punctured and longitudinally sulcate at the middle. The elytra are sub-opaque and sulcate, with the interstices minutely and inconspicuously punctured and the alternate ones a little more convex.

♂. The head is armed with a broad carina, which is produced outwards at the angles, but nearly straight at the

summit. The prothorax is elevated into a dorsal hump produced bluntly forwards and very minutely notched in front.

♀. There are two carinae on the head, but none on the pronotum.

This is exceedingly like the first-described species, but a little smaller, relatively narrower, and more finely punctured. The cephalic carina of the male is not toothed in the middle and the thoracic hump is narrower and scarcely bituberculate in front.

Oniticellus modestus, sp. n.

Fusco-ferrugineus, opacus, metasterni medio pedibusque sat nitidis; capite cupreo-nigro prothoracisque medio fusco, nonnunquam vage cupreo: sat elongatus, depressus, toto inermis; capite emarginato, irregulariter punctato; prothorace densissime punctato, postice leviter sulcato; elytris striatis, minute granulatis, apicibus pygidioque setiferis.

♀. Clypeo paulo magis producto, tibiis anticis fortius dentatis. Long. 5·5–7·5 mm.; lat. max. 3–4 mm.

Hab. S. India, Belgaum, Calicut.

Dull opaque ferruginous brown, with the legs and the middle of the metasternum shining, the head slightly coppery, and the prothorax vaguely darker at the middle and sometimes feebly metallic. The body is elongate and very flat above, and there is no armature of any kind in either sex. The head has intermixed coarse and fine punctures and the clypeus is gently emarginate in front. The pronotum is densely, and at the side rugosely, punctured, and there is a lightly impressed longitudinal line at the middle of the basal half. The sides and base are gently and continuously rounded and the front angles very blunt. The elytra are finely striated and the interstices flat and minutely granulated. The elytra near the extremities and the pygidium are furnished with short stiff bristles, and the metasternum is strongly punctured. The front tibiae are armed with four strong teeth.

The female has the clypeus a little produced and the front tibiae rather broader and more strongly toothed.

In some of the species of *Oniticellus* the more pronounced sexual characters, contrary to the general rule, are those of the female sex, and certain authors have therefore described the females as males. I have proved by dissection that the sexes of the present species are correctly discriminated.

This species seems to be the southern representative of the

North Indian *Oniticellus imbellis*, Bates, and was named by Reiche *O. fuscopunctatus*, F.; but by the kindness of Dr. Adam Bóving, of Copenhagen, who has made for me an excellent drawing of the Fabrician type specimen, I am able to state that that is a species of *Onthophagus*, very much smaller and entirely unlike the insect here described. Reiche is responsible also for the manuscript name "*modestus*, Dej.," which I have adopted.

Oniticellus modestus is closely related to the African *O. spinipes*, Roth, for which Mr. Péringuey has formed a new genus *Tiniocellus*, which he has widely separated from *Oniticellus* by reason of his counting only eight joints in the antenna. This is an error, for there are nine joints, and these species cannot be separated from *O. cinctus*, F., *planatus*, Lap., *formosus*, Chev., &c.

I may take this opportunity of noting that Mr. Péringuey has incorrectly given the last-named species as a synonym of the S.-African *O. pictus*, Hausm. *O. formosus*, Chev., is a West-African insect, larger than *O. pictus* and differing in the form of the clypeus and other respects.

XXIX.—On the Generic Names of the Rupicaprine Ruminants known as Serows and Gorals. By R. I. POCOCK, Superintendent of the Zoological Society's Gardens.

THE rupicaprine ruminants commonly known as Serows and Gorals were first dismembered from the genus *Antelope* by Hamilton Smith in 1827 (Griffith's An. Kingdom, v. p. 352). This author grouped under the subgenus *Næmorhedus** the three species *sumatrensis*, Shaw, *duvaucelii*, H. Sm., and *goral*, Hardw. One of these must be the type of *Næmorhedus*.

In 1834 Hodgson (P. Z. S. 1834, p. 85) adopted *Næmorhedus* for the same species, with the addition of the Nepalese form described by himself as *thar*. Although clearly recognizing that the four species ought to be affiliated in pairs, *N. goral* and *N. duvaucelii* forming a group apart from *N. sumatrensis* and *N. thar*, Hodgson himself did not divide *Næmorhedus* into two genera or subgenera, nor select one of the species as its type.

The next writer to deal systematically with the question, namely Ogilby (P. Z. S. 1836, p. 138), pointed out that

* I preserve the original spelling of the name throughout this paper, and ignore the emendations that have been proposed.

goral and *thar* are generically distinct. For the former he introduced the genus *Kemas*, for the latter *Capricornis*, entirely setting *Næmorhedus* aside. Now *Kemas*, or, rather, *Cemas*, had been previously used by Oken (Lehrb. Zool. ii. p. 727, 1816) for a series of antelopes of which *goral* was not one. Hence, if it be maintained that *Kemas* and *Cemas* are, strictly speaking, the same names, *goral* cannot be the type of *Kemas*. If, on the other hand, the difference in the formation of the initial letters "K" and "C" be regarded as a sufficient reason for considering the names different, *goral* might be the type of *Kemas*, and some other antelope, say *gnu*, according to Messrs. Sclater and Thomas's selection ('Book of Antelopes,' i. pt. ii. p. 93, 1895), the type of *Cemas**. Since Ogilby quotes no authorities for any of the genera cited in his paper, it is impossible to say whether he was aware of Oken's use and spelling of the name or not. Ogilby, indeed, left the matter in a most perplexing and unsatisfactory state, on account of his disregard of the claims of *Næmorhedus*, which, by the law of priority, must supersede either *Kemas* or *Capricornis*. This appears to me to be clearly a case where the decision of the next reviser, if lawfully made, should be adhered to. This was Gray. When he published his 'List of Mammals in the British Museum' in 1843 †, the generic nomenclature of the group stood as follows:—

Næmorhedus, containing *sumatrensis*, *duvaucelii*, *goral*.
Kemas, ,, *goral*.
Capricornis, ,, *thar* (= *bubalina*).

Now Gray followed Ogilby in admitting the two genera defined by that author as *Kemas* and *Capricornis*. He reserved *Capricornis* for *thar* (= *bubalina*) and adopted *Næmorhedus* for *goral* and *sumatrensis*. His association of these two species was apparently due to his being acquainted only with the horns of *sumatrensis*. This mistake, however, in nowise affects the fact that he dropped *Kemas*, Ogilby, as a synonym of *Næmorhedus* and did not drop *Capricornis*. His reason for this was quite obvious and natural and wise, namely, that *Kemas* was, in his opinion, preoccupied as *Cemas*, Oken (see p. xxvi of the introduction to the List

* This selection can, I imagine, only hold good if the type of *Cemas* had not been previously fixed by elimination.

† In 1841 (Journ. As. Soc. Bengal, p. 913) Hodgson referred *goral* and *thar* to "*Næmorhedus* vel *Kemas*." But since he thus merely reverts to his original view as to the two species being congeneric, his paper does not affect the question at issue.

Mamm. in B. M.). But, whatever the reason for his action may have been, I do not see how his decision, since the choice rested with him, can possibly be set on one side. In his subsequent works (Ann. & Mag. Nat. Hist. xiii. p. 232, 1846; List Ost. Spec. in B. M. 1847, p. 57; P. Z. S. 1850, pp. 135-136; and Cat. Mamm. Ung. iii. pp. 110-114, 1852) he confirmed his verdict and brought his system into conformity with modern views. He correctly withdrew *sumatrensis* from *Nemorhedus*, ranged it with *thar* (= *bubalina*) under *Capricornis*, and left *goral* with *duvaucelii* as its synonym as the sole representative of *Nemorhedus*.

It was subsequently stated by Jerdon ('Mammals of India,' 1867, p. 283), and, following him, by W. L. Sclater (Cat. Mamm. Ind. Mus. p. 147, 1891), that *sumatrensis* is the type of *Nemorhedus*. I can find no evidence for, much less proof of, the truth of this statement. If true it would invalidate Gray's nomenclature. Since it appears to be unfounded, I see no escape from the adoption of that author's settlement of the question.

Of authors who succeeded Gray, some—like Horsfield (P. Z. S. 1856, p. 403), Adams (P. Z. S. 1858, pp. 522-523), and Blyth (Cat. Mamm. As. Soc. p. 174, 1863, and Burma List, p. 46, 1875)—followed his nomenclature; others—like Turner (P. Z. S. 1850, p. 173), Jerdon, M.-Edwards (Rech. Mamm. 1868-1874), and W. L. Sclater—reverted to the original view of H. Smith and Hodgson that the Gorals and Serows are congeneric and to be entitled *Nemorhedus*.

In 1891, however, Dr. Blanford (Mamm. Brit. India, pp. 513 & 516) pointed out that Ogilby was right in separating the two, and, agreeing apparently with Jerdon that *sumatrensis* was the type of *Nemorhedus*, he adopted the inadmissible name *Cemas* for the Gorals and *Nemorhedus* for the Serows, entirely ignoring Gray's previous settlement of the question. Without further inquiry into the matter, Trouessart adopted Blanford's view (Cat. Mamm. i. p. 964, 1898), merely compromising the question by classifying the species under *Nemorhedus* with *Kemas* and *Nemorhedus* (s. s.) as subgenera.

In 1900 Mr. Lydekker ('Great and Small Game of India,' p. 136) complicated the subject still further by following Blanford, but with the substitution of *Urotragus* for *Cemas*, on the grounds of the inadmissibility of *Cemas* or *Kemas* for the Gorals. This system of nomenclature was adopted by Trouessart in 1905 (Cat. Mamm., Suppl. p. 734), and it reappears in the second edition of Mr. Lydekker's above-quoted work published in 1907. *Urotragus*, it should be

explained, was a generic name proposed by Gray in 1871 for the long-tailed Chinese Goral described as *Antilope caudata* by A. Milne-Edwards. This species, however, is not usually admitted to be generically distinct from the Himalayan form.

Although it has been suggested to me that *Kemas* of Ogilby should be regarded as a different name from *Cemas* of Oken because of the optical and, to those who pronounce the initial "C" as a sibilant, phonetic differences between "C" and "K," I nevertheless agree with Gray, and, following him, with Mr. Lydekker and M. Trouessart, that "C" and "K" in this and analogous cases must be looked upon as identical letters.

But, whatever the ultimate verdict on this point may be, *Kemas* cannot, in my opinion, be reserved for the Gorals, because of Gray's decision to call these animals *Nemorhedus*. And this action on the part of Gray similarly disposes of the claims of *Urotragus* to generic recognition so long as *caudatus*, the type of *Urotragus*, is regarded, as I think it should be, as congeneric with *goral*, the type of *Nemorhedus*.

In 1894 Heude (*Hist. Nat. Chinois*, ii. pp. 222 & 234) followed Ogilby's nomenclature, adopting *Capricornis* and *Kemas*, which he characterized; but in 1898 (*op. cit.* iv. pp. 13-14) he broke up *Capricornis* as follows:—

1. *Capricornis* for *thar*, *chrysochaetes*, *fargesianus*, *longicornis*, *brachyrhinus*, *nasutus*.
2. *Nemotragus*, nov., for *erythropygus*, *platyrhinus*, *cornutus*, *ungulosus*, *microdonticus*, *argyrochaetes*.
3. *Lithotragus*, nov., for *maritimus*, *rocherianus*, *benetianus*, *marcolinus*, *berthelianus*.
4. *Capricornulus*, nov., for *crispus*, *pryerianus*, *saxicola*.
5. *Austritragus*, nov., for *sumatrensis*.

It is quite beyond my purpose, if it was within my power, to deal with these so-called species*; and the adoption by

* With the exception of *thar*, *crispus*, and *sumatrensis*, the names enumerated above were applied by Heude to what he believed to be new species inhabiting China and Japan. With regard to the Chinese forms, I find it impossible to believe that they should rank as "species" in the ordinarily accepted sense of the word. Probably a subspecific value should be assigned to some of them, possibly a higher value to a few. Many of the features, again, upon which the "species" rest may be attributable to differences of age or of sex or of season, or to individual variation irrespective of such conditions. It is impossible to say, the provokingly involved and verbose nature of the text making the attempt to clear up the questions raised one upon which few will attempt to embark without localized material. Nevertheless, it must be admitted that the papers of Heude have a certain value and interest, inasmuch as the observations they record substantiate

Heude of Ogilby's generic names does not affect the question as to what is the type of *Næmorhedus*, except in so far as his use of the name *Capricornis* may silence those who might otherwise maintain that this name should be dropped on the grounds of its failure to receive recognition at the hands of modern writers.

The following is a list of the generic names that have been proposed for the Serows and Gorals. Since it is desirable that every generic name, whether admitted at the present time or not, should be definitely assigned to a particular species as its type, I have, without prejudice, selected a type for each of those proposed by Heude. Only one of these, however, namely *Capricornulus*, has, in my opinion, any claim to recognition, *Lithotragus*, *Nemotragus*, and *Austritragus* being complete synonyms of *Capricornis*. *Capricornulus* may, perhaps, be admitted on the grounds that the lacrymal bone forms a very short union with the nasal in the typical species *crispus*, which in this particular approaches *Næmorhedus* and differs from *Capricornis*.

Næmorhedus, H. Smith, 1827. Type by Gray's revision of 1843 and 1846 *goral*, Hardwicke.

Capricornis, Ogilby, 1836. Type ab initio *thar*, Hodgson*.

Kemas, Ogilby, 1836. Type ab initio *goral*, Hardwicke.

Urotragus, Gray, 1871. Type ab initio *caudatus*, M.-Edwards.

Austritragus, Heude, 1898. Type ab initio *sumatraensis*, Bechstein †.

Capricornulus, Heude, 1898. Type by selection *crispus*, Temm.

the fact that considerable variation in the colour of the pelage, the structure of the skull, and the size and shape of the horns exists in specimens of *Capricornis* and *Næmorhedus* occurring in the Chinese area. And however much one may secretly sympathize with the omission of the generic and specific names Heude proposed from Zoological Records, the morality of this proceeding is open to question, at all events, on the grounds that the record of such names, once published, must be preserved if only to prevent their subsequent use in a different sense by authors ignorant of their preoccupation.

* 'Gleanings,' iii. p. 324 (Oct. 1831). In 1832 (P. Z. S. p. 12) Hodgson substituted *bubalina* for *thar*, and of late years the species has been, after Blanford's example, erroneously cited as *bubalinus*.

† 'Uebersicht vierfüss. Thiere,' i. p. 98 (1799). Up to the present time this species has been always cited as *sumatrensis*, Shaw, 1801.

Lithotragus, Heude, 1898. Type by selection *maritimus*, Heude.

Nemotragus, Heude, 1898. Type by selection *argyrochætes*, Heude.

Allowing *Capricornulus* to stand, at all events provisionally, the above-mentioned genera may be reduced to the following three:—

1. *Capricornis*, Ogilby (= *Lithotragus*, Heude + *Nemotragus*, Heude + *Austritragus*, Heude).
2. *Capricornulus*, Heude.
3. *Næmorhedus*, H. Smith (= *Kemas*, Ogilby + *Urotragus*, Gray).

NOTE.—When revising the names of the Serows and Gorals I came across a hitherto unnoticed synonym of the Nilgiri wild goat (*Hemitragus hylocrius*). The reference is as follows:—“*Capra Neilgherri*, H. A. Leveson, Sport in many Lands, p. 238, pl. iv. fig., ? 1876.” My copy of this volume bears no date; but since it belonged apparently to the first edition, and contains a memoir of the author (“The Old Shekarry”), who died in 1875, the date of the name in question may be placed as probably not earlier than 1876.

XXX.—On Muscardinidæ from the Iberian Peninsula.

By ANGEL CABRERA.

SPANISH and Portuguese dormice are, for the most part, badly worked, no two authors agreeing as to the number and geographical distribution of species. Of *Eliomys* especially several apparently different forms have been described, partly by myself, the validity of which requires to be discussed. Since the publication of my paper on Spanish *Eliomys** my opinion on this subject has been somewhat modified, as a result of the examination of much new material, including a fine series mainly collected by Mr. Gerrit S. Miller, to whose kindness I owe the opportunity of examining it.

In the present paper I give a summary of my conclusions on the whole family, as represented in the Iberian Peninsula.

* Bol. Real Soc. Españ. de Hist. Nat. 1904, p. 180.

ELIOMYS.

Peninsular representatives of this genus were universally known as *Eliomys quercinus* (or its synonymous "*nitela*") till 1890, when Reuvens named a specimen from Lisbon *E. nitela*, var. *lusitanica* *. Seven years later Dr. Graells described some Andalucian dormice as *E. nitela*, var. *amori* †; in 1899 a skull from N.W. Spain was regarded by Mr Barrett-Hamilton ‡ as belonging to *E. mumbyanus*, Pomel. Two other Spanish forms have been described by myself, *E. hortualis* in 1904 and *E. hamiltoni* as recently as last October §. All these names must be commented on separately.

E. nitela, var. *lusitanica*, Reuvens.—Type locality: Lisbon, Portugal. The type, in the Munich Museum, is briefly described by Reuvens as a "dunkel rostfarbiges Exemplar," and a co-type in the British Museum is, Mr. Miller informs me, quite similar to specimens of *Eliomys* from Seville in the same collection. The name, therefore, is available for a large dark red form living in southern parts of Spain and Portugal, and specifically distinct from *quercinus* not only on account of its colour, but by the form and size of the skull and by the peculiar colour-pattern of the tail, the underside of which is usually black or blackish in its middle third. This species has been described in detail by Oldfield Thomas || and myself under the name "*Eliomys amori*, Graells," but on Mr. Miller's suggestion it must be called *E. lusitanicus*.

Myoxus nitela, var. *amori*, Graells.—Type locality: Cordoba, Andalucia. In the old-fashioned original description, based on three specimens, this form is said to be bright red on the back, smaller than *quercinus*, and with the under surface of the tail entirely white. The bad figure that illustrates it was probably drawn from a brightly coloured mounted specimen of *E. quercinus* from France, in the Madrid Museum of Natural Sciences. In the red colour of the body, the description agrees equally with *E. lusitanicus* and with old

* Reuvens, 'Die Myoxidæ oder Schlaefer,' 1890, p. 28, footnote.

† Graells, Mem. Ac. Cienc. Madrid, xvii. (1897) p. 481, pl. xvii.

‡ Ann. & Mag. Nat. Hist. (7) iii. 1899, p. 227.

§ Bol. Soc. Españ. Hist. Nat. 1907, p. 226. The number of the 'Boletín' in which *E. hamiltoni* is described is dated June-July, but it was really published towards the end of October. Some Insectivores referred to in the same paper were previously described in the September number of the present Magazine.

|| P. Z. S. 1901, i. p. 41, footnote.

alcoholic specimens of *quercinus*; while as regards size, "smaller" or "larger," without detailed measurements nor indication of the age of specimens, are words of little scientific value. As for the absence of black on the ventral surface of the tail, this is characteristic of *E. quercinus*, but there are specimens of *lusitanicus* that also lack the black central portion; the co-type of this species in the British Museum, Mr. Miller writes me, "is just one of these unusual specimens without black on underside of tail"; and I have seen several dormice from different Andalucian localities, evidently of the large red form, with the tail entirely white below.

Graells's description and figure being not sufficiently accurate for purposes of identification, I asked Professor Coscollano, of Cordoba Institute, for information, and from him I learn that the Cordoban *Eliomys* is the same animal as that from Seville. A specimen in the Institute collection has the upper parts of the body brownish red and the underside of the tail white, with a blackish centre. Moreover, Graells said the types of *amori* were in his possession, and the only *Eliomys* in the Graells collection, now in the Madrid Museum, is a specimen of *E. lusitanicus*, without black on the ventral side of tail. It bears no indication of locality or collector, but I think it may be regarded as one of the co-types. Mr. Oldfield Thomas was therefore correct in applying the name *amori* to the Andalucian form when its identity with *E. lusitanicus* was not yet suspected. It is noteworthy that the two names given to this animal were based on specimens with the tail unusually coloured.

Barrett-Hamilton's "*Eliomys mumbyanus*, Pomel."—Based on a skull from Cabañas, Coruña province, N.W. Spain, in the British Museum. The skull of true *mumbyanus* being quite similar in form to that of *quercinus*, the only reason that led Barrett-Hamilton to regard this specimen as of the Pomel form was undoubtedly its small size; but, as he compared *mumbyanus* not with true *quercinus*, but with specimens from Seville (*E. lusitanicus*), that reason has very little force. In my opinion, the Cabañas skull is one of *E. quercinus*, perhaps not quite adult.

E. mumbyanus from North Africa seems to me merely a diminutive race of *E. quercinus*. Specimens from Mogador are identical in colour and skull-features with *quercinus* from the French Pyrenees, but rather smaller.

Eliomys hortualis, Cabrera*.—Type locality: Valencia,

* *L. c.* 1904, p. 183.

E. Spain. Based on three specimens with the upper parts, especially the black markings of head and tail, strongly suffused with red, and the skull somewhat different from that of *E. quercinus*, as figured by Reuvens*. In *E. hortualis* the hind part of the frontals is nearly square, whereas in Reuvens's figure it is triangular. The redness of the black markings proving to result from long immersion in alcohol, the red suffusion on the back and the skull-features only remain as valuable characters.

Now, in the series before me, there are two specimens from Valencia and several others from the Spanish provinces of Castellón, Huesca, and Burgos, and there are also two from Ariège in South France. All of them evidently belong to a single species, and the same as that of Belgium, Germany, and Switzerland; and from comparison with them it is clearly seen to be impossible to separate my *E. hortualis* from *E. quercinus* even as a local race. The reddish tinge of the back, conspicuous in one of the Valencian specimens in the series, is seen also in a male from the Huesca Pyrenees (exact locality: Panticosa, 1558 m. altitude), and in a very adult female from l'Hospitalet, Ariège, the slight redness of the hair probably being a mark of old age. As to the skull-peculiarities, all the series, and, as a matter of fact, all the specimens of *E. quercinus*, exhibit the nearly square frontals. If correctly depicted, the skull figured by Reuvens, which led me to describe the Valencian dormouse as a new species, must be either from a very young or from an abnormal specimen.

E. hamiltoni, Cabrera.—Type locality: El Pardo, near Madrid. Under the supposition that the skull of *E. quercinus* was different from that of *E. hortualis* and *mumbyanus*, this form was separated on account of two characters exhibited by a number of specimens from El Pardo: the white parts, especially on the head, stained with sulphur-yellow, and the skull similar to that of *hortualis* in size and shape, but with straight, not convex, zygomatic arches. Now, in Mr. Miller's series I find straight, and even concave, as well as convex zygomata; and as to the hue of the white parts, a yellowish suffusion exists in some specimens from Ariège, Huesca, and Burgos, while it is not seen on a specimen from Madrid Moncloa Park in my private collection. *E. hamiltoni* is therefore indistinguishable from *quercinus*, the yellowness of the white hairs probably being an effect of prevailing

* Reuvens, l. c. 1890, pl. i. fig. 2.

food, as is the case in certain specimens of *Glis* recorded by Ghidini *. In El Pardo dormice feed chiefly on acorns.

To sum up the foregoing conclusions: *Eliomys* is represented in the Peninsula by two different species—a northern and central one, *E. quercinus*, reaching on the south as far as the Guadiana River, Central Portugal, and the province of Murcia; and a southern one, *E. lusitanicus*, inhabiting Andalucía and the southern part of Portugal. Lisbon, Don Benito, and Daimiel are the most northern localities in which *E. lusitanicus* has been collected.

Thomas's *E. gymnesicus* need not be commented on here, as it is a Balearic form only, never found on the mainland.

GLIS.

Glis glis is recorded from N.W. Spain by Seoane †, from Andalucía by Machado ‡ and Martínez Reguera §, and from Madrid by Cazorro ||. The last proves to be erroneous, as the grey dormouse does not inhabit the province of Madrid, the specimen in the Madrid Museum that Cazorro alludes to being a young *Eliomys quercinus* with the grey juvenile coat. Graells describes *Glis* as "more common in the eastern and southern than in the central and northern parts of the Peninsula"; he, however, bases this conclusion not on his own experience, but on the statements of Machado and Reguera ¶. Now, when I think of Reguera's admitting the existence of ass-deer hybrids, and of Machado's including such a species as *Myoxus frugivorus* among the Andalusian mammals, I cannot place too much confidence in the assertions of these authors. Both from my own experience and from information obtained from collectors and country people, I am convinced that *Glis* has never been seen either in Andalucía nor in Valencia; the Valencian names ("rata del camp" and "rata de plumall") quoted for it by Graells really belong to *Eliomys quercinus*. The genus seems to be also unrepresented in Portugal, as Seabra does not include it in his catalogue of mammals from that country **.

* Bollett. Soc. Ticin. Science Nat. ii. 1905, p. 53.

† V. Lopez Seoane, 'Fauna Mastol. de Galicia,' 1861-63, p. 265.

‡ Machado y Nuñez, 'Catal. Mamif. de Andalucía,' 1869, p. 27.

§ L. Martínez y Reguera, 'Fauna de Sierra-Morena: Mamíferos del término de Montoro,' 1881, p. 161.

|| Manuel Cazorro, "Fauna Matritense" (Actas Soc. Esp. Hist. Nat. 1894).

¶ Graells, Mem. Ac. Madrid, 1897, p. 479.

** Jorn. Scienc. Lisboa, (2) vi. 1900, p. 90.

With regard to the north of the Peninsula, *Glis* evidently occurs there. Seoane records a specimen actually obtained in the Caabeiro woods, near Ferrol; two specimens from Navarre exist in the Museum of Madrid, and another, from San Esteban de Palantordera, Barcelona province, is preserved in the Martorell Museum of Barcelona.

On comparison with true *G. glis* from Germany in the same collection, the Navarre specimens in the Madrid Museum appear to represent a well-marked local form, which I describe as follows:—

Glis glis pyrenaicus, subsp. n.

Characters. Similar to the typical form in all essential respects, but readily distinguishable by its larger skull and the strong buffy tinge of its back.

Colour. Upperparts buffy grey, the hairs being iron-grey with yellowish-buff ends. In the middle of the back there are numerous black hairs, showing a bright metallic gloss. Under surface creamy white, separated from the upper colour by a narrow ill-defined zone of pure yellowish buff extending from the cheek to the hip. Tail glossy brownish grey, with the usual whitish line along its underside. Ears and orbital rings brown. Hands and feet white; a broad brown metatarsal patch as usual.

Skull. Like that of typical *G. glis*, but larger, approaching *G. italicus* in this respect.

Measurements (type in flesh). Head and body 169 mm.; tail-vertebræ 137; hind foot (s. u.) 28; ear 16.

Skull: greatest length 41.5; basilar length 33; zygomatic breadth 24; breadth of brain-case 18; interorbital breadth 5.5; length of nasals 14; palatilar length 16; diastema 10; upper tooth-row 7.5.

Hab. Navarre Pyrenees, North Spain. The specimens recorded from Ferrol and Barcelona probably belong to the same species.

Type. Adult female from the neighbourhood of Allo, province of Navarre. No. 1223, Museum of Natural Science of Madrid.

Remarks. This form seems to be the most western representative of the grey dormouse, and opposite in size to the small eastern *G. g. spoliatus*. Whether or not it ranges southwards along the Burgos Mountains and Serrania de Cuenca, as other Pyrenean mammals do, I am not able to say at present.

MUSCARDINUS.

Although recorded from Andalusia by Machado and Reguera, and included in an anonymous list of rodents from N.W. Spain *, this genus has, in fact, not yet been found in the Peninsula. Graells rightly doubted its existence in Spain, while Seabra does not record it in Portugal. All the specimens I have seen in Spanish collections are from France, Germany, or Italy.

XXXI.—*Eighteen new European Voles.*

By GERRIT S. MILLER.

AMONG the European voles in the collection of the British Museum are specimens of the following new forms.

Evotomys cæsarius, sp. n.

Type.—Adult male (skin and skull). B.M. no. 3. 2. 11. 2. Collected at St. Helier, Jersey, Channel Islands, January 2, 1896, by Capt. G. E. H. Barrett-Hamilton. Presented by the collector.

Characters.—A member of the *nageri* group, agreeing with *E. skomerensis* in the presence of a well-defined third reentrant angle on inner side of third upper molar, but differing from the Skomer vole in the shorter, more evenly cuneate nasals (in this respect resembling *E. nageri*, *E. vasconicæ*, and *E. norvegicus*), broader rostrum, shorter tail (45 to 49 mm. instead of 53 to 59 mm.), and much darker colour (upperparts a rich, dark reddish brown approaching the cinnamon-rufous of Ridgway, but not so vivid, the sides lighter and suffused with dull buff, though not sufficiently to produce any marked contrast with back; underparts a clear rich buff, between the buff and cream-buff of Ridgway; tail sharply and conspicuously bicolor, blackish above, concolor with belly below; feet a dusky grey above, rather dark hair-brown on furred portion of sole).

Measurements.—Type. Head and body 96 mm. (97) †; tail 49 (45); hind foot 18 (19); ear from meatus 11 (10). Skull:

* The list, attributed to Señor J. Alonso Lopez by Seoane, is found in a book entitled 'Consideraciones generales sobre varios puntos á favor de la libertad y fomento de los pueblos,' 1820, vol. ii. p. 115.

† Measurements in parentheses are those of a second specimen from the type locality (♂ ad., B.M. no. 3. 2. 11. 1).

condylo-basal length 25.6; zygomatic breadth 14 (14); interorbital constriction 4.0 (4.0); occipital breadth 11.6; occipital depth (median) 7.0; nasal 7.0 (7.0); diastema 7.2 (7.0); mandible 15.4 (15.2); maxillary tooth-row 6.2 (6.2); mandibular tooth-row 6.0 (6.0).

Specimens examined.—Two, both from the type locality.

Remarks.—In general appearance the Jersey red-backed vole resembles the richly coloured *Evotomys hercynicus rubidus* of the adjacent French mainland (two specimens examined from Dinan, Côtes-du-Nord, collected by Capt. Barrett-Hamilton), though the large size of its skull and the peculiarities of the third upper molar at once show its relationship with *E. skomerensis*. In the Skomer vole, however, the general colour above is much lighter, approaching the orange-rufous of Ridgway, though less red, and the underparts are a conspicuously contrasted whitish grey with only a faint buffy tinge. The feet are also whitish, much paler than in the Jersey animal, both above and on hind part of sole.

Arvicola sapidus, sp. n.

Type.—Adult female (skin and skull). Collected at Santo Domingo de Silos, Province of Burgos, Spain, October 7, 1906, by G. S. Miller. Original number 7216.

Characters.—Size large, as in the British *Arvicola amphibius* (hind foot 33 to 37 mm.; condylo-basal length of skull in adults 42 to 44.4 mm.), but skull with nasals very broad, the greatest breadth of both together nearly equal to anterior rostral breadth, and colour, as in the small Italian *A. musignani*, conspicuously buffy (upperparts between ochraceous-buff and clay-colour often tinged with russet, strongly "lined" with black along middle of back, nearly clear on sides; underparts light ochraceous-buff clouded by the grey (Ridgway no. 6) under colour; feet drab-grey; tail brownish, lighter below than above).

Measurements.—Type. Head and body 187 mm.; tail 123; hind foot 34; ear from meatus 18. Skull: condylo-basal length 42 (44.4)*; zygomatic breadth 23.4 (25); interorbital constriction 4.4 (4.4); occipital breadth 17 (18.6); occipital depth (median) 11 (13); nasal 11.6 (13); diastema 13.4 (14.8); mandible 28 (29.4); maxillary tooth-row 10.6 (10.8); mandibular tooth-row 10.8 (11).

* Measurements in parentheses are those of the largest skull examined (♂, Barracas, Province of Castellon, Spain, March 10, 1907, Norberto Gonzalez. Original number 134).

Specimens examined.—One hundred and nine from the following localities in Spain:—La Coruña, Coruña, 2; Pájaros, Leon, 6; Arrechavaleta, Vitoria, 1; Santo Domingo de Silos, Burgos, 20; Jaca, Huesca, 6; Panticosa, Huesca, 25; Lerida, Lerida, 13; Barracas, Castellon, 12; Silla, Valencia, 1; Villalba, Madrid, 2; Bejar, Salamanca, 1; Seville, Seville, 6; Coria del Rio, Southern Spain, 2; near Tarifa, Gibraltar, 1; Venta de Baul (between Guadix and Baza), Granada, 1.

Remarks.—The Iberian water-rat is well differentiated from its allies by the combination of large size, buffy coloration, and broad nasal bones. In two fully adult topotypes of *Arvicola musignani* the skull is much smaller, length from front of nasal to back of interparietal 32 and 34 mm. as compared with 37 and 40.4 mm. in the type of *sapidus* and the large male from Barracas. While the size of *Arvicola amphibius* is about equal to that of the Spanish animal, the British form shows no tendency toward buffy coloration, and the nasal bones are very narrow, their greatest combined breadth noticeably less than anterior rostral breadth.

Arvicola tenebricus, sp. n.

Type.—Adult male (skin and skull). B.M. no. 6. 1. 21. 5. Collected three miles east of Biarritz, Basses Pyrénées, France, December 30, 1905, by J. F. Davison, Esq. Original number 7. Presented by the collector.

Characters.—Like *Arvicola sapidus*, but coloration dark and brownish, in strong contrast with the buffy tints of the Spanish animal (upperparts a dull greyish buff, so heavily overlaid with black that the general effect is not far from a rather light, grizzled bister on back, and a greyish wood-brown on sides; underparts slaty grey, washed with light ochraceous-buff on chest and belly; feet hair-brown; tail blackish above, greyish below, not distinctly bicolor).

Measurements.—Type. Head and body 193 mm.; tail 112; hind foot 34; ear 17. Skull: condylo-basal length, 41.6; zygomatic breadth 24; interorbital constriction 4.4; occipital breadth 17.8; occipital depth 10.4; nasal 12; diastema 13; mandible 26.8; maxillary tooth-row 10.6; mandibular tooth-row 10.2.

Specimens examined.—Eleven, from the following localities: vicinity of Biarritz, Basses Pyrénées, 7; l'Hospitalet, Ariège, 2; Porté, Pyrénées Orientales, 2.

Remarks.—The Pyrenean water-rat resembles *Arvicola*

amphibius and *A. terrestris* in colour, but is readily distinguishable from the northern forms by its broad nasals. With the material at hand there are no apparent characters to distinguish the Biarritz specimens from those taken in Ariège and the Pyrénées Orientales at altitudes of about 4800 feet.

Microtus arvalis meridianus, subsp. n.

Type.—Adult female (skin and skull). B.M. no. 6.6.4.26. Collected at Biarritz, Basses Pyrénées, France, April 13, 1906, by J. F. Davison, Esq. Original number 30. Presented by the collector.

Characters.—Similar to *Microtus arvalis arvalis* of Central and Northern Germany, but coloration much more buffy (upperparts a finely grizzled yellowish brown, the general effect something between wood-brown and a very light bister; underparts as in true *arvalis*, but with a more evident buffy wash; feet buffy white; tail not sharply bicolor, dark brownish above, buffy white below).

Measurements.—*Type*. Head and body 115 mm.; tail 32; hind foot 16; ear from meatus 12. Skull: condylo-basal length 25.4; zygomatic breadth 15; interorbital constriction 3.0; occipital breadth 11; occipital depth (median) 6.0; nasal 7.2; diastema 8.0; mandible 16.2; maxillary tooth-row 6.4; mandibular tooth-row 6.4.

Specimens examined.—Seven, all from the type locality.

Microtus levis, sp. n.

Type.—Adult male (skin and skull). B.M. no. 4.4.6.55. Collected at Gageni, Roumania, April 25, 1899, by W. Dodson. Original number 67. Presented by the late Lord Lilford.

Characters.—Externally as in *Microtus arvalis* of Central and Northern Germany; skull differing from that of true *M. arvalis* in greater length (condylo-basal length usually more than 26 mm. instead of 24 to 25.6 mm.) and less relative breadth (ratio of zygomatic breadth to condylo-basal length about 50 instead of about 55), much longer narrower brain-case (distance from interorbital constriction to condyle decidedly greater than zygomatic breadth), more inflated audital bullæ, and in the smoothly rounded interorbital region, which, together with sides of brain-case, apparently never develops distinct ridges; teeth as in *M. arvalis*.

Measurements.—*Type*. Head and body 110 mm.; tail 38;

hind foot 17.5; ear from meatus 11. Skull: condylo-basal length 26.6 (25)*; zygomatic breadth 14.4 (14.4); distance from interorbital constriction to back of condyle 15.4 (14); interorbital constriction 3.4 (3.2); occipital breadth 12.2 (11.4); occipital depth (median) 6.6 (6.8); palatal depth 8.0 (7.8); nasal 7.8 (7.4); diastema 8.0 (7.4); mandible 16.6 (15.8); maxillary tooth-row 6.4 (5.8); mandibular tooth-row 6.2 (5.8).

Specimens examined.—Seventeen, all from the type locality.

Microtus angularis, sp. n.

Type.—Adult male (in alcohol). B.M. no. 80.10.28.2. Collected in Transylvania (probably near Hatszeg, Hunyad, Hungary) by C. G. Danford, Esq. Presented by the collector.

Characters.—A large member of the *Microtus arvalis* group, about equal to the Grecian *M. hartingi* in size, but with much longer tail (about 40 mm. instead of 24 to 27 mm.). Skull peculiar in the very short, deep rostrum (depth at back of nasal noticeably greater than distance between front of zygoma and anterior extremity of nasal) and the unusually conspicuous angle (about 34° instead of about 18° to 22° as in *M. arvalis*, *M. hartingi*, and *M. orcadensis*) at which the nasals slope downward; audital bullæ relatively larger than in *M. arvalis*, but not so strongly inflated as in *M. hartingi*. Teeth with pattern of enamel-folding as in *Microtus arvalis*, but all of the triangles, especially those of lower molars, with transverse diameter noticeably increased and area of dentine spaces reduced. Colour apparently as in *M. arvalis*.

Measurements.—Head and body 115 mm.; tail 41; hind foot 18; ear from meatus 12. Skull: condylo-basal length 27 (ca.)†; zygomatic breadth 16.4 (ca.); interorbital breadth 4.0 (ca.); occipital breadth 13; occipital depth 7.6 (ca.); nasal 8.0; diastema 8.4; mandible 17.4 (ca.); maxillary tooth-row 6.6; mandibular tooth-row 6.4.

Specimen examined.—The type.

Microtus asturianus, sp. n.

Type.—Adult female (skin and skull). Collected at

* Measurements in parentheses are those of an old male *Microtus arvalis* from Königsberg, Germany (no. 112213, U.S. National Museum).

† Certain measurements of the badly broken skull were taken before cleaning, while the fragments were still in approximately normal position.

Pájares, Leon, Spain, June 23, 1907, by Norberto Gonzalez. Original number 321.

Characters.—Larger than *Microtus arvalis*, the skull massive and deep, with strongly convex dorsal profile, widely spreading zygomata, short, broad brain-case, strongly ridged interorbital region, and very large audital bullæ; teeth as in *M. arvalis*; colour about as in the more buffy forms of *M. arvalis* (upperparts buffy clay-colour, rather coarsely "lined" with black along median dorsal area, clearer and more nearly approaching ochraceous-buff on sides; underparts dull grey, clear or washed with light buff; feet an indefinite buffy grey tinged with drab, not conspicuously different from colour of back; tail obscurely bicolor, buffy grey below, brownish mixed with grey above).

Measurements.—Type. Head and body 120 mm.; tail 37; hind foot 20*; ear 14. Skull: condylo-basal length, 26.2; zygomatic breadth 15.2; distance from interorbital constriction to back of condyle 15; interorbital constriction 3.2; occipital breadth 12.2; occipital depth (median) 6.4; palatal depth 8.6; na-al 7.8; diastema 7.8; mandible 16.6; maxillary tooth-row 6.6; mandibular tooth-row 6.4.

Specimens examined.—Three, all from the type locality.

Remarks.—In its large, massive skull *Microtus asturianus* differs conspicuously from its nearest geographical ally, *M. arvalis meridianus* of the Basses-Pyrénées region. Its strongly convex dorsal outline gives the skull a superficial resemblance to that of *M. cabreræ* of the Sierra de Guadarrama, but the nasal bones are strictly of the *arvalis* type. The size and massiveness of the skull are so great as to suggest a small *Microtus orcadensis*, but it is scarcely probable that any direct relationship is indicated by this resemblance.

Microtus sandayensis westræ, subsp. n.

Type.—Adult male (skin and skull). B.M. no. 8.1.2.1. Collected at Puriswall, Westray, North Orkney Islands, April 5, 1906, by Norman B. Kinnear, Esq. Original number 290. Presented by the collector.

Characters.—Size and cranial characters as in *Microtus sandayensis sandayensis* (Millais), but first lower molar with anterior outer re-entrant angle occasionally (in 2 specimens among 6) as well developed as in *M. orcadensis*; colour not so pale as in the Sanday vole, the underparts strongly washed with yellowish brown (general effect above a dark hair-brown

* Collector's measurement. In the prepared specimen the hind foot (slightly distorted) after relaxing measures 19.4 mm.

approaching bister, the arrangement of colour as in *M. sandayensis sandayensis*, but light tips to hairs of underfur more nearly dull ochraceous-buff, and dark shading from longer hairs more noticeable; underparts light ochraceous-buff, nearly as in *M. orcadensis*, but colour not so rich, and clouding due to slaty bases of hairs more evident; feet and tail as in true *sandayensis*, but sprinkling of dark hairs on upper side of tail more conspicuous).

Measurements.—Type. Head and body 108 mm.; tail 34; hind foot 18; ear from meatus 10.5. Skull: condylo-basal length 27.2; zygomatic breadth 16.2; interorbital constriction 3.6; occipital breadth 12; occipital depth (median) 6.4; nasal 7.8; diastema 8.2; mandible 17.4; maxillary tooth-row 6.6; mandibular tooth-row 6.8.

Specimens examined.—Seven, all from Westray Island, kindly placed at my disposal by Mr. Kinnear.

Remarks.—The voles of the North Orkney Islands differ from those of the southern group in their smaller size, lighter colour, and in the peculiar low, flattened form of the braincase. In typical *Microtus sandayensis* the first lower molar invariably (12 specimens) differs from that of *M. orcadensis* (53 specimens) in the shallowness of the anterior outer re-entrant angle, which is much less developed than that of the inner side (in *M. orcadensis*, as in the continental members of the *arvalis* group, the two angles are approximately equal). Four specimens of *M. s. westrae* have this aberrant type of tooth, while in two the angles are of normal depth. The colour is less pallid than in the typical form, though not so dark as in *M. orcadensis*.

The degrees of distinctness of the Orkney voles among themselves appear to bear a direct relation to the depth of water separating the islands, and therefore presumably to the length of time that the different colonies have been isolated. Specimens of *M. orcadensis* showing no indication of the existence of local forms on the various islands have been examined from Rousay, Pomona, Shapinshay, and South Ronaldshay, the channels separating which range from 6 to 8 fathoms in depth. Between the islands inhabited by this species and those occupied by *M. sandayensis* lies a narrow but comparatively deep strait, with 17 to 20 fathoms of water. Finally, between Sanday and Westray, with their different, though not completely segregated forms, the depth of the water is intermediate, 10 to 12 fathoms.

Microtus agrestis exsul, subsp. n.

Type.—Adult female (skin and skull). B.M. no. 6. 3. 1. 3. Collected on North Uist, Hebrides, February 5, 1906, by J. F. Davison, Esq. Presented by the collector.

Characters.—In general like the large Scandinavian *Microtus agrestis agrestis*, but underparts with more evident brownish wash, often becoming a clear rather light ochraceous-buff; first upper molar with small third inner triangle usually present (in 10 among 14 specimens) and almost as well developed as second inner triangle of middle molar.

Measurements.—Type. Head and body 123 mm.; tail 44; hind foot 19; ear from meatus 12. Skull: condylo-basal length 28; zygomatic breadth 15·8; interorbital constriction 3·2; occipital breadth 12; occipital depth 6·6; nasal 8·0; diastema 8·2; mandible 18; maxillary tooth-row 7·0; mandibular tooth-row 7·0.

Specimens examined.—Fourteen, eleven from North Uist and three from South Uist, Hebrides*: all but three lent by (Mr. Kinnear. An immature male from Kildalton, Islay No. 392, Kinnear collection), appears to represent the same form, but is too young to be positively identified.

Remarks.—A supplemental triangle in the first upper molar, similar to that usually present in *Microtus agrestis exsul*, occurs in 4 among 32 specimens of true *agrestis* and in only 2 among 48 British mainland skulls. The cranial characters of fully adult individuals of the Hebridean vole as compared with true *agrestis* and the common British form are well indicated by the following table (in mm.) :—

	Number of skulls.	Condylo- basal length.	Mandible.	Upper tooth-row.	Lower tooth-row.
<i>agrestis</i> ..	9	26·4 to 28·4	16·6 to 18	6·6 to 7·0	6·2 to 6·6
<i>exsul</i>	7	27 to 28	17 to 18	6·8 to 7·0	6·4 to 7·0
<i>neglectus</i> ..	13	25 to 26	15·4 to 16·2	5·8 to 6·4	5·8 to 6·2

The discovery of this vole is of unusual interest, as the probable existence of some such animal in North Britain was pointed out several months ago †, at a time when the characters of the Hebridean form were unknown.

* Mr. Kinnear has called my attention to the fact that no voles have yet been found on the island of Lewis, the largest of the Outer Hebrides.

† Stejneger, Smithsonian Miscell. Coll. xlviii. p. 478 (May 4, 1907).

Pitymys subterraneus capucinus, subsp. n.

Type.—Adult female (skin and skull). Collected in spruce-forest near "Salon du Capucin," Mont Dore, Puy de Dôme, France (altitude about 4200 feet), August 2, 1906, by G. S. Miller. Original number 7002.

Characters.—Similar to *Pitymys subterraneus subterraneus*, but skull larger, brain-case broader and more flattened, and colour not so dark (general effect above approaching mars-brown, but with a slight buffy cast; feet a clear, very pale smoke-grey, noticeably contrasting with colour of back).

Measurements.—Type. Head and body 102 mm.; tail 33; hind foot 15. Skull: condylo-basal length 23.4 (22)*; zygomatic breadth 13.8 (13); interorbital constriction 3.8 (3.8); occipital breadth 11.2 (10.8); breadth of brain-case under zygoma 10.8 (9.6); occipital depth (median) 5.4 (5.6); nasal 6.4 (6.0); diastema 7.0 (6.8); mandible 14.8 (13.8); maxillary tooth-row 5.8 (5.2); mandibular tooth-row 5.6 (5.2).

Specimens examined.—Two, both from the type locality.

Pitymys dacius, sp. n.

Type.—Adult female (skin and skull). B.M. no. 4. 4. 6. 65. Collected at Gageni, Roumania, April 25, 1899, by W. Dodson. Original number 65. Presented by the late Lord Lilford.

Characters.—Similar to *Pitymys subterraneus*, but skull larger, nasals more strongly bent downward anteriorly, brain-case more depressed posteriorly (the dorsal profile of skull thus made slightly convex throughout); posterior upper molar with third inner re-entrant angle very shallow; colour indistinguishable from that of *P. subterraneus* in the usual hair-brown phase.

Measurements.—Type. Head and body 88 mm.; tail 32.5; hind foot 14.5; ear from meatus 8.5. Skull: condylo-basal length 23; zygomatic breadth 13.6; interorbital constriction 3.8; occipital breadth 10.8; breadth of brain-case under zygomata 10; occipital depth (median) 5.0; nasal 5.8; diastema 7.0; mandible 15; maxillary tooth-row 5.6; mandibular tooth-row 5.8.

Specimen examined.—The type.

Remarks.—Although represented by a single specimen

* Measurements in parentheses are those of an adult male *M. subterraneus subterraneus* from Belgium (No. 2189, Lataste collection).

only, this species appears to be well characterized by the convex dorsal profile of the skull and the very shallow third re-entrant angle on inner side of posterior upper molar, features which are not closely approximated in a considerable series of *P. subterraneus* from Belgium, France, Switzerland, and the Transylvanian Alps.

Pitymys pyrenaicus brunneus, subsp. n.

Type.—Adult female (skin and skull). B.M. no. 6. 4. 1. 82. Collected in the Forest of Bouconne, Gers, France (altitude 250 m.), February 4, 1900, by A. Robert. Presented by O. Thomas, Esq.

Characters.—Similar to *Pitymys pyrenaicus pyrenaicus*, but colour much more brownish, the upperparts a light, dull, faintly grizzled wood-brown, with scarcely a trace of the bister and clear hair-brown tints characteristic of the typical form.

Measurements.—Type. Head and body 93 mm.; tail 26; hind foot 15; ear from meatus 8. Skull: condylo-basal length 23; zygomatic breadth 14; interorbital constriction 4.0; occipital breadth 11; occipital depth (median) 5.6; palatal depth 6.2; nasal 6.0; diastema 7.0; mandible 15; maxillary tooth-row 5.8; mandibular tooth-row 5.8.

Specimens examined.—Seven, all from the type locality.

Remarks.—This appears to be a well-defined local race of *Pitymys pyrenaicus*, as the seven skins differ without exception from the eleven Pyrenean specimens with which they have been compared. Its geographical range will probably be found to extend over the low country lying between the Pyrenees and the Gironde.

Pitymys planiceps, sp. n.

Type.—Adult (skull only). No. 2190, Lataste collection. Barèges, Hautes-Pyrénées, France. Altitude about 4000 feet.

Characters.—Size about as in *Pitymys pyrenaicus*; teeth as in that species, *P. savii*, &c.; skull more flattened than in any other known European member of the genus, the dorsal profile nearly straight from posterior extremity of nasal to back of interparietal, the general outline when viewed from above essentially as in *P. pyrenaicus* and *P. savii*.

Measurements.—Condylo-basal length 23 (23); zygomatic breadth 14 (13.8); interorbital constriction 3.8 (3.8); occipital breadth 11.4 (11.4); occipital depth 5.4 (6.0); palatal depth 6.2 (6.8); nasal 6.0 (6.2); diastema 7.0 (7.0);

mandible 14·6 (15); maxillary tooth-row 5·6 (5·6); mandibular tooth-row 5·6 (5·6).

Remarks.—The characters of the skull on which this species is based are so peculiar that it seems necessary to recognize the animal as distinct. In September 1906 I visited Barèges chiefly for the purpose of securing further specimens of *Pitymys planiceps*, but though colonies of *P. pyrenaicus* were readily found in the forest above the town, I failed in the main object of my search.

Pitymys pelandonius, sp. n.

Type.—Adult female (skin and skull), collected at Santo Domingo de Silos, Province of Burgos, Spain (altitude 980 m.), October 21, 1906, by G. S. Miller. Original number 7382.

Characters.—Similar to *Pitymys mariae*, Major, but skull with broader, less elongate brain-case; general colour of upperparts wood-brown, the sides somewhat more buffy; feet and tail whitish.

Measurements.—Type. Head and body 96 mm.; tail 28; hind foot 14·4; ear from meatus 8·4. Skull: condylo-basal length 22 (22)*; zygomatic breadth 14 (13); occipital breadth 10·6 (9·8); breadth of brain-case under zygomata 10·2 (9·6); occipital depth (median) 5·6 (5·0); palatal depth 6·8 (6·4); nasal 6·0 (6·0); diastema 6·6 (6·6); mandible 14·4 (14); maxillary tooth-row 5·4 (5·6); mandibular tooth-row 5·6 (5·4).

Specimens examined.—Five, three from the type locality and two from Castrillo de la Reina, Province of Burgos.

Remarks.—At both Silos and Castrillo this animal occurs in rocky ground partly overgrown with shrubs and small trees. Its habits are essentially the same as those of *Pitymys subterraneus* or *P. pyrenaicus*, and much less mole-like than those of the meadow-haunting *P. ibericus*.

Pitymys depressus, sp. n.

Type.—Adult female (in alcohol). B.M. no. 6. 11. 4. 15. Collected at Rascafria, south side of Sierra de Guadarrama, Province of Madrid, Spain, by M. de la Escalera.

Characters.—A member of the *Pitymys duodecimcostatus* group†, related to *P. lusitanicus*, *P. mariae*, and *P. pelandonius*, but immediately recognizable by its broadened, much flattened

* Measurements in parentheses are those of the type (adult female) of *Pitymys mariae*.

† See Major, Ann. & Mag. Nat. Hist. 7th ser. xv. pp. 508-510 (May 1905).

skull and very small audital bullæ. Viewed from the side the skull is as flat as that of *Pitymys savii*; dorsal profile slightly but evenly convex, the nasals not so abruptly sloping as usual; rostrum excessively shallow immediately behind nasals, its least depth barely exceeding greatest combined breadth of nasals; length of brain-case to posterior edge of interparietal barely equal to breadth under zygomata, the general outline subcircular; occipital region oblique posteriorly, so that condyles are plainly visible when skull is viewed from above, very low and wide in posterior view; audital bulla very small and low, the greatest diameter contained about four times in condylo-basal length of skull (about three to three and one half times in *lusitanicus*, *marie*, and *pelandonius*); teeth as in the related species; external characters apparently showing no special peculiarities.

Measurements.—Type. Head and body 85 mm.; tail 25; hind foot 13; ear from meatus 8. Skull: condylo-basal length 22.4; zygomatic breadth 14; interorbital constriction 3.6; occipital breadth 11.2; occipital depth (median) 5.4; palatal depth 6.8; nasal 6.2; diastema 6.4; mandible 14.8; maxillary tooth-row 5.6; mandibular tooth-row 5.6.

Specimens examined.—Four, all from the type locality.

Pitymys ibericus centralis, subsp. n.

Type.—Adult male (skin and skull). Collected at Santo Domingo de Silos, Province of Burgos, Spain (altitude 980 m.), October 15, 1906, by G. S. Miller. Original number 7313.

Characters.—Not so large as *Pitymys ibericus ibericus* (hind foot 16 to 17.2 mm. instead of 17 to 18 mm.); colour hair-brown, usually tinged with buffy, but never so pale as in the typical race; feet whitish, in rather noticeable contrast with back.

Measurements.—Type. Head and body 102 mm.; tail 24; hind foot 16.8; ear from meatus 8. Skull: condylo-basal length 25; zygomatic breadth 15 (ca.); interorbital breadth 4.2; occipital breadth 12; occipital depth 7.0; palatal depth 8.0; nasal 7.0; diastema 8.4; mandible 17.2; maxillary tooth-row 6.0; mandibular tooth-row 6.2.

Specimens examined.—Twenty, all from the type locality.

Remarks.—True *Pitymys ibericus* is a large pallid form, probably confined to the hot coast district of Murcia and Alicante. It is strikingly different from the small Granada animal, its nearest geographical ally, as well as from specimens from Jerez de la Frontera, Seville, Valencia, and Burgos. It is probable that more than one race is represented among the members of this group occurring through Central and North-western Spain.

Pitymys ibericus regulus, subsp. n.

Type.—Adult female (skin and skull). Collected on north slope of the Alhambra Hill, Granada, Spain, December 22, 1906, by G. S. Miller. Original number 7441.

Characters.—Similar to *Pitymys ibericus centralis*, but smaller (hind foot 15 to 16 mm. instead of 16 to 17·2 mm.), and with very small, narrow molars.

Measurements.—Type. Head and body 100 mm.; tail 26; hind foot 16; ear from meatus 9. Skull: condylo-basal length 25; zygomatic breadth 15; interorbital constriction 4·0; occipital breadth 12; occipital depth 6·2; palatal depth 8·0; nasal 6·4; diastema 8·0; mandible 16·6; maxillary tooth-row 5·4; mandibular tooth-row 5·4.

Specimens examined.—Seven, all taken in the almond orchard on north slope of the Alhambra hill.

Remarks.—This local race of *Pitymys ibericus* is at once recognizable by its unusually small molars, the actual structure of which, however, shows no peculiarities. In size of teeth it represents the opposite extreme from the large form occurring in the valley of the Baul, only about 70 km. east of Granada, and also in the Guadalquivir drainage-basin.

Pitymys ibericus fuscus, subsp. n.

Type.—Adult male (skin and skull). Collected on the Dehesa de Valencia, Valencia, Spain, March 7, 1907, by Norberto Gonzalez. Original number 131.

Characters.—Size as in *Pitymys ibericus centralis*, but colour much darker (upperparts a uniform bister, nearly as dark as that of Ridgway, faintly varied by blackish hair-tips and tinged with wood-brown on sides; underparts dull slaty grey washed with buffy; feet whitish, in rather marked contrast with body; tail very obscurely bicolor, whitish tinged above with brown).

Measurements.—Type. Head and body 104 mm.; tail 22; hind foot 17; ear from meatus 10. Skull: condylo-basal length 24·2; zygomatic breadth 14·8; interorbital constriction 4·2; occipital breadth 11·4; occipital depth 6·4; palatal depth 7·6; nasal 6·0; diastema 8·0; mandible 16·4; maxillary tooth-row 5·8; mandibular tooth-row 5·8.

Specimens examined.—Two, both from the type locality.

Remarks.—The two specimens exactly resemble each other and differ conspicuously from all the other Spanish skins examined. Apparently this form is confined to the Dehesa, as in a male taken by Mr. Gonzalez at Catarroja on the adjacent mainland the colour is indistinguishable from that of *P. ibericus centralis*.

BIBLIOGRAPHICAL NOTICE.

European Animals: their Geological History and Geographical Distribution. By R. F. SCHARFF, Ph.D., B.Sc. London: Constable & Co., 1907. Pp. viii, 258. 7s. 6d. net.

DR. SCHARFF has produced a book that will prove of exceeding value to all who are interested in the difficult problem of the geographical distribution of animals. He has brought together a mass of facts concerning both the plants and animals of Europe and their present-day distribution such as will be found in no other work of its kind, and herein he has earned the gratitude of us all.

In his interpretation of many of these facts, however, we venture to think the results of his labours are less satisfactory. And for this reason:—In his Introduction he insists, and rightly, on the importance of palæontological evidence in determining what must have been the centre of distribution for any given group or species; yet, almost in the same breath, he tells us that “our fossil evidence is of so fragmentary a character that it is often extremely difficult to point to any particular country as the home of a species or genus. The present distribution, however, may be looked upon as a reliable guide in directing our enquiries in this respect.” If this is true, why bother about geological evidence? And, as a matter of fact, Dr. Scharff does not, or at most regards it as auxiliary to the evidence afforded by living species; and therein he discounts the value of many of his conclusions.

Thus the present-day distribution of many of the species herein enumerated has to be accounted for by arguments that are far from convincing, in some cases, indeed, they break down completely. In the case of the common rabbit (*Oryctolagus cuniculus*), for example, Dr. Scharff endeavours to show, if we interpret him aright, that we must regard Spain as the land of its origin, from which centre of dispersal it eventually made its way along the S.W. coast of France to Ireland by a continuous land-connection. But since fossil remains of this animal have been found within the confines of Great Britain, this contention may be regarded as robbed of its probability. Spain and Portugal, according to Dr. Scharff, are to be regarded as having played the part of a very important centre of distribution in past times, both of plants and animals. Rather, it would seem, they should be regarded as backwaters which have served as isolation-areas.

Similarly, in describing the distribution of beavers over Europe, he writes: “We have here an example of an animal which evidently spread westward from the east, since it has never been found fossil in either Ireland, Italy, or Spain, where we should have expected it to occur if it had originated in the west.” As a matter of fact, more remains of beavers—and from different horizons—have been found in Italy than in any other part of Europe. That it will be found in Spain is highly probable, for during the Pleistocene period this animal had a remarkably wide range.

The author, too, appears to hold views as to the fixity of mammalian species which are not generally shared, as he speaks more than once of species now living which crossed into this or that area during *Miocene* times. Yet it is surely generally conceded that no existing species extended so far back in time.

Instances of this kind could be multiplied, but we feel that it would savour too much of ingratitude to dwell on the blemishes of these pages; for, despite of them, Dr. Scharff's book is one that all must read, and all will find of very real value, inasmuch as it embraces within its scope Invertebrates as well as Vertebrates, and not a few of the more interesting plants. Moreover, the pages of the work are copiously illustrated. Maps are plentifully distributed, and each map has an "inset" figure of the animal to which it refers. If the defects to which we have referred are made good in a second edition, which in all probability will be demanded, this book will form one of the most admirable treatises on the subject which has ever appeared.

W. P. P.

MISCELLANEOUS.

The Name Archæocidaris. By J. W. GREGORY.

IN the Ann. & Mag. Nat. Hist. for November 1907, Dr. Bather advocates the substitution of the name *Echinocrinus* for the well-known and appropriate name *Archæocidaris*. This change seems unnecessary, and it will probably be admitted by all students of Echinoderms as undesirable unless absolutely necessary. The name *Echinocrinus* is misleading, as it is admitted that it was given by Agassiz under the mistaken idea that the fossils which he thus named were crinoids. No one would take the responsibility of overthrowing a well-established name because it happens to assert a wrong affinity for the genus; but when a truthful name has been well established, it is deplorable to resuscitate a misleading term from which we have been saved by the common-sense of an earlier generation.

In this case there is a sound excuse for allowing the discarded name to remain buried, owing to its close resemblance to the earlier *Echinoencrinus*. *Archæocidaris* is probably more common in the Carboniferous rocks of the west of Scotland than in any other part of the British Isles, and the name is therefore especially well known among Scotch palæontologists. Professor Bell (in the 'Annals' for 1891, ser. 6, vol. viii. pp. 106-9) showed that, according to the strict rules of priority, *Actinia* is the name of a Holothurian and that *Holothuria* is an Ascidian. That fact was pointed out sixteen years ago, but the old use of the names continues in defiance of the rules. Until these changes are accepted I hope palæontologists will retain the name *Archæocidaris*.

University, Glasgow.

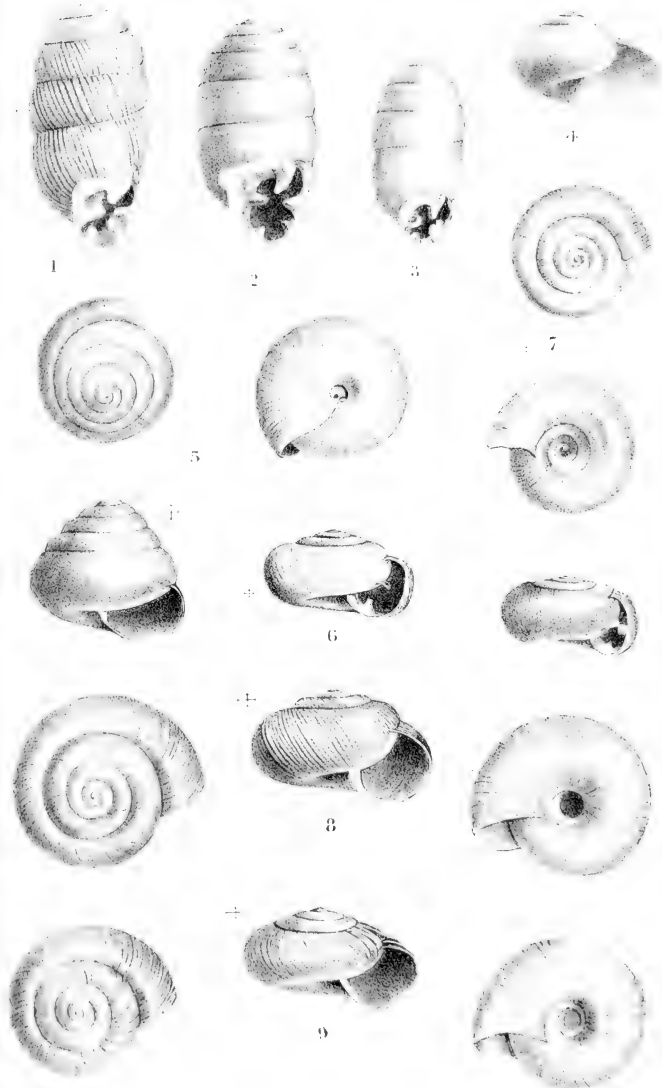


FIG. 4.

FIG. 5.

FIG. 6.



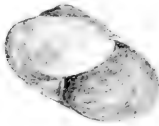




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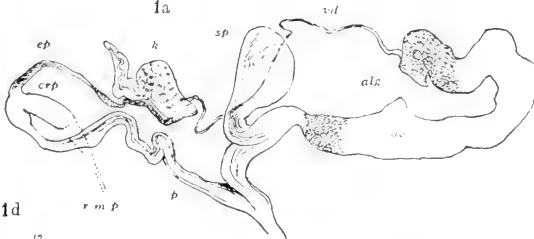
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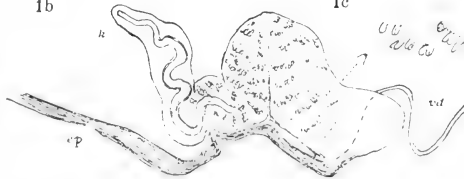
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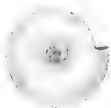
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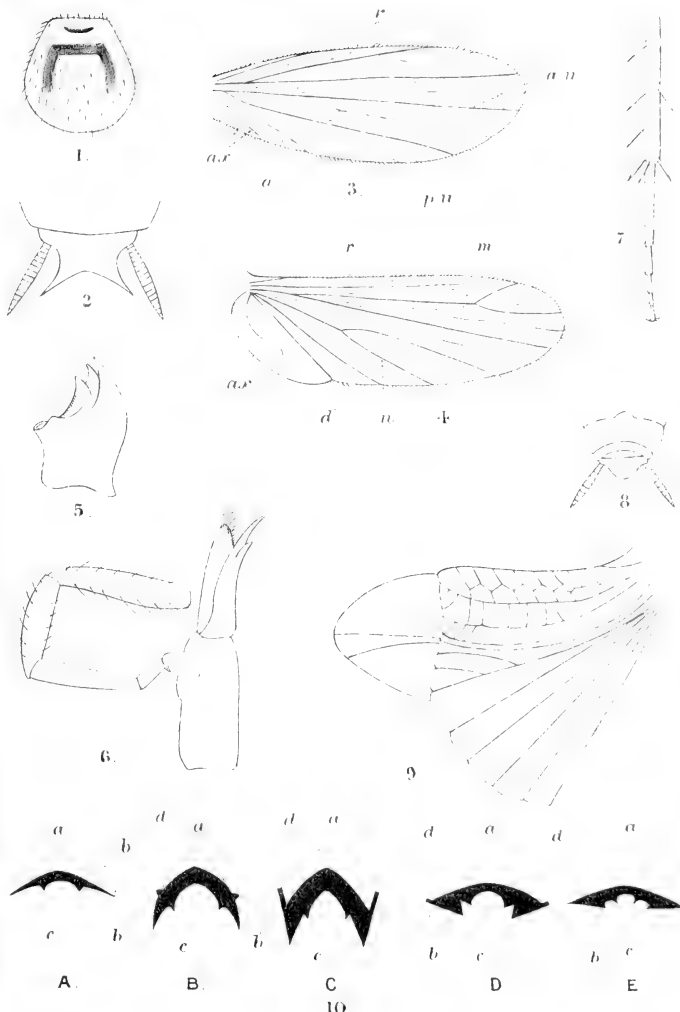
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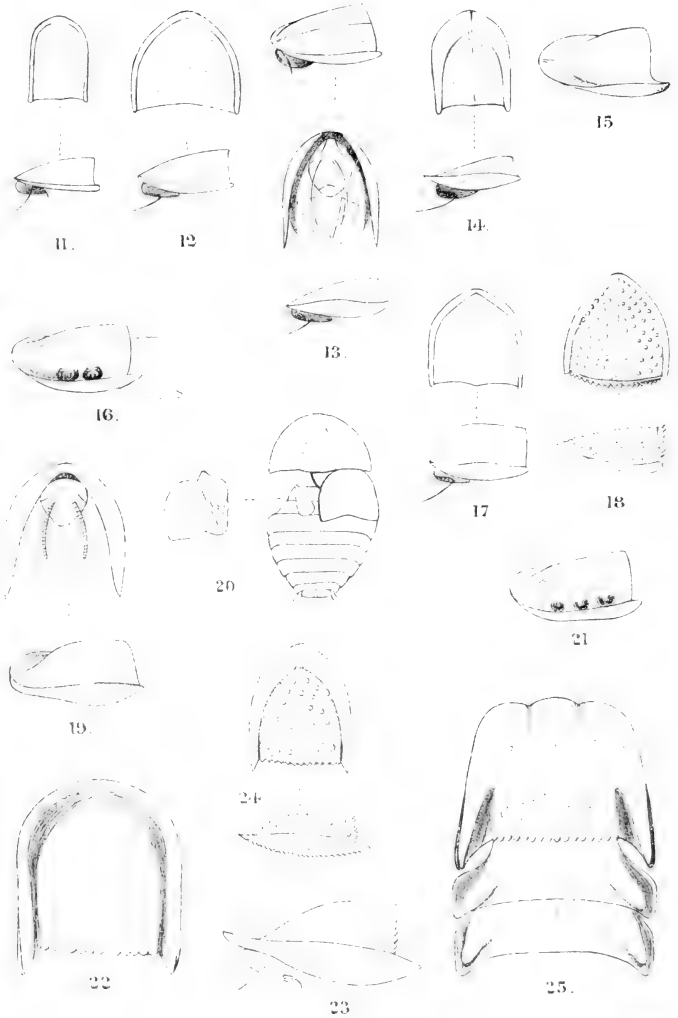
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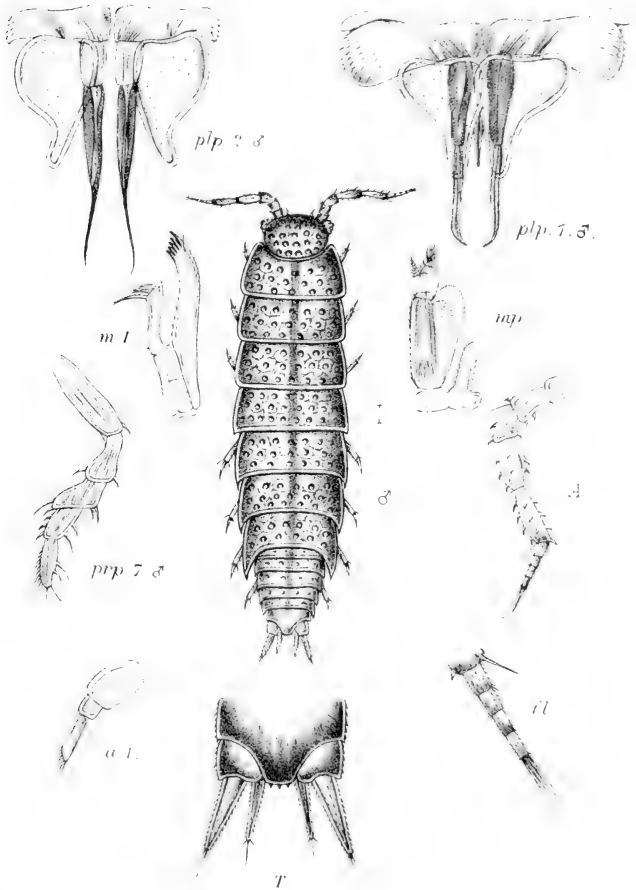














THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 3. MARCH 1908.

XXXII.—*New African Phlebotomic Diptera in the British Museum (Natural History).*—Part I. *Tabanidæ*. By ERNEST E. AUSTEN.

THE interest excited at the present time by blood-sucking flies, in view of the possibility that they may act as carriers of micro-organisms pathogenic to man or domestic animals, supported by an appeal for specimens circulated by H.M. Foreign and Colonial Offices throughout the British Empire, has resulted during the last year or two in the acquisition by the British Museum (Natural History) of a certain amount of material, chiefly from Africa, including many new species. Some of the latter, from Tropical Africa, are described in the following pages, and descriptions of others, including a number of additional species of *Hematopota* (a genus of which the African continent is apparently the headquarters), will be published shortly in subsequent communications in this series. The types of all the new species described below are in the British Museum (Natural History). Coloured figures of the majority will appear later in an official publication.

PANGONINÆ.

GENUS *CADICERA*, Macq.

Cadicera quinquemaculata, sp. n.

♀.—Length (2 specimens) 14.5 to 16.25 mm.; width of
Ann. & Mag. N. Hist. Ser. 8. Vol. i. 14

head 5 to 5·3 mm.; width of front at vertex 0·6 mm.; width of third segment of abdomen 7 to 7·5 mm.; length of wing (perfect only in one specimen) 15 mm.

*Dorsum of thorax clove-brown**, slightly pollinose though shining, with tufts of shining golden-yellow hair on sides; first segment of abdomen dull, sepia-coloured; remaining segments shining black, with a triangular patch of silvery-white appressed hair on each posterior angle of second segment, and a median patch of shining appressed golden-yellow hair on fourth, fifth, and sixth segments, the last patch continuous with a smaller area of similar hair on seventh segment; wings ochraceous buff, anterior portion of proximal half brown and apex infuscated; femora black or blackish brown; tibiæ cream-buff, with a broad blackish-brown band on distal third.

Head black or blackish brown, occipital region, jowls, margins of face, and a transverse band above base of antennæ greyish pollinose; front above this band and face shining (denuded?), latter with long and sparse blackish-brown hairs on sides; under surface of head clothed with blackish-brown hair; ocelli wanting; *palpi* black, not shining, clothed with coarse black hair, last joint less swollen and more pointed at the tip than in *C. rubramarginata*, Macq.; *antennæ* black. *Thorax*: median area of dorsum clothed with short blackish-brown hair, which passes into pale golden-yellow hair in front and behind; the conspicuous lateral tufts of golden-yellow hair are below the ends of the transverse suture and on the postalar calli; pleuræ and pectus seal-brown, clothed with blackish-brown hair. *Abdomen*: first segment clothed with brown hair, a short row of silvery-white hairs on posterior margin on each side near posterior angles; patches of silvery-white hair on second segment transversely elongate, scattered hairs extending almost to middle line, where there are a few golden-yellow hairs; a few whitish or yellowish hairs on posterior angles of fourth segment; remainder of dorsum, except where marked with patches of golden-yellow hair, clothed with short appressed black hair; patch of golden-yellow hair on fourth segment commencing a little before the middle and extending to hind margin; patches on fifth and sixth segments in shape of truncated equilateral triangles reaching to front margins, and with their bases resting on hind margins; venter clothed with minute appressed black hairs, with patches of silvery hair on second and fourth segments towards the sides. *Wings*: brown area

* For names of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1886).

on proximal half extends to end of stigma and down to fifth vein, though the distal extremity of the second basal cell may be somewhat lighter; apical infuscation commencing on costa above fork of third vein and extending to lower branch of latter; third vein infuscated throughout its extent. *Squamæ* whitish. *Halteres* dark brown. *Legs*: front tarsi brown, lighter at base of first joint; middle and hind tarsi dark brown, first joint except tip cream-buff.

Cape Colony, South Africa.—Two specimens (*co-types*): one individual from Pirie Bush, near King William's Town (*A. N. Stenning*); the second specimen without precise locality or other data. These are the two specimens referred to by Miss Ricardo (*Ann. & Mag. Nat. Hist. ser. 7, vol. v. 1900, p. 101*), who, however, was prevented from seeing that both belonged to the same species, since at the time when her paper was written the specimen without data was not set, and its abdomen was consequently concealed by its wings.

Cadicera quinquemaculata cannot be confused with any of the other species of this genus at present described, from which the markings of the tibiæ are alone sufficient to distinguish it without difficulty. It presents, however, a deceptive resemblance in general appearance and markings to *Corizoneura obscura*, Ricardo, the type of which is from Blantyre, Nyasaland Protectorate. Nevertheless, apart from other differences, the *Corizoneura* can be distinguished by the hair on the under side of the head being yellowish white instead of blackish brown, by that on the pleuræ being largely yellowish instead of entirely blackish brown, by the much duller tibiæ, the burnt-umber tips of which do not present nearly such a sharp contrast to the remainder, and by the hind tarsi being entirely russet.

Miss Ricardo's statements (*loc. cit. p. 100*) that in *Cadicera* "ocelli are present" and that in *C. rubramarginata*, Macq., ocelli are "present and distinct" are somewhat misleading, as will be seen from the following results of an examination of the Museum material belonging to this genus. The single specimen (a ♀) of *C. rubramarginata* in the Museum collection has the anterior ocellus alone; a ♂ and two ♀♀ of *C. melanopyga*, Wied., show no ocelli, but a third ♀ of this species has the anterior ocellus alone, which is very minute; in one of four ♀♀ of *C. chrysostigma*, Wied., there is a still more minute anterior ocellus, but the other two ocelli are wanting, and the remaining specimens of this species exhibit no trace of ocelli whatever; the single specimen (a ♂) of *C. crassipalpis*, Macq., has likewise no

trace of ocelli; lastly, in the two co-types of *C. quinque-maculata*, Austen, ocelli are similarly absent. It would appear, then, that in *Cadicera* the ocelli are either obsolete or in a vestigial condition, represented, if present at all, solely by the anterior ocellus. The statement "Pas d'ocelles distincts" in Macquart's diagnosis of the genus is therefore reasonably accurate.

Pangonia biclausa, Lw., = *Cadicera rubramarginata*, Macq., and represents a variety with the fourth posterior cell closed. Loew's remarks on his "Varietät" (Dipt.-Fauna Südafr. p. 91) are sufficient to prove this. Giglio-Tos (Ann. Soc. Ent. Fr., année 1895, p. 357) is in error in thinking that *P. biclausa*, Lw., should be referred to the genus *Scione*, Walk.

Pangonia brevis, Lw., which also has the fourth posterior cell closed, likewise belongs to the genus *Cadicera*, Macq., and has nothing to do with *Scione*, Walk. (cf. Ricardo, *loc. cit.* p. 109). *Cadicera brevis*, Lw., is closely allied to and possibly identical with *C. (Pangonia) melanopyga*, Wied. There can be no doubt that the closed or open condition of the fourth posterior cell is a variable character in *Cadicera*.

Genus PANGONIA, Latr.

Pangonia compacta, sp. n.

♀.—Length (6 specimens) 13·5 to 14·6 mm.; width of head 4·6 to 5 mm.; width of front at vertex just under 1 mm.; length of proboscis 6 to 7 mm.; length of wing 11·5 to 12 mm.; greatest width of wing 4·75 mm.

Compactly built, thick-set species, with short and relatively broad wings, and fourth as well as first posterior cell closed before reaching margin; dorsum of thorax dark olive-yellow pollinose; first three segments of abdomen ochraceous, remainder black or blackish brown, with lighter hind borders; wings tinged with luteous; femora black or blackish brown, extreme tips and tibiae and tarsi buff.

Head grey pollinose, yellowish on the front, vertical region brownish; a shining black median triangle on upper part of front, its base a little above halfway between base of antennæ and occipital margin, and its apex directed backwards; front part of jowls dark brown; under side of head clothed with yellowish-white hair, upper part of front with short yellowish hair; *palpi* brown; first joint of *antennæ* blackish,

second joint dusky with a reddish tinge, third joint ferruginous, first and second joints slightly yellowish pollinose, first joint with long brownish hairs above; proboscis curving downwards. *Thorax* clothed with yellowish pile, longer and somewhat paler on pleuræ. *Abdomen*: first segment with a black median blotch, not reaching hind margin and almost concealed by scutellum; second segment with a median black spot roughly resembling a truncate triangle, which has its base resting on front margin and scarcely extends beyond middle of segment; second and third segments with a more or less distinct black patch on the lateral margins, and third segment usually also with some indistinct blackish markings near the middle line; first segment, except on median black area, clothed with short, appressed, shining, chrome-yellow hair; second and following segments, except on hind borders, clothed with short appressed black hair; hind borders of second, third, and fourth segments clothed with appressed, shining, silvery-white hair, forming transverse bands which are deeper towards the sides; hind borders of following segments similarly fringed with shining chrome-yellow hair, median portion of band on third segment also sometimes chrome-yellow; black hair on fifth and following segments longer, forming a fringe at tip of abdomen; ventral surface of first segment blackish, of second and third segments orange-buff, clothed with minute, appressed, shining, chrome-yellow hair, but without lighter bands on hind borders; ventral surface of fourth segment similar in coloration, but with hind border lighter, and with base or a band across the middle dark brown; ventral surface of remaining segments black or blackish brown, with hind borders yellow and clothed with chrome-yellow hair. *Wings*: first posterior cell closed at a distance of from 0.75 to 1 mm. before reaching margin; fourth posterior cell closed at one third of this distance or less from margin; stigma ochreous; a tuft of whitish hair on base of costa, conspicuous when wings are in resting position. *Squamæ* porcelain-like. *Halteres*: stalk ochraceous, knob yellowish white, conspicuous. *Legs*: coxæ yellowish-grey pollinose, clothed with yellowish hair; femora clothed with black, tibiae with bright cream-coloured hair.

Mashonaland, Southern Rhodesia: type and five other specimens from Salisbury, April, November, December 1899, and March 1900 (*G. A. K. Marshall*).

In addition to the foregoing, the Museum collection contains a series of specimens of what appears to be a subspecies

of *P. compacta*, and may be designated and characterized as follows:—

Pangonia compacta centralis, subsp. n.

♀.—Length 11·3 to 11·6 mm.; length of wing 10 mm.; greatest width of wing 3·9 to 4·1 mm.

Agreeing in all respects with the typical form of P. compacta except:—in its diminutive size (not exceeding 12 mm. in length), in the relatively somewhat greater reduction in the dimensions of the median black spot on the second abdominal segment (which is generally of a quadrate or elongate quadrate shape, and does not reach the middle of the segment), in the usually greater depth of the pale hind border to the fourth segment (in which the blackish-brown area is sometimes so much reduced that the segment is almost entirely ochraceous), and in the darker colour of the wings, which have a more brownish tinge.

Nyasaland Protectorate (British Central Africa): type and six other specimens from the Samulu stream, near Chibwano's, Chikala, 29. iii. 1906 (*Dr. J. E. S. Old*). The collector's field-note is as follows:—"Numerous only near the bank, in the heat of the day; flight rapid, with humming sound much like that ordinarily associated with large common flies. Several were found together in spots only; they rushed at once to the ankles and legs, and inserted the long proboscis. Vegetation—both short and long grass (1 to 5 feet), scrub, and Ficus-trees in the neighbourhood, and low green trees fairly thick on the banks."

In coloration and markings *Pangonia compacta* resembles *P. rüppellii*, Jaenn., the type of which was collected in Abyssinia, from which, however, it can be distinguished by its broader and bulkier body, shorter and broader wings, and closed fourth posterior cell. In spite of the latter character, which will also serve to differentiate the species from most if not all other hitherto described African representatives of the genus in its restricted sense, *Pangonia compacta* is a true *Pangonia*, and cannot be referred to *Scione*, Walk. (*Diclisia*, Schin.), a South-American genus the species of which have hairy eyes and quite a different *facies*. In view of the number of specimens (six of the typical form and seven of the subspecies *centralis*) available for comparison, and the fact that the same character is found in all, it is impossible to consider the closure of the fourth posterior cell as a mere aberration; *P. compacta* and the following species, in which the fourth posterior cell is likewise closed, must therefore be regarded as forming a group distinguished from its congeners by the character in question.

Pangonia fodiens, sp. n.

♀.—Length (1 specimen) 13·5 mm.; width of head 4·5 mm.; width of front at vertex 0·6 mm.; length of wing 10·6 mm.; greatest width of wing 4·25 mm.

Fourth as well as first posterior cell closed before reaching margin of wing.—Dorsum of thorax as in foregoing species; first segment of abdomen straw-yellow and pollinose, except black area beneath scutellum, second and third segments ochraceous, remainder deep black, with buff-coloured hind borders, fringed with shining yellowish hair; basal half of venter cream-buff, second and third segments clothed, except on basal angles, with yellowish-white hair; fourth and following segments of venter deep black, with pale hind margins, very narrow and inconspicuous on fifth, sixth, and seventh segments; wings luteous, not relatively broad; legs as in foregoing species, but last two joints of front and middle tarsi brown, and tips of other tarsal joints brown or brownish.

Head as in foregoing species, but face distinctly less produced, shining black callus on upper half of front guttate instead of triangular, and hair on upper part of front black or blackish; palpi black; coloration of first and second joints of antennæ as in *P. compacta*, though first joint distinctly shorter; third joint wanting. Thorax as in foregoing species. Abdomen: dorsum of second and third segments as in foregoing species, but median basal black triangle on second segment broader and not reaching to middle of segment; basal angles of ventral surface of second and third segments clothed with minute black hairs. Halteres as in foregoing species.

Nyasaland Protectorate (British Central Africa): Samulu stream, near Chibwano's, Chikala, 29. iii. 1906 (*Dr. J. E. S. Old*): taken at same time and place as the specimens of *Pangonia compacta centralis* referred to above.

Although presenting a strong superficial resemblance to *Pangonia compacta*, *P. fodiens* can be distinguished at once by its narrower head and body, less prominent face, and the fact that the tarsi are tipped with brown; the front above the antennæ is also narrower; the remaining differences are sufficiently indicated in the above description. For systematic position, see remarks above, with reference to *Pangonia compacta*.

Pangonia oldii, sp. n.

♂ ♀.—Length, ♂ (10 specimens) 15·5 to 18 mm., ♀ (11 specimens) 15·2 to 17·6 mm.; width of head, (♂) 5 to 5·5

mm., (♀) 5 to 5·75 mm.; width of front of ♀ at vertex 0·75 to 1 mm.; length of proboscis, (♂) 8·75 to 12 mm., (♀) 7·3 to 8·75 mm.; length of wing 13·6 to 15·6 mm.

Dusky, dark-winged species, with first two segments of abdomen tawny, remainder blackish brown with lighter hind borders; median area of third segment often more or less tawny; posterior angles of second, fourth, and fifth segments clothed with silvery-white hair; on second segment silvery hair forms continuous band on hind margin, broadening out on each side of middle line; wings uniformly brownish, first posterior cell closed before reaching margin, fourth posterior cell open; hind legs and front and middle femora chestnut, tips of front and middle tarsi brown, basal joints and front and middle tibiæ ochraceous buff.

Head yellowish pollinose, a brown or brownish patch on middle of front in ♀; face moderately prominent, with a shining black somewhat triangular callus on each side, in ♂ extending to front margin of buccal cavity; ♀ with a shining reddish-brown, elongate, quadrate, median callus between and immediately above bases of antennæ, and a shining dark brown ocellar spot; sides of face below tubercles brownish; in ♀ terminal and most prominent portion of face brown, or, when denuded, shining dark brown; anterior portion of lower margin of jowls dark brown; under side of head clothed with yellowish-white hair; *palpi* ferruginous; *antennæ* orange-rufous, first and second joints pollinose, in ♂ upper side of first and upper and under sides of second joint bearing long black hairs, which in ♀ are confined to upper side of second joint. *Thorax*: dorsum dark brown, yellowish pollinose, and clothed with short yellowish pile, which is intermixed with blackish hairs; lateral margins edged with longer pale yellowish hair, forming a fringe on each side, which includes the postalar callus; the usual longitudinal markings on dorsum, as also the transverse suture, rendered somewhat more distinct by denser pollen, especially in ♀; pleuræ clothed with yellowish pile, a tuft of black or blackish-brown hair on mesopleura, below and a little in front of base of wing. *Abdomen*: first segment with a blackish median area, wholly or partly concealed by scutellum; near this dark blotch clothed with blackish hair, elsewhere with shining cadmium-yellow pile, especially conspicuous on posterior angles and hind margin; second and following segments, except where clothed with silvery-white pile as indicated in diagnosis above, covered with short black hair; in ♂, second segment usually with a small

black median basal spot or triangle; hind borders of third and following segments dull, sepia-coloured in ♂, mummy-brown in ♀; silvery-white hair on posterior angles of fourth segment covering from one fourth to one third of hind margin on each side; lateral margins of sixth or sixth and seventh segments also with yellowish or whitish hair: *ventral surface*, extreme base of first segment blackish or brownish; remainder of first and whole of second segment tawny; in ♂ base of third segment sometimes likewise tawny, but tawny area of venter sharply marked off from blackish-brown apical portion; in venter of ♀ the two colours are usually less sharply contrasted, and the central portion of the third and following segments is often more or less tawny, the blackish-brown colour being confined to the sides of the segments; venter of ♂ clothed with minute black hairs, denser and somewhat longer on apical segments; second segment with more or less conspicuous silvery-white hairs near hind margin, and similar hairs often present near hind margin of fourth segment on each side; sixth and seventh segments with pale yellowish hairs on posterior angles: venter of ♀ with more pale hairs; second segment with minute silvery hairs interspersed among the black except on basal angles; pale yellowish hairs largely present on fourth, also clothing sides of fifth segment, and predominant on following segments. *Halteres*: stalk brownish, knob buff to ochraceous buff. *Legs*: front and middle femora and hind legs (except under side of tarsi) clothed with black hair; under side of hind tarsi clothed with ferruginous hair; front and middle tibiae clothed with pale yellowish hair.

Nyasaland Protectorate (British Central Africa): types of ♂ and ♀ and 16 other specimens from the Nangondo stream and its vicinity, Masanji-Shire District, 31. iii. 1906 (*Dr. J. E. S. Old*); 3 specimens from the Upper Shire River, near Mpimbi, 20 miles west of Zomba, 1100 feet, May 1905, "In large numbers following the nswala antelope" [*Epyceros melampus*] (*Major F. B. Pearce, C.M.G., Deputy Commissioner*). The field-note by *Dr. Old* (after whom I have much pleasure in naming this fine species, as a slight recognition of the efforts made by him during the last four years to supply the National Collection with specimens of the blood-sucking Diptera of British Central Africa) is as follows:—"Nangondo stream: here and some miles beyond, where I shot an mpala [*Epyceros melampus*], which seemed to attract them after a little while, a large *Pangonia* was seen. I send several specimens of it. It makes a loud

humming noise, resembling that of a large bee, and on alighting immediately thrusts its long proboscis through the skin."

Pangonia oldii is closely allied to *P. zonata*, Walk. (a Somaliland species, the type of which is from Tajurrah), but may be distinguished as follows:—In *P. oldii* the shining callus on each side of the face is longer and less abruptly truncated; the sides of the second abdominal segment in front of the hind border are clothed with black instead of golden-yellow hair; the hair on the posterior angles of the second and fourth abdominal segments is pure white instead of yellowish; on the fourth segment these white hairs do not extend to the middle line, whereas the fourth abdominal segment of *P. zonata*, ♀, has a continuous broad hind border of yellowish hair; on the ventral surface the median portion of the second abdominal segment of *P. oldii*, ♀, is clothed largely with silvery hair, that of the same segment of *P. zonata*, ♀, with yellowish hair; the ventral surface of the dark segments at the distal extremity of the abdomen of *P. oldii*, ♀, is clothed with black and yellowish hair intermixed, while in the case of *P. zonata*, ♀, the ventral surface of the same segments is exclusively clothed with a thick coat of yellowish hair: other differences are to be found in the colour of the legs and hair clothing them.

SYNONYMY.

Pangonia alboatra, Walk. (Ins. Saund., Dipt. i. (1850) p. 13.—Cape of Good Hope), = *P. angulata*, Fabr. In Walker's type the white hind border to the second abdominal segment is interrupted in the middle, but the interruption is apparently due to denudation, since, when the abdomen is viewed obliquely from the right front, the hinder border appears to be complete.

Pangonia magrettii, Bezzi (Bull. Soc. Ent. Ital. xxxiii. (1901) p. 7.—Eritrea), is, perhaps, merely a dark form or subspecies of *P. rüppellii*, Jaenn., the type of which is from Abyssinia.

TABANINÆ.

Genus HÆMATOPOTA, Mg.

Hæmatopota fulva, sp. n.

♀.—Length (6 specimens) 8·5 to 10·4 mm.; width of

head 2.4 to 3.2 mm.; width of front at vertex 1 mm.; length of wing 8.5 to 10 mm.

Tawny; thorax somewhat darker, russet; abdomen unicolorous, without markings; wings ochraceous, with a broad light brown or drab-coloured border, commencing just beyond the stigma (above the end of the backwardly-directed appendix to the upper branch of the third vein) and extending to the anal angle, or nearly so; legs tawny, front tarsi and tips of joints of middle and hind tarsi brown.

Head tawny; frontal callus fairly deep, its upper margin straight; brown spot on each side of front well-marked and conspicuous, median frontal spot absent; a small reddish-brown fleck below callus in middle line, between and just above bases of antennæ; face with a shining triangular spot on each side, its apex directed backwards and extending on to jowl; hair clothing jowls tawny; palpi tawny, clothed with blackish mixed with bright tawny hair; antennæ tawny, last three annuli of third joint black, expanded portion of third joint sometimes considerably infuscated towards the tip, first joint short, not incrassated, first and second joints clothed with black hair, last annulus of third joint equal in length to the two preceding annuli taken together. Thorax without conspicuous markings; close to front margin the commencement of a narrow light grey median stripe, at some little distance on each side of which is a faintly indicated light stripe (sometimes tawny olive) extending to transverse suture; pleuræ, pectus, and scutellum of same colour as dorsum. Abdomen clothed with minute ochraceous hairs. Wings: characteristic Hæmatopota-markings very faint, noticeable mainly in the basal halves of the posterior cells, from the second to the fifth; no dark blotch beneath stigma, which is large, elongate, and cinnamon-coloured; first and second basal cells, first submarginal cell as far as fork of third vein, and first posterior cell to same distance without dark markings; one or two faint darker blotches in discal cell, and two or three in apical portion of anal cell; two faint, pale, sinuous streaks usually visible in apex of wing, running from second to third veins, beyond fork of latter; extreme bases of second to fifth posterior cells usually not infuscated; lower down a more or less distinct double row of curved light markings running across these cells, in a direction roughly parallel to hind margin, the upper row sometimes merged in the pale bases of the cells; no pale flecks along hind margin itself, at tips of veins: a doubly curved light streak across the axillary cell beyond the middle; when the wing is viewed against a dark back-

ground, remains of the usual rosettes round the fork of the third vein, distal extremity of the discal cell, and distal extremity of the second basal cell can be seen more or less distinctly in different specimens; appendix to upper branch of third vein rather long. *Halteres* mummy-brown, stalk ochraceous buff.

Angola: type and five other specimens from Benguella, February 1905 (*Dr. F. Creighton Wellman*). Dr. Wellman sends the following note with reference to this species:—“Found in sedgy and grass-grown marshes, near large streams. Like others of its genus, a vicious biter; fairly active; twelve specimens taken.” The collector is to be congratulated on the discovery of this remarkable species, which, owing to its peculiar coloration, cannot be confused with any of its congeners known to me from any part of the world.

Hamatopota denshamii, sp. n.

♀.—Length (6 specimens) 9·6 to 11·3 mm.; width of head 2·8 to 3 mm.; width of front at vertex 1 mm.; length of wing 8·6 to 10·3 mm.

Olive-brown, with five olive-grey longitudinal stripes on dorsum of thorax, and a narrow median light stripe on abdomen; frontal callus black; wings tinged with buff, and with a brown border to the tip and hind margin, as far as the end of the sixth vein; coxæ dark grey, femora olive- or greyish brown.

Head smoke-grey to yellowish grey, vertex with a pair of faint light brown longitudinal stripes, which meet together above callus; *frontal callus* of moderate depth, its upper margin slightly convex and rising to a point in the median line, which in rubbed specimens may be produced into a shining ridge; brown spot on each side of front usually well marked, median frontal spot absent; *palpi* pinkish buff, elongate, blunt at the tips, clothed with black interspersed with light yellowish hair; first and second joints of *antennæ* ochraceous buff, first joint not swollen, expanded portion of third joint dark brown, rufous at the base, last three annuli black, last annulus equal in length to the two preceding annuli taken together. *Thorax*: median stripe on dorsum only half as wide as admedian stripes, latter wider in front; *pleuræ* and *pectus* olive-grey. *Abdomen* clothed with minute, appressed, buff-yellow hairs; *venter* olive-grey on each side. *Wings*: light markings rather coarse; against a dark background remains of the usual three rosettes can be distinguished, otherwise the markings are confined to the brown

border; two sinuous streaks running across tips of sub-marginal cells, beyond fork of third vein, the distal streak breaking up into a series of detached markings running across the posterior cells; axillary cell faintly tinged with brown, with a broad pale streak running parallel with the wing-margin and continued along the sixth vein, thus enclosing an area of darker colour; basal, anal, and discal cells, proximal two-thirds of first posterior cell, and bases of remaining posterior cells not infuscated; a faint dark marking usually visible across middle of discal cell; *stigma* dark brown, conspicuous. *Halteres* light russet to brown, stalk yellowish. *Legs*: tibiæ ochraceous buff, clothed with minute ochraceous hairs, distal two-thirds of front tibiæ brown; front tarsi dark brown, middle and hind tarsi lighter brown, ochraceous buff at base.

Uganda, Nile Province: type and three other specimens taken between Nimule and Wadelai, June 1906 (*the late Dr. W. A. Densham*); two additional specimens from Nimule, November 1904, "on cattle" (*Capt. E. D. W. Greig, I.M.S.*). Named in memory of the late Dr. W. A. Densham, who, when forwarding his specimens, wrote as follows:—"This species was a great pest in June 1906 between Nimule and Wadelai, especially where the grass was long. It did not occur particularly near water, but chiefly along native paths, through open rolling grassy country. Natives are much annoyed by its bite."

Hematopota denshamii is closely allied to *H. similis*, Ricardo, and *H. unicolor*, Ricardo, both of which also occur in Uganda; from the former, however, it is distinguished by the colour of the basal joints of the antennæ, the deeper frontal callus, and the last annulus of the third joint of the antennæ being as long as the two preceding joints taken together, instead of but little longer than either; from *H. unicolor* it may be distinguished by the colour of the frontal callus, and by the first joint of the antennæ not being swollen.

Hematopota semiclara, sp. n.

♀.—Length (7 specimens) 7·5 to 9·6 mm.; width of head 2·25 to 2·6 mm.; width of front at vertex 0·8 mm. to 1 mm.

Grey, body narrow; thorax light olive-grey, with four lighter or darker brown longitudinal stripes: abdomen olive-grey, second to sixth segments inclusive more or less olive on each side of median line, leaving a narrow light median stripe; wing-markings exceedingly faint, tip of wing and hind border

lightly infuscated and variegated with vestiges of the usual light marks, but central area of wing devoid of markings and semi-hyaline; legs dull tawny, tips of tarsi darker.

Head grey on front, yellowish grey on face and jowls; frontal callus dark brown, sometimes more or less ochraceous, very narrow from above downwards, upper margin often produced upwards into a triangular prominence in middle line; blackish-brown or black spot on each side of front well marked, when seen from above it appears surrounded by a very light grey area, median frontal spot absent; palpi cream-buff, clothed on outer side with black hair intermixed with some ochraceous hairs; antennæ short, first and second joints ochraceous buff, first joint slightly incrassated, clothed like the second with black hair, third joint dark brown, ochraceous at base, last three annuli black, last annulus about equal in length to the two preceding annuli taken together. Thorax: dark stripes on dorsum often not reaching front margin; scutellum with a brown fleck on each side, which is sometimes obsolete. Abdomen: olive patches on second and majority of following segments usually quadrate in shape, lateral margins of segments grey; venter with an olive median stripe. Wings: area devoid of markings includes basal, anal, and discal cells, and proximal two-thirds of first submarginal and first posterior cells; second and third posterior cells also without markings at extreme base; stigma elongate, dull tawny ochraceous to dark brown, conspicuous. Legs: front tarsi reddish brown, last joints of middle and hind tarsi brown.

Angola: type and five other specimens from the vicinity of Bailundo, November to December 1904 (Dr. F. Creighton Wellman); one specimen from Benguella, 1905 (Dr. F. C. Wellman). When forwarding these flies Dr. Wellman wrote:—"I took about 60 specimens of this species in long grass in a treeless valley, and in thin bush on the side of a mountain, 220 to 300 miles from the coast. Sluggish. Eyes bright green when alive. Some specimens were infested with a minute red tick." Like the foregoing species, *Hematopota semiclara* is allied to *H. unicolor*, Ricardo, but it is distinguished by its smaller size, more slender shape, less swollen first antennal joint, and by the wing-markings, *inter alia* by the discal cell being entirely semi-hyaline.

Genus TABANUS, Linn.

Tabanus denschamii, sp. n.

♀.—Length (4 specimens) 17 to 21 mm.; width of head

6 to 7 mm.; width of front at vertex 0.6 mm. to just under 1 mm.; length of wing 14 to 17 mm.

Seal-brown; longitudinal stripes on dorsum of thorax and a median series of very broad truncated triangles on abdominal segments grey or smoke-grey; wings with extreme base, costal border as far as end of first longitudinal vein, and base of anal cell dark brown; veins in proximal two-thirds of wing distinctly suffused with brown.

Head: front, face, and jowls grey pollinose; subcallus cream-buff pollinose; face and jowls clothed with whitish hair; sides of front only slightly convergent below; *frontal callus* and its linear extension (when visible) chestnut, callus elongate quadrate, rounded above, touching or but narrowly separated from the eye on each side; ocellar region slightly brownish; eyes bare; *palpi* tapering to a point, clothed with pale yellowish hairs, sometimes thickly interspersed with black hairs on outer side; first joint of *antennæ* pollinose rufous, its upper angle blackish brown, second joint dark brown, third joint black or blackish brown. *Thorax*: pectus, pleuræ, a broad ill-defined stripe above base of wings, and three sharply marked dorsal stripes, the median one very narrow and scarcely extending beyond middle, grey; a stripe of black hair in front of base of wing; postalar callus bearing a conspicuous tuft of whitish hair; grey dorsal stripes clothed with yellowish hair, dorsum elsewhere clothed with dark brown or blackish hair, pectus and pleuræ with whitish hair; *scutellum* grey pollinose, ground-colour ferruginous, brownish at base, clothed at base and on disk with dark brown hair, margin fringed with whitish hair. *Abdomen*: median series of very broad, truncated, smoke-grey triangles on dorsum very conspicuous and sharply defined, forming a continuous series extending from the second to fifth segment inclusive; on the first segment there is merely a median grey spot, in contact with the truncated apex of the triangle on the second segment; on the second, third, and fourth segments the broad bases of the triangles, which rest on the hind margin, extend on each side considerably beyond the truncated apex of the following triangle; a median grey mark sometimes visible on sixth segment; second, third, and fourth segments with a small, somewhat oval, grey spot on each side of the median triangle, and much less pronounced than the latter; first segment lightly greyish pollinose when viewed obliquely from behind; triangles clothed with minute pale yellowish hairs; lateral margins of segments clothed with whitish hair; *venter* greyish pollinose, clothed with minute pale

yellowish hairs, except last segment, which is clothed with coarse, erect, and much longer black hair, and median region of penultimate segment, which is clothed with short black hair; ground-colour of venter ferruginous, with a very broad, interrupted or subinterrupted, dark brown median stripe; second and following segments with a narrow brown posterior band in front of hind margin; extreme hind margins cream-buff. *Wings*: among the veins suffused with brown are the base of the anterior intercalary vein and the posterior transverse vein (together forming the distal boundary of the discal cell), and the extreme base of the upper branch of the third longitudinal; alula and base of anal angle brown, central portion of alula paler; *squamae* blackish brown. *Halteres* brown, knobs usually yellowish. *Legs*: dull ferruginous pollinose, front femora, tips of front tibiae, and all tarsi brownish black; hair for the most part whitish or yellowish, a conspicuous fringe on outside of hind tibiae.

Uganda and North-eastern Rhodesia: type and two other specimens from Unyoro, Uganda, halfway between Masindi and Murchison Falls, January 1907 (*the late Dr. W. A. Densham*); a fourth specimen from Fwambo, N.-E. Rhodesia (near the south-eastern end of Lake Tanganyika), between October 1892 and February 1893 (*W. H. Nutt*).

This exceedingly striking species has been named in honour of the late Dr. W. A. Densham, Medical Officer, Sleeping Sickness Extended Investigations, Uganda, who unfortunately lost his life at the end of May 1907, through being charged by a wounded buffalo. Dr. Densham's specimens, which were received barely two months before his death, formed part of a small but interesting collection of blood-sucking Diptera from Uganda, most carefully pinned, in excellent condition, and accompanied by notes. Another collection had previously been received from Dr. Densham, and there can be no doubt that, had it not been for his untimely death, our knowledge of the blood-sucking flies of one of the newest dependencies of the British Crown would have been largely augmented by the efforts of this painstaking investigator.

Dr. Densham's field-note on this species is as follows:—
“I saw this fly for the first time in January 1907, halfway between Masindi and the Murchison Falls. In its flight and manner of alighting it resembles Fly no. 4 [*Tabanus tæniola*, Pal. de Beauv.], and I overlooked the first that appeared. I found it in several camps in the neighbourhood, but its distribution seems very local. The natives say that it is al

elephant-fly, but I shot an elephant in the vicinity, and saw no biting flies at all on or near it."

Tabanus denshamii is allied to *T. nyasæ*, Ricardo (Ann. & Mag. Nat. Hist. ser. 7, vol. vi. 1900, p. 164:—syn. *T. tarsalis*, Adams, Kansas Univ. Sc. Bull. vol. iii. (xiii.) 1905, p. 151), the type of which is from British Central Africa. *T. nyasæ*, however, is distinguished by its more hyaline wings, less deeply suffused veins, the costal border to end of first vein being merely tawny instead of dark brown, absence of infuscation at the base of the upper branch of the third vein, much larger lateral abdominal spots, narrower median triangles on the abdominal segments, and paler femora and tibiae.

Tabanus wellmanii, sp. n.

♀.—Length (6 specimens) 11·25 to 12·3 mm.; width of head 4 to 4·5 mm.; width of front at vertex 0·5 mm.; length of wing 10 to 11·3 mm.

Front narrow, pearl-grey above; *thorax* clove-brown, with a pair of pearl-grey stripes scarcely extending beyond transverse suture, and a narrow transverse band of silvery pile on hind border; *abdomen* seal-brown, third and fourth segments each with a greyish-white median spot, bluntly triangular or semioval in outline, and clothed with shining, appressed cream-coloured hair.

Head clove-brown, front, face, jowls, and occiput grey pollinose, face and jowls clothed with white hair; *frontal callus* and *subcallus* (? denuded) dark brown, the former elongate quadrate, extending from eye to eye; *palpi* dark brown, slender, clothed with whitish hair; first and second joints of *antennæ* slate-grey, clothed above with minute black hairs, first joint also with whitish hairs below, third joint narrow, elongate, clove-brown, slightly ferruginous at extreme base. *Thorax*: grey dorsal stripes conspicuous when viewed from behind, the interspace also greyish, divided by a narrow median light brown stripe, each grey stripe with a light brown outer edging; ground-colour of transverse posterior band (including greater portion of postalar calli) pearl-grey; *pectus* and *pleuræ* greyish pollinose, clothed with whitish hair; *scutellum* bluish-grey pollinose, upper portion of hind margin brownish. *Abdomen*: median spots with their bases resting on hind margins of segments, spot on third segment not reaching to front margin; sides of first segment, and posterior angles of second, third, and fourth segments grey, clothed with whitish hair; hind

margins of third and fourth segments, on each side of median spot, narrowly grey; venter greyish pollinose, basal portion of segments usually brownish; last two segments clothed with erect black hair, remainder with short, more or less appressed, whitish hair. *Wings* with a brownish tinge; stigma well defined, brown; *squamæ* dark brown. *Halteres* brown, knobs somewhat lighter. *Legs* clove-brown; tibiae, except tips, cream-coloured and clothed with whitish hair; second, third, and fourth joints of front tarsi strongly expanded.

Angola: type and five other specimens from the Chiyaka district, March 1906 (*Dr. F. Creighton Wellman*). I have much pleasure in naming this species after its discoverer, who states that it is a "pertinacious biter," and was "taken in a thick jungle" *.

This and the following species are allied to *Tabanus insignis*, Lw., but present still closer resemblance to a new species which occurs in French Congo (Gaboon), and will shortly be described by M. Surcouf, of the Muséum d'Histoire Naturelle, Paris, under the name of *Tabanus argenteus*. From this species *T. wellmanii* is distinguished by the presence of the pearl-grey stripes on the thorax, by the band of silvery pile on the hind border being much less deep, by the scutellum being for the most part bluish grey instead of dark brown except at the base, and by the abdominal spots not being semicircular and their transverse diameter being much less: the width of each spot is less than that of the space between it and the lateral margin of the segment, instead of greater, as in *T. argenteus*.

Tabanus sharpei, sp. n.

♀.—Length (1 specimen) 11·5 mm.; width of head 4 mm.; width of front at vertex 0·6 mm.; length of wing 9·25 mm.

Closely resembling foregoing species, but distinguishable by the abdominal markings and wider front.—Clove-brown; front pearl-grey; thorax with a pair of narrow, well-defined, pearl-grey stripes, ending just beyond transverse suture, and hind border pearl-grey, clothed with silvery pile; abdomen with sides of first segment, a large quadrate blotch on posterior angles of second, and a doubly emarginate cross-band on hind

* For description of *Chrysops wellmanii*, Austen, discovered by Dr. Wellman in the same district and at the same time, cf. Austen, Ann. & Mag. Nat. Hist. ser. 7, vol. xx., Dec. 1907, pp. 512-513.

borders of third and fourth segments, deepest in centre, light grey.

Head grey pollinose, face and jowls clothed with white hair; front narrowing anteriorly; *frontal callus* somewhat elongate, extending from eye to eye below, narrower above; *palpi* fairly broad at base, then tapering rapidly, cream-buff, clothed with whitish hair; first two joints of *antenna* greyish, their upper angles blackish, first joint clothed for the most part with whitish hair, third joint clove-brown, its basal portion broad. *Thorax*: some yellowish hairs near anterior margin of dorsum, between the stripes; hair on latter whitish; pectus and pleuræ greyish pollinose, clothed with whitish hair; *scutellum* clove-brown, paler at extreme base. *Abdomen*: grey markings clothed with whitish hairs, ground-colour with blackish or dark brown hair; venter grey, with clove-brown cross-band at base of each segment, except first and second, which are entirely grey, and last segment, which is entirely clove-brown; erect coarse black hair on under side of last segment long. *Wings* hyaline, stigma inconspicuous; *squamæ* brownish. *Halteres* walnut-brown. *Legs*: femora dark greyish brown; tibiæ, except tips, cream-buff; front tarsi and tips of front tibiæ black; middle and hind tarsi, and tips of middle and hind tibiæ, seal-brown; front tarsi expanded; femora and tibiæ clothed with whitish or yellowish-white hair; whitish hairs also present on upper side of first three tarsal joints.

Nyasaland Protectorate (British Central Africa): a single specimen from Katumbe, North Nyasa, 6. xii. 1906 (*Dr. J. E. S. Old*). The collector's field-note with reference to this fly is as follows:—"Country, swampy jungle, with very tall, coarse reeds, and forest with low trees. Only game seen were bushbuck, waterbuck, and wart-hog; old eland spoor plentiful, and that of buffalo some months old." This species has been named after Sir Alfred Sharpe, K.C.M.G., C.B., Governor and Commander-in-Chief of the Nyasaland Protectorate, whose efforts on behalf of the big game of the territory under his administration have entitled him to the gratitude of all who have the welfare of the African fauna at heart.

For affinities of *T. sharpei* see notes on *T. wellmanii* above. Besides the differences already mentioned, *T. sharpei* can be distinguished from *T. wellmanii* by the hyaline wings, the practical absence of the stigma, and the narrower front tarsi, in which the angles of the expanded joints are more rounded and much less produced. From *T. argenteus*,

Surcouf, MS., *T. sharpei* is distinguished *inter alia* by the broader front, the much shorter and broader basal portion of the third joint of the antennæ, the shorter palpi, conspicuous grey stripes on the front part of the dorsum of the thorax, the shape of the abdominal markings, and the hyaline wings.

XXXIII.—*On Phytosaurian Remains from the Magnesian Conglomerate of Bristol* (*Rileya platyodon*). By FRIEDRICH BARON HUENE, D.Sc., Tübingen, Germany.

[Plate VI.]

SOME years ago the writer published (Pal. u. geol. Abhandl. vi. (x.) 1902, pp. 62 & 63) a description of one humerus and two vertebræ from the Bristol Conglomerate as Phytosaurian, with the new name *Rileya bristolensis*. Now, after having finished the monograph of European Triassic Dinosaurs (which has not yet completely appeared), I find some more Phytosaurian bones, which I propose to describe here.

The tooth described by Riley and Stutchbury (Trans. Geol. Soc. v. 1836, pl. xxix. fig. 5) as *Palæosaurus platyodon* (and figured by Owen, 'Odontography,' 1845, pl. lxii. A, fig. 7) is not a Dinosaurian, but a Phytosaurian tooth. There is no difference between this tooth and some of the Belodont teeth in the Stuttgart Museum. The name *Palæosaurus* cannot be accepted, because it is preoccupied by Geoffroy for another reptile (Mém. Inst. xii. 1831, p. 48). As this tooth and seven other bones are the only Phytosaurian remains amongst a great many Dinosaurian bones, it is highly probable they belong to the same animal. Some of the bones alone have been called *Rileya bristolensis*, therefore the generic name *Rileya* must now comprise the tooth also. Of course the oldest of the specific names has to be applied, so the animal will be called *Rileya platyodon*, Riley and Stutchbury sp.

Teeth.—The outline of the broad and compressed tooth (type specimen in the Bristol Museum) is like that of a broad lancet-shaped leaf. The base is a little laced. The sharp anterior and posterior edges are finely serrated, so that in 1 mm. length there are little more than 3 denticules. The latter are disposed vertically to the border. The crown is 17 mm. long and 12.5 mm. in maximum breadth. Another tooth from Bristol is in the British Museum (Pl. VI. fig. 1).

Vertebræ.—The vertebræ (fig. 2) are too long for the two species of *Thecodontosaurus* occurring at Bristol. Both centra are similar to those of *Steganolepsis Robertsoni*, Huxley, from Elgin (Pal. u. geol. Abhandl. vi. (x.) 1902, p. 63, fig. 76). They are proximal caudal vertebræ. One of them is 30 mm. long and 25 mm. high, the other is 48 mm. long and 23 mm. high. Both articular faces are slightly concave. There are low præzygapophyses preserved. These vertebræ are in the possession of the Yale University Museum, New Haven, Conn., U.S.A.

Hæmapophyses.—In the Bristol Museum (no. 30) is a proximal hæmapophysis (fig. 3). It is widely bifurcated and had probably two separated articular faces. The distal extremity is broken off.

	mm.
Preserved length.....	40
Greatest diameter from one proximal ramus to the other	30
Length of the clasp, anterior side.....	16
" " posterior side	30
Transverse diameter of the clasp	9

Humerus.—The writer has already described one humerus (Pal. u. geol. Abhandl. vi. (x.) 1902, p. 62, fig. 75), and in the British Museum is a second one. Both are right humeri. That in the British Museum (fig. 4) is incomplete at the distal end, but it is larger than the humerus (fig. 5) in the Bristol Museum (nos. 95 & 96). The anterior aspect of the proximal end is not visible in both humeri; therefore the length of the processus lateralis is unknown. The proximal and distal ends have the same breadth. The median border is strongly incurved, the lateral one is nearly straight. Besides the condylus lateralis is a broad and sharp-edged ectepicondylus. The caput humeri is broken off in both specimens.

	Bristol specimen. mm.	Brit. Mus. specimen. mm.
Total length	170	(?) 190 (pre- served 150)
Width at proximal end	55 (? 60)	75 (80 ?)
" distal end.....	50 (? 60)	..
Diameter in the middle of shaft..	20	23

Radius.—A bone in the Bristol Museum (no. 52) is to be taken as the radius (fig. 6). It is not quite complete at both extremities. The thicker end is the distal one; it shows a

stronger curvature to one side, which must be the ulnar one. The section at the proximal end is oval.

	mm.
Preserved length	130
Probable length	135
Diameters at proximal end	25/15
Diameter in the middle	12
Diameters at distal end	30/17

Metacarpal.—A little flat bone (fig. 7) in the Bristol Museum (no. 102) is probably a metacarpal bone. It resembles a little the metacarpal of *Rhytidodon* figured by McGregor (Mem. Amer. Mus. Nat. Hist. ix. 1906, pl. ix. fig. 27).

	mm.
Length	56
Diameters of proximal end	30/12
" distal end	19/11
" in the middle	8/17

The bones of *Rileya platyodon* indicate an animal of great size. It might be as large as *Myriosuchus*, *Belodon*, and *Rhytidodon*; it is even larger than *Steganolepis*. The anterior leg is much more slender than in *Steganolepis*, about as much as in *Rhytidodon*, only the metacarpals seem to be more enlarged at both extremities. The hæmapophyses have two articular faces, as in *Rhytidodon*.

The teeth of "*Palæosaurus*" *stricklandi*, Davis (Quart. Journ. Geol. Soc. xxxvii. 1881, pl. xxii. fig. 6), from the Rhætic, which are very similar to those here described, also of course belong to a Phytosaur.

EXPLANATION OF PLATE VI.

- Fig. 1.* Tooth of *Rileya platyodon*, Riley and Stutchbury sp., about nat. size (specimen in the British Museum). *a*, side view; *b*, front view; *c*, transverse section; *d*, enlargement of the serration.
- Fig. 2.* Two caudal vertebræ (in the Yale University Museum, New Haven, Conn.), $\frac{1}{2}$ nat. size. Each shows one præzygapophysis.
- Fig. 3.* Back view of proximal hæmapophysis (in the Bristol Museum, no. 30), $\frac{1}{2}$ nat. size.
- Fig. 4.* Back view of right humerus (in the British Museum), $\frac{1}{2}$ nat. size.
- Fig. 5.* Back view of right humerus (in the Bristol Museum, no. 95), $\frac{1}{2}$ nat. size.
- Fig. 6.* Radius (in the Bristol Museum, no. 52), $\frac{1}{2}$ nat. size. *a*, whole view; *b*, distal end from opposite side; *c*, distal end from right side of fig. *a*; *d*, section at proximal end; *e*, section in the middle; *f*, section at distal end (the flat side of it is upper side in fig. *a*).
- Figs. 7 a, 7 b.* Metacarpal (in the Bristol Museum, no. 102), $\frac{1}{2}$ nat. size. Two views of the same.

XXXIV.—Note on the Ophidian Genus *Emydocephalus*.

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

THE genus *Emydocephalus* was proposed by G. Krefft in 1869 for two sea-snakes, *E. annulatus*, Krefft, and *E. tuberculatus*, Krefft, distinguished from *Aipysurus*, Lacep., by the presence of only three labial shields above and below. I regard Krefft's snakes as based on individual differences of the same species, which was described about the same time by Bavay as *Aipysurus chelonicephalus*, and lately by Stejneger as *Emydocephalus ijimæ*. I have now examined a good number of these snakes from the Loyalty Islands and from the Loo Choo Islands, and I have not the slightest doubt that they all belong to one species. In his recent work on the Reptiles of Japan, Stejneger dissents "most emphatically" from this procedure, and maintains his *E. ijimæ* as distinct. However, it will be seen, by referring to his own work, that Major Wall has reported upon six examples from Okinawa, Loo Choo, which clearly show the characters on which he based the distinction to be inconstant.

There is, however, one point in which I now agree with Dr. Stejneger, and that is that the genus *Emydocephalus* should be held distinct from *Aipysurus*, with which I had united it in ignorance of its very marked cranial and dental characters. Stejneger has already pointed out that, contrary to the definition of *Aipysurus*, the maxillary bone in *Emydocephalus* is shorter than the ectopterygoid, and that the poison-fangs are not followed by a series of smaller teeth. But this is not all. Having had a skull prepared, I find that the dentition is rudimentary on the palatine, pterygoid, and dentary bones, that the poison-fangs are remarkably small, and that the supratemporal bone (squamosal of most authors) differs from that of all other sea-snakes in being small and not detached posteriorly from the cranium, a condition very similar to that of *Elaps* among the terrestrial Elapines. The postorbital, which is large in *Aipysurus*, is vestigial in *Emydocephalus*.

The validity of the genus *Emydocephalus* is therefore beyond question.

XXXV.—Notes on a small Collection of Plankton from
New Zealand.—I.

THE collection was made by Miss Margaret Benson, D.Sc., in the Bay of Islands, New Zealand, about 35° S., 174° E. It is much to be desired that other travellers should follow this excellent example; the necessary outfit is small and inexpensive, the work is easy and clean.

Three hauls were made under different conditions, but all were at the surface and between high water and half-tide.

Haul.	Date.	Hour.	Surface temp.	Remarks.
1 A	18. vi. 06.	5 to 5.45 P.M.	54° F.	Overcast.
1 B	21. vi. 06.	9.10 P.M.	54° F.	Starlight.
1 C	23. vi. 06.	4.50 P.M.	57° F.	Clear, sunset.

As might be expected, the bulk of the catch in each case consisted of Medusæ, Copepoda, and other small Crustacea.

I. CRUSTACEA (excluding COPEPODA).
By W. T. CALMAN, D.Sc., British Museum.

(a) CLADOCERA.

Penilia schmackeri, Richard.

Penilia schmackeri, Richard, Ann. Sci. Nat., Zool. (7) xviii. p. 344, pl. xv. figs. 5, 7, 11, 15, pl. xvi. fig. 8 (1895).

Penilia pacifica, Krämer, Trans. New Zealand Inst. xxvii. p. 222, pl. xxiii. figs. 1-5 (1895).

Penilia schmackeri, Hansen, Cladoceren u. Cirripedien, Plankton-Exp. p. 4, pl. i. figs. 1-1 b (1899); Sudler, Proc. Boston Soc. Nat. Hist. xxix. pp. 109-131, 3 pls. (1899); Richard, Bull. Mus. Oceanogr. Monaco, no. 52, p. 9 (1905).

The numerous specimens referred to this species (hauls 1 A, 1 B, and 1 C), which are all females, agree closely with the figures and descriptions of Richard and Hansen quoted above, and confirm the suggestion of Hansen that the *P. pacifica* of Krämer, from Hauraki Gulf and Port Jackson, is identical with Richard's species. The known distribution of the species includes Hong Kong, Vera Cruz (Gulf of Mexico), Beaufort (North Carolina), the Gulf of Guinea, and the Mediterranean.

Podon polyphemoides (Leuckart).

Podon polyphemoides, Poppe, Abh. naturwiss. Ver. Bremen, x. p. 298 (1889); Krämer, Trans. New Zealand Inst. xxvii. p. 221 (1895); Hansen, Cladoceren u. Cirripedien, Plankton-Exp. p. 8 (1899); Lilljeborg, Nova Acta Reg. Soc. Sci. Upsal. (3) xix. p. 633, pl. lxxxv. figs. 7-11 (1900).

Numerous females and a few males are in the collection (hauls 1 A, 1 B, and 1 C). They agree closely with Lilljeborg's description and figures. It is interesting to confirm the occurrence of this species in New Zealand waters, since it has not been recorded from any locality nearer than the Gulf of Guinea (*Hansen*).

Like the last, this is a "neritic" species, only occurring close to land; unlike it, however, it is by no means confined to the warmer seas, being found as far north as the Lofoten Islands.

(b) ISOPODA.

Munna sp.

Three immature female specimens, not exceeding 1.3 mm. in length of body, are in the collection (haul 1 B). They apparently belong to an undescribed species, but in the absence of fully adult specimens it seems inadvisable to attempt to diagnose it. The antennules consist of six segments, apart from a very minute and somewhat doubtful terminal segment. The only species recorded from New Zealand is *M. neozelanica*, Chilton*, which has five large segments and two minute terminal ones in the antennule. Chilton's species further differs from the present in its much larger size (3 mm.) and in having the female operculum broadly truncate instead of pointed.

(c) AMPHIPODA.

Paradexamine pacifica (G. M. Thomson).

Paradexamine pacifica, Stebbing, Das Tierreich, Amphipoda, I. Gammaridea, p. 518 (1906).

Numerous small specimens (haul 1 B), none exceeding 2.5 mm. in length, appear to belong without doubt to this species, which is known from New Zealand and from East Australia.

* Ann. & Mag. Nat. Hist. (6) ix. p. 1, pls. i. & ii. (1892).

In addition to the species mentioned above there occurred (haul 1 B) numerous specimens of a species probably belonging to the family Aoridae. None of the specimens exceed 4 mm. in length, and only in a few of the more minute are the antennules and antennae preserved. In the absence of adult specimens it does not appear possible to identify the species.

(d) MYSIDACEA.

Pseudomma sp.

Among a number of minute specimens of Mysidacea (haul 1 B), too immature for identification, there is one, belonging to the genus *Pseudomma*, which deserves mention, since, so far as I can discover, no species of the genus has hitherto been recorded from the surface*. The specimen, which measures 3 mm. in length, is further remarkable in possessing on each side of the plate which represents the metamorphosed and coalesced ocular peduncles a well-defined crescentic mass of bright red pigment. In the species hitherto described the ocular pigment is completely absent. The specimen approaches *Ps. roseum*, Sars, in the shape of the antennal scale, which has the external tooth very little beyond the middle of its length, and in having four spines on the truncated distal end of the telson. It differs in the absence of distinct serrations on the margin of the ocular plate and in the presence of only three pairs of lateral denticles on the telson. These denticles are not articulated spines, but I learn from Mr. W. M. Tattersall that this is probably a character of immaturity, since in allied genera the spines are at first formed as teeth, which later become articulated.

(e) CUMACEA.

Leptostylis (?) *insularum*, sp. n. (Figs. 1-5 a.)

Description of adult female.—Total length 9.3 mm.

Carapace a little more than two sevenths of total length, nearly twice as long as deep and $1\frac{1}{2}$ times as long as broad, its dorsal surface not strongly arched. Pseudorostrum horizontal, acute, about $\frac{1}{4}$ of total length of carapace. Antennal notch obsolete. Ocular lobe a little broader than long, inflated, without pigment. Frontal lobe crossed by two low, rounded, crescentic, transverse ridges. Near the posterior

* *Ps. australe* is recorded by Sars from 33 fathoms at the entrance to Port Philip, in company with Decapod larvae. Other species are on record from depths of 45-1675 fathoms.

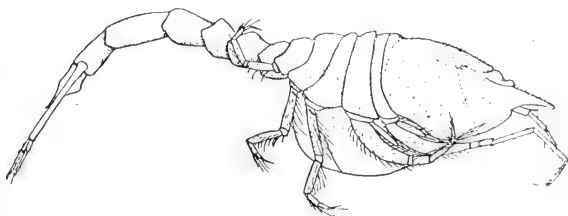
end of the fronto-lateral suture on each side is a shallow depression, and there is a median depression posteriorly between the branchial regions. Posterior margin of carapace slightly raised dorsally. The whole surface of carapace is rough with minute spiniform points and short setæ, and there is a line of minute spines running obliquely downwards and forwards on the anterior part of the lateral surface.

Posterior thoracic and abdominal somites nearly smooth. Third and fourth leg-bearing somites distinct. Posterolateral angles of the fifth rounded.

Abdomen rather stout and, including the telson, about equal in length to the cephalothoracic region. Telson a little longer than last somite, with about nine pairs of lateral spines.

Antennular peduncle extending well beyond tip of pseudo-rostrum, its three segments subequal.

Fig. 1.



Leptostylis (?) *insularum*, adult female, from the side.

Third maxillipeds with the ischium produced externally as a finger-shaped lobe, apparently soft-skinned, carrying a few short setæ (figs. 2 & 2 a).

First legs with basis about three fourths as long as distal segments together, with numerous and very long plumose hairs distally. Dactylus equal to carpus and a little shorter than propodus (fig. 3).

Second legs with basis about four fifths as long as the slender distal segments together, with numerous long hairs. Dactylus nearly twice and carpus four times as long as propodus. Posterior legs stout, with numerous setæ. Basis of third and fourth pairs carrying small exopodites of two segments.

Uropods slender. Peduncle twice as long as telson, with numerous short spines on its inner edge. Rami subequal, a

Fig. 2.

Fig. 2 a.



Fig. 3.



Fig. 2.—*Leptostylis* (?) *insularum*, ad. fem.: third maxilliped from under side. 2 a. Ischium of same, from upper side, further enlarged.
 Fig. 3.—First leg.

little less than half as long as peduncle. Endopodite of three segments, the first slightly longer than second or third,

Fig. 4.

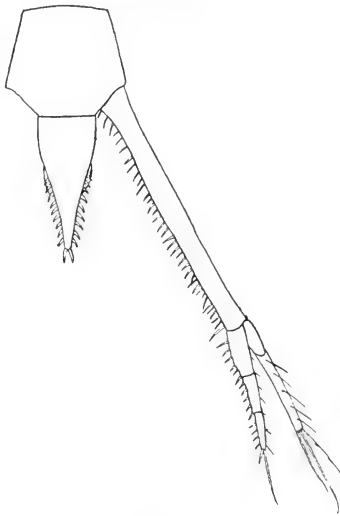


Fig. 5.

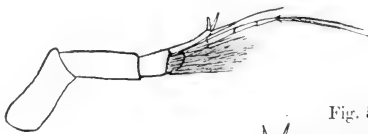


Fig. 5 a.

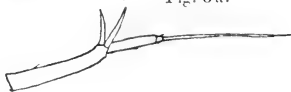


Fig. 4.—Telson and uropod.

Fig. 5.—Antennule of male. 5 a. Inner flagellum of same, further enlarged.

first with six, second with five, third with four spines on inner edge. Two unequal apical spines and a few short

setæ on outer edge. Exopodite with three slender apical spines and some setæ on outer edge (fig. 4).

Adult male.—Total length 9.4 mm.

Carapace less inflated than in female, more than twice as long as deep and one and two thirds as long as broad. Pseudorostrum not more than one seventh of length of carapace. The ridges and depressions described above in the female are all present and there is a slight vertical ridge on the anterior part of the side of the carapace. The surface of the carapace is nearly smooth.

Abdomen a little longer than cephalothoracic region. Telson $1\frac{1}{2}$ times as long as last somite, strongly gibbous dorsally, with nine pairs of lateral spines.

Antennular peduncle (fig. 5) stouter than in female, third segment nearly as stout and less than half as long as the preceding, bearing distally a brush of sensory filaments. Outer flagellum of five segments, the basal one dilated. Inner flagellum (fig. 5a) of three segments, the last very minute and the first having a pair of stout spines at its distal end.

Antennæ as long as the body, of normal structure.

Structure and proportions of third maxillipeds and legs much as in female. All the legs except the last pair bear exopods and have the basal segment expanded.

Peduncle of uropods about one and four fifths as long as telson, with numerous spines on its inner edge. Exopod slightly longer than endopod and about two fifths of length of peduncle. Endopod with seven spines on inner edge of first segment, six on second, and three on third.

First and second pairs of pleopods well developed, biramous; exopod of two segments and endopod unsegmented.

Remarks.—In the possession of vestigial exopodites on the second and third legs of the female this species agrees with those commonly referred to *Leptostylis*, and I accordingly place it provisionally in that genus. It must be admitted, however, that this character is open to suspicion as a generic distinction in view of its variability, as described by Bonnier in his *Diastylopsis* (?) *dubia*. In other respects the new species differs considerably from *L. longimana*, the type of the genus *Leptostylis*, notably in having the telson of moderate size, with more than one pair of lateral spines. I have elsewhere described a species (*L. walkeri*, Bull. Mus. d'Hist. Nat. Paris, 1907, p. 121) having numerous lateral spines on the telson, which is nevertheless closely allied to certain undoubted species of *Leptostylis*, and the same character is found in several species which Zimmer has referred to that genus.

Diastylis neo-zealanica, G. M. Thomson (Journ. Linn. Soc., Zool. xxiv. p. 268, pl. xviii. figs. 1-11, 1892), of which I have examined a specimen kindly sent me by Mr. Thomson agrees closely with the present species in the form and armature of the telson and uropods, in having minute exopods on the third and fourth pairs of legs, and in the form of the ischium of the third maxilliped (the original figure of this appendage is defective in this point). The two species are at once distinguished, however, by the form of the carapace, which in Mr. Thomson's species is obliquely costate.

Leptostylis sp.

A species closely allied to, but apparently distinct from, Zimmer's *Leptostylis thileniusi* (Zool. Jahrb., Abth. Syst. xvii. p. 449, 1902) is represented by a number of males (the largest only 3.3 mm. in length) and a single young female. As all the specimens are in poor condition, however, I do not attempt to describe the species fully. It differs from that described by Zimmer in having the cephalothoracic region not longer than the abdomen, the third free thoracic somite not strongly produced backwards at the sides, so that there is only a slight interval between the second and third pairs of legs, and the telson armed with only three pairs of lateral spines. The two forms agree in the armature of the abdomen, with ventral spines and dorsal setæ, and apparently in the disposition of the ridges on the carapace, although these are difficult to see in our specimens. They further agree in the remarkable and characteristic structure of the third maxilliped, which, however, I interpret somewhat differently from Dr. Zimmer. The large rounded plate which he describes as a process of the second segment (basis) of the limb is, according to my observations, an outgrowth from the third segment or ischium, and is an enlargement of the digitiform process of that segment observed in *L. insularum*. It is, indeed, adherent along its proximal border to the distal border of the basis; but this connexion is simply a continuation of the articulation between the basis and ischium.

(f) DECAPODA.

Pinnotheres sp.

A single male specimen belonging to this genus occurred in haul 1 B. In the present state of our knowledge the identification of solitary specimens of this sex appears to be

hardly possible. Two species of the genus, *P. pisum* (L.) and *P. novæ-zealandiæ*, Filhol, are mentioned in Hutton's 'Index Faunæ Novæ Zealandiæ' (1904, p. 250). I am not aware of any observations on the swimming-powers of the males, but the occurrence of a specimen in a tow-net gathering is unexpected.

II. CHÆTOGNATHA.

By G. HERBERT FOWLER, B.A., Ph.D.

Two specimens only occurred in the collection, both in haul 1 A. They were immature, showing neither ovaries nor testes, and no trace of the corona ciliata was left. Formulæ* :—

10	25	8	3	3
10	23	9	3	2-3

While the formulæ and the flaccid body suggest *hexaptera*, the presence of a neck-constriction behind the head and the apparent extension of the lateral fins are against this determination; further, the tips of the jaws are clearly not of hexapteran type. On the other hand, no species, even at 10 mm. in length, has been recorded with so few teeth. The specimens seem pretty clearly to belong to an undescribed species, but it is eminently undesirable to give a name to two immature examples. In the hope that further specimens may be captured elsewhere in Southern Seas are appended the diagnostic characters :—

Head small, separated from the trunk by a neck-constriction; no collarette present. Body flaccid, thickest about the middle of the total length, tapering gradually forwards, diminishing rapidly near the tail-septum. Longitudinal muscles broad but weak, lateral fields narrow. Tail-segment narrow, 23 to 25 per cent. of the total length (including tail-fin). Anterior fins long, (?) widest about the middle of their length, reaching anteriorly to the ganglion, posteriorly almost to the posterior fin. Posterior fins fairly long, (?) about as wide as the anterior fins, widest in front of the tail-septum; about two thirds are on the trunk and one third on the tail. Jaws slender, the oldest with slightly curved tips; tip small. Vestibular ridge undeveloped; corona ciliata not seen.



* For these and the terminology employed should be consulted 'Siboga' Expedition, Report on the Chaetognatha, by G. Herbert Fowler. Leiden, 1906.

The lateral fins were a good deal folded and the epidermis had become detached from the body-wall, so that it was not possible to ascertain the exact boundaries of the fins; the rays were very inconspicuous.

XXXVI.—On some new Species of the Coleopterous Genus *Mimela*. By GILBERT J. ARROW.

THE species of this brilliant genus of Rutelidæ, although ranging as far as Japan and Java, appear to flourish to a special and remarkable degree in the eastern part of the Himalayan region, Burma, and Tonkin. Half the fifty described species are inhabitants of that region, and eight more are here described from the same part, all of them contained in the British Museum collection. One from Western and another from Eastern China have been added.

Mimela lævigata, sp. n.

Læte viridi-metallica, nitida, supra paulo magis aureo-viridis, elytrorum sutura angustissime violacea; capite irregulariter punctato, prothoracis et elytrorum lateribus grosse punctatis, supra fere lævigatis, pygidio fere lævi, punctis nonnullis marginalibus, corpore subtus glabro, metasterni lateribus solum crebre punctatis; mesosterno sat longe producto, haud acuto, tibiis anticis extus sinuatis, haud dentatis.

Long. 21–22 mm.; lat. max. 12 mm.

Hab. Sikkim (*Sir J. D. Hooker*); Mungphu (*E. Atkinson*).

Entirely bright metallic green, with the upper surface rather more golden green and the extreme edge of the elytral suture violet. It is a large species, of elongate oval form and almost devoid of hairy clothing. The head is irregularly punctured, the clypeus rugosely. The pronotum is scarcely visibly punctured on its disk, but strongly and confluent at the sides. The scutellum is short and smooth. The elytra are almost without punctures on the inner half, but very strongly and irregularly punctured on the outer half, and the pygidium is very smooth, only exhibiting a few punctures near its circumference. The prosternal process is broad and triangular at the summit, and the mesosternal process is moderately long but rather blunt. The front tibiæ are without a lateral tooth in either sex.

Our collection contains one specimen of each sex.

Mimela marginalis, sp. n.

Saturate viridis, haud metallica, antennis, clypeo, pedibus, abdominis extremitate supra et subtus, prothoracis et elytrorum marginibusque externis flavibus, plus minusve viriditinctis, corpore subtus fusco-æneo; corpore supra tenuiter minute punctato, clypeo subtiliter rugoso; mesosterno paulo producto sat acuto, tibiis anticis bidentatis.

Long. 19-23 mm.; lat. max. 12-13 mm.

Hab. Allahabad, Mungphu, Bhotan.

Deep non-metallic green, with the antennæ, clypeus, legs, the hind margins of the propygidium and pygidium, the outer margins of the pronotum and elytra, and usually the extremity of the abdomen beneath testaceous, more or less suffused with metallic green. The body is oval, very smooth, very lightly punctured above and thinly clothed at the sides beneath with greyish hairs. The clypeus is finely rugose, the forehead, pronotum, and scutellum minutely and sparingly punctured. The elytra are finely and rather irregularly punctured, with a complete line of punctures upon each adjoining the suture, and a few other imperfect lines. The pygidium is rather more coarsely but not deeply punctured. The antennæ are long, the mesosternal process is short but rather slender and acute, and the front tibiæ are bidentate, the apical tooth being blunt and long and the lateral one short and rather sharp. The inner claw of the front tarsus is rather widely cleft.

♀. The terminal tooth of the front tibia is very long.

M. marginalis is most nearly related to the Ceylon species *M. mundissima*, Walker, but is larger, more elongate, and has a less sharply defined marginal yellow band. In the Ceylonese species the mesosternal process is not produced and the front tibiæ are not distinctly bidentate. It, again, is closely allied to the S.-Indian *M. xanthorrhina*, Hope, which differs in its paler green colour, less definite marginal band, and more strongly sculptured elytra.

Mimela amabilis, sp. n.

Saturate viridis, supra haud metallica, corpore subtus pedibusque metallicis, antennis fere nigris; corpore convexo, subgloboso, supra sat lævi, subtiliter punctato; mesosterno angulato, sed ultra coxas medias haud producto, tibiis anticis fœminæ distincte, maris vix bidentatis.

Long. 15-16 mm.; lat. max. 9.5 mm.

Hab. Burma, Karen Hills; Siam, Renong (*Doherty*).

Deep green, with the legs and lower surface metallic, and the upper surface non-metallic but with a very faint rosy reflection, generally visible at least in the anterior part. The head and prothorax are finely and rather closely punctured, the clypeus almost rugosely. The scutellum has a few very minute punctures and the elytra are lightly and thinly punctured, in rows, the subsutural interstice being irregularly punctured. The pygidium is finely punctured—a little more strongly at the sides. The mesosternum is not produced in front of the coxæ.

♂. The front tibia has a rather long blunt apical tooth, but only a vestige of a lateral one.

♀. The front tibia is distinctly bidentate.

This species is very closely related to *M. downesi*, Hope, but that is almost entirely devoid of puncturation upon the upper surface.

Mimela ohausi, sp. n.

Læte viridi-metallica, capitis medio, pronoto utrinque, elytri utriusque vitta externa aliaque media, femorum 4 posteriorum medio, segmentorum abdominalium lateribus pygidiique apice igneorufis, scutello cœruleo; capite crebre rugoso, postice fortiter punctato, prothorace, scutello, elytris pygidioque leviter ac sparse punctulatis; mesosterno haud producto, tibiis anticis utriusque sexus fortiter bidentatis.

Var. tota violacea.

Long. 1.45 mm.; lat. max. 8 mm.

Hab. Assam, Tonkin, Yunnan.

Bright metallic green, with a deep blue scutellum and fiery-red patches on the head, each side of the pronotum, the end of the pygidium, the four posterior femora and the sides of the ventral segments, and a discoidal and lateral stripe on each elytron. It is a small species of elongate-oval shape. The head is closely and finely rugose in front and strongly punctured on the vertex, the pronotum and scutellum very thinly and minutely punctured and the former deeply channelled along the middle and rather inflated on each side. The elytra are very lightly punctured, some of the punctures forming double rows. The pygidium has a few moderately strong punctures. The prosternal process is narrow and not very prominent, and the mesosternum is not produced. The front tibiæ are strongly bidentate in both sexes.

In the female the apical tooth of the front tibia is longer and blunter and the club of the antenna rather shorter than in the male. The only female I have seen is a specimen of a deep violet colour in the collection of Dr. Ohaus.

This species very closely resembles *M. horsfieldi*, Hope, in its form, colouring, and puncturation, but is generally rather smaller. It is less regularly oval in shape, and the form of the prosternal process, mesosternum, and front tibiæ are quite different. In addition the eyes are larger, the head much more strongly sculptured, the pronotum has a deep median groove, and its sides are more convex and not strongly punctured.

Mimela atkinsoni, sp. n.

Parva, ovata, sat globosa, polita, omnino brunneo-ænea, corpore supra subtiliter punctato, clypeo paulo rugoso, prothorace sat angusto, æqualiter punctato, haud sulcato; pedibus brevibus, posticis crassis, tibiis anticis leviter bidentatis; mesosterno haud producto.

Long. 13 mm.; lat. max. 8 mm.

Hab. Pegu, Tenasserim.

Collected by the late E. T. Atkinson.

Very shining deep metallic olive-green above and below, except the antennæ, which are deep red. The form is oval, convex, and rather globular, the head relatively rather large, and the legs short, the hind legs very thick and the femora strongly arched. The clypeus is strongly and almost rugosely punctured, the forehead and prothorax rather closely, but a little less closely at the sides of the latter, the scutellum very sparingly. The elytra are minutely punctured in nearly regular longitudinal lines, of which the innermost are strongly impressed at the posterior margins. The pygidium is rather deeply but not closely punctured, the lower surface of the body almost smooth. The prosternum is large and the mesosternum not produced. The front tibiæ are bidentate, and the upper tooth is minute and obtuse in the male and rather more marked in the female.

In the type (♂) specimen the outer margins of the elytra have a rosy tint which I have not seen in others.

In colouring, sculpture, the compact form, and the structure of the hind legs *M. atkinsoni* very nearly approaches *M. excisipes*, Reitter, but it is smaller, more globose, and a little less strongly punctured, the sculpture of the sides of the pronotum in particular not being rugose.

There are specimens in the British Museum and in Dr. Ohaus's collection, all of them collected by the late E. T. Atkinson.

Mimela subsericea, sp. n.

Viridi-metallica, corpore subtus, pedibus antennisque æneo-testaceis, tarsis rufo-cupreis, corpore supra creberrime punctato, capitis antice pronotique marginibus lateralibus punctis confluentibus, aliis distinctis; mesosterno minutissime producto, coxas intermedias haud superante, processu prosternali lato, robusto; pedibus sat robustis, tibiis anticis haud acute bidentatis, antennis sat gracilibus.

Long. 14–15 mm.; lat. max. 8–9 mm.

Hab. Assam, Naga Hills (*Doherty*); Burma, Ruby Mines (*Doherty*), Mandalay (*Atkinson*).

Bright metallic green, with the lower surface and legs coppery testaceous and the tarsi more or less fiery-copper-coloured. The body is rather globose and the legs short and stout, and the whole upper surface is very strongly and densely punctured, but moderately shining. The punctures are confluent on the clypeus and at the sides of the head and pronotum. There is a straight line of punctures on each side of the elytral suture, leaving a quite smooth inner margin to each elytron, and slight traces of three or four other smooth longitudinal lines upon each. The pygidium is strongly but less densely punctured. The prosternal process is rather broad, the mesosternal process pointed but not produced, and the front tibia has a very long blunt terminal tooth and a slight upper tooth.

This species is nearly allied to the succeeding one (*M. soror*), but smaller and more densely punctured, except upon the pygidium, which is smoother and more shining. The mesosternum is not distinctly produced as in that species, and the hind angles of the pronotum are much more rounded.

It is represented in the British Museum and in Dr. Ohaus's Collection.

Mimela soror, sp. n.

Læte viridi-metallica, pygidii lateribus nunnihil, corpore subtus pedibusque testaceo-dilutis, ore antennisque flavis; corpore supra toto dense punctato, clypeo rugoso; processu mesosternali minuto, acuto, tibiis anticis haud acute bidentatis, antennis gracilibus.

Long. 19–20 mm.; lat. max. 10·5–11·5 mm.

Hab. N. India, Manipur (*Doherty*).

This species is metallic green above and the antennæ, legs, and lower surface are ferruginous and more or less suffused with green. A small pale patch is vaguely traceable on each side of the pygidium in certain lights. The form is oval and

convex. The clypeus is broad and coarsely rugose, the forehead strongly punctured, the pronotum coarsely and densely at the sides and a little more finely in the middle, the scutellum very minutely and the elytra densely and irregularly, leaving only a narrow smooth sutural strip and slight vestiges of two or three others upon each. The pygidium is strongly and thickly punctured, the punctures becoming confluent at the sides, and the lower surface of the body is smooth in the middle and rugose and hairy at the sides. The mesosternal process is very short but sharp, and the front tibiæ (in the female) have a long blunt terminal tooth and a feeble upper one.

It is very closely related to *M. chrysoprasa*, Hope, of Borneo and the Malay Peninsula, but a little smaller, with the prothorax rather less strongly punctured, the scutellum more minutely, the pygidium punctured instead of finely granulated, and the femora and tibiæ of a rather darker shade.

The two females in the British Museum were collected by the late W. Doherty.

Mimela pyriformis, sp. n.

Viridi-metallica, corporis supra marginibus externis omnibus anguste flavescens, corpore subtus, pedibus antennisque testaceis leviter viridi-micantibus; corpore supra densissime punctato, pygidio minute granulato et setoso, elytris postice dilatatis; processu mesosternali acutissimo, tibiis anticis bidentatis, dente superiore minuto, acuto.

Long. 23 mm.; lat. max. 14 mm.

Hab. Assam, Naga Hills.

This insect has a peculiar pear-shaped outline, producing an approximation to the curious form of *M. sericea*, Ohaus, but it is larger and more convex and much less opaque.

It is metallic green, slightly shining, with the outer margins of the clypeus, prothorax, and elytra, the lower surface, legs, and antennæ testaceous, with a greenish reflection. The head is rugosely punctured, the punctures almost obliterated upon the clypeus; the pronotum is very densely punctured, the scutellum moderately, the elytra densely and uniformly, with a smooth juxta-sutural line and an almost obliterated dorsal one. The outer edges of the elytra are nearly straight and diverge slightly for almost their whole length, so that their greatest breadth is very little before the extremity. They are long and slope rather gradually at the hinder part. The pygidium is short and broad, finely granulated and

thinly pubescent. The mesosternal process is small but acutely produced. The front tibiæ are distinctly bidentate and the antennæ slender.

There are two male specimens in the British Museum, one of them collected by the late E. T. Atkinson and the other by Col. W. F. Badgley.

Mimela oblonga, sp. n.

Elongata, convexa, læte olivaceo-viridis, clypeo, prothoracis lateribus pygidiique lateribus postice pallidioribus atque metallicis; sat crebre haud grosse punctata, clypeo, prothoracis marginibus pygidioque rugosis; corpore subtus sat dense hirto, cum femoribus testaceo, abdomine cuprascente, tibiis brunneis, tarsis nigris; mesosterno haud producto, tibiis anticis obtuse bidentatis.

Long. 21 mm.; lat. max. 12 mm.

Hab. Sze-chuen, Chin-fu-san.

Four specimens (all females) have been sent to us by the Rev. Wilfred A. Maw.

Light olivaceous green, with the clypeus, the lateral margins of the pronotum, and the posterior part of the sides of the pygidium pale and metallic, the femora and breast testaceous, the abdomen more or less dark coppery, the tibiæ brown, and the tarsi black. It is strongly convex, shining, and elongate, with the sides subparallel, and the breast and the sides of the abdomen are thickly clothed with grey hair. The clypeus is coarsely rugose and rather straight in front, the forehead strongly punctured, the pronotum, scutellum, and elytra moderately finely but closely, the punctures becoming much coarser and confluent at the sides of the pronotum. The pygidium is coarsely rugose but slightly shining. The mesosternum is pointed but scarcely extends beyond the middle coxæ, and the front tibiæ are bluntly bidentate.

This species is very closely related to *M. passerinii*, Hope, and of the same colour and shape, but its smoother upper surface gives it a quite different appearance. The elytra are much more finely but moderately closely punctured, and the pygidium is rugose, but not so densely as in *M. passerinii*, and scarcely hairy. The prosternum also is blunter and scarcely produced.

Mimela plicicollis, sp. n.

Viridi-ænea, clypeo, pronoti lateribus elytrisque paulo dilutioribus, corpore subtus pedibusque cupreis; clypeo rugoso, fronte rugose

punctata, prothorace æqualiter et subtiliter punctato, medio profunde longitudinaliter sulcato, lateribus sat leviter arcuatis, postice plus minusve plicatis, elytris fortiter punctatis, lineis geminatis longitudinalibus postice impressis, pygidio grosse fere rugose punctato; mesosterno haud producto, tibiis anticis bidentatis.

Long. 13-15 mm.; lat. max. 8-9 mm.

Hab. E. China, Tientsin.

A considerable number of specimens were collected from April to June 1906 by Mr. F. M. Thomson.

It is nearly related to *M. specularis*, Ohaus, and *M. vittai-collis*, Burm., and the colour is that of the latter except that it is almost uniform above, only the clypeus, the lateral margins of the prothorax, and the elytra being a shade lighter. It is smaller than either of those species, and the curious corrugation of the posterior part of the sides of the prothorax distinguishes it at a glance from all. This corrugation is variable in its extent, but is almost invariably a very marked feature. The upper surface of the insect is strongly and closely punctured, except the prothorax and scutellum, of which the puncturation is fine. The pygidium is coarsely punctured and the sides of the body are thinly pubescent beneath. The mesosternum is pointed, but not produced beyond the coxæ, and the front tibiæ are bidentate in both sexes.

I printed in 1899 a few synonymical notes relating to *Mimela*. To these I may add the following:—

M. lucidula, Hope, and *lathamii*, Hope, belong to *M. splendens*, Gyll.

M. glabra, Hope, type, is a female of *M. downesi*, Hope.

M. limbata, Burm., and *M. pomacea*, Bates, are *M. passerinii*, Hope,

M. covalis, Ohaus, is *M.* (" *Anomala* ") *inscripta*, Nonf.

M. pyroscelis, Hope, is a species of *Anomala*.

XXXVII.—*Description of a new Elapine Snake of the Genus Apisthocalamus, Blgr., from New Guinea.* By G. A. BOULENGER, F.R.S.

Apisthocalamus loennbergii.

Snout short, broadly rounded. Rostral a little broader than deep, the portion visible from above measuring one

fourth to one third its distance from the frontal ; internasals about half the length of the præfrontals ; frontal once and one fifth to once and one third as long as broad, as long as or a little shorter than its distance from the end of the snout, much shorter than the parietals ; nostril between two nasals, narrowly separated from the internasal and the first labial ; præocular once and a half to twice as long as deep, in contact with or narrowly separated from the posterior nasal ; one postocular (exceptionally two) ; temporals 1+1 or 2 ; six upper labials (exceptionally seven), third and fourth (or third, fourth, and fifth) entering the eye, last largest ; three or four lower labials in contact with the anterior chin-shields, which are as large as the posterior. Scales in 15 rows. Ventrals 213-218 ; anal divided ; subcaudals 22-32. Dark olive-brown above, lateral scales yellowish in the centre ; upper lip and lower parts yellowish, without spots ; indications of a yellowish nuchal collar may be present.

Total length 590 mm. ; tail 40.

Four specimens from Dutch New Guinea, north of Fak Fak, altitude 1700 feet, obtained by Mr. A. E. Pratt, to whom we owe the discovery of another species of the same genus (*A. pratti*, Blgr.) a few years ago.

The present species is named after Prof. E. Lönnberg, who described in these 'Annals' another member of the same group under the name of *Pseudapisthocalamus nymani*. It is still doubtful whether *Apisthocalamus* and *Pseudapisthocalamus* can be regarded as valid genera, so closely are they related to the previously described *Toxicocalamus*. The species, six in number, all from New Guinea, are, at any rate, easily distinguished by means of the following characters :—

A. Præocular present ; scales in 15 rows ; anal divided.

a. Nostril between two nasals.

- | | |
|---|--|
| Two postoculars ; ventrals 196 ; subcaudals 50 or more | <i>Apisthocalamus lorix</i> , Blgr. |
| One postocular ; ventrals 190 ; subcaudals 41 | <i>Apisthocalamus pratti</i> , Blgr. |
| One postocular (exceptionally two) ; ventrals 213-218 ; subcaudals 22-32 .. | [Blgr. <i>Apisthocalamus loennbergii</i> , |

b. Nasal single ; ventrals 196-205 ; subcaudals 26-29

[Lönnb. *Pseudapisthocalamus nymani*,

B. No præocular ; nostril between two nasals.

- | | |
|---|---|
| Scales in 15 rows ; ventrals 261 ; anal entire ; subcaudals 25 | [Blgr. <i>Toxicocalamus stanleyanus</i> , |
| Scales in 17 rows ; ventrals 299-305 ; anal divided ; subcaudals 30-31 | [Blgr. <i>Toxicocalamus longissimus</i> , |

XXXVIII.—On the large Flying-Squirrels referred to
Petaurista nitida, Desm. By OLDFIELD THOMAS.

THE members of the *Petaurista nitida* group of Flying-Squirrels have not hitherto been very exactly determined, partly owing to want of Javan material, representing true *nitida*, and partly to doubt as to the application of Gray's name *melanotus*.

Now, however, thanks to the generosity of Mr. W. E. Balston, the Museum has received two good examples of the true Javan *nitida*, while an examination of Gray's type of "*Pteromys melanotus*" shows clearly enough to which form that name belongs.

Comparison of the whole series in the Museum shows that each of the four great Malayan land-areas—the Peninsula, Sumatra, Borneo, and Java—has its own local form. All agree with each other in size and in the general characteristics of rich rufous colour with brown or black nose-tip and chin, hands, feet, tail-tip, and a variable amount of black round the eyes and behind the ears.

The diagnostic characters of the different forms are as follows:—

Petaurista nitida melanotus, Gray.

Pteromys melanotis, Gray, P. Z. S. 1836, p. 88 (*nom. nud.*).

Pteromys melanotus, Gray, Charlesw. Mag. Nat. Hist. i. p. 584 (1837).

General colour bright bay, the head markedly lighter than the body. Ears comparatively long and narrow, coloured like the head, except that the hinder part of their outer surface has generally a certain number of long black hairs upon it. Dark eye-rings inconspicuous. Hands and feet not wholly dark, the rufous trespassing more or less upon the metapodials.

Hab. Malay Peninsula and neighbouring islands. Examples in Museum from Perak, Selangore, Malacca, Johore, Singapore, and Pulo Tioman.

Type. Young. B.M. no. 116 a.

It is rather unfortunate that the name *melanotus* falls on the form which is markedly less black-eared than either the Sumatran or Bornean animal, but the light head of the type and its "bright red-bay colour" (in 1837—now somewhat dulled by time) indicate that it can only be referred to the present subspecies.

Petaurista nitida marchio, subsp. n.

Colour comparatively dark, a number of the dorsal hairs with black ends, which overlie and partly hide the deep rufous chestnut of the fur in general. Ears themselves not unlike those of *melanotus*, though the dark hairs of the metectote are blacker and more prominent; but in addition the long hairs of the side of the head behind the ears are also black-tipped so as to form a darker area in this region. Hands with the chestnut penetrating on to the metacarpals nearly to the base of the digits.

Condyllo-basal length of skull 67.2 mm.; upper tooth-row, exclusive of p^4 , 15.5.

Hab. Sumatra. Type from Si Rambi; another specimen from Kotta Sani, near Solok (*Weber*), and a third from "W. Sumatra" (*Faber*).

Type. Adult female. B.M. no. 0.8.2.24. Collected by Dr. E. Modigliani in 1890-91 and presented by the Museo Civico, Genoa.

Petaurista nitida rajah, subsp. n.

"*Pteromys melanopsis*, Gray" *, Mottley & Dillwyn, Nat. Hist. Labuan, p. 2 (1855).

"*Pteromys melanopsis*, Mottl. & Dillw.," Trouess. Cat. Mamm. i. p. 397 (1899) * (in synonymy of *P. nitidus*).

Ground-colour almost as light as in *melanotus*, but darkened by blackish tips to the dorsal hairs, so that the general colour is intermediate between that of *melanotus* and *marchio*. Head like body. Dark orbital rings at a maximum. Ears apparently shorter than in the other forms and less narrow; their backs heavily tufted with deep black hairs, which form a conspicuous black patch on each side. Hands and feet wholly dark, the rufous not trespassing on to the metapodials.

Condyllo-basal length of skull 64.5 mm.; upper tooth-row, exclusive of p^4 , 14.

Hab. Borneo. Type from Mt. Dulit, Baram, E. Sarawak. Alt. 2000'.

Type. Adult female. B.M. no. 99.12.9.31. Collected 1st October, 1896, and presented by Dr. Charles Hose.

Petaurista nitida nitida, Desm.

Pteromys nitidus, Desm. N. Dict. d'H. N. xxvii. p. 403 (1818); *Mamm.* ii. p. 342 (1822).

Colour darker and more brownish chestnut than in the

* Should any eccentric nomenclaturist wish to resuscitate either of these misprints as the name of the Bornean subspecies, the type of the name would be Mr. Dillwyn's specimen No. 51. 5. 6. 7.

other forms, especially posteriorly, where the dark tone of the hinder back and thighs grades into the dark of the feet, instead of being contrasted with them. Head like body. Dark orbital rings scarcely perceptible. Hairs on back of ears not darker than those on rest of head. Hands and feet wholly dark brown or black.

Hab. Java. Specimens examined from Preanger and Buitenzorg.

XXXIX.—*The Nomenclature of the Flying-Lemurs.*

By OLDFIELD THOMAS.

IN the 'Proceedings of the Biological Society of Washington' Mr. G. S. Miller* has recently drawn attention to the unfortunate fact, first published by Palmer, that the well-known name of *Galeopithecus* is antedated by *Cynocephalus*, each name having the same type, the *Lemur volans* of Linnæus.

But the conclusions drawn by Mr. Miller as to the consequent names of the family and its two constituent genera are, as I believe, all invalidated by the important fact that the type locality of Linnæus's *Lemur volans* is the Philippines, and that therefore the name *volans* and the many generic names based on it, *Cynocephalus*, *Galeopithecus*, *Galeopus*, *Dermopterus*, and *Pleuropterus* †, are, like *Colugo*, all applicable to the Philippine form and not to the Malayan one.

The references are as follows:—

Lemur volans, Linn. Syst. Nat. (10) i. p. 30 (1758), ex Petiver, Bontius, and Seba. The quotations being:—

Cato-Simius volans camelli, Pet.(iver), Gaz.(ophylacii Naturæ et Artis), t. 9. f. 8 (1702); and Act. Angl. 277. n. 1065 (=Phil. Trans. Roy. Soc. pt. 277, included in vol. xxiii. 1704).

Vespertilio admirabilis, Bont.(ius), Java, p. 68 (1658).

Felis volans ternatea, Seba, Mus. i. p. 93, pl. 58. figs. 2 & 3 (1735).

Of the three authors quoted, Petiver has to be taken as the primary one, both because I consider it compulsory to take the first one (except when Linnæus quotes his own earlier works) and also, in this case, because the localities given by Bontius and Seba (Guzerat and Ternate respectively) are

* P. Biol. Soc. Wash. xix. p. 41 (1906).

† An additional name, *Galeolemur*, has been formed in the group, based on Temminck's "*Galeopithecus macrurus*" from Ceylon. But this animal proves, as might have been expected from its locality, to have been a Flying-Squirrel (*Petaurista*). Cf. Schlegel, Mon. Singes pp. 335-6 (1876).

both erroneous, no member of the group occurring in either place, so that their account might refer to either the Philippine or Malayan forms.

In Petiver's 'Gazophylacii' the locality is put as "Philippine Islands," and in the Royal Society paper the province Pampanga, in Southern Luzon, is specially mentioned.

As a consequence the synonymy of the Luzon Colugo would be :—

Cynocephalus volans, L.

Lemur volans, L. (as above).

Cynocephalus volans, Bodd. Dierkundig Mengelwerk, ii. p. 8, footnote † (1768). (So far as the reference to *Lemur volans* is concerned.)

Galeopithecus volans, Pall. Act. Ac. Petrop. iv. p. 208 (1780). (Reference to *Lemur volans*, but not the specimens figured.)

Galeopithecus philippinensis, Waterh. P. Z. S. 1833, p. 119.

Galeopithecus (Colugo) philippinensis, Gray, Cat. Monk. &c. B.M. p. 98 (1870).

Colugo philippinensis, Miller, l. c.

In drawing up this synonymy I act on the assumption that a generic name must be allocated in accordance with the specific name mentioned by its author as his type, and that if his specimens are wrongly determined, his genus will none the less retain as its genotype the species to which that name is originally and rightly applicable, unless he has guarded himself by expressly stating the contrary*.

This ruling, in extreme cases, may seem contrary to common-sense, but the technical difficulties and confusion resulting from an attempt to make the author's specimens the primary basis for the allocation of his generic name are so great that I am convinced that the plan followed above is alone satisfactory †.

* As Mr. Pocock has done in forming the genus *Phormictopus* (Ann. & Mag. Nat. Hist. (7) viii. p. 545, 1901).

† To those who do not admit the general rule here formulated, it may be pointed out that, in this particular case, the question may be said to be determined by the title to Pallas's paper: "*Galeopithecus volans*, Camellii. descriptus," as it was "the Reverend and Learned Father George Joseph Camel" who sent home from the Philippines the original types in turn the basis of Linnæus's *Lemur volans*.

Moreover, there is no hope of saving the time-honoured name of *Galeopithecus*, which might have been a temptation to abandon the simple rule of making generic names follow specific ones; for *Cynocephalus* antedates *Galeopithecus* by many years, and has absolutely the same basis, i. e. *volans* as type-species name, with references to Pallas's animal and that figured by Seba.

The only result therefore, in this case, of refusing adherence to the above rule, would be the disaster of having the confusing name *Cyno-*

For example, in literally hundreds of cases genera have been based on earlier described species without any clear description of the specific characters of the specimens representing, in the eyes of their founders, the species named as genotypes. It would be preposterous to maintain that any or all such names might be upset or transferred merely by evidence (perhaps disputable) being brought forward (say in the form of labelled specimens) that what the genus-founder thought was one species was really another belonging to a different genus.

The author must suffer the penalty for his own mistakes, and if he makes a genus for, say, *Lemur volans*, to *Lemur volans* (*i. e.* the true original *L. volans*) his name must stick, whether his specimens were rightly determined or not.

As a result, the common Malay Colugo would seem to be without a generic name, and I would propose for it that of *Galeopterus*, like enough to recall the familiar *Galeopithecus*, different enough to avoid confusion. And as genotype I would take Waterhouse's *G. temminckii*, of which the typical skull has been figured and is now in the British Museum*.

Following out Mr. Miller's sensible suggestion that the name *Cynocephalus* should not be made the basis of the family name in this group, and being prohibited by the rules from using his name Colugidæ, I would call the family Galeopteridæ.

The group names would then be:—

Suborder DERMOPTERA.

Family Galeopteridæ.

Genus I. GALEOPTERUS.

Type. *G. temminckii*. *Range.* Malay Peninsula and Islands.

Genus II. CYNOCEPHALUS.

Syn. *Galeopithecus* and *Colugo*.

Type. *G. volans*. *Range.* Philippine Islands.

With regard to the species of *Galeopterus*, I am at present only able to state that *G. temminckii*, Waterh., appears to be the name of the Sumatran form, and *G. undatus*, Wagn., that of the large, large-toothed Javan species.

There is an extreme resemblance between the Colugos of the Malay Peninsula, Natuna Islands, and Borneo; indeed I fail to find any cranial difference whatever between examples

cephalus for the Common Colugo, instead of its being relegated to comparative obscurity as the name of the rare and seldom-quoted Philippine species.

* *Tomes coll., ex Zool. Soc. Mus., B.M. no. 7. 1. 1. 220.*

from Pinang, Bunguran (typical of *natunæ*, Miller), and North Borneo. On the other hand, the Malay specimens vary immensely among themselves, sometimes even when coming from the same locality.

In this connection it is to be noted that while most of Mr. Miller's insular species of mammals have been founded on fine series of specimens, those of *Galeopterus* have, with one exception, been based on either one or two examples, and therefore he has hardly had sufficient material to test the cranial variability of these animals.

XL.—*Three new African Species of Mus.*

By R. C. WROUGHTON.

THE recent receipt by the Natural History Museum of a collection (Rudd Exploration) from Tette containing specimens of the multimammate group of mice, and thus fixing Peters's *Mus microdon*, of which they are the topotypes, led me to examine all the individuals representing this group in the Museum Collection. The species of this group extend almost all over Africa, filling the place which *Micromys* occupies in Europe. The National Collection possesses fine series from many localities, but nevertheless insufficient to justify a monograph of the whole group; two forms, however, which came under my notice are sufficiently distinct to be worthy of description.

Mus huberti, sp. n.

A multimammate mouse rather larger than *M. erythroleucus* and of a paler colour.

Fur rather short, 7–8 mm. long on the back.

General colour above near "wood-brown," below pale grey. Individual hairs of the upper surface pale slate-grey basally, tipped with black, and with a subterminal pale buff ring; of under surface pale grey basally, white at the point. Chin, hands, and feet white.

Skull markedly larger than in *M. erythroleucus*.

Dimensions:—

Head and body (circ.) 135 mm.; tail (circ.) 135; hind foot 27; ear 19.

Skull: greatest length 32; zygomatic breadth 16; diastema 9; upper molar series 4.9.

Hab. N. Nigeria (type from Zungeru).

Type. Adult male. B.M. no. 4. 7. 9. 18. Original

number 4. Collected 15th August, 1903, and presented by Capt. H. G. Cock, R.A.

Temminck's *M. erythroleucus* was based on a young individual from Guinea. A similarly young specimen from Ashantee in the Museum Collection agrees very well with a series collected by Mr. Robin Kemp in S. Nigeria, and I have taken this series as adequately representing Temminck's *M. erythroleucus*, of which Gray's *M. gambianus* is apparently a synonym. The S. Nigerian series quite constantly shows a marked shortness of tail, which thus distinguishes *M. erythroleucus* from the present species even without the richer darker colour (near "mummy-brown") of the former species.

Mus cunninghamei, sp. n.

A multimammate mouse about the size of *M. ugandæ*, with a very short tail.

Fur soft and rather long, 12 mm. long on the back.

General colour above a brownish "sepia," with a buffy grizzling; below buffy white; bright buffy on the flanks. Individual hairs of upper surface pale slate basally, then pale buff with black tips; black tips entirely wanting on flanks and belly.

Dimensions:—

Head and body 150 mm.; tail 120; hind foot 27; ear 19.

Skull: greatest length (circ.) 33; zygomatic breadth 17; diastema 95; upper molar series 5.

Hab. Islands of Victoria Nyanza (type from Chivi Island).

Type. Old male. B.M. no. 2. 7. 5. 11. Original number 4. Collected 27th December, 1901, and presented by Mr. R. J. Cunninghame.

Mr. de Winton described *M. ugandæ* on a young animal from Entebbe, but older specimens since received from the same place establish the fact that in that species the head and body and tail are of about equal lengths, as they are also in *M. hildebrandti*, Peters. This character at once distinguishes the present species from both its neighbours. *M. hildebrandti* further differs by its much smaller size and *M. ugandæ* by its different colouring (near "vandyke-brown" in the adult).

In working out the above my attention has been drawn to a series of another *Mus* taken at Deelfontein which seems to me

to be quite different from any other species I know. I propose to call it

Mus granti, sp. n.

A mouse about the size of *M. colonus*, with tail equal in length to head and body.

Fur soft and rather long, 10–12 mm. long on back.

General colour above a buffy drab, below white. Individual hairs of upper surface "plumbeous" basally for $\frac{3}{4}$ their length, then "pinkish buff," with, however, a considerable admixture of all-black hairs, proportion of these latter smaller on flanks; on the lower surface from chin to anus basal $\frac{2}{3}$ "cinereous," remainder pure white. Hands and feet white. Tail dark, rather thickly clothed with stiff hairs, 2 mm. long near base, lengthening to 5 mm. at tip of tail, almost forming a brush.

Posterior median tubercle of second molar larger than anterior and than any of the median tubercles of anterior molar.

Dimensions of the type (measured in the flesh) :—

Head and body 120 mm.; tail 122; hind foot 23; ear 17.

Skull: greatest length 31.5; basilar length 25; zygomatic breadth 15; diastema 9; upper molar series 5.

Hab. Deelfontein, Cape Colony.

Type. Adult female. B.M. no. 2. 9. 1. 86. Original number 114. Collected February 2nd, 1902, by C. H. B. Grant, and presented by Col. A. T. Sloggett, R.A.M.C.

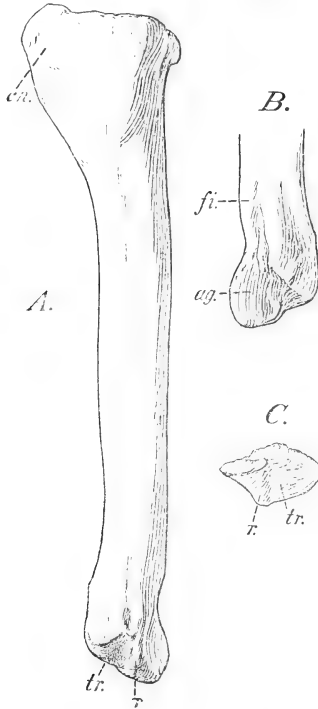
A series of six specimens agreeing in all essential characters. The mammary formula is rather doubtful, but is most probably $5-2=10$, as in *M. colonus*.

This species resembles *M. damarensis* in the large size of the posterior median tubercle of the upper second molar, but in both skull and body it is much smaller and lacks the pure white belly of de Winton's species. This character also separates it at sight from *M. lehochla*, Sm., *M. pelulcus*, Sun-l., and *M. namaquensis*, Sm.

XLI.—*Note on a Megalosaurian Tibia from the Lower Lias of Wilncote, Warwickshire.* By A. SMITH WOODWARD, LL.D., F.R.S.

THE British Museum is indebted to Miss Evelyn Irby for the tibia of a Megalosaurian Dinosaur recently discovered in the Lower Lias of Wilncote, near Stratford-on-Avon. The

bone was obtained during the sinking of a well near Wilmcote railway-station, and was found imbedded in a shelly limestone which Mr. R. Bullen Newton assigns to the zone of *Am. angulatus*. As the only evidence of a Megalosaurian hitherto



Right tibia of a Megalosaurian Dinosaur, one quarter nat. size, posterior view (A), with the lower part in anterior view (B) and in end-view (C).—Lower Lias; Wilmcote, Warwickshire. [Brit. Mus. no. R. 3542.] *ag.*, facette for ascending process of astragalus; *cn.*, enmial crest, bent inwards and backwards; *fi.*, facette for fibula; *r.*, ridge; *tr.*, trochlear surface for astragalus.

recorded from the Lias is a single tooth from the Lower Lias of Lyme Regis*, this new specimen is of considerable interest.

* R. Lydekker, 'Catal. Foss. Rept B.M.' pt. i. (1888) p. 173, fig. 28.

The bone measures 45 cm. in extreme length, and its form and proportions are shown in the accompanying text-figure. Its outer face is dense and smooth, as usual in the carnivorous Dinosaurs; and there is a large internal cavity, which has caused its anterior wall to collapse and the upper end to be twisted by crushing in the rock. The upper end is expanded into the usual large cnemial crest (*cn.*), but this is distorted backwards and inwards. The vertical ridge for contact with the upper part of the fibula is similarly displaced. The lower end, being more nearly solid, is better preserved, and displays clearly the facette for the astragalus. Posteriorly this facette (fig. A, *tr.*) is shown as a well-formed trochlea, bounded externally by a low ridge (*r.*), which is also conspicuous in end-view (fig. C). Anteriorly the facette (fig. B, *ag.*) is produced upwards as a low triangular depression, which would accommodate an ascending process of the astragalus. Externally there is a large facette for contact with the fibula (fig. B, *fi.*).

Compared with the tibia of *Megalosaurus** and its immediate allies †, the new bone from the Lias is remarkably slender. This slenderness, indeed, and the trochlear shape of the facette for the astragalus, suggest a lighter and more active reptile than the ordinary Megalosaurians. The great development of the anterior ascending process of the astragalus shows that the Liassic genus is more nearly related to the Jurassic and Cretaceous than to the Triassic families of carnivorous Dinosaurs; but the tibia alone is insufficient for a more exact determination of its affinities.

XLII.—*Descriptions and Records of Bees.*—XVIII.

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

Megachile helianthi, sp. n.

♀.—Length $13\frac{1}{2}$ mm.

Black, robust, but of the parallel-sided type; ventral scopa entirely white (in the type specimen full of bright orange pollen); lower margin of clypeus strongly undulate, with a broad, shallow, central emargination; claws with a large and

* R. Owen, 'Foss. Rept. Weald. & Purb. Form.' pt. iii. (Mon. Pal. Soc. 1857), p. 18, pl. ix.

† O. C. Marsh, 'The Dinosaurs of North America' (16th Ann. Rep. U.S. Geol. Surv. 1896), pp. 153-163, with plates.

sharp basal tooth. Head large, round; cheeks flattened, not spined; punctures of head and thorax dense and coarse, on a dullish surface, but clypeus (convex in middle) and middle of supraclypeal area shining, with well-separated strong punctures; hair of head and thorax greyish white, the vertex also with dark fuscous hair, very short and easily overlooked; antennæ dark; mandibles short and thick, 4-dentate, fringed beneath with pale golden hairs; first joint of labial palpi about $\frac{4}{5}$ or $\frac{5}{6}$ length of second; tegulæ black. Wings strongly and broadly infuscated on apical margin; nervures black. Abdomen strongly but not densely punctured, with narrow white hair-bands, more or less failing in the middle; sixth dorsal segment rapidly descending, strongly concave in profile, its basal half with sparse, erect, pale hair, its apical with pale tomentum. Legs black, the tarsi (especially the middle and hind ones) broad and thick; hind basitarsus not quite so long as the other joints together, if claw is included. Third joint of maxillary palpi with very fine short pubescence and shorter than 1 + 2.

Belongs to the subgenus *Sayapis*, and is related to *M. sayi*, Cresson, but easily distinguished by the shining sparsely-punctured clypeus, the character of the clypeal margin, and the wholly white ventral scopa.

Hab. Boulder, Colorado, at flowers of *Helianthus lenticularis*, Aug. 29, 1906 (*S. A. Rohwer*).

Megachile terrestris, sp. n.

♀.—Length about $10\frac{1}{2}$ mm.

Black, moderately robust, in build something like *M. montivaga* or *M. melanopyga*, the abdomen strongly convex in profile; *ventral scopa entirely rather pale orange*, as are the narrow but very distinct abdominal bands; *clypeus undulate, with three low broad dentiform angles*, one being median; claws with a strong basal tooth. Head and thorax densely punctured, with the copious long pubescence very pale yellowish, becoming strongly fulvous on clypeus, lower part of cheeks, and vertex, and a little so in middle of mesothorax; head ordinary; clypeus closely punctured but shining; mandibles with only three distinct teeth, the innermost rounded; first joint of labial palpi a little shorter than second; last joint of maxillary palpi with the pubescence very short, indistinct; antennæ dark; mesothorax dull; tegulæ piceous. Wings strongly infuscated, yellower basally; nervures ferruginous, the outer ones piceous. *Tarsi ferruginous*, more or less infuscated, and clothed with orange-

fulvous hair; extreme apices of tibiæ slightly ferruginous, the legs otherwise black, with pale yellowish hair; hind basitarsus not greatly broadened. The hair of the abdomen between the bands, which in most species is black, is *fulvous*, and as it is long and overlaps the bands, it makes them appear yellower than they otherwise would; sixth dorsal segment descending almost perpendicularly, and then abruptly bending to the strong lip, the descending portion covered with long fulvous hair.

A very distinct species, not closely related to any other, so far as I am aware.

Hab. Florissant, Colorado, 8000 feet, June 14, 1907, flying over the ground (*S. A. Rohwer*).

Megachile anogra, sp. n.

♀.—Length 11 to 12 mm. (13½ with the head thrust forward).

Black, rather robust, with greyish-white pubescence; the abdomen shining, with narrow white entire hair-bands, that on first segment broader and enlarged at sides; ventral scopa white, entirely black on the last two segments; claws with a strong basal bristle, but no well-developed tooth. Head and thorax densely punctured, with copious greyish-white hair; on the clypeus the hair is a shade greyer and thin, showing the shining and strongly punctured surface; margin of clypeus normal; *mandibles peculiar, short and thick, with an apical blunt tooth, and a long straight cutting-edge beyond*; cheeks rounded; eyes sage-green; tegulae very dark brown. Wings only moderately dusky; second r. n. joining second s. m. very near its end. Legs black, with light hair, that on inner side of tarsi fuscous or reddish fuscous; apical corners of middle tarsal joints with pectiniform spines or bristles; hind basitarsus not greatly broadened. Abdomen between the bands, and the sixth segment, very shiny, with coarse black hair; *sixth segment wholly without pale hair* and not rapidly descending.

A pretty and distinct species, rather like *M. generosa*, Cresson, but easily separated by the wholly light hair of vertex and mesothorax and other characters.

Hab. Florissant, Colorado, at flowers of *Anogra coronopifolia* (scopa full of light yellow pollen), July 21, 1907; also July 22, 1907 (*S. A. Rohwer*).

Megachile chrysothamni, sp. n.

♀.—Length 13 mm. or a trifle less.

Black, with white pubescence, having rather a mould-like appearance on thorax; abdomen shining, rather parallel-sided, with creamy-white hair-bands; *ventral scopa white, black on last segment and apical third of penultimate one*; claws without any distinct basal tooth. Head normal; eyes pale greenish grey, parallel; vertex with a band of black hair, and middle of mesothorax with a little of the same colour; clypeus shining, but closely punctured, its anterior edge very thick, but not dentate; mandibles 4-dentate; antennæ dark; mesothorax very densely punctured; tegulæ dark reddish. Wings moderately dusky. Legs black, with light hair, that on inner side of tarsi pale yellowish; middle tarsi thick; hind basitarsus only moderately broadened. *Abdomen with hair on first two segments wholly pale, beyond these coarse and black between the bands, as also on sixth segment, which, however, is covered with pale tomentum at its tip; sixth segment ordinary, not subvertical.*

Rather like *M. texana*, Cresson, but the black hair does not cover the penultimate ventral segment, and the last three abdominal bands are very entire and conspicuous, giving the insect a distinctive appearance. The shining, rather parallel-sided abdomen is also peculiar. Perhaps the closest real affinity is with *M. manifesta*, Cresson, although this would never be suggested by superficial appearances.

Hab. Boulder, Colorado, at flowers of *Chrysothamnus graveolens* (scopa full of bright yellow pollen), Sept. 1, 1906 (S. A. Rohwer).

Megachile newelli, sp. n.

♀.—Length about 11 mm.

Very black; short, broad, with a heart-shaped abdomen; ventral scopa white (full of bright orange pollen, doubtless from some species of Compositæ), the last segment with black bristles at the sides; pubescence greyish white, rather scanty; the thorax seen from above is black, with a creamy-white band in the scutello-mesothoracic suture, and a spot on each side of it, a little in front, these markings being very conspicuous; abdominal bands present, but only moderately developed. Head very broad; flagellum inclined to be reddish beneath; clypeus very densely punctured; mandibles very broad, the teeth low and obtuse; lower margin of mandibles strongly concave; apical joint of maxillary

palpi not or hardly pubescent; the broad and flat vertex, the mesothorax, and scutellum with thin black hair; tegulae very dark brown. Wings dusky. Legs black, spurs very pale; middle tarsi greatly broadened; hind basitarsus very large and flat, much longer than the remaining joints together, and with light yellow hair on its inner side. Abdomen with very short black hair between the bands; last segment with erect hair only at sides.

Very closely allied to the Mexican *M. chrysofila*, Ckll., but differing in the colour of the ventral scopa, the proportionately longer hind basitarsus, the shape of the mandibles, &c.

Hab. Keatchie, Louisiana, July 8, 1905, two specimens (*Wilmon Newell*).

Megachile murinella, sp. n.

♀.—Length about 10 mm.

Black, broad, the abdomen long-cordiform; pubescence greyish white, scanty, becoming mouse-grey on sides of metathorax; abdominal bands well developed, but hardly noticeable because dull mouse-grey, the last and the sides of the penultimate scantily overlapped by shining white hairs; ventral scopa dull white, black on last segment except at extreme base, and some black hair at sides of penultimate; claws with a sharp basal tooth; no light hair-markings on thorax above. Head ordinary, rather large, eyes distinctly converging below; clypeus shining, with strong, rather close punctures, its apical margin straight; mandibles 4-dentate, with golden hairs projecting from the lower margin; antennae dark; mesothorax densely punctured; tegulae dark rufous. Wings moderately dusky; recurrent nervures joining second submarginal cell at equal distances from apex and base. Legs black, hair on inner side of tarsi pale yellowish; spurs whitish; hind basitarsus only moderately large. Abdomen between the bands with a pale hardly noticeable pruinosity; some black hairs, not readily observed, on the last two segments, particularly the penultimate one.

I had formerly supposed, from a superficial examination, that the grey abdominal bands were accidentally discoloured; but this seems not to be the case. The species is related to *M. cleomis*, Ckll., but much smaller.

Hab. Mesilla Park, New Mexico, Sept. 2, 1898 (*Cockerell*).

Megachile kallstrœmiæ, sp. n.

♀.—Length nearly 11 mm.

Black, short and broad, with cordate abdomen, and having a white line of pubescence in front of scutellum, and spot on each side, as in *M. newelli*, to which it is closely allied. It differs from *newelli* in being a little smaller, less robust, greyer (from the pubescence), with whiter hair-bands, the hair of face very white; the last dorsal segment with obvious pale pruinosity. It is evidently a desert representative of the same stock (originally neotropical) which produced *newelli*. The dusky wings, black hairs at sides of apex of abdomen, and mesothorax in front with a widely interrupted band of white hair, are characters separating it from the hitherto undescribed female of *M. townsendiana*, Ckll., the latter having wings clear or almost, no black hair at sides of apex of abdomen, and mesothorax in front with two spots or bars of white hairs.

Hab. Mesilla Park, New Mexico, at flowers of *Kallstrœmia*, July 27 (Cockerell); Mesilla, July 15, at flowers of *Verbesina encelioides* (Cockerell); Las Cruces, New Mexico, at flowers of *Solidago canadensis*, Sept. 9 (C. H. T. Townsend).

Females of *M. townsendiana*, taken in company with males, are from Las Cruces, Aug. 23. *M. townsendiana* was also taken at San Augustine, at the base of the Organ Mts., New Mexico.

Megachile verbesinæ, sp. n.

♀.—Length about 15 mm., width of abdomen $4\frac{2}{3}$.

Black, parallel-sided, with white pubescence, and narrow entire white abdominal hair-bands; sixth segment with pale tomentum; ventral scopa entirely white; clypeus shining, with well-separated punctures, its margin straight, but with a little dentiform prominence, not projecting at all below the margin, in the middle. Thorax above without any conspicuous pale hair-markings. Superficially, this species looks just like *M. heterodonta*, Ckll., except that the abdomen is not quite so long and narrow. It is, however, entirely distinct from *heterodonta* by the last dorsal segment, which instead of being nearly vertical and covered with black bristles, is subhorizontal and tomentose. The mandibles also are not as in *heterodonta*, but have four ordinary teeth, counting the inner angle. A closer real affinity is found with *M. casadæ*, Ckll.; but in that species the abdomen is shorter, the sixth segment is strongly concave in profile, and the hind basitarsus is not nearly so long and broad. (In

verbesinae the hind basitarsus much exceeds the other joints together.) From *M. sidalceae*, Ckll., the new species is easily known by the absence of the conspicuous white line of hair across the thorax, and the total absence of black hair on the scutellum.

The vertex has a small amount of fuscous hair among the white, but the mesothorax none. The second abdominal segment has a little fuscous hair, almost concealed by the white.

Hab. Upper Rio Grande, at Rinconada, New Mexico, at flowers of *Verbesina exauriculata*, Sept. 26 (*Cockerell*).

Megachile populi, Ckll.

Renewed study convinces me that *M. opuntiarum*, Ckll., is conspecific with *populi*.

Megachile emoryi, Ckll.

This fine species has hitherto been known only by the unique type, but Mr. S. A. Rohwer took a female at Boulder, Colorado, Aug. 30, 1907, at flowers of *Helianthus pumilus*.

Megachile perihirta, Ckll.

Copeland Park, Boulder County, Colorado, Sept 6, 1907 (*S. A. Rohwer*). This is the second specimen known.

Megachile mucorosa, sp. n.

♂.—Length about 11 mm., width of abdomen about $4\frac{1}{2}$.

Black, with dull white pubescence, abundant on head and thorax, pure white and dense on face and lower part of cheeks; *no black or fuscous hair anywhere*, but inner side of tarsi with orange hair. Head rather large; eyes yellowish green, slightly converging below; antennæ black, faintly crenulated, not flattened or expanded at apex; clypeus normal; vertex and mesothorax dull, with feeble punctures; tegulae reddish, darker basally. Wings nearly clear, the nervures and stigma rather dark ferruginous. Legs black, *the anterior femora largely red above and the anterior tibiae with the inner surfaces red, their tarsi simple*; coxal spines distinct but short, with a little patch of shining copper-red hair at outer base; hind tarsi rather thick. Abdomen with a large shining basin on first segment, the other segments strongly depressed basally and furrowed apically; *sixth segment densely punctured above, with a strong longitudinal keel, which points toward the apex of the transverse keel*,

which is produced into a broad beak-like structure, perfectly entire, its point forming somewhat more than a right angle, and curved downwards; beneath, the segment presents two large oblique teeth on each side, the inner the larger, and in the broad median interval appears the stout spine-like process of the seventh segment. Four ventral segments are visible.

Related to *M. reflexa*, Cresson, but differs in the colour of the legs and pubescence. It cannot be the male of *M. populi*, as the sculpture of the thorax is quite different, and the venation of the hind wings differs.

Hab. Boulder, Colorado, Aug. 9, 1906 (*W. P. Cockerell*).

Megachile onobrychidis, sp. n.

♂.—Length $8\frac{1}{3}$ mm.

Black, with dull white hair, dense and pure white on face and lower part of cheeks and pleura; no black or fuscous hair, that on inner side of tarsi orange; *vertex shining, with strong well-separated punctures*; antennæ slender, black, flagellum faintly reddish beneath, not flattened or expanded at apex; mandibles with a reddish spot just before tip; first joint of labial palpi shorter than second; mesothorax very densely punctured; tegulæ very dark reddish, with a white patch of hair in front. Wings moderately dusky; second r. n. joining second s.m. a considerable distance from its end. Legs black; *anterior femora with no red patch*, their tibiæ faintly reddish on inner side, *their tarsi simple*; coxal spines strong but rather short; hind tarsi slender. Abdomen short, rather shining, with narrow white hair-bands; in addition to the usual apical bands there are distinct, but less pronounced basal ones; sixth segment above very densely punctured, with fine whitish tomentum, and a pit or depression in the middle just before the transverse keel, which is jagged apically, and with a slight rounded emargination; beneath, the lateral teeth are very low, the points of the inner ones scarcely more distant than they are from the lateral ones; median projection of seventh segment small, but evident; four ventral segments.

Hab. Mesilla Park, New Mexico.

On the Agricultural College farm, April 25, 1895, I observed what I supposed to be a single species of *Megachile* visiting the flowers of *Onobrychis sativa* in some numbers, these flowers being the only ones at which I had so far obtained *Megachile* that year. Two specimens were caught, and these now prove to belong to different species, *M. onobrychidis* and *M. schismatura*.

Megachile schismatura, sp. n.

♂.—Length about $9\frac{1}{2}$ mm.

Superficially like *M. onobrychidis*, but differing as follows: face broader, eyes less converging below; vertex with a good deal of fuscous hair; the recurrent nervures joining second s.m. about equally far (a short distance) from base and apex; keel of sixth abdominal segment presenting a very large circular emargination, the lateral corners of which are sharply pointed, forming much less than right angles; on each side of the emargination the margin is crenate, but not jagged; sixth segment above the keel densely white-pruinose. The pubescence of *M. onobrychidis* has a faint yellowish tint, wanting in *schismatura*. The eyes of *schismatura* are distinctly darker and narrower than those of *onobrychidis*. In the apical emargination of the abdomen, *M. frugalis*, Cress., is like *schismatura*, but the latter has only minute lateral teeth, instead of the prominent ones of *frugalis*.

Hab. Mesilla Park, as described under *M. onobrychidis*.

Megachile albula, Lovell & Cockerell.

Described from Maine. I find I have a male which I took at Beulah, New Mexico, 8000 ft., July 11.

Note on Gilbert Turner's Australian Bees.

I take the opportunity to add a note explaining the localities of Gilbert Turner's bees, described in earlier numbers of this series. I am indebted to Mr. Rowland E. Turner for the following information:—"The abbreviations on the labels on the Australian bees are: Seaf., Seaforth, a locality on the coast 20 miles north of Mackay, Queensland; Ridg., The Ridges, a small property 13 miles from Mackay which was held by my brother the late Gilbert Turner and myself in partnership for many years. Hy. is merely short for Hymenoptera. All the bees sent by my brother to the Museum were taken at one of the two above places, but as they are not settlements of any size I always use the locality Mackay." (*Litt.*, Dec. 2, 1907.)

University of Colorado,
Boulder, Colorado, U.S.A.,
Jan. 12, 1908.

XLIII. — *Descriptions of Thirty new Species of Tabani from Africa and Madagascar.* By GERTRUDE RICARDO.

THE new species now described will be shortly embodied in a larger work to be issued by the Paris Museum.

Tabanus brucei, ♀, sp. n.

Type (female) and four other females from Ankole, Uganda, 16. 5. 03 (*Lt.-Col. Bruce*), 1903. 206.

A large species with a reddish abdomen, banded wings, and fore tibiæ incrassate; related to *Tabanus septempunctatus*, sp. n., but distinguished by the absence of black spots on the abdomen.

Length 20-21 mm.

Head large, almost broader than the thorax. Face and forehead rusty red; face, cheeks, and beard with reddish pubescence. Palpi large, reddish, black at the apex, longer than those of *T. septempunctatus*, stout at the base, tapering to a point; pubescence red. Antennæ black, with black pubescence on the first two joints; the first joint stout, cylindrical, the second very small, the third broad at base with a moderate tooth. Forehead about four times as long as it is broad, equal in width throughout, with short reddish pubescence. Frontal callus brown, broad, transverse, not reaching the eyes, beyond is an oblong brown spot, not contiguous. Eyes bare with no markings.

Thorax and scutellum brown, covered with dense short reddish pubescence, sides and breast reddish with longer red hairs. Squamæ blackish. Abdomen rather broad, short, uniformly bright red, with short reddish-yellow pubescence; on the extreme lateral margins of segments 3, 4, and 5 are some coarse black hairs; underside black, with narrow yellow segmentations and short yellow pubescence. Legs wholly black; fore tibiæ incrassate, curved; the first tarsal joint as long as the other four, which are short and oblong; the claws and pulvilli large; the pubescence on legs black, thickest on the posterior femora. Wings hyaline, brown at base and on the fore border as far as the end of the first longitudinal vein, with a brown band extending across the wing to the fifth posterior cell.

Tabanus septempunctatus, ♀, sp. n.

The type and specimens mentioned below are in the British Museum Coll.

Type (female) and three other females from Fwambo, N.E. Rhodesia, near the south-east end of Lake Tanganyika (*W. H. Nutt*), 96. 83.

One female from Mazoë, Mashonaland, Dec. 1898 (*G. A. K. Marshall*).

This species, which is related to *Tabanus latipes*, Macq., in the markings of the wings, is easily distinguished from it by the black spots on the abdomen. It is a handsome reddish-yellow large species, with black legs and antennæ and broad fore tibiæ; there are seven black spots and three black bands on the abdomen.

Length 20 mm.

Head large, as broad as the thorax. Face and forehead rusty red, with long reddish-yellow pubescence on the face and cheeks, the beard being of the same colour. Palpi rather more yellow, stout, ending in an obtuse point; pubescence short, the same colour as that on the face, tips of the palpi black with black pubescence. The antennæ wholly black; the first joint stout, the second small, cap-shaped, both with black hairs, the third long with an obtuse tooth. Frontal callus dark brown, broad, transverse, not reaching the eyes, and no prolongation from it is visible. Eyes have no bands or markings. Forehead broad and short, about $3\frac{1}{2}$ times as long as it is broad. Thorax brown, with reddish-yellow tomentum, most noticeable on the anterior border; sides and shoulders rusty red, with reddish-yellow pubescence; breast browner; scutellum as thorax, with traces of the bright-coloured tomentum. Abdomen large, rather broad, rusty red; in the centre of the second segment is an oblong, brown-black spot reaching the anterior border of the segment, but posteriorly triangular, not reaching the border; on the third segment are three spots, the centre one semicircular in shape with its base on the anterior border not extending beyond half the width of the segment, the side spots more oblong, touching the anterior border; on the fourth segment are three similar spots; on the fifth and sixth a black band on the anterior border, extending over about half the segment; the seventh almost wholly black, the short sparse pubescence is reddish yellow: the underside yellowish, with broad black bands on the anterior half of each segment, beginning from the second, the posterior borders densely covered with yellow pubescence. Legs wholly black, with short black pubescence, some yellow pubescence on the hind femora; the coxæ with yellowish tomentum; the fore tibiæ broad, swollen, curved; the first tarsal joint as long as the other four, which are broad and short; the pulvilli and claws

long. Wings hyaline, dark brown at the extreme base and on the fore border to the end of the first longitudinal vein. A broad brown transverse band extends from the stigma across the wing into the fifth posterior cell; veins brown, the first longitudinal vein thickened, black.

The specimen from Mashonaland has the pubescence on the face and forehead rather more yellow than in the type, and a fine short black line proceeding from the frontal callus is present. The thorax and scutellum are almost entirely covered with the reddish-yellow tomentum, otherwise it is identical with those from Rhodesia.

Tabanus subvittatus, ♀, sp. n.

Type (female) and two other females from Bihé, Angola, Dec. 1903 (*Wellmark*), 1904. 243, in Brit. Mus. Coll.

This species is very nearly related to *Tabanus septempunctatus*, ♀, Ricardo, but differs in the spots on the abdomen.

The black spots of the fourth segment are all included in one black band, the spot on the second segment is more oblong than square, and the pubescence of the posterior borders of the segments on the underside is of a paler yellow. The yellow pubescence of the posterior femora is more distinct and in one of the specimens extends to the posterior tibiae. The specimens are of smaller size, 18 mm. On two of them is a note, "Caught near cattle."

Tabanus quadriguttatus, ♀, sp. n.

The type is in the British Museum collection, and was sent me with three other females for identification by Dr. Kröber; they were taken at Usambara, Nguele River, near Victoria Nyanza Lake, on the south-east shore.

A medium-sized blackish species, with hyaline wings, brown on the fore border and at the apex; legs, palpi, and antennæ black; abdomen black, with grey spots. It is related to *Tabanus billingtoni*, Newstead, but distinguished by the black fore tibiae and by the markings of the abdomen.

Length 19 mm.

Head broader than the thorax. Face reddish, but entirely covered with dense whitish tomentum, with long, fine, white hairs on the cheeks and some black hairs beneath the antennæ; beard white. Palpi blackish, with grey tomentum and black pubescence, rather long, the same width throughout with the exception of the short pointed apex. Antennæ black; the first joint twice as large as the second, which is small, cap-shaped, both with black pubescence; the third long

and slender, with a medium-sized tooth. Forehead the same colour as the face, about five times as long as wide, with reddish-brown oblong callus reaching the eyes and continued as a raised line almost to the vertex. Eyes with no band. Thorax brownish red, covered with grey tomentum, no distinct stripes visible; traces of golden pubescence on the sides above the wings, continuing to the base of the scutellum, some short black pubescence is present on the dorsum; sides and breast reddish with grey tomentum, black hairs above and grey hairs below; the scutellum is similar to the thorax. Abdomen rather long, dull blackish; the second segment partly dull reddish, with a grey tomentose triangular spot on the base of the second, third, fourth, and fifth segments, and narrow greyish segmentations on the first four segments, with golden or whitish hairs at the sides of these segments, elsewhere on the sides the pubescence is black, also on the dorsum of the abdomen wherever the dark colour prevails; the underside black, with narrow segmentation of whitish pubescence. Legs wholly black, the coxæ with grey tomentum and pubescence, the femora with some whitish pubescence, especially on the hinder ones, elsewhere the pubescence is black. Wings longer than the abdomen, hyaline with yellow-brown veins and stigma, tinged with brown along the fore border and at extreme base and on the whole apex; the brown colouring is, however, faint in the upper part of the second submarginal cell and a pale streak is visible in the first submarginal cell, the hind border is also tinged with brown, leaving the discal, basal, and apical cells clear, except along the veins; all posterior cells widely open.

Tabanus grandissimus, ♀, sp. n.

The following specimens are in the British Museum Collection:—

Type (female) and another female from Fwambo, N.E. Rhodesia, near the south-east end of Lake Tanganyika (*W. H. Nutt*), 96. 83; two females from Lake Tanganyika (*W. A. Cunningham*), 1906. 76; two females from Lunzua, British Central Africa (*A. Sharp*), 1901. 29; one female from Deep Bay, west coast of Lake Nyasa, 1670 feet, 26. ii. 94 (*R. Crawshaw*), 98. 81.

A large robust black species with dark brown wings, the largest species of *Tabanus* as yet described from Africa, the type measuring 29 mm., the other specimens ranging from 23 mm. to 26 mm., the two from Lake Tanganyika being the smallest. Bigot described a species as *Tabanus*

deyrollei, 27 mm., the type of which is apparently lost. This species is distinguished from *Tabanus biguttatus*, Wied., by its larger size and red tibiæ.

Head large, wider than the thorax. Face brown, with yellowish-brown tomentum and rather thick black pubescence; beard blackish. Palpi yellow, but very thickly covered with black pubescence on the outside, on the inner side they are yellow, nearly bare of pubescence. Antennæ black, the second joint reddish; the first joint stout, covered with black pubescence, the second with some black hairs; the third long, slender, the tooth very near the base. The subcallus is the same colour as the face, bare. Forehead blackish, densely covered with yellowish tomentum, about five times as long as it is broad; the frontal callus brown, oblong, not reaching the eyes, the line usually proceeding from the callus is here separated from it and indistinct. The thorax is black, shining, with red colour sometimes showing through, the sides with grey tomentum and black hairs; the breast brown with black pubescence; the scutellum similar to the thorax; the squamæ dark brown. Abdomen long, black, covered with bluish-grey tomentum, devoid of pubescence, the sides with black hairs, thickest on the first segment and at the apex; the underside black with some black pubescence. Legs black with red tibiæ; the fore tibiæ black at the apex, the middle tibiæ and the first joint of the tarsi wholly red, the posterior tibiæ black at the extreme apex; the pubescence on the red tibiæ black, thickest on the posterior tibiæ; on the underside of these last is some red pubescence, on the underside of the posterior tarsi bright red pubescence. Wings dark rich brown, becoming paler at the apex and on the hind border, the centres of the second basal, the discal, and anal cells hyaline, veins and stigma brown; all the posterior cells widely open.

Tabanus obscurissimus, sp. n.

One female from Lökkoh Creek, Sierra Leone, April 1904 (*Major F. Smith*), 1004. 143; one female from the Congo, 1900. 120; one female from Libreville, Gaboon (presented by Dr. A. L. Bennett), 99. 134, with note "Draws blood from man and beast"; one female from Wassau Territory, Gold Coast (*Dr. S. H. Jones*), 1901. 81.

This dull mahogany-coloured species, with a narrow abdomen and brownish wings, is distinguished from *T. testaceiventris*, Macq., and *T. gabonensis*, Macq., by the black hairs on the face, the black beard, and the bright red third joint

of antennæ hardly darker at the apex, and by its long narrow abdomen.

Length 18 mm.

Head wider than abdomen. Face brown, with dull fulvous tomentum and black pubescence, the latter consisting of fairly long black hairs, thickest below the antennæ and on the cheeks; the beard blackish brown. Palpi yellowish brown, with black pubescence, which often gives them the appearance of being blackish; they are yellower on the inner side, slightly stout at base, terminating in a long point. Antennæ red; the third joint bright red, a little duller at the apex, the first and second with black pubescence; the first stout, the second very small, cup-shaped, with a long upper projection covered with black hairs, the third long with a moderate tooth. Forehead above the antennæ the same as face, when denuded shining brown, narrower at vertex, eight times as long as broad, above a little browner, with shining red-brown long callus reaching the eyes and continued as a raised stripe almost reaching the vertex, gradually narrowing to a fine line.

Thorax dull brown, no stripes, lighter brown at the sides; the pubescence on the dorsum short, dull yellowish, mixed with some black hairs; sides with long fine black hairs, behind the wings they are fulvous and short; breast brown, with black pubescence.

The scutellum same as thorax. Abdomen long, narrow, dull mahogany-brown in colour, covered with short black pubescence; the underside identical; the squamæ brown. Legs reddish brown, the femora being brownish; the tibiæ reddish, the fore tibiæ yellowish red or yellow, black at their apices, and the fore tarsi are black; the pubescence on legs black, thick and long on the femora, on the lighter fore tibiæ is some yellowish pubescence. Wings pale brown, paler at the extreme apex, on the second submarginal cell, and on the interior border, which in some of the specimens is almost hyaline. Veins brown.

Tabanus fuscmarginatus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and two other females from Kampala, Kiadondo, Uganda, in banana-plantation, 9. 5. 03 (*Lt.-Col. Bruce*), 1903. 206.

A species very nearly allied to *Tabanus pervasus*, Wlk., but certainly distinct; it is a large robust species, with a

broad chestnut-brown abdomen, reddish legs, narrow forehead, and blackish antennæ.

Length 23 mm.

It is distinguished from *Tabanus pervasus*, Wlk., by the bare abdomen, on which is no trace of bluish-grey tomentum, and the underside is the same colour; the palpi are a little longer, with more attenuated point. It has the same narrow forehead, about five times as long as it is broad and narrowed anteriorly, with the oblong reddish callus continued as a fine line halfway up the forehead, the callus with a median indented line; the face is yellowish brown, with yellowish-brown hairs above and blackish ones below, the scanty beard being blackish; the palpi are reddish, with black pubescence, not very stout at base, with a rather long point. The antennæ are blackish, the first two joints dull red, with black hairs; the first joint stout, large, cap-like, the second very small, the third with the usual tooth rather near the base. Thorax reddish brown, with some yellowish-brown and grey tomentum and some black hairs anteriorly; no stripes are visible. Scutellum chestnut-brown like the abdomen, with black pubescence, darker at base. Abdomen bright chestnut-brown, almost devoid of pubescence, traces of yellowish-brown tomentum only on the first segment; sides with short black hairs; the lateral margins of fourth, fifth, and sixth segments yellowish transparent; the underside the same colour as the dorsum. Legs reddish brown, coxæ with black pubescence and some brown tomentum. Femora dull reddish, the fore femora darker, all with black pubescence; tibiæ brighter red, apex of fore tibiæ black; fore tarsi black, the others the same colour as the tibiæ, both with black pubescence, which is thickest on the hind tibiæ and tarsi. Wings hyaline, tinged with brown, on the fore border brown, a little yellowish at the base; veins brownish, tinged with brown, which becomes paler towards the apex of the wing.

Tabanus obscurehirtus, ♀, sp. n.

Type (female) from Lutete, Congo, Nov. 10, 1903, and another female from Leopoldville, Congo (presented by Liverpool School of Tropical Medicine), Dec. 7, 1903, 1904. 267.

A yellow robust species easily distinguished from *T. par*, *T. thoracinus*, P. B., and *T. obscuripes*, sp. n., by its long black-haired femora and white fore tibiæ. The thorax also appears redder than in the above-mentioned species.

Length 15 mm.

Head a little wider than the thorax. Face red, thickly covered with yellow tomentum and with yellow pubescence; beard yellow. Palpi long, slender, slightly broader at the base, tapering to a point, with thick black pubescence and some yellow hairs below. Antennæ bright red, only the extreme apex black; the first and second joints pale yellow, with black pubescence; the tooth fairly prominent near the base. Forehead narrow, six times as long as it is broad, yellow, the frontal callus brown, red, shining, not reaching the eyes, narrow, produced to a point posteriorly, whence a narrow line proceeds nearly reaching the vertex. Thorax fulvous, with short yellow tomentum on the dorsum; no stripes, sides with longer yellow hairs; the breast yellow, with thick pubescence consisting of long yellow hairs. Scutellum and abdomen fulvous, the segmentation of the latter very narrowly pale yellow, the dorsum with short yellow pubescence, the lateral borders of the last four segments with yellow transparent margins; the underside similar, with short black pubescence. Legs dull reddish, the basal half of the fore tibiæ white, with white pubescence, the basal half of the other tibiæ pale reddish, with some black pubescence on the middle pair, and on the posterior pair with thick black pubescence, long on the outer and inner borders, mixed with a few fulvous hairs; the fore femora dull black, the middle and posterior femora dull red, but all so thickly covered with black pubescence that they appear black; the fore and middle femora with fringes of long black hairs on the outer and inner borders; all the tarsi blackish, with black pubescence; the coxæ blackish, with grey tomentum. Wings tinged with brown, yellow on the fore border; veins yellow; no appendix; all the posterior cells widely open.

Tabanus obscuripes, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and another from Zegi, Tsana, Abyssinia, v. & vi. 1902 (*Degen*), 1902. 222; two females from Dembratcha, Godjam, Abyssinia, April and May, 1902 (*Degen*), 1902. 222.

This yellow species from Abyssinia is nearly allied to *Tabanus par*, Wlk., and *Tabanus thoracinus*, P. B., but is distinguished from them by the black fore femora.

Length 14 mm.

Forehead narrow, nearly six times as long as it is broad. The palpi have a few black hairs, but chiefly whitish pubes-

cence, thick below. The fore femora are black, shining, pale yellow at the extreme apex, with black pubescence and white hairs on their outer borders; the other femora have also some whitish pubescence, the fore tibiæ at the apex and all the fore tarsi black; the other legs are reddish yellow, the tarsi with black pubescence. The wings are tinged with yellow; a very short appendix is present in all the specimens except one.

Two damaged specimens from Ruwe, Lualaba River, Congo Free State, area 10° S., 26° E., Feb. 1906 (*Dr. A. Yale Murray*), 1906. 98, may possibly belong to this species, which would thus have a wide distribution; the specimens are too poor to enable us to speak with certainty. It is probable that with the advent of fresh material many variations will be found in this group represented by the typical form of *T. par* of Walker, and that the species will only be distinguished by small differences, such as the colouring of the legs and of their pubescence and colouring of the wings.

Tabanus obscurior, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and three other females from Wathen, Congo Free State, 1904 (*per Rev. W. H. Bentley*), 1905. 207.

This species from West Africa is very closely allied to *Tabanus obscuripes*, sp. n., from Abyssinia, and is only distinguished from it by the browner wings with no appendix, by the fore femora and tibiæ having no yellowish-white hairs but only black pubescence, and on the middle and posterior femora the pubescence is here reddish yellow, not whitish; the palpi are slightly darker, with yellowish hairs below, and the hairs on the face are darker than in *Tabanus obscuripes*, and have some reddish-yellow hairs intermixed.

Length 14 mm.

Tabanus claritibialis, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) from south end of Nyasa to Upper Shiré, C. Africa, 1500 feet, 14. i. 06 (*E. L. Rhoades*), and another female from Upper Shiré, 1500 feet, 20. i. 06 (*E. L. Rhoades*).

A species approaching in general resemblance the group represented by *Tabanus par*, Wlk., but differing from all the known species in the colouring of the legs and shape of forehead; for the present we place it in this group.

A species with reddish-yellow abdomen, black thorax, clear wings, and *black legs with all the tibiæ white*.

Length 14½ mm.

Head wider than the thorax. Face covered with whitish-grey tomentum and with white pubescence; beard white. Palpi a little stout at base, ending in a rather obtuse point, reddish, covered with dense white pubescence and some short black hairs towards the apex on the upper border. Antennæ reddish, darker at the apex, the first joint cylindrical, rather smaller than usual, the second very small, both with black pubescence; the third long, with tooth very near the base and small, the first division with grey tomentum. Subcallus reddish brown, shining, furrowed in centre, with some grey tomentum chiefly round base of antennæ. Forehead not so narrow as in the species belonging to *T. par* group, one width throughout, about four times as long as it is broad, blackish, covered with grey tomentum; the frontal callus the same colour as the subcallus, almost square, not quite reaching the eyes, the line proceeding from it short, thick; a dark, shining, small, oblong spot on vertex; there are white hairs on each side of the frontal callus and at its base. Back of head whitish, with black pubescence. Thorax black, somewhat shining, with the beginnings of three grey median stripes, and with some grey tomentum; otherwise bare; sides reddish, with black hairs. Breast brown, with grey tomentum and some white pubescence. Scutellum blackish, with grey tomentum and some white pubescence. Abdomen uniformly reddish yellow, with the last three segments brownish or blackish, pubescence black, short; underside identical, but with some whitish tomentum. Legs black, with black pubescence; the tibiæ pale yellowish white, with whitish pubescence, black at their extreme apex, the fore tibiæ more widely so. Wings hyaline, veins brown, stigma yellow; no appendix; the first posterior cell widely open.

Tabanus morsitans, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) from Somaliland (*Capt. R. E. Drake Brokman*), 1905, and two other females from Somaliland (*Capt. Swayne*), 94. 201 (damaged).

This fly is believed by the donor (*Capt. Brokman*) to disseminate a disease which is fatal to horses and mules and occurs in certain districts at times when the fly is also found. "Letter from donor to Mr. E. F. Fagan, 20. v. 05." The two specimens collected by *Capt. Swayne* are mentioned in a note in 'Monograph of Tsetse Flies' by Mr. E. E. Austen on page 367 as representing "Balaad," a fly called thus by

the natives in Somaliland, and stated by Col. Swayne to be by far the worst fly on the Webbe, the natives stating that when numerous it kills horses and camels.

A narrow-bodied brownish species with two distinctly separated calli on the broad forehead and with round grey spots on each side of the abdomen, clear wings, yellowish legs and antennæ. It resembles a *Hæmatopota* in general appearance and is related to *Tabanus suffis*, Jaennicke, but distinguished from it by the large, convex, transverse, black frontal callus, with both borders straight, not indented; the eyes apparently not striped; the lateral spots of the abdomen are round, isolated, not obliquely placed, touching the posterior borders of the segments as in the above-mentioned species.

Length 13 mm.

Head wider than the thorax. Face greyish with long white hairs; beard white. Palpi white, short, stout at base, ending in a short point, hairy with short black pubescence and some silvery-white hairs. The reddish-brown band on the upper part of face bearing the antennæ is covered with grey tomentum. The first and second joints of antennæ yellow with black pubescence; the third joint is wanting. Forehead broad, the same width throughout, hardly more than twice as long as it is broad, covered with yellowish-brown tomentum; the frontal callus large, black, shining, very convex, transverse, reaching the eyes; beyond and distinctly separated from it is an irregular, almost heart-shaped, black spot slightly indented in the middle, and another smaller brownish spot on the vertex. Eyes bare with apparently no stripes. Thorax blackish brown, with grey tomentum and with two greyish indistinct stripes and the sides greyish, the dorsum with very scanty black pubescence; the breast and sides reddish, covered with grey tomentum and white pubescence; the scutellum reddish brown, shining. Abdomen long and narrow, dark brown, more reddish brown on the basal segments; the first segment with a small median grey spot, and two oval grey spots on sides, of grey tomentum; every other segment, except the last one, with a distinct, round, isolated, grey spot on each side and traces of a median grey spot, which is most distinct on the second and third segments; the dorsum is almost bare of pubescence, the segmentations narrowly greyish; underside brownish, with greyish-yellow segmentations. Legs reddish yellow, fore tarsi and apex of fore tibiæ darker. Wings hyaline, veins and stigma yellowish (the two collected by Capt. Drake have an appendix), the first posterior cell is widely open.

[To be continued.]

XLIV.—Description of a new Longicorn Beetle from South Africa. By W. L. DISTANT.

Megacaelus gustavi, sp. n.

Black, with a more or less olivaceous tint; elytra crossed by a transverse yellowish-white fascia at middle; head somewhat thickly brownish pilose, finely punctate at base, with a central medial linear impression not quite reaching base; antennæ robust, first joint thickest and clavate towards apex, second very short, third longest, a little longer than



Megacaelus gustavi, sp. n.

fourth or fifth which are subequal, remaining joints excluding apical gradually narrowing and almost subequal, apical joint shortest; pronotum finely punctate, centrally anteriorly subcordately depressed, on each side of the anterior margin of the depression a transverse flattened tuberculous ridge, at base a central transverse ridge; scutellum slightly centrally concave, broadly ridged on each side; elytra somewhat thickly punctate, the punctures more visible on the transverse pale fascia, each elytron with two longitudinal discal linear ridges, their apices angularly rounded and in the ♀ not reaching the abdominal apex; body beneath more or less brownly pilose; legs finely shortly pilose, the margins of the femora and tibiæ more distinctly so.

Long. ♀ 30 mm.; max. lat. hum. angl. 10 mm.

Hab. Cape Colony; East London (*G. Distant*).

Allied to *M. didelphis*, Chevr., but not only differing in colour and markings, the narrow transverse pale fascia being placed at middle of elytra, but also in the antennæ, which are almost twice as broad.

XLV.—*On a new British Terrestrial Isopod* (*Trichoniscus linearis*, sp. n.). By ALEXANDER PATIENCE.

[Plate XI.]

Family Trichoniscidæ.

Genus TRICHONISCUS, Brandt, 1833.

Trichoniscus linearis, sp. n. (Pl. XI.)

Description of species.—Body oblong linear in form, fully three and a half times as long as broad. Dorsal face moderately convex and very strongly tuberculated transversely across the segments. Cephalon with front obtusely rounded; lateral lobes fairly prominent and each bearing one or two tubercles. Lateral parts of the segments of mesosome having no obvious spicules, the lateral parts of the three posterior segments recurved and acuminate. Metasome occupying less than one fourth of the length of body, the terminal expansion being broadly rounded at the tip and carrying three small spicules. Eyes consisting apparently of a single visual element imbedded in dark pigment. Antennulæ with the last joint about twice the length of second and having from five to seven sensory filaments. Antennæ about one-third the length of body, the joints of peduncle being strongly spinulose, and the flagellum being composed of four articulations. Left mandible with two, right with one, penicil behind the cutting part. The meral joint of seventh peræopod in male is broadly expanded, while the last joint is densely ciliated on the outer edge. The seventh peræopod in female not observed. Inner ramus of first pair of pleopoda in male biarticulate; the terminal joint about same length as first, and ending in a sharp point turned slightly inwards and finely serrated on the outer edge. Inner ramus of second pair biarticulate, proximal joint short; the distal joint greatly produced, contracted at about half its length and then produced to a fine hair-like point. The tip of the outer plate reaches to about the middle of distal joint of inner ramus. Uropoda with outer ramus about twice the length of basal part, the inner ramus being narrower and shorter. Colour of the living animal, white, semipellucid, the male exhibiting slight ramifications of minium-red across the segments. No trace of pigment

discernible on the dorsal face of the female. Length of adult male and female specimens about 3 mm.

Remarks.—Three specimens of this species (one male and two females) were sent to me for examination by my friend Mr. R. S. Bagnall, F.E.S., Winlaton-on-Tyne, and, so far as I have been able to ascertain, it does not seem to have been hitherto described. It is at once distinguished from all the other British species of *Trichoniscus* by its conspicuously linear form, approaching nearer to *T. pygmaeus*, G. O. Sars, in this respect than any other member of the genus. It offers some further points of resemblance to the just-named species, notably in the form and structure of the first and second pairs of pleopoda of the male. The inner ramus of the first pair in both species shows a close resemblance; the proximal part of the outer plate, however, is more broadly expanded in *T. linearis*; while the distal joint of the inner ramus of the second pair appears to be more flexible than that found in *T. pygmaeus*. It differs obviously, however, from that species in the structure of the eye, having only one visual element—in this respect resembling not only *T. roseus* (Koch), but also *Trichoniscoides albidus* (B.-Lund), *Haplophthalmus danicus*, B.-Lund, and *H. mengii* (Zaddach); while the dorsal face is very much more strongly tuberculated, and the tip of the last segment of the metasome is rounded, whereas in *T. pygmaeus* it is truncate. *T. linearis* agrees in the form of the telson with *T. stebbingi*, Patience, and *T. spinosus*, Patience.

Occurrence.—Mr. Bagnall found three specimens in Kew Gardens, London, December 3rd, 1907, in company with *Haplophthalmus danicus*, Budde-Lund, under flower-pots, in a moderately cool greenhouse. In these flower-pots, among the roots of several plants, *T. stebbingi* was also found. Mr. Bagnall informs me that its movements are slower than any other species of the genus, resembling rather the movements of *Haplophthalmus*, and, in consequence of this, was regarded as belonging to that genus until examined under a microscope.

The genus *Trichoniscus* is readily distinguished from *Haplophthalmus* by the abruptly contracted metasome, the epimeral plates of the two anterior segments not being concealed. These latter in *Haplophthalmus* are small and concealed by the lateral part of the last segment of the mesosome, while the three posterior segments are broadly expanded. The sculpture of the dorsal face in this genus is also somewhat different, having more or less distinct longi-

tudinal ribs. In the oral parts *Haplophthalmus* differs from *Trichoniscus* in the structure of the maxillipeds, the terminal part of which is 5-articulate, while the epignath is simple and lanceolate.

Other species belonging to the *Trichoniscidæ* taken at Kew on that date were *Trichoniscus pusillus*, Brandt, *T. pygmaeus*, G. O. Sars, *T. roseus* (Koch), *Trichoniscoides albidus* (B.-Lund), *Haplophthalmus danicus*, B.-Lund, and *H. mengii* (Zaddach).

Note.—A preliminary description of *T. linearis* was read to the Glasgow Natural History Society on January 28th, 1908.

EXPLANATION OF PLATE XI.

- ♂. Male specimen of *Trichoniscus linearis*, about 3 mm.
*a*¹. Antennula.
 A. Antenna.
f. Flagellum of antenna.
*m*¹. First maxilla.
mp. Maxilliped.
pp. 7 ♂. Seventh peræopod of male.
plp. 1 ♂. First pair of pleopoda of male.
plp. 2 ♂. Second pair of pleopoda of male.
 T. Last segment of metasome with uropoda.

*m*¹ is magnified on a higher scale than *mp*.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

November 6th, 1907.—Sir Archibald Geikie, K.C.B., D.C.L., Sc.D., Sec.R.S., President, in the Chair.

The following communications were read :—

1. 'On a Collection of Fossil Plants from South Africa.' By Prof. Albert Charles Seward, M.A., F.R.S., F.G.S.

The material on which this paper is based was, for the most part, collected by members of the Geological Survey in Cape Colony from the Molteno and Burghersdorp Beds. The Molteno Beds are placed at the base of the Upper Karroo, or Stormberg Series; the Burghersdorp Beds constitute the uppermost strata of the Middle Karroo, or Beaufort Series. Mr. A. L. Du Toit, who has contributed accounts of the stratigraphy of the plant-bearing and associated rocks.

describes the occurrence of a transitional zone between the Molteno and the Burghersdorp Beds. The following species are described :—

(A) MOLTENO BEDS.

<i>Schizoneura Carrerei</i> , Zeill.		<i>Teniopteris Carruthersi</i> , Ten.Woods.
<i>Schizoneura</i> sp.		<i>Cladophlebis (Todites) Rasserti</i>
<i>Thinnfeldia odontopteroides</i> (Morr.).		(Presl).
<i>Thinnfeldia</i> sp.		<i>Pterophyllum</i> sp.
<i>Thinnfeldia</i> sp. nov.		<i>Baiera</i> sp. nov.

(B) BURGHERSDORF BEDS.

<i>Schizoneura</i> sp.		<i>Strobilites</i> sp. nov.
<i>Thinnfeldia</i> sp. nov.		<i>Pterophyllum</i> sp. cf. <i>Pt. Tietsii</i> ,
<i>Teniopteris Carruthersi</i> , Ten.Woods.		Schenk.
<i>Danaopsis Hughesii</i> , Feist.		<i>Stigmatodendron</i> sp. nov.
<i>Odontopteris</i> sp. nov.		

A description is also given of *Schizoneura africana*, Feistmantel, a species originally figured by Hooker in an appendix to Bain's paper, published in 1845.

The additional plants recorded from the Molteno Beds afford further evidence in favour of assigning this member of the Stormberg Series to the Rhætic Period. While possessing certain Rhætic species, the Burghersdorp flora as a whole indicates a somewhat lower horizon.

2. 'Permo-Carboniferous Plants from Vereeniging (South Africa).' By Prof. Albert Charles Seward, M.A., F.R.S., F.G.S., and Thomas Nicholas Leslie, F.G.S.

The majority of the specimens described in this paper were obtained by Mr. Leslie from a sandstone-quarry $1\frac{1}{2}$ miles from Vereeniging, on the banks of the Klip River; the sandstones are associated with shales, coal-seams, and glacial conglomerates. In the opinion of the Authors, the plant-beds should be included in the Ecca Series (Lower Karroo). While recognizing certain well-marked differences between the *Glossopteris*-floras and the Upper Carboniferous and Permian floras of the Northern hemisphere, they are inclined to think that there are more types common to the two botanical provinces than is generally supposed.

The following species have been recognized at Vereeniging :—

<i>Schizoneura</i> sp.		<i>Neuropteridium validum</i> , Feist.
* <i>Glossopteris angustifolia</i> , Brongn.,		<i>Bothrodendron Leslii</i> , Sew.
var. nov.		* <i>Lepidodendron</i> sp. nov.
<i>Glossopteris angustifolia</i> , Brongn.		* <i>Lepidodendron Pedreanum</i> (Carr.).
<i>Glossopteris Browniana</i> , Brongn.		<i>Sigillaria Brardi</i> , Brongn.
<i>Glossopteris indica</i> , Schimp.		<i>Psymphyllum Kidstoni</i> , Sew.
<i>Glossopteris</i> sp. cf. <i>Gl. retifera</i> , Feist.		<i>Cordaites (Nagyerathiosis) Hislopi</i>
<i>Gangomopteris cyclopteroides</i> , Feist.		(Bumb.).
* <i>Callipteridium</i> sp.		<i>Conites</i> sp.

Those marked with an asterisk are recorded for the first time.

MISCELLANEOUS.

The Echinoid Name Cidaris and its Modern Application.

By F. A. BATHER, British Museum (Nat. Hist.).

FOR many years past the writers on Echinoidea have been at loggerheads over the meaning to be attached to the name *Cidaris*, and, as was pointed out to them in the Introduction to the 'Zoological Record' for 1903 (Section "Echinoderma"), the confusion seemed likely to continue until they decided "who, under the rules of nomenclature, was its author, or which species was the genotype." At last a few have ventured on this attempt; but the conflict of opinion continues. It would be safer to remain a spectator, but having now occasion to discuss some genera of Cidaridæ, I have been forced to choose a side in the quarrel. This choice has been determined by the elaborate and carefully considered rules recently issued by the Nomenclature Committee of the International Congress of Zoologists—rules by which every zoologist should feel bound, whatever his private views or previous practice. As an example of their application to an old and common genus, the present enquiry may have more than a special interest.

How does the case stand? Taking only leading writers during the present century, we find J. Lambert * saying "*Cidaris*, dont le type est le *C. mauri* Schynwoet, 1711"; T. Mortensen † says "*Cidaris* Klein (emend.)," and, from page 19, it appears that he regards *Echinus cidaris* Linn. as genotype, and believes that Lovén showed this to be identical with *C. baculosa* Lamarck; L. Doederlein ‡ has changed his view once since 1900, and his latest statement is "*Cidaris* Leske (Syn. *Dorocidaris* A. Agassiz), Type *C. papillata* Leske"; H. L. Clark § says "*Cidaris* Leske. Type species *tribuloides* Lamarck."

Preliminary criticism of the simplest kind shows that Mr. Lambert's view, however logical from his peculiar standpoint, is out of court. The Dutch author S. Schynwoet was entirely pre-Linnean; the name "*Cidaris mauri*" occurs also in the equally pre-Linnean Klein || under *Cidaris mammillata* (p. 19), and is supposed by A. Agassiz ¶ to be a synonym of "*Phyllacanthus imperialis* Brandt," = *Cidarites imperialis* Lamarck. If the last-mentioned has any claim to be the genotype of *Cidaris*, that claim cannot be based on *C. mauri*.

We pass to Dr. Mortensen. It is a contradiction to ascribe

* 1902. "Ech. foss. Barcelone, 1^e partie," Mém. Soc. géol. France, Pal., ix. fasc. 3, Mém. 24, p. 27.

† 1903. 'Ingolf' Exped. vol. iv. Echinoidea, pt. 1, p. 28. Copenhagen.

‡ 1906. "Echinoiden," Wiss. Ergeb. der deutschen Tiefsee-Exped. Bd. v. Lief. 2. Jena.

§ 1907. "The Cidaridæ," Bull. Mus. Comp. Zool. Harvard, li. no. 7.

|| 1734. 'Naturalis dispositio Echinodermatum.' Gedani.

¶ 1872. 'Revision of the Echini,' p. 175. Cambridge, Mass.

Ciliaris to Klein, 1734, and to take as genotype *Echinus cidaris* Linn., a species that dates at earliest from 1752. To the bearing of this specific name on the post-Linnean *Ciliaris* we shall recur, merely pointing out that, if it equals *C. baculosa*, then *Ciliaris* replaces *Phyllacanthus* Brandt, according to the usual diagnoses and content of that genus, though not according to the views of Mortensen.

Professors Doederlein and Clark, it will be observed, agree in ascribing *Ciliaris* to Leske*, and here they appear to be in complete accord with the facts and with every code of nomenclature. They differ, however, as to the genotype, for which, to all appearance, Clark adopts a species not mentioned by Leske. Such a course is not permissible unless the later name can be shown to have supplanted one of Leske's names. Prof. Clark does, in fact, attempt to justify his choice by stating that his genotype, *Ciliarites tribuloides* Lam., was included in *Ciliaris papillata* Leske, and that it was selected as type by Brandt. The former statement is correct in so far as Lamarck himself referred to Leske's figure of *Ciliaris papillata*, var. *minor* Leske, a reference which was accepted by A. Agassiz (1872, 'Revision,' p. 99). It therefore appears that Clark, no less than Doederlein, regards *Ciliaris papillata* Leske as containing the genotype; indeed, he says that all the rest of Leske's twenty-eight species have been removed to other families.

Taking, then, Leske as author of *Ciliaris*, let us apply the rules of nomenclature. Those relating to the determination of a genotype are now summarized in Article 30 of the International Code†. Applying them in order of precedence, as we are definitely instructed to do, we are checked first by (d): "If a genus, without originally designated or indicated type, contains among its original species one possessing the generic name as its specific or subspecific name, either as valid name or synonym, that species or subspecies becomes *ipso facto* type of the genus." Now the opening sentences of Leske's "Additamentum ad Kleinii § 21. Species II. *Ciliaris mauri* &c." (1778, p. 125) run thus: "Spec. XIX. *Ciliaris papillata*. Tab. VII. Non possum non, quin hic iterum cum KLEINIO et LINNEO sentiam, qui ad unam speciem referunt omnes varietates, quas alii, præsertim Cl. VAN PHÉLSUM, species esse existimant. Nominatur hæc species a LINNEO: *Echinus cidaris*, hemisphærico depressus; ambulacris quinque repandis linearibus; areis alternatim bifariis. *S. N. p. 1103. sp. 8. Mus. L. vi. p. 710. Faun. Svec. p. 513, n. 2118.*" The diagnosis quoted is that of *Syst. Nat.* ed. x. (1758). It would not have been possible for Leske to say more plainly or precisely that he regarded his *C. papillata* and *Echinus cidaris* Linn. as synonymous. It seems to follow that, whichever name be accepted, this species must be the genotype by rule (d).

* 1778. 'Additamenta ad Klein': Lipsiæ, pp. xvii, 74, et seqq.

† See 'Science,' n. s. xxvi. p. 621; Oct. 1907. Also J. A. Allen, 1907, "A List of the Genera and Subgenera of North-American Birds," Bull. Amer. Mus. Nat. Hist. xxiv. pp. 1-50.

Since *C. papillata* Leske is merely a substitute for the pre-Linnean and non-binominal "*Cidaris Mammillata Mauri*" of Klein, Lambert also may be claimed as a supporter of this view. Happily, then, our four twentieth-century authorities seem to be essentially in agreement with the course that the rule imposes. It is with the next step that trouble begins.

It is generally admitted that *Cidaris papillata* Leske is a composite species. Leske himself (1778, pp. 125 *et seq.*) divided it into four varieties: I. *major*, Tab. vii. a, Tab. xxxix. f. 2; II. *minor*, Tab. vii. b, Tab. xxxvii. f. 3; III. *spinis conoideis*, a SCILLA tab. xxii. f. 1, 2, 3 delineata; IV. *spinis claviculatis*. The last includes only various fossils not regarded as truly characteristic. The first three varieties were placed by Lamarck* in three fresh species: I. *Cidarites imperialis*; II. *C. tribuloides*; III. *C. hystrix*. Those references are on the whole accepted in A. Agassiz (1872, 'Revision,' pp. 151, 99, 105 respectively). Since Lamarck made no other mention of *Cidaris papillata*, it seems to follow that one of his three species must fall into the synonymy of that species. The obvious course would have been to take Var. I. as the type of *C. papillata*; but, as things happened, the name *papillata* became generally attached to a form that appears to represent *C. hystrix*. Therefore it is safest to follow A. Agassiz and others in regarding *C. hystrix* as a synonym of *C. papillata*; otherwise there would be terrible confusion.

We have, then, three species representing the original *C. papillata*, viz. I. *imperialis* Lam., II. *tribuloides* Lam., III. *papillata* Leske. The last of these must be regarded as carrying on the traditions of the species, so to speak. Its holotype is the specimen from Sicilian seas figured as a "Hystrix" by Scilla (1759, 'De corporibus marinis lapidescentibus,' ed. 2, tab. xxii. f. 1, 2, 3). Now, as we have already agreed that *C. papillata* Leske is the type of *Cidaris*, and as we have now defined *C. papillata* Leske, it might seem that the question was settled. Not so!

Let it be remembered that the reason for selecting *C. papillata* as genotype of *Cidaris* was its alleged synonymy with *Echinus cidaris* Linn. But if the species be thus divided, the hegemony might be held to lie with that division which corresponded to *Echinuscidaris*. Here a totally different difficulty arises. Mortensen, for instance, professing to follow Lovén, identifies *Echinus cidaris* with *Cidarites baculosa* Lam., and therefore regards the last-mentioned species as the genotype, although no one has hitherto supposed it to represent a Leskian species. This course, however, depends on a misreading of Lovén, who has discussed the meaning of *Echinus cidaris* at great length †. Lovén shows that the type-specimen of *Echinus cidaris* Linn., 1752, belongs to *Cidarites baculosa* Lam. We, however, are concerned not with this, but with *Echinus cidaris* Linn., 1758. Here the diagnosis was altered from "globoso-depressus" to "hemisphaerico-depressus," and

* 1816. 'Hist. nat. Anim. sans Vertèbres,' iii. pp. 54-56.

† 1887. "Echinoidea descr. by Linnæus," Bih. Svensk. Vet.-Akad. Handl. xiii. Afd. 4, no. 5, pp. 138 *et seq.*

references were added to *Cidaris mammillata mauri* of Klein and to *Echinometra digitata* 2 of Rumph, both of which are included by Leske in *C. papillata*. Lovén therefore supposes (*op. cit.* p. 149) that "the species which caused him [Linnæus] to alter the word 'globoso' to 'hemisphærico' was . . . the *Cidaris papillata* Leske." This conclusion is confirmed, in Lovén's opinion, by the change of habitat from the East Indies (1752) to the Ocean (1758) and the Norwegian Ocean (1761, 'Fauna Suecica'). The reasoning seems inevitable that *Echinus cidaris* Linn., 1758, was rightly regarded by Leske as synonymous with his *Cidaris papillata*, and that, to be more precise, it corresponded with Leske's var. 3, which now is the restricted and universally accepted *C. papillata*. So clear is this that it is really hard to see why this species should not be called *Cidaris cidaris* (Linn.).

I have worked out this conclusion quite independently; it agrees with the conclusion reached by Doederlein in 1906. Clark objects to it because *Dorocidaris* A. Ag. thus becomes a synonym of *Cidaris*; and he correctly says that Doederlein does not discuss the divisions of *C. papillata* Leske. The preceding discussion shows, however, that the same conclusion would have followed had he done so. Clark, it is true, comes to different conclusions in the process, but he does not use the rule of type by tautonomy. Doederlein appears to have acted on the principle of elimination, which, so far as I can see, does lead to his conclusion. Clark applies in addition rule (*g*) of the International Code, or Type by subsequent designation. This certainly takes precedence of elimination, and it will be interesting to see how Clark applies it—ignoring for the moment the Tautonomy rule.

Clark says (p. 174) "Brandt, who was the first writer to subdivide *Cidaris*, distinctly states that *tribuloides* is the type of *Cidaris* s. str." I suppose that Clark is here referring to J. F. Brandt (1835) †, but, if so, he can hardly be speaking by the book. Brandt did nothing of the kind. Here are his actual words (p. 67):— "Genus *Cidarites* Lamk. Subgen. [nov.] *Phyllacanthus* Br. . . (p. 68) Sectio B. Nob.* Spec. 1. *Cidarites* (*Phyllacanthus*) *dubia* Br. [sp. nov.] . . . Sectioni B. e specierum cognitarum numero adjungendæ, *C. imperialis* Lamk. . . *C. hystrix*. . . *C. geranioides* . . . *C. pistillaris*. . . [Footnote]* Sectio A seu prima subgeneris *Phyllacanthus*. . . amplectitur *Cidaritidem tribuloidem* Lamarckii aliasque affines." It is clear that Brandt mentions no species of *Cidaris* s. str. Brandt; that every species mentioned is referred by him to his new subgenus *Phyllacanthus*; that he fixes on no type; that, though the species which, owing to our conventions with regard to footnotes, comes highest on the page is *C. dubia*, yet the species that comes first in reading, in actual writing, and in sense is the only species named under Sectio A, viz. *Cidarites* (*Phyllacanthus*) *tribuloides*. I do not here propose to enquire whether any valid reason exists for considering *C. dubia* (= *imperialis* Lam.) as genotype of *Phyllacanthus*: the question does not concern

† 'Prodromus descript. anim. ab H. Mertensio . . . observ. . .' Fasc. i. Petropoli.

the subject of this paper. But I do deny that Brandt made *C. tribuloides* genotype of a restricted *Cidaris*.

If the rule of first reviser is to be applied, we must turn to a paper quoted by many, but entirely overlooked by Prof. Clark. J. E. Gray (1825, Ann. Philos. xxvi. p. 426) fixed the genotype as *C. imperialis* Lam., still further defining that species by a reference to Klein, t. vii. f. A. This, it will be remembered, was the type of Leske's Var. I. *major*; it was also the first species mentioned by Lamarck; therefore on both counts Gray was only following the dictates of common-sense in taking it as the genotype. Under the rules of nomenclature, however, this choice can be justified only by reinstating *papillata* as the trivial name of this species, leaving *hystrix* to Leske's Var. III. This conclusion would, of course, cut out *Phyllacanthus*, a much older genus than *Dorocidaris*.

This line of argument need not, however, be pursued further. *Cidaris imperialis*, by whatever name it be called, is excluded by the previous application of the tautonomy rule. The genotype of *Cidaris* by that rule is *C. papillata* = *Echinus cidaris*.

Among the results, "unfortunate" or otherwise, of this rule are the retention of *Phyllacanthus*, the suppression of the name *Dorocidaris*, and its replacement by *Cidaris* transferred from the section to which it is applied by Clark (viz. *C. metularia*, *C. tribuloides*, *C. thouarsi*), as well as from that to which it is applied by Mortensen (viz. the same three species + *C. affinis*, *C. reini*, and *C. baculosa*, of which the two former are referred by Clark to *Tretocidaris* Mortensen, and the last to *Phyllacanthus*). For a genus including all these species and others Doederlein (1906) has revived the name *Cidarites* Lamarck, without fixing on a genotype. In Clark's protest against this resurrection I heartily join, for the simple reason that Leske himself used *Cidarites* and *Cidaris* indifferently, applying the former name to *C. excavatus*, *C. coronalis*, *C. corollaris*, *C. circinnatus*, and *C. ovariis* merely because they were fossils. As Clark says, *Cidarites*, in Lamarck's sense, "is clearly a substitute for, and synonym of, *Cidaris*."

If a generic name be required for this section, one is already provided in *Gymnocidaris* A. Agassiz, 1863, with genotype *Cidaris metularia*.

The main results of this enquiry may be summarized thus:—

CIDARIS Leske (synn. *Cidarites* Lam., *Dorocidaris* A. Ag.).

Genotype, *C. papillata* Leske, restr. (synn. *Echinus cidaris* Linn., 1758, and *Cidarites hystrix* Lam.).

GYMNOCIDARIS A. Ag. (synn. *Cidarites* restr. Doederlein, *Cidaris* restr. Clark).

Genotype, *G. metularia* (Lam.).

PHYLLACANTHUS Brandt (syn. *Cidaris* restr. Gray).

Genotype, *P. imperialis* (Lam.).

I express no opinion as to the validity or extent of these generic divisions.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 4. APRIL 1908.

XLVI.—*Descriptions of some new Species of Noctuidæ from Peru.* By HERBERT DRUCE, F.L.S. &c.

ALL the species now described were collected by Mr. W. F. Rosenberg's late collector Mr. G. Ockenden.

Fam. Noctuidæ.

Subfam. HADENINÆ.

Miselia albistriga, sp. n.

Head and thorax greenish brown; antennæ and palpi pale brown; abdomen dark brown above, paler on the underside; a tuft of greenish hairs at the base of the abdomen and two tufts of reddish-brown hair above the anus. Primaries dark brown, crossed from the costal to the inner margin by two curved greenish lines; a white spot at the end of the cell, the apex and outer margin mostly greenish; secondaries very dark brown, the fringe paler. Underside pale brown.

Expanse $1\frac{1}{5}$ inch.

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

Miselia albistellata, sp. n.

Male.—Head, tegulæ, thorax, and abdomen blackish brown, the underside of the abdomen and legs pale brown; antennæ and palpi brown. Primaries pale fawn-colour,

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darkest about the middle, the base of the wing white, the costal margin spotted with white; a small spot in the cell and a large one at the end of the cell, both white; several white dots below the cell and along the inner margin; a submarginal row of white dots extends from the apex to the anal angle; the fringe pale fawn-colour: secondaries creamy white, with a black spot at the end of the cell; the fringe very pale fawn-colour: the underside much paler than the upperside, darkest along the costal margin of the primaries. —*Female* similar to the male, but the primaries much darker and redder brown, with all the white spots much smaller and more indistinct; the secondaries dark blackish brown.

Expanse, ♂ 1, ♀ $\frac{9}{16}$ inch.

Hab. S.E. Peru, Oconeque, Carabaya, 7000 feet; Santo Domingo, 6000 feet (*Ockenden, Mus. Druce*).

Miselia chrysochlora, sp. n.

Head, collar, tegulæ, and thorax pale yellowish green mixed with dark brown hairs; abdomen dark brown. Primaries pale yellowish green, the costal margin spotted with dark brown from the base to the apex; the central part of the wing and the inner margin thickly covered with dark brown spots of various sizes; a curved, narrow, zigzag line crosses the wing beyond the middle; a submarginal row of various-sized dark brown spots extends from the apex to the anal angle; the fringe alternately dark brown and yellowish green: secondaries dark brown; the fringe yellowish green mixed with dark brown hairs. Underside: primaries dark brown, paler at the base; secondaries greyish, irrorated with dark brown scales to beyond the middle; a black spot at the end of the cell; the outer margin from the apex to the anal angle broadly dark brown; the fringes of both wings as above.

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

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

Miselia ignepectus, sp. n.


Head red; collar, tegulæ, and thorax dark reddish brown; abdomen above greyish brown, the sides and anus bright red, the underside pale brown; the legs clothed with red hairs. Primaries very dark brown, irrorated with grey scales; a rather wide olive-green band crosses the wing from the costal margin close to the base to the inner margin; a large olive-green spot at the end of the cell, and a submarginal, wavy, olive-green line extending from the apex to the anal

angle; the fringe greyish brown: secondaries dark brown, palest at the base; the marginal line red; the fringe brown. Underside: primaries dark brown, the costal and outer margins broadly banded with red; a black line at the end of the cell, beyond which a very indistinct dark line crosses the wing from the costal to the inner margin: secondaries pale brown, thickly irrorated with red scales; a dark submarginal line crosses the wing from near the apex to the anal angle.

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

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

Miselia albitela, sp. n.

Head, collar, tegulæ, and thorax yellowish brown; antennæ pale brown; abdomen greyish; anus yellowish brown; underside of abdomen and legs pale yellowish brown. Primaries dark reddish brown, yellowish brown at the base; a wide -shaped mark at the end of the cell and a submarginal broken band of spots extending from the apex to near the anal angle, both yellowish brown; a marginal row of very indistinct grey spots extends from the apex to the costal margin; a white angular-shaped spot below the cell, not reaching the inner margin; the fringe pale yellowish brown: secondaries sordid white, the outer margins broadly dusky; the fringe yellowish. Underside: primaries dark blackish brown, the outer margin from the apex to the anal angle reddish; secondaries very similar to the upperside, but slightly reddish.

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

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

Miselia erythurus, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen dark brown; the sides of the abdomen and anus reddish brown; legs dark brown. Primaries dark brown; a very indistinct spot in the cell and one beyond; a row of very minute black dots crosses the wing from the costal to the inner margin; a >-shaped yellow mark below the cell and a submarginal row of small yellow spots extending from the apex to the anal angle; the fringe dark brown: secondaries white, the apex and outer margin irrorated with brown scales, the fringe white. Underside: primaries brown; secondaries white.—*Female* very similar to the male, but with the secondaries dark brown, palest at the base.

Expanse, ♂ $1\frac{5}{16}$, ♀ $1\frac{1}{2}$ inch.

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

Allied to *Miselia imitata*, Mssn.

Miselia melanoleuca, sp. n.

Male.—Head white, antennæ black; collar white, edged with black; tegulæ white, edged with black; thorax and base of abdomen white; abdomen and underside of thorax black; legs spotted with white; anus greyish. Primaries white, costal margin spotted with black; three large black spots close to the apex; two elongated black spots at the anal angle and a large elongated black spot crossed by two narrow white lines extending from the base along the inner margin, the outer margin thinly irrorated with small black dots; the fringe black and white: secondaries white, the apex and part of the outer margin black. Underside of primaries black; secondaries white, with the costal margin broadly black.

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

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

Chabuata erythrias, sp. n.

Female.—Head, collar, tegulæ, and thorax reddish brown; abdomen above dark brown, the sides and the underside and legs reddish brown. Primaries dark reddish brown; a grey spot at the end of the cell; the outer margin from the apex to the anal angle black, the marginal line pale brown; the fringe black; secondaries dark brown, palest at the base. Underside: primaries black, the costal and outer margins red: secondaries reddish brown, palest on the inner margin.

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

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

Hyssia ruficana, sp. n.

Male.—Head, antennæ, collar, and tegulæ reddish fawn-colour; thorax grey; abdomen dark brown; anus and underside of abdomen and legs pale brown. Primaries reddish fawn-colour; a small grey spot close to the base; two large grey spots about the middle of the costal margin; two fine grey lines cross the wing from the grey spots to the inner margin; between the grey lines on the inner margin are two rather large black spots; the outer margin from the

apex to the anal angle broadly banded with grey, much waved on the inner side; the fringe grey: secondaries pale brown.

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

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

Hyssia melanopis, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen dark brown; antennæ dark reddish brown; underside of thorax and legs blackish brown. Primaries very dark brown, crossed by fine broken black lines; an indistinct black spot at the end of the cell, the outer margin from the apex to the anal angle pale brown; a submarginal black waved line crosses the wing from the costal margin near the apex to the inner margin; the fringe dark brown: secondaries cream-colour, darkest from the apex to the anal angle; the fringe yellowish white. The underside of both wings brown, the primaries the darkest.

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

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

Hyssia stenorena, sp. n.

Head, antennæ, collar, tegulæ, and thorax dark reddish brown; abdomen pale greyish brown above; the underside of thorax, legs, and abdomen dark blackish brown. Primaries dark reddish brown, the base green; a round green spot in the cell; a large greenish-white spot at the end of the cell, the inner margin pinkish brown almost from the base to the anal angle; a rather wide submarginal line edged with black extending from the apex to the anal angle olive-green; a marginal row of white dots; the fringe dark brown: secondaries dark brown, palest at the base; the marginal line green; the fringe brown. Underside: primaries black, the apex and outer margin red: secondaries greyish, thickly irrorated with brown scales; a black spot at the end of the cell and a very faint submarginal black line from the costal to the inner margin.

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

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

Hyssia olivescens, sp. n.

Male.—Head, collar, tegulæ, and thorax olive-green; palpi

and antennæ black; abdomen brownish black; anus and underside of thorax olive-green; legs alternately brown and olive-green. Primaries olive-green; a zigzag black line crosses the wing near the base from the costal to the inner margin; a pale square-shaped spot in the cell and a rather large whitish spot edged with black at the end of the cell; a faint submarginal line with a few black spots about the middle extends from the apex to the anal angle; the fringe olive-green: secondaries brownish black; the fringe olive-green. Underside: primaries brownish black, the costal margin and a marginal row of small spots reddish brown: secondaries greenish grey thickly irrorated with dark brown scales; a dark marginal band extends from the apex to the middle of the outer margin.

Expanse $1\frac{6}{10}$ inch.

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

Hyssia poliorhoda, sp. n.

Male.—Head and thorax grey; antennæ, collar, and tegulæ reddish brown; abdomen dark grey; the underside and the legs reddish brown. Primaries dark reddish brown, thickly irrorated with silver-grey scales; a faint greyish spot at the end of the cell; a dark brown submarginal line extends from the apex to the anal angle; the fringe brown: secondaries white, the costal margin, apex, and part of the outer margin clouded with brown. Underside: primaries black, the costal margin from the base to the apex red: secondaries white, the costal margin irrorated with red scales.

Expanse $1\frac{3}{10}$ inch.

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

Eriopyga phæostigma, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax reddish brown; abdomen black, the anal tuft reddish brown; underside of the abdomen and thorax dark brown. Primaries reddish brown; a blackish-brown spot in the cell and a larger spot at the end of the cell, both edged with small black dots; the outer margin blackish brown; the marginal line pale brown; the fringe dark brown: secondaries dark blackish brown; the fringe pale brown. Underside brown; primaries darker than the secondaries.—*Female* similar to the male, but very much darker in colour and with the spot

at the end of the cell much paler in colour ; the underside is also much darker than in the male.

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

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

Eriopyga metaleuca, sp. n.

Head, collar, tegulæ, thorax, and abdomen pale greyish brown ; antennæ brown. Primaries pale brown, thickly irrorated with greyish scales ; two greyish spots in the cell ; a reddish submarginal line crosses the wing from the apex to the inner margin near the anal angle ; the fringe pale brown : secondaries white.

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

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

Eriopyga griseorufa, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen grey ; antennæ and palpi reddish brown ; underside of the abdomen and legs reddish grey. Primaries grey, shaded with reddish brown along the outer margin ; two zigzag, fine, reddish-brown lines cross the wing from the costal to the inner margin, the first nearest the base, the second beyond the cell ; a faint brown dot in the cell ; the marginal line yellowish ; the fringe grey : secondaries pale greyish, the apex and outer margin the darkest. Underside : both wings pinkish grey.

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

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

Meliana disticta, sp. n.

Male.—Head, collar, tegulæ, thorax, abdomen, and legs pale brown. Primaries bright ochreous ; a pale whitish line down the middle of the wing from the base to the outer margin ; a black streak below the base of the cell ; two small black dots at the end of the cell, several small whitish spots with black points close to the apex ; the outer margin spotted with black from the apex to the anal angle ; the fringe ochreous : secondaries white.

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

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


Subfam. *CUCULLIANÆ*.*Dascuplexia lichenifera*, sp. n.

Male.—Head and palpi green; antennæ black; collar green, with a black line; tegulæ and thorax grey, irrorated with green and brown hairs; abdomen grey, with three tufts of green hairs at the base; the legs grey, banded with green. Primaries grey, darkest at the apex and along the costal margin, also thickly irrorated with small black dots; two broken green bands cross the wing about the middle from the costal to the inner margin; the outer and inner margin and a line close to base of the wing pale green; the fringe grey: secondaries brownish white, darkest at the apex and round the outer margin; a black spot at the end of the cell; a submarginal row of brown dots extending from the apex to the anal angle; the fringe brown and grey. Underside of the primaries dark brown; the secondaries very similar to the upperside.—The *female* very similar to the male, but darker in colour.

Expanse, ♂ $1\frac{3}{10}$, ♀ $1\frac{1}{2}$ inch.

Hab. Peru, Oconque, Carabaya, 7000 feet (*Ockenden, Mus. Druce*).

Rhizotype conflucens, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, and thorax dark reddish brown; abdomen blackish brown, the anal tuft yellowish; underside of the abdomen and legs pale brown. Primaries dark reddish brown, the costal margin from the base to the end of the cell pale brown streaked with black; a large -shaped spot at the end of the cell pale brown; the outer and inner margins pale brown; a dark brown spot at the anal angle; a pinkish-brown line crosses the wing from the apex nearly to the middle of the inner margin; the fringe alternately light and dark brown: secondaries dark brown. Underside: both wings pale brown, crossed by a black line beyond the middle.—The *female* similar to the male, but darker in colour.

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

Hab. S.E. Peru, Santo Domingo, 6000 feet; Oconeque, Carabaya, 7000 feet (*Ockenden, Mus. Druce*).

Subfam. *ACRONYCTINÆ*.*Cropia viridimicans*, sp. n.

Head, collar, tegulæ, thorax, and upperside of the abdo-

men greyish brown; antennæ brown; underside of abdomen and legs pale brown. Primaries green, crossed from the costal to the inner margin by fine brown and black lines; a wide white band crosses the middle of the wing from the costal to the inner margin, the band is slightly clouded with brown at the sides and at the end of the cell; the marginal line black; the fringe dark brown: secondaries reddish brown; a black-and-white dot at the anal angle and a marginal row of small black-and-white dots extending from the apex to the anal angle. Underside: both wings reddish brown.

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

Hab. Ecuador, Sarayacu (*Buckley, Mus. Druce*).

Perigea pyrosticta, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax golden brown; abdomen and legs black. Primaries dark brown, shaded with golden brown at the base, along the costal margin, and at the apex; two golden-brown spots in the cell and a small tuft of white scales at the end of the cell; the fringe dark brown: secondaries black. Underside of both wings dark glossy brown, the secondaries irrorated with grey scales at the base.

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

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

Perigea rubrifusa, sp. n.

Head, antennæ, collar, tegulæ, and thorax reddish brown; abdomen dull brown; legs red and brown. Primaries dark reddish brown, the costal margin spotted with darker brown; a light spot at the end of the cell; a waved submarginal line extends from the apex to the anal angle; the outer margin spotted with black; the fringe reddish brown: secondaries brown; the fringe reddish.

Expanse $1\frac{3}{10}$ inch.

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

Perigea purpurea, sp. n.

Male.—Head, collar, tegulæ, and thorax purple-brown; antennæ dark brown; abdomen pale brown; underside of thorax and legs purple-brown. Primaries purple-brown, streaked with white on the costal margin; several small

white spots at the end of the cell; beyond the cell a series of black streaks; a submarginal row of black dots with white points extends from the apex to the anal angle; the fringe purple-brown: secondaries pale brownish white, shaded with pink round the outer margin.—*Female* similar to male, the secondaries much darker.

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

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

Macapta holophæa, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, and abdomen greyish brown; legs brown. Primaries pale brown, thickly irrorated with grey and black scales; a submarginal row of small black dots extends from the apex to the inner margin; the fringe dark brown: secondaries similar in colour to primaries, but paler at the base; the fringe paler brown. Underside similar to the upperside, but slightly more red in shade.

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

Hab. Peru, Oconeque, Carabaya, 7000 feet (*Ockenden*); Huancabamba, 6000–10,000 feet (*Boettger, Mus. Druce*).

Gonodes albifissa, sp. n.

Head, palpi, collar, tegulæ, and thorax grey; antennæ black; abdomen above blackish, the underside and legs grey. Primaries: the costal half grey, the inner half fawn-colour; a fine black curved line extends from the inner margin near the base to the end of the cell; the wing near the apex dark grey; the marginal line black; the fringe pale brownish grey: secondaries grey, palest at the base; a dark streak at the end of the cell; the fringe brownish white. Underside: primaries black, with a spot in the cell and the costal and outer margins all grey: secondaries yellowish white, a black spot at the end of the cell, beyond which a row of small black dots crosses the wing from the costal to the inner margin; the fringe yellowish white; the outer margin of both wings spotted with black.

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

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

Monodes hemipolia, sp. n.

Male.—Head, palpi, collar, tegulæ, and thorax pale brownish grey; antennæ black; abdomen above black, the underside and legs grey, the anal tuft yellowish brown. Primaries: the basal half grey, irrorated with reddish-brown scales; a black spot at the end of the cell; a reddish-brown band from the end of the cell to the inner margin; the apex and outer margin dark grey; the fringe brown: secondaries uniformly dark brown; the underside of both wings greyish brown, indistinctly marked with black lines.

Expanse 1 inch.

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

Monodes leucostigma, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen brown, tegulæ tipped with white. Primaries dark brown; a large black spot close to the base; a white dot at the end of the cell; a greyish-white line crosses the wing from the apex to the inner margin; the outer margin and fringe reddish brown: secondaries dull greyish brown; a dark line at the end of the cell. The underside of both wings pale brown.

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

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

Monodes semirufa, sp. n.

Male.—Head and antennæ black; collar, tegulæ, thorax, and legs brown; abdomen black. Primaries: the basal half of the wing reddish brown; beyond the cell a white line crosses the wing from the costal to the inner margin; beyond the white line the wing is dark brown, thickly irrorated with greyish-white scales; a marginal row of very small reddish-brown spots extends from the apex to the anal angle; the fringe dark brown: secondaries greyish brown. Underside of both wings pale brown.

Expanse 1 inch.

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

Monodes chionopis, sp. n.

Male.—Head, collar, tegulæ, and thorax pale fawn-colour, thickly irrorated with black scales; antennæ and abdomen black, the anal tuft pale brown; legs blackish. Primaries pale fawn-colour, irrorated with black scales; the base of the

wing black; a large black spot close to the apex and some black lines on the costal margin; a round white dot in the middle of the cell; the marginal line black; the fringe brown: secondaries greyish white, darkest at the apex and round the outer margin. Underside: primaries black, the outer margin from the apex to the anal angle brown: secondaries white, the apex black; a faint brown line crosses the wing below the middle.

Expanse 1 inch.

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

Calymniodes obconica, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and legs reddish brown; abdomen black. Primaries dark reddish brown, marked very similar to *Calymniodes leucographa*, Hmps., but instead of being white round the large central reddish-brown patch it is greyish blue; a submarginal row of black spots crosses the wing from the costal to the inner margin near the anal angle; the fringe reddish brown: secondaries white, broadly black at the apex and partly round the outer margin; the fringe partly black and white. Underside: primaries black, the costal and outer margins reddish brown: secondaries white, with black spot at the end of the cell; the costal margin and apex irrorated with reddish-brown scales.

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

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

This species is allied to *Calymniodes leucographa*, Hmps., and *Calymniodes promentona*, Dogn.

Calymniodes rhodopis, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, and thorax dark brown, the base of the collar white; abdomen black above, the underside and legs blackish brown. Primaries brown, irrorated with black scales; three white zigzag lines cross the wing from the costal to the inner margin, the first close to the base, the second about the middle of the cell, and the third considerably beyond the cell; a round reddish-brown spot edged with black at the end of the cell; an indistinct submarginal pale brown line extends from the apex to the inner margin; a marginal row of white dots; the fringe brown: secondaries white, the costal margin, apex, and outer margin clouded with brown; a black spot at the

end of the cell. The underside greyish brown, irrorated with dark brown.

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

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

Calymniodes turcica, sp. n.

Male.—Head, antennæ, palpi, collar, thorax, and abdomen reddish brown, collar edged with light brown. Primaries brown, streaked with black at the base and along the costal margin; the cell and a rather large square-shaped spot beyond dark brown; a white dot with a white line under it in the cell; five small white dots at the end of the cell; the outer margin paler brown, with a greyish-brown spot above the anal angle; the marginal line black; the fringe dark brown: secondaries dark brown, with a darker brown spot at the end of the cell; the fringe dark brown. The underside pale brown, the costal margin of the primaries reddish.

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

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

Calymniodes albiorbis, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen dark brown; legs black and brown. Primaries dark brown, crossed about the middle by a wide pale brown band edged on each side with a wavy black line; a white spot in the cell and two white lines at the end of the cell; the costal margin streaked with greyish-brown lines; a sub-marginal pale brown line extends from the apex to the anal angle; the fringe dark brown: secondaries greyish white, clouded with brown at the apex and round the outer margin.

Expanse 1 inch.

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

Chytonix chlorophila, sp. n.

Male.—Head, palpi, collar, tegulæ, thorax, and abdomen pale green; antennæ, underside of thorax, and abdomen brown; legs brown, banded with black. Primaries pale green, the costal margin spotted with brown and white; a large V-shaped brown mark about the middle of the costal margin; a brown spot about the middle of the outer margin and one at the anal angle; a wavy white line crosses the wing from the costal margin to the anal angle; the outer

margin spotted with black; the fringe brown: secondaries blackish brown, the fringe green. Underside pale brown.

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

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

Leucosigma uncifera, sp. n.

Male.—Head, collar, tegulæ, and thorax pinkish brown; abdomen and legs brown, the anal tuft reddish; antennæ dark brown. Primaries reddish brown, irrorated with white scales; a large white mark at the end of the cell and two white waved lines cross the wing from the costal to the inner margin, the first line at the end of the cell, the second beyond, edged with black on the inner side; the outer margin spotted with white; the fringe brown: secondaries greyish white, clouded with brown at the apex. Underside pinkish white.

Expanse 1 inch.

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

Neocalymnia obconica, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, abdomen, and legs brown. Primaries brown, crossed by two faint brown lines, the first near the base, the second beyond the cell; a large reddish-brown patch on the costal margin near the apex; the fringe dark brown: secondaries blackish brown. Underside: primaries and secondaries dark blackish brown, the costal margin of primaries pale brown.

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

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

Delta albiclava, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen fawn-colour. Primaries fawn-colour, streaked with darker brown; a dark brown mark at the end of the cell; a black line below the cell extending from the base almost to the outer margin; a silvery-white streak below the black line; the veins black: secondaries fawn-colour, palest at the base; the fringe brown. Underside: both wings pale brown.

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

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

Acroriodes diplolopha, sp. n.

Male.—Head, palpi, and antennæ dark reddish brown; collar and tegulæ greyish brown; thorax, abdomen, and legs greyish. Primaries dark brown, shading to light reddish brown on the inner half of the wing; a large brown spot edged with white at the end of the cell; the costal margin streaked with black; a pale greyish band extends from the apex to the anal angle; the marginal line black; the fringe alternately light and dark brown: secondaries cream-colour, broadly bordered with black; the fringe pale brown. Underside: primaries blackish brown; secondaries similar to the upperside.

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

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

Eriopus leucotoma, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, and thorax dark reddish brown; abdomen blackish brown; legs reddish brown. Primaries reddish brown; a darker brown line crosses the wing about the middle from the costal to the inner margin; a large dark brown spot at the end of the cell; three fine white lines cross the wing from the costal to the inner margin; the marginal line black, edged with white on the inner side; the fringe reddish brown: secondaries blackish brown; the fringe reddish brown. Underside: primaries brown, reddish along the costal margin: secondaries reddish brown; a submarginal line of small black dots extending from the apex to the anal angle.

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

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

Allied to *Eriopus floridensis*, Guen.

XLVII.—*A List of Mammals collected by Mr. C. F. M. Swynnerton in Northern Gazaland (Portuguese East Africa) and the Melssetter District of Rhodesia.* By R. C. WROUGHTON.

THE Chirinda Forest, in or near which Mr. Swynnerton largely made his collection, is an isolated patch of forest of quite small extent situated in the Melssetter District of

Rhodesia, on the border of Portuguese East Africa, and about 150 miles south of Umtali on the Salisbury-Beira Railway.

Although for the most part the specimens composing this collection belong to known forms, yet they seem to be of considerable interest from the point of view of distribution. Thus the *Galago*, *Petrodromus*, and Mongoose are the same as those of the Zambesi Valley, and the local form of *A. pumilio* is the same as that of Rhodesia, while the Vley rat is identical with that of the Zoutpansberg district of the Transvaal. Again, the Chirinda monkey is *Cercopithecus alboocularis beirensis*, while the *Cricetomys* differs from the Beira form and agrees with that from Inhambane; but the new form of *Funisciurus palliatus* described, though distinct, is, in colour-pattern at least, closely allied to the Zululand and Nyasa forms and quite different from *F. sponus*, the form of the coast country from Inhambane to Beira and Gorongoza.

1. *Cercopithecus alboocularis beirensis*, Poc.

The present specimen approaches perhaps nearest to *C. alb. beirensis* than to typical *C. alboocularis* from Nyasa, but the distinguishing characteristics are much less marked than in the series from Beira in the Rudd Collection on which the local race was based.

2. *Papio cynocephalus*, Geoff.

Sclater, in his 'Mammals of South Africa,' seems to fix the Zambesi as the southern limit of the long-legged yellow baboon, but the present specimen and those in the Rudd Collection from Inhambane show that this is not so. Mr. Grant tells me in his experience the Limpopo River is approximately the frontier-line between *P. porcarius* and *P. cynocephalus*.

3. *Galago crassicaudatus*, Geoff.

The specimens are quite like those in the Rudd Collection from the Gorongoza District, Portuguese E. Africa.

4. *Epomophorus crypturus*, Pet.

5. *Rhinolophus augur*, K. Anders.

This is most probably Andersen's subspecies *zambesiensis*.

6. *Petrodromus tetradactylus*, Pet.

Indistinguishable from specimens from Beira in the Rudd Collection.

7. *Crocidura flavescens*, I. Geoff.

8. *Crocidura martensi*, Dobs.

9. *Myosorex tenuis*, Thos. & Schw.

The type locality of this species is Zuurbron.

10. *Pæcilogale* sp. (juv.).

11. *Mungos cauii*, Sm.

Quite like specimens from Mashonaland.

12. *Viverra civetta*, Schreb.

13. *Genetta rubiginosa*, Puch.

14. *Funisciurus mutabilis*, Pet.

The typical habitat of this species is the southern part of the Portuguese province of Mozambique; in the Rudd Collection it is represented by specimens from Beira and Gorongosa, and has been received from N.E. Rhodesia and beyond.

15. *Funisciurus palliatus swynnertoni*, subsp. n.

A dark-coloured race of *F. palliatus*.

Size about as in typical *F. palliatus*.

Fur fairly long (16 mm. on back) and soft.

General colour above grizzled black and buff, below cinnamon-rufous; individual hairs of underfur on the back basally black for $\frac{2}{3}$ their length, then bright buff with minute black tips; longer hairs black, with one or more buff rings; individual hairs of belly with very short black bases, then bright orange-rufous. Face coloured like back, cheeks cinnamon-rufous. Tail almost black, suffused with rufous, the individual hairs basally whitish, then black with a buff ring, terminal half ferruginous. Feet and hands chestnut-brown.

Skull slightly shorter and markedly narrower than in *F. sponus*, and markedly smaller in all ways than either typical *F. palliatus* or its Zululand race *ornatus*.

Dimensions:—

Head and body 200 mm. (circ.); tail 200 (circ.); hind foot 49; ear 19.

Skull: greatest length 46; greatest breadth 26; inter-orbital breadth 12; basilar length 37; diastema 11; upper molar series (exclusive of supplementary anterior molar) 8; bullæ 9.5.

Hab. Chirinda Forest, N.E. Transvaal.

Type. Adult male. B.M. no. 6. 10. 6. 7.

The long series obtained by Mr. Swynnerton are remarkably even in their general colouring. The colour-pattern is that of *F. palliatus* and *F. p. ornatus*, but the complete absence of ferruginous colouring on the face, the dark chestnut feet and hands, and its smaller size distinguish it from these at a glance, while the totally different colouring separates it from *F. sponus*, which it closely approaches in size.

16. *Mus microdon*, Pet.

17. *Arvicanthis pumilio dilectus*, de Wint.

Mr. de Winton based *A. dilectus* on specimens collected by Mr. Darling at Mazoe in Mashonaland, and externally these specimens are identical; but I place them with some hesitation in this subspecies, for the skulls are too damaged to be any guide.

18. *Arvicanthis dorsalis*, Sm.

19. *Pelomys fallax*, Pet.

First obtained by Peters in S. Mozambique.

20. *Otomys irroratus cupreus*, Wrought.

The solitary individual is indistinguishable from the Rudd Collection specimens from the Zoutpansberg District of the Transvaal.

21. *Acomys selousi*, de Wint.

The specimen is in bad condition and its skull is missing.

22. *Leggada minutoides*, Sm.

23. *Dendromus pumilio*, Wagn.

24. *Thamnomys arborarius*, Pet.

Unfortunately the skulls are damaged or missing.

25. *Cricetomys gambianus adventor*, Thos. & Wrought.

Mr. Swynnerton's specimens are distinctly more closely allied to the Inhambane race (*adventor*) than to the one from Gorongoza (*cunctator*).

26. *Georychus darlingi*, de Wint.

The specimen is young, but I think I have correctly allotted it to the Rhodesian species rather than to the much larger *G. beiræ*.

27. *Lepus saxatilis zuluensis*, Thos. & Schw.28. *Cephalophus monticola*, Thunb.

XLVIII. — *Some Species of Leptocheirus, a Genus of Amphipoda*. By Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S.

[Plates XII. & XIII.]

IN a work published in 1906 on the Crustacea of Devon and Cornwall* the four species then known as denizens of the eastern side of the North Atlantic were described, and three of them were figured. Since that time two other undescribed species have come into my hands, one of which has been found in brackish water in Norfolk by Mr. Robert Gurney, who has placed it in my hands for description, and a single specimen of the other has been found by me among material which I dredged in 1880 in the Fosse de Cap Breton, in the Bay of Biscay. These two species I now describe, and notice the seventh species known on the western side of the Atlantic, namely *Leptocheirus pinguis* of Stimpson.

Leptocheirus subsalsus, sp. n. (Pl. XII. figs. 1-6.)

The first segment of the urosome has its hinder margin smooth. The secondary appendage of the antennule (fig. 1) consists of only a single joint, which is not longer than the first joint of the filament, which latter is 13-jointed. The first gnathopod (fig. 2) has the coxa (epimera) of nearly oblong shape, the extremity broad and very obtusely rounded; the propodus is much shorter than the carpus; widening from its base to its wide transverse extremity. The finger of equal length with the palm. Second gnathopod (fig. 3) has the basal joint very long, equalling in length the whole of the rest of the limb; the setæ on the hinder margin of the

* 'The Crustacea of Devon and Cornwall,' by Canon A. M. Norman, F.R.S. &c., and Thomas Scott, LL.D., F.L.S. 1906. William Wesley & Co.

wrist and hand are short and stiff, the finger in form of a nail, about one third as long as the hand. The first peræopod (fig. 4) has the meros unusually expanded for the genus, the carpus short, not exceeding half the length of the preceding joint, itself nearly as broad as long, the propodos is somewhat longer, the nail rather more than half as long as the propodos. The propodos of the last peræopods (fig. 5) is much narrower than the preceding joint and has a few short setæ both on the front and hinder margins. The uropods (fig. 6) are furnished with only a few spines, and those of small size.

Length 5 mm.

This species has been found by Mr. Robert Gurney in brackish water in some of the rivers connected with the Broads.

Leptocheirus bispinosus, sp. n.

(Pl. XII. figs. 7-9; Pl. XIII. figs. 1-3.)

The first segment of the urosome has a strong and acute angular backward projection on each side (Pl. XIII. fig. 3), but no central spine-process. The antennules have their secondary appendage (Pl. XII. fig. 7) five-jointed and equal in length to three joints of the flagellum. The first gnathopod (Pl. XIII. fig. 1) has the coxa widening from the base and distally very widely rounded; the basal joint is stout, the carpal and propodal joints subequal in length, the former being only very slightly longer than the latter, which is subovate, widest in the middle; the palm rounded off and not distinctly defined; the finger is longer than the extremity of the propodos, it has its inner face serrulated and minutely ciliated. The second gnathopod (Pl. XIII. fig. 2) has the coxa unusually small for the genus, not reaching to as much as half the length of the basos; this last joint is very long, nearly equalling the whole of the rest of the limb; the propodos is not quite as long as the carpus; the finger is nail-formed and scarcely curved, in length it is about equal to one third of the propodos. The first peræopod (Pl. XII. fig. 8) has the meros of equal breadth throughout, and it is as long as the basal joint; the carpus is rather more than half the length of the meros; the propodos and finger gradually attenuate from the base of the former to the acute extremity of the latter. The last peræopod (Pl. XII. fig. 9) has the propodos produced, half as long again as the carpus; remarkably parallel-sided, with scarcely any spines or setæ except at the base of the nail. Uropods (Pl. XIII. fig. 3) with numerous spines of considerable size, those of second pair stronger than in any other species known to me except *L. pilosus* (Zaddach) = *L. hirsutimanus*, Bate.

Length 10 mm.

A single specimen was procured by me in 1880 (July 9), when dredging with my late friends Dr. Jeffreys and the Marquis de Folin in the Fosse de Cap Breton, Bay of Biscay, in 35-60 fathoms.

The chief characteristics of this species are the long secondary appendage of the antennules, the form and size of the coxa of the first and second gnathopods, the spine-formed process on the side of the first segment of the urosome, and the strongly formed spines of the second uropods.

Leptocheirus pinguis (Stimpson).

(Pl. XIII. figs. 4-8.)

1853. *Ptilocheirus pinguis*, Stimpson, Invert. Grand Manan, p. 56.
 1862. *Protomeidea pinguis*, Bate, Cat. Amphip. Crust. p. 170 pl. xxxi. fig. 2.
 1862. *Protomeidea fimbriata*, Bate, l. c. p. 169, pl. xxxi. fig. 1.
 1873. *Ptilocheirus pinguis*, Verrill, U.S. Comm. Fish and Fisheries, p. 561.
 1893. *Leptocheirus pinguis*, Della Valle, Gammarini del Golfo di Napoli, p. 432, pl. lvii. figs. 1-3.
 1906. *Leptocheirus pinguis*, Stebbing, Das Tierreich, Amphipoda, I, Gammaridea, p. 627.

The cephalon is about equal in length to the first two segments of the mesosome; the first and second segments of the urosome have each a spine-point situated on both sides of the centre of the dorsum, and those of the second segment are accompanied by a cluster of short stiff setæ. The telson is subtriangular, the apex forming a very obtuse angle, the breadth greatly exceeding the length; near the lateral margins are groups of short stiff setæ similar in character to those of the second segment of the urosome; all the segments of the urosome are short and closely crowded together. The accessory appendage of the antennules (Pl. XIII. fig. 4) consists of six to eight joints, and equals in length the first three joints of the flagellum. The coxæ (or epimera) of the gnathopods and following peræopods have their hinder margin beset with well-developed spines (see figures): that of the first gnathopod is small, linguiform, narrowed, rounded at the extremity; that of the second gnathopod is very large, its length not much exceeding its breadth. The first gnathopod (fig. 5) has the propodos subequal in length to the carpus and slightly widening from the base to the extremity, where the palm is directly transverse; the finger is finely denticulated and exactly fits the slightly convex shape and the length of the palm. In the second gnathopods (fig. 6) the basal joint has a length equal to the following joints to the middle of the

propodos; the propodos is one third shorter than the carpus; the nail only slightly bent, equal in length to one third of the propodos. The first peræopods (fig. 7) have the meros about one third longer than the carpus and equal in length to the gradually tapering propodos; the nail is long and slender and is as long as two thirds of the propodos. The last peræopods (fig. 8) have the propodos strong, with setæ on both sides, and only slightly longer than the preceding joint. The uropods are furnished with spines of moderate size.

The male differs considerably from the female in the anterior part of the body. The first segment of the mesosome is as long as the head and about twice as long as the following segment. The first gnathopods have the coxa of much larger size and quite different shape, it being rhomboidal in outline; the gnathopod itself is much more developed than in the female, larger and longer; and the palm of the propodos is slightly concave instead of very slightly convex, and is furnished with a short, stumpy, strong spine at its commencement. The coxa of the second gnathopods is largely developed and extends downwards beyond those of adjoining limbs.

Length 15 mm.

I am indebted to Prof. S. I. Smith for specimens of this species from Long Island and also from Vineyard Sound. As regards distribution he writes (*l. c.*):—"Common on the whole coast of New England upon muddy bottoms, and north to Labrador. In depths it extends down to 150 fathoms, and probably much farther."

The following diagnostic characters of the North-Atlantic species of *Leptocheirus* may be useful:—

Coxæ (epimera) of gnathopods and following segments having their hinder margin furnished with spines	<i>pinguis</i> .
Coxæ without such spines	2.
2. Finger of second gnathopods unguiform	3.
Finger of second gnathopods stiliform, tipped with setæ	6.
3. First segment of urosome with spine-processes on hinder margin	4.
First segment of urosome without spine-processes	5.
4. A central and two lateral spine-processes	<i>guttatus</i> .
No central, but two lateral spine-processes	<i>bispinosus</i> .
5. Nail of posterior gnathopods cleft	<i>pilosus</i> .
Nail of posterior gnathopods simple, not cleft	<i>subsalsus</i> .
6. Coxa of first gnathopods very small, terminating in a fine point	<i>della vallei</i> *.
Coxa of first gnathopods quadrate, front corner scarcely produced	<i>pectinatus</i> .

* *della vallei*, Stebbing, = *Protomedeia fasciata*, Costa (nec Kröyer).

EXPLANATION OF THE PLATES.

PLATE XII.

Fig. 1.	<i>Leptocheirus subsalsus</i> , sp. n.	Antennules and antennæ.
Fig. 2.	" "	First gnathopod.
Fig. 3.	" "	Second gnathopod.
Fig. 4.	" "	First peræopod.
Fig. 5.	" "	Last peræopod, terminal joints.
Fig. 6.	" "	Urosome.
Fig. 7.	<i>Leptocheirus bispinosus</i> , sp. n.	Secondary appendage of antennule.
Fig. 8.	" "	First peræopod.
Fig. 9.	" "	Last peræopod, terminal joints.

PLATE XIII.

Fig. 1.	<i>Leptocheirus bispinosus</i> , sp. n.	First gnathopod.
Fig. 2.	" "	Second gnathopod.
Fig. 3.	" "	Urosome.
Fig. 4.	<i>Leptocheirus pinguis</i> , Stimpson.	Secondary appendage of antennule.
Fig. 5.	" "	First gnathopod.
Fig. 6.	" "	Second gnathopod.
Fig. 7.	" "	First peræopod.
Fig. 8.	" "	Last peræopod, terminal joints.

XLIX.—*Descriptions of Thirty new Species of Tabani from Africa and Madagascar.* By GERTRUDE RICARDO.

[Concluded from p. 278.]

Tabanus tritæniatus, ♀, sp. n.

One female (type) from Bailundo, Angola, Dec. 1904–Jan. 1905 (*Dr. F. C. Wellman*), 1906. 139; one female from Bihé, Angola, Dec. 1904 (*Dr. F. C. Wellman*), 1906. 139.

A very small black species nearly allied to *T. gratus*, Loew, from which it is further distinguished by the shape of the middle callus, which is larger, occupying nearly the whole width of the forehead, and almost square, with its anterior and posterior borders often irregular, blackish brown; in *T. gratus* it is much smaller and narrower oblong in shape. Its small size will distinguish it at first sight, the type measuring 8 mm., the other female only 6½ mm.

Abdomen with three grey stripes, the middle one attaining the sixth segment, the side ones the fourth segment, but sometimes ending before this. Antennæ reddish; the first joint greyish with black-haired upper angle, the third blackish

or brown at tip. Eyes with two stripes at least. Thorax with grey stripes. Frontal callus brown, shining, slightly protuberant, occupying whole width of head and connected by a short line with middle callus. Forehead grey, with black pubescence towards vertex. Legs reddish. Wings quite clear.

Tabanus unitæniatus, ♀, sp. n.

Type (female) and another female from Pungwe Valley, S.E. Africa, 1896 (*G. A. K. Marshall*), 96. 84, at the fortieth mile-peg from commencement of Beira Railway; one female from Wau, Bahr-el-Ghazal, Egyptian Soudan, 25. vii. 1905 (*per Dr. A. Balfour*), "at light."

A species probably nearly related to *T. unilineatus*, Loew, from Mozambique, but distinguished from it by the redder abdomen, lighter fore tibiæ, the more slender palpi, the triangular frontal callus, and the larger size (13 mm.). It is a narrow-bodied reddish species, with a median white stripe on the abdomen and wings almost clear.

Head small, broader than the thorax. Face reddish, covered with grey tomentum and with short scanty white pubescence; beard white. Palpi yellow, thickly covered with black hairs, long and narrow, only slightly broader at the base, ending in an obtuse point. Antennæ bright red, the extreme apex black; the first joint short, broad, with a few black hairs; the second small, cap-shaped, with black hairs on its upper angle; the third with an obtuse tooth. Forehead about four times as long as it is broad and the same width throughout, reddish with some little grey tomentum; the callus shining red-brown, convex, oval, becoming narrower at its lower end, whence proceeds a narrow short raised line, which widens to a spindle-shaped callus; from the vertex a narrow black line proceeds in two branches surrounding this last. Eyes with no markings. Thorax reddish brown, with traces of grey tomentum and of three stripes, the sides reddish with grey tomentum. Abdomen narrow, reddish brown, with a greyish-white median stripe reaching the fifth segment, the apex black, the segmentations very narrowly white, the pubescence on dorsum mostly black; under-side testaceous with a black apex, in the other female it is very largely black. Legs reddish, the femora (especially the fore femora) blackish, the fore tibiæ blackest at their apex, and fore tarsi black. Wings hyaline, the stigma yellowish, the veins yellowish brown (in the other female the fore border has a very slight tinge of yellow); the first posterior cell not narrowed.

Tabanus conspicuus, ♀, sp. n.

Type and two other females from Yoiuti, Juba River, about 20 miles from mouth, E. African Protectorate, Feb. 1905 (*Major L. H. R. Pope Hennessey*). "Flew into cabin of steam launch."

A handsome medium-sized species, easily distinguished by its large size, yellow legs and antennæ, and by the light yellow abdomen with only one grey median stripe hardly bordered by any darker colour, and lastly by its striped thorax.

Length 19 mm. One specimen measures only 16 mm.

Head large, wider than the thorax. Face reddish, covered with dense white tomentum, so that it appears whitish, with long white hairs below the antennæ; beard white. Palpi large, white, with no black pubescence, stout at base, prolonged to a point. Antennæ reddish, at apex black; the first joint with grey tomentum and black pubescence, cap-shaped; the second smaller, cup-shaped, with black pubescence; the third long with a moderate tooth. Forehead fairly broad, about five times as long as it is broad, and the same width throughout, the same colour as the face, but posteriorly more yellow, or altogether yellower; the callus reddish brown, shining, large, oblong, not reaching the eyes, prolonged as a stripe which is not always united to it and is often divided into two lengths, the last half being shorter, not reaching the vertex. Eyes with no stripes or markings. Thorax brown, with greyish-yellow tomentum forming three stripes, the median one narrower; sides greyer; pubescence short, scanty, and yellow, with some longer yellow hairs at the sides, bordered by black hairs above; breast grey, with whitish pubescence; scutellum the same colour as thorax. Abdomen large, yellow, with a central stripe of white tomentum composed of triangular-shaped spots with long apices each united to the preceding one; spot on the first segment is not always discernible; on the second segment the triangular shape is nearly obsolete; the stripe has a faint reddish border on each side, which after the fourth segment becomes black; the pubescence on the dorsum is short and black, intermixed with yellow pubescence, which is thicker at the sides; the sides of the first two segments have some grey tomentum; underside yellow, with very narrow white segmentations, becoming darker at the apex. Legs reddish yellow; tibiæ yellower; the coxæ covered with grey tomentum; the fore tarsi and extreme apex of tibiæ black, the other tarsi brownish; the pubescence on the fore coxæ and femora silvery white, on the others shorter and yellow; on the tibiæ it is the same, but

on the tarsi blackish; the last four joints of the fore tarsi rather broad. Wings longer than the abdomen, hyaline; the veins brownish, all with yellow-brown shading; the stigma yellowish; the first posterior cell slightly narrowed.

Tabanus subangustus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) from Abutshi, River Niger, W. Africa (A. Braham), 1903. 146; three females from N. Nigeria, 7. vii. 1905, &c., received from Dr. J. H. Ashworth, Edinburgh University (coll. by Dr. Dalziel); one female from Odut, S. Nigeria (Dr. Dudgeon).

This species is related to *T. nigrohirtus*, Ric., but distinguished at once by the broader forehead and frontal callus, and by the longer narrower abdomen, and the grey stripe is wider, about 1 mm. in width, and more distinct; the posterior cell narrowed in *T. nigrohirtus* is not so in this species; both are West African species.

Length 17 mm.

There are specimens in the Paris Museum, from Senegambia.

A reddish-brown species, with one grey median stripe and wings tinged with brown.

Head hardly wider than the thorax. Face reddish, covered with grey tomentum, on the sides of the cheeks it is yellower, some white hairs are visible on these last; beard yellowish white. Palpi yellow, covered with black pubescence; only slightly enlarged at the base, gradually tapering to a point. Antennæ bright red, long and slender; the first joint oblong, short, the second small with its upper corner prolonged, both with black pubescence; the third very long and slender, the tooth small near the base, the extreme apex black; the subcallus the same as face. The forehead brown, rather broad, short, about three times as long as broad and the same width throughout; the frontal callus brown and shining, large, nearly square, almost reaching the eyes, on the posterior border irregular, prolonged in a line which enlarges, becoming spindle-shaped, and nearly reaches the vertex, which is brown; the sides bordering the callus are covered with yellow tomentum. Eyes with no markings. Thorax reddish brown with grey tomentum, through which blackish stripes appear; the sides and breast reddish, covered with grey tomentum and yellow hairs; the pubescence on sides of thorax black; the scutellum brownish. Abdomen dull reddish brown, with one

continuous distinct stripe of grey tomentum, the sides of which are straight; the pubescence on the dorsum black, except on the stripe which has white hairs and at the sides are yellow hairs; underside reddish, darker at the apex. Legs brown; the tibiæ yellowish red, darker on apex in the fore tibiæ; the fore tarsi and the apical joints of the other tarsi brown; the apex of the femora yellowish; the pubescence on the coxæ whitish, elsewhere black and short. Wings longer than the body, hyaline, tinged with yellowish brown; veins yellow; stigma yellowish brown; all posterior cells widely open.

Tabanus albostrigatus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type and another female from the Transvaal (*Ross*), 97. 99.

A black species with a white median stripe on the abdomen and grey side-spots. Antennæ blackish; the palpi very slender, pale yellow. Legs yellow, with darker femora. Eyes very slightly pubescent. Wings with an appendix, tinged with brown.

Length 13 mm.

Head broader than thorax. Face grey, with scanty white pubescence; some black hairs below the antennæ; beard white. Palpi pale transparent yellow, curved, very slender, ending in a long point, slightly stouter at base, with some short black hairs. Antennæ slender; tooth very obtuse, only an angle; the first joint yellowish, covered with grey tomentum and black hairs, not very cap-shaped; the second small, yellowish, with black pubescence; the third black, red at its extreme base only. Forehead short, about four times as long as it is broad and same width throughout, grey, with small brown triangular frontal callus, not reaching the eyes, continued in a narrow thick line almost to the vertex, which is covered with grey tomentum; the pubescence on the forehead black. Eyes with no band, the pubescence very slight and easily overlooked, the back of the head with white pubescence. Thorax blackish brown, covered with fairly dense short greyish pubescence, through which three grey stripes appear; the sides grey, with longer black hairs; the breast-bone covered with black hairs; a tuft of white hairs below near root of wings. Scutellum same colour as thorax, with the same pubescence. Abdomen blackish brown; the median white stripe continuous, its average width less than

1 mm., with almost straight borders, it widens slightly on the second segment at the base; on the sides of the second, third, and fourth segments ill-defined but distinct grey spots appear, not reaching the sides, but taking up the whole width of the segment as a rule; the pubescence on the dorsum is short, thick, black, with three stripes of whitish-grey pubescence, covering the median stripe and the side-spots; these can best be seen by viewing the abdomen from the front; the lateral margins of the abdomen yellow, transparent, with whitish-grey pubescence; the underside brownish, the segmentations and the sides yellowish, the pubescence black, with two side stripes of the whitish-grey pubescence. Coxæ black, covered with grey tomentum and black and white pubescence; the fore femora blackish, the middle and posterior ones dull reddish with grey tomentum and whitish pubescence; the tibiæ yellow, the fore tibiæ reddish at the apex, at the base yellow with white pubescence, therefore with the appearance of fore tibiæ pale at base; the middle tibiæ with white pubescence at the base and black at the apex; the posterior tibiæ with black pubescence; the fore and middle tarsi brownish, the posterior ones yellow, all with black pubescence. Wings hyaline, slightly tinged with brown on the longitudinal veins, on the fore border and round the apices of the basal cells, and on the anal vein; the appendix distinct, the veins brown, the stigma small and yellowish brown.

This species is distinguished from *Tabanus albilinea*, Wlk., by its slightly pubescent eyes, blacker, more pubescent, and narrower abdomen, smaller size, darker antennæ, blackish frontal callus and stripe (not reddish brown as in the Walker species), darker femora, and more slender palpi.

Tabanus obscurestriatus, ♀, sp. n.

Type (female) from Congo, Nov. 18, 1904; 1904. 267 in the British Museum collection.

A small reddish species with a black median stripe and clear wings with a short appendix.

Length 12 mm.

Head not large, but wider than the thorax. Face covered with grey tomentum, the pubescence silvery white; palpi reddish, with some white pubescence, stout at base, gradually tapering to a point; beard white. Between the antennæ and across the face is an indistinct reddish-brown band; the antennæ are reddish, slender, the tooth very slight, the first and second joints with black pubescence. Forehead about

five times as long as broad and the same width throughout, above the antennæ shining reddish yellow, convex, with a median furrow; the frontal callus the same colour, nearly square, reaching the eyes and continued as a broad stripe nearly reaching the vertex; the forehead covered with yellowish tomentum, darker on the vertex. Eyes with no bands. Thorax brownish, with two fulvous lateral stripes bordered by a black one, all indistinct; the dorsum with grey tomentum and short fulvous pubescence, the sides with yellowish tomentum and black hairs, the breast with white pubescence; the scutellum the same colour as the thorax. Abdomen reddish; the black stripe begins from the first segment and is continuous to the apex, its borders not very clearly defined; the pubescence on the dorsum is black; the fourth, fifth, and sixth segments are yellowish and have yellow hairs at the sides, the seventh is wholly black, all the segments on the lateral margins are black; the underside wholly reddish, with yellowish pubescence. Legs reddish yellow; the anterior femora brown, the tibiæ pale yellow, with white pubescence; on the anterior tibiæ the apex is brown, the fore tarsi brown, the pubescence on the femora black. Wings clear, pale yellow on their extreme outer border, the veins and stigma yellowish, the appendix short but stout.

Tabanus nigrostriatus, ♀, sp. n.

Type (female) from Plateau of Zomba, Nyasaland (*R. Sharpe*), 97. 46, and a series of females from the same place.

A species quite distinct from any other African described species, with a long, narrow, bright chestnut-brown abdomen, which has a distinct black median stripe. Wings hyaline, tinged with brown, usually with an appendix, but this seems a variable character in this species.

Length $17\frac{1}{2}$ mm.

Head broader than thorax. Face reddish, covered with greyish-white tomentum and some white hairs; on the cheeks the ground-colour is more apparent; beard whitish yellow. Palpi yellow, with some black pubescence, long, only slightly broader at base, ending in an obtuse point. Antennæ red, sometimes darker at the apex (in one specimen only the base of the third joint is red); tooth fairly prominent; the first joint oblong, the second small, both with black pubescence. Forehead brownish, about four times as long as broad and slightly narrower anteriorly; the subcallus reddish, with yellow-grey tomentum round the base of the antennæ; the frontal callus dark brown, shining, convex, hardly reaching the eyes,

prolonged in a narrow line, which enlarges spindle-shaped, almost reaching the vertex; the tomentum bordering it is yellowish. Eyes bare, with no markings. Thorax reddish brown, with traces of black stripes, one broad and two lateral stripes, the red ground-colour appearing between as narrow lines, the dorsum with grey tomentum; the sides and breast reddish brown, with grey tomentum; the scutellum blackish. Abdomen light reddish brown, the segmentations very faintly yellow; the black stripe composed of oblong black spots on each segment, beginning from the second, almost joining, and giving the appearance of a continuous narrow black stripe on which no grey tomentum or spots appear; on the first segment there is an indistinct median black spot, on the fifth and sixth segments the stripe is broader, and the seventh segment is almost entirely black; the lateral margins of the fifth and sixth are yellow, transparent; the pubescence on the dorsum is black and short, thickest on the sides, sometimes there are traces of yellow pubescence on the segmentations; on the seventh segment the black hairs are long; underside same colour, with no black stripe visible, but the apex black. Legs blackish brown, the tibiæ the same colour as the abdomen, the fore tibiæ brown at the apex, the tarsi brown on their apical joints; the pubescence on the coxæ and femora whitish and the femora with whitish tomentum, some few yellow hairs on the fore tibiæ; otherwise the pubescence is black, short, not very noticeable. Wings hyaline, tinged with brown, darkest on the fore border; the appendix, when present, is short, thick, and indistinct (on two of the specimens it is entirely absent), the stigma brown, veins brown, all cells widely open.

Tabanus kingsleyi, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) from Port Lokkoh, Sierra Leone, April 1904 (*Major F. Smith*), 1904. 143; and four other females, on one of which is attached the following note:—"Numerous, no other species about; bit donor severely in the house, several hundred yards from the water. Dry season, April." One female from near Baiwalla, Sierra Leone, June 1903 (*Dr. H. J. Conyngham*), 1903. 292.

A species belonging to the group of *Tabanus tæniola*, Macq., with the typical light abdominal stripes bordered by darker ones, but bearing some resemblance to *Tabanus gabonensis*, Macq., and *Tabanus secedens*, Wlk.; distinguished from them,

however, by the side stripes composed of spots contiguous to each other, and thus forming a distinct stripe, whereas in *Tabanus secedens* the side spots are isolated and the whole abdomen is of a reddish-brown shade, any gradations in colour merging in each other, not forming well-marked dark stripes as in the *T. tæniola* group. It is distinguished from *T. tæniola* by the heavily striped thorax, similar to that of *T. gabonensis* &c., and by the wings tinged with brown, shaded on most of the veins.

Length 13-16 mm.

Face covered with greyish tomentum, which becomes yellowish brown above the antennæ, and with short white pubescence; beard whitish. Palpi pale yellow, with white pubescence at base and short black pubescence elsewhere, not very stout at base, ending in a broad point. Antennæ reddish; the first joint rather smaller than is usual, with black pubescence; the second small, with black pubescence; the third long, with small tooth near the base, becoming brownish red after the base; and the last four divisions wholly blackish. Forehead covered with yellowish-brown tomentum, nearly six times as long as it is broad, narrowing slightly anteriorly; the frontal callus dark brown, oblong, furrowed in the middle, almost or entirely reaching the eyes, with a long thick line proceeding from it. Thorax blackish, the two broad stripes composed of grey tomentum, covered with yellow pubescence; sides greyish, with some yellow pubescence, which is continued round base of thorax, elsewhere it is black; breast and sides covered with grey tomentum and some white pubescence. Scutellum blackish, covered with greyish tomentum except in the centre. Abdomen reddish brown, blackish on the last three segments, with a distinct grey, tomentose, median, continuous stripe, continued to the sixth segment, bordered by dark brown or blackish stripes, to which are contiguous the yellowish side spots, forming a fairly distinct stripe as far as the fourth segment; the pubescence on median stripe and on the side spots is chiefly yellowish, elsewhere black; underside yellowish, with broad black median stripe, covered with white pubescence. Legs blackish; tibiæ yellowish, black at apex; middle and posterior femora often largely yellowish red, femora with grey tomentum and white pubescence; the tibiæ with whitish pubescence, elsewhere it is black. Wings hyaline, tinged with brown, most intense on the fore border; stigma reddish brown, veins brown.

Tabanus quadrisignatus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and another female from Ruwe, Lualaba River, Congo Free State, circa 11° S., 26° E., Feb. 1906 (Dr. A. Yale Massey), 1906. 98.

A well-marked species nearly related to *Tabanus fraternus*, Macq., better known as *Tabanus trisignatus*, Loew (which is a synonym of the Macquart species), but easily distinguished from it by the four distinct triangular median spots, the older species having only three, and by the heavily striped thorax and bright red-yellow antennæ. In the thoracic stripes it resembles *Tabanus kingsleyi*, from which it is distinguished by the markings of the abdomen.

It is a medium-sized species with black thorax, marked with two distinct broad greyish stripes, a reddish-brown abdomen with yellowish-grey side spots besides the median ones, blackish legs with red-yellow tibiæ, and clear wings very slightly tinged brown.

Length $13\frac{1}{2}$ –15 mm.

Head wider than thorax. Face reddish (denuded), in the other specimen it is covered with greyish-yellow tomentum and with white pubescence; beard white. Palpi very pale yellow, with white pubescence, slightly broader at base, ending in a moderate point. Antennæ bright red-yellow; the first joint cylindrical, hardly at all cap-shaped, with greyish tomentum and black pubescence and a few white hairs; the second very small, with black pubescence; the third long, darker at its apex, with a moderate tooth. Forehead reddish (denuded), with yellowish-grey tomentum, nearly five times as long as it is broad, narrowing anteriorly; the frontal callus red-brown, oblong, not reaching the eyes, the line proceeding from it is short and thick, some black hairs on the vertex. Thorax blackish brown, the two broad stripes continued to base, composed of grey tomentum, with yellowish pubescence; sides with grey tomentum, the pubescence on dorsum black, with whitish hairs round the base of wings and continued from the base of the stripes round thorax to the sides. Breast and sides reddish, covered with grey tomentum and with white pubescence; black hairs above. Scutellum reddish yellow at base, black in the centre, with black pubescence and yellowish hairs elsewhere. Abdomen reddish brown; some grey tomentum on the first segment, on the four following segments a grey, tomentose, median, triangular spot, all with broad bases, the first one

longest, all with whitish pubescence; the side spots in the type are large on the second segment, smaller on the third and fourth segments, all yellowish in colour, with grey tomentum and some white hairs, irregular in shape; the fifth segment is black at the sides and the sixth wholly black, both, however, with yellow transparent side margins; in the other female there are traces of side spots on the fifth segment; pubescence on dorsum black, yellowish on the lighter spots, sides with white pubescence, black at the extreme apex; underside pale reddish yellow, blackish at the apex, with chiefly white pubescence. Halteres brown, with whitish knob. Legs blackish brown, with red-yellow tibiæ; they are similar to those of *Tabanus coniformis*, Ricardo. Wings clear, very slightly tinged round veins with pale yellowish brown; the first posterior cell slightly narrowed at opening; veins brown, stigma yellowish.

Tabanus coniformis, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and another from Ruwe, Lualaba River, Congo Free State, circa 11° S., 26° E., Feb. 1906 (*Dr. A. Yale Massey*), 1906. 98; two females from Benguela, Angola, 1905 (*Dr. F. C. Wellman*), 1906. 139. "Entangled in an old spider's web near my bungalow."

A species not belonging to any very distinct group, but nearest to that one represented by *Tabanus taniola*, Macq. It is a slender reddish-brown species, with the abdomen very pointed at the apex, with indistinct median and side spots and a black apex; the legs are blackish, with red-yellow tibiæ; the wings quite clear, with no appendix. Antennæ red-yellow.

Length 14 mm.

Head wider than thorax. Face covered with greyish tomentum, which becomes yellowish brown on the subcallus and extreme borders of cheeks, pubescence white; beard white. Palpi yellowish red, with thick short white pubescence, moderately stout, with short apex. Antennæ reddish; the first joint cap-shaped, with white pubescence and black hairs on the upper angle; second small, with whitish pubescence; the third long, with moderate tooth; the last four divisions nearly as long as the first division; the extreme apex black. Forehead red, covered with same coloured tomentum as the subcallus; the frontal callus reddish brown, hardly reaching the eyes, oval, with a thick line proceeding from it

which is furrowed in the middle and nearly reaches the vertex ; the forehead is about four times as long as it is broad, only slightly narrower anteriorly. Eyes with no markings. Thorax reddish brown, with darker indistinct stripes and with indistinct grey stripes ; the dorsum with greyish tomentum and some black pubescence, traces of whitish pubescence round the roots of wings and base of thorax ; sides and breast covered with greyish tomentum and white hairs. Scutellum reddish, black at base, with grey tomentum and a few white and black hairs. Abdomen reddish brown, with triangular, narrow, grey, median, tomentose spots, only distinct when viewed from behind and only on the second, third, and fourth segments ; the sides with irregular, reddish-yellow, oblong spots covered with greyish tomentum on the first four segments ; the last three segments are wholly black, the fifth and sixth with lighter segmentations ; the pubescence on the dorsum black ; on the posterior borders of the fifth and sixth segments with white and black hairs, the sides with white pubescence, black at the apex ; underside reddish yellow, black at apex, the segmentations very narrowly white ; pubescence white, black at apex. Legs blackish brown, the fore tibiæ red-yellow on basal half, the other tibiæ wholly red-yellow ; the middle and posterior tarsi the same colour, but blacker at apex ; the pubescence on coxæ and femora is white, with some grey tomentum ; on the fore tibiæ white on basal half, elsewhere black, with some white pubescence on the middle and posterior tibiæ. Halteres with dark stem and a yellowish knob.

Tabanus brunnescens, ♀, sp. n.

The following specimens are in the British Museum collection :—

Type (female) and another female from the Gold Coast, Sept. 1905 (*Dr. McConell*) ; two females from Obuasi, S. Ashanti, 6. iii. 06 (*Dr. W. M. Graham*), 1906. 150. "Caught in house on window."

A smaller darker species than *T. gabonensis* and *T. secedens*, with a short abdomen, distinguished from them by the thoracic stripes, which are broad and two in number, wholly covered with yellow pubescence, the same width throughout, not showing the suture of thorax as is usual in the above species, and continued to the scutellum, leaving only the middle of it black, with black pubescence. The abdomen is darker in colour, not marked with darker segmentations, but more uniformly dark brown ; the median stripe continuous, yellowish red, covered with yellow and black pubescence, and the side

spots indistinct yellowish. The legs are rather darker than those of *T. gabonensis*.

Length 16 mm.

One of the specimens from Ashanti has the pubescence on the thoracic stripes and median abdominal stripe more grey than yellow.

Head large, wider than the thorax. Face covered with whitish tomentum, which is yellowish brown above the antennæ, the pubescence white, short, scanty; beard white. Palpi yellowish, the same shape as those of *Tabanus claripes*, sp. n., with black pubescence. The antennæ are also similar in shape, red, with black pubescence; the third joint is wanting. Forehead yellowish brown; callus dark brown, long, almost reaching the eyes, with a thick line proceeding from it; forehead on posterior half and at sides dark brown, with black pubescence, the yellowish-brown colour only appearing around the line proceeding from callus and at the sides; the hind margin of head narrow, yellowish. Thorax dark brown, with two broad median and two narrower side stripes composed of greyish-yellow tomentum with yellow pubescence, the pubescence on the dark part of the thorax black. Scutellum brown, the yellow thoracic stripes reaching its apex and continued round it. Abdomen rather short, stout, dark reddish brown, the median continuous stripe fulvous, reaching from the second to the fifth segment; on the sides of the second and third segments appear reddish-yellow indistinct spots; the pubescence of dorsum is yellowish on the stripe, otherwise black, short, and thick; underside pale yellowish, with a dark brown broad median stripe; the pubescence short, white on the pale colour and black on the dark stripe. Legs blackish; fore tibiæ at base pale yellowish red; the middle and posterior tibiæ dull red on the basal half; the pubescence on the coxæ white, on the femora black, on the fore tibiæ whitish on the pale colour, black at the apex, on the other tibiæ it is black with some fulvous hairs; tarsi with black pubescence. Wings tinged pale brownish, lighter in centre of cells; no appendix.

Tabanus claripes, ♀, sp. n.

The following specimens are in the British Museum collection:—

The type (female) from Leopoldville, Congo, Jan. 18, 1904 (coll. Drs. Dutton, Todd, and Christy), presented by the Liverpool School of Tropical Medicine, 1904. 267, is in the British Museum collection.

A large reddish-brown species with striped thorax and brownish wings, easily distinguished by its bright reddish-yellow coxæ from *Tabanus secedens*, Wlk., and *Tabanus gabonensis*, Macq., and by its larger size and redder legs, the fore femora being red, not blackish, and by the markings of the abdomen, which consist of distinct, grey, median, triangular spots, not continuous, and of indistinct reddish-yellow side spots.

Length 24 mm.

Head large, wider than thorax. Face covered with greyish tomentum, yellowish at sides of cheeks and above antennæ on subcallus, pubescence whitish, short, longer on lower part of face; beard whitish. Antennæ dark reddish brown, blackish at apex; the first joint large, cap-shaped, with black pubescence, thickest on the upper angle; the second small, with black pubescence; the third large, with small, rather acute tooth, with brownish tomentum on the first division. Forehead long, narrow, about seven times as long as broad, narrowed anteriorly, yellow like the subcallus; frontal callus bright reddish brown, long, almost reaching the eyes, furrowed in the middle and continued as a thick line beyond the middle of the forehead; the pubescence of the forehead consists of a few black short hairs and of yellowish hairs beyond. Palpi long, curved, not very stout at base, ending in a long point, yellow, covered with short black pubescence. Thorax brown, with two broad median stripes and two narrower side stripes composed of pale yellowish tomentum; pubescence on dorsum short, black, on the stripes yellowish, with tufts of longer white hairs at base of wings; sides and breast covered with greyish tomentum and white hairs. Scutellum brown, with yellowish tomentum, redder at apex; the pubescence black, short. Abdomen long, stout, brown, with reddish colour appearing on the first and second segments and at sides; on the first segment there is a trace of a grey spot, on the second segment it is almost oblong, barely wider at the base; on the third segment it is a long triangular spot reaching the fore border; on the fourth segment it is a broader triangular spot not reaching the fore border; on the sixth segment it is a very short triangular spot; all these spots are greyish yellow, covered with greyish-yellow hairs; the reddish colour of abdomen appears as indistinct irregular-shaped markings on the sides; the pubescence of the dorsum is short, black, rather thick, on the sides it is white; the side-borders of the last segments are yellow, transparent; the underside pale reddish, with a darker median broad stripe covered with short white pubescence. Legs bright red; the

coxæ at their extreme apex and the middle coxæ wholly black; the knees, apex of fore tibiæ, and the fore tarsi blackish; the fore tibiæ are pale yellowish on their upper surface; the pubescence on the fore coxæ is long, white, on the other coxæ scanty and short; on the femora it is white, longest and thickest on the fore pair, with some black pubescence; on the fore tibiæ it is white on the pale colour, black at the apex, and black on the other tibiæ; the tarsi with thick black pubescence. Wings pale brownish, yellowish brown on the fore border, with some clear spaces in the middle of the cells; veins and stigma brown; the first posterior cell a little narrowed at its opening; no appendix.

Tabanus disjunctus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and another from Lutete, Congo, Nov. 19, 1903, presented by the Liverpool School of Tropical Medicine, 1904. 267.

A species with three series of grey spots on the abdomen similar to those of *Tabanus distinctus*, Ricardo, to which it is closely related, but the median spots in this species are not connected and the legs are more wholly reddish, the fore femora not being brownish; it is also larger in size and browner in colour. It is distinguished from *Tabanus pervasus*, Wlk. (probably the same as the South-African form of *Tabanus bovinus*), by the clear wings and the more distinct triangular side spots with their bases resting on the posterior borders of the segments. It is distinguished from *Tabanus sticticalis*, Surcouf, from Font el Julon, N. of Sierra Leone, by its larger size and more distinctly defined side spots.

Length 20 mm.

It differs from *Tabanus distinctus* in the following particulars:—Face covered with yellowish-brown tomentum and with short thick white hairs. Palpi light yellow, larger and rather stouter. Antennæ rather darker; the third joint blackish only, red at the base. Forehead covered with yellowish tomentum; vertex not reddish, but with the same tomentum; the few hairs on the forehead seem chiefly yellowish; it is about six times as long as it is broad, narrowing slightly anteriorly. Thorax brownish, with five indistinct grey stripes, and the scutellum the same colour. Abdomen brown; the median spot on the second segment with long apex, which, however, does not reach the posterior border of the first segment; the second spot on the third

segment triangular, with a very short apex barely reaching half the width of the segment; the third spot with a slightly longer apex; the fourth spot on the fifth segment sub-triangular, nearly reaching the posterior border of the next segment; on the sixth and seventh segments there are no spots; the side spots are four in number on each side, almost similar in shape to those of *Tabanus distinctus*, but not so well defined, more irregular in shape; underside reddish, with white-haired segmentations. Legs reddish, the extreme apex of the fore coxæ and extreme apex of fore femora, the apices of the fore tibiæ, and the tarsi blackish; the coxæ with long white pubescence; the fore femora with short black pubescence above and long white below; on the outer border of the other femora it is also white but not so long; the fore tibiæ with thick white pubescence on their basal half, giving them a whitish appearance; the other tibiæ with chiefly white pubescence, on the tarsi it is black. Wings clear, yellowish on fore border; stigma yellowish; veins brown; the first posterior cell slightly narrowed at opening.

Tabanus distinctus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) from Benguella, Angola (*A. T. Massey*, per Col. Giles), and another female from Lake Tanganyika (*W. A. Cunningham*), 1906. 76.

A medium-sized species with light reddish-brown abdomen very distinctly marked with three series of grey triangular spots and thorax with fairly distinct grey stripes. It is distinguished from *Tabanus congoensis*, sp. n., by the quite clear wings and shape of side spots of abdomen, which are isosceles triangles with their bases resting on the posterior borders of segments.

Length $15\frac{1}{2}$ mm.

Head wider than the thorax. Face reddish yellow, covered with greyish-white tomentum and with short thick white pubescence on the cheeks and lower part of face; beard white, long. Palpi pale yellow, with yellowish-white pubescence and traces of a few black hairs, stout at base, slightly curved, ending in a long point. Antennæ red; the first joint very slightly cap-shaped, with black hairs on the upper angle and some white hairs on its outer border; the second very small, with black pubescence; the third dull red, with obtuse tooth, black at the extreme apex. Forehead covered with grey tomentum; the frontal callus reddish

brown, shining, barely reaching the eyes, long, with a short stout line proceeding from it; the vertex (? denuded) reddish brown, a few black hairs on the sides; the forehead narrows anteriorly a little and is about five times as long as it is broad; back of head whitish, with white hairs. Thorax reddish, with five grey indistinct and four black stripes; the grey stripes are composed of grey tomentum, the median one is narrow, with a broader one on each side and side-stripes; the two middle black stripes only reach the suture; these black stripes only appear as stripes contrasted with the reddish ground-colour of the thorax, which is not apparent in the specimen from Lake Tanganyika, the thorax being blackish, with the five grey stripes apparent, which may probably prove a more correct description of this species when a long series is available for comparison; pubescence on dorsum black, on the grey stripes whitish yellow, sides with black hairs, and with white hairs near the root of wings; breast and sides reddish, with grey tomentum and white hairs. Scutellum reddish, with black pubescence and yellowish hairs round the margin. Abdomen reddish, darker at apex, with three distinct, grey, tomentose triangular spots on the second, third, fourth, and fifth segments; there are traces of them on the sixth; the seventh is wholly black; the median spots are roughly equilateral triangles with broad bases resting on the posterior border of each segment and each apex reaching the base of the succeeding spot, all almost equal in size, except the one on the sixth segment, which is smaller; the side spots are isosceles right-angled triangles with the side nearest the median spots and the base, which rests on the posterior border of segment, straight, both together forming a right angle; the pubescence of dorsum black, on the grey spots yellowish or white; sides of abdomen with white hairs, at the apex some black hairs; underside pale yellowish red, with grey tomentum and pubescence. Legs yellowish red, the apices of fore coxæ and the fore femora reddish brown, the fore tarsi and the apices of fore tibiæ blackish, the other tarsi brownish; the coxæ with long white pubescence, the fore and middle femora with black pubescence above and some white below; the posterior femora with wholly white pubescence, the fore tibiæ with whitish hairs on the yellowish base, the other tibiæ with chiefly whitish pubescence, elsewhere it is black. Wings clear; veins brown; stigma yellowish brown, the first posterior cell distinctly narrower at opening; no appendix.

The specimen from Lake Tanganyika is browner in colour.

Tabanus congoensis, ♀, sp. n.

The following specimens are in the British Museum collection :—

Type (female) and two other females from Wathen, Congo Free State (*Rev. W. H. Bentley*), 1904. 207, and one female from Tumbo, Congo, Nov. 5, 1903 (presented by the Liverpool School of Tropical Medicine).

A dark brown species with well-marked grey triangular median spots and side spots; greyish stripes on the brown thorax, reddish legs, and wings greyish, tinged yellowish brown round the veins and on the fore border.

Length 16 mm.

The specimen from Tumbo measures $18\frac{1}{2}$ mm. It is distinguished from *Tabanus temperatus*, Wlk. (which is probably the same as the South African variety of *Tabanus bovinus*), by its smaller size and narrower abdomen, the median triangular spot on the second segment is narrower at its base and more oblong in shape, the colour of the abdomen is more largely a uniform dark brown with the side spots small, but fairly distinct.

Head wider than thorax. Face reddish, densely covered with greyish tomentum, the ground-colour perceptible on the upper part of face and on the subcallus, where the tomentum is also more yellow in colour; the pubescence white, consisting of rather longer white hairs in middle of face below the antennæ and of shorter ones on the cheeks; beard white, scanty. Palpi yellow with thick black pubescence, long, wide at the base, tapering to an obtuse point. Antennæ dull reddish, black at apex; the first joint large with black pubescence; the second small, with black hairs on the upper prolongation and outer border; the third long, wide at the base, with an obtuse tooth. Forehead about six times as long as it is broad, narrower anteriorly, red with brown and yellow tomentum; the frontal callus reddish brown, oblong, convex, almost reaching the eyes, continued in a thick line halfway along the forehead. Eyes with no markings. Thorax brownish with two stripes of grey tomentum continued to the base of the thorax, grey at sides and on the anterior border, the pubescence of black rather long hairs, with traces of some yellow pubescence; the sides of thorax more red, with black pubescence; breast red, with grey tomentum and black pubescence and some white hairs; the scutellum reddish, with black and yellowish pubescence and traces of grey tomentum. Abdomen brownish, appearing reddish brown on the second segment; the first segment covered with grey tomentum on

the anterior border, on the posterior border a small, median, yellowish spot with yellow hair divided in half by a line or furrow; on the second segment the grey triangular spot is long, reaching the anterior border, narrow at its base; on the three following segments the spots are wider and shorter, not reaching the anterior border; on the sides of the second, third, and fourth segments an isolated, roundish, grey spot is visible; in one of the other females from Waihen the spots are more distinct and oblong, and a small one is perceptible on the fifth segment, the segmentations from the third segment are narrowly whitish; the dorsum rather thickly covered with short black hairs, a few yellow hairs are visible on the bases of the grey triangles; underside reddish, transparent, with white segmentations and pubescence; the margins of abdomen on the fourth, fifth, and sixth segments are yellow, transparent, with some white pubescence. In one of the specimens the side spots are rather indistinct, the triangle on the second segment does not reach the fore border, and the abdomen is darker, showing no light segmentations. Legs reddish, the fore coxæ blackish with long white hairs; the pubescence on the femora black, on the fore tibiæ white, on the middle and posterior tibiæ black; the apex of the fore tibiæ and all tarsi blackish; some grey tomentum on the femora. Wings greyish, tinged with yellowish brown on all the veins and on fore border; stigma the same colour; veins brown. In a third specimen from the same place the side spots are rather indistinct, the triangle on the second segment does not reach fore border, and the abdomen is larger, showing no light segmentations.

Tabanus silvanus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and another from Amboihimitombo Forest, Madagascar (Forsyth Major Coll.), 98. 46.

A dark brown species with almost clear wings; the abdomen obscurely brown, with distinct, grey, median, triangular spots and narrow grey segmentations; the antennæ blackish. Legs dull reddish.

Length 15 mm.

This species is probably related to *Tabanus atrimanus*, Loew, but distinguished from it by the absence of the large, tomentose, white side spots on the second segment, and by the legs being redder.

Head broader than thorax. Face greyish white with white

hairs; beard white. Palpi yellow; fairly stout at base, tapering to a point; some black hairs visible. Forehead the same colour as the face; the subcallus with wrinkles and a fine median black line. Frontal callus reddish brown, oblong, not reaching the eyes, prolonged as a fine line; on the vertex a short reddish stripe, grey in the centre, is apparent; tomentum on posterior half of the forehead yellowish. Antennæ blackish; the first and second joints and base of the third dark reddish brown. Thorax brown, shining, with four grey stripes and a median lineal yellowish stripe; the sides greyish with grey hairs, with black hairs above, reaching to the wings. Scutellum brown with some grey tomentum. Abdomen dark reddish brown, short, with grey tomentum; on the first segment is an imperfect triangular grey spot in the centre; on the second a median triangular grey spot hardly reaching beyond half the width of the segment; on the third segment a similar spot with shorter apex; the three following segments with similar spots which become smaller and more oblong in shape; all the segmentations after the third segment are whitish, becoming broader at the sides; the brown colour becomes darker round the grey triangular spots; the dorsum is devoid of pubescence; the sides are bordered with fine short white hairs; the underside brownish, with white segmentations and short white pubescence. Legs reddish brown; the fore legs darker with the exception of the base of the tibiæ, the pubescence greyish, short. Wings hyaline; the veins and stigma dark brown, the cross-veins at the apices of the basal cells have a slight shading which is hardly perceptible in the upper cross-veins; no posterior cells narrowed at their apices.

Tabanus diversus, ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) and another from Ruwe, Lualaba River, Congo Free State, circa 11° S., 26° E., Feb. 1906 (*Dr. A. Yale Massey*), 1906. 98.

This small black species, with the abdomen marked with very distinct grey spots and thorax with grey stripes and spots, clear wings, short antennæ, and brown legs with yellowish tibiæ, is very nearly allied to *Tabanus insignis*, Loew, from E. Africa, but easily distinguished by its black, not brown colour, by the absence of the four white spots on the second segment of abdomen, by the different, more oblong shape of the large spots on the third and fourth seg-

ments, by the shorter antennæ, the frontal callus with a very short, thick line proceeding from it, and the thorax with two greyish-haired spots at the base and no white tomentose margin as in *T. insignis*.

Length $11\frac{1}{4}$ mm.

Head wider than thorax. Face covered with grey tomentum and with white pubescence; beard white. Palpi yellow, with fairly long, white pubescence, moderately stout at base, ending in a long acute point. Antennæ short, reddish; the first joint yellowish, with black pubescence on the upper angle and whitish elsewhere, cylindrical, hardly at all cap-shaped; the second small, red, with black pubescence; the third red, at apex black, with broad, short, first division, and tooth marked by an angle; the last four joints very small. Forehead fairly broad, very slightly narrower anteriorly, about four times as long as it is broad, brown, covered with grey tomentum and with some grey and black hairs; the frontal callus reddish brown, nearly square, almost reaching the eyes, the line proceeding from it is very short and thick; in the second specimen it is broader still, nearly as broad as the callus itself, on each side of this line the brown ground-colour appears as an ill-defined long spot; the vertex is brownish. Back of head whitish with white hairs. Thorax black, shining, with two median, grey, tomentose stripes, not reaching beyond the middle of thorax, at base of thorax two grey hairy spots; sides grey with white pubescence; on the stripes the pubescence is whitish, elsewhere black; at the base of thorax near the root of the wings there is thick white pubescence. Sides and breast with grey tomentum and white pubescence. Scutellum dull reddish, with grey tomentum and white pubescence. Abdomen black; on first segment trace of a small, grey, median spot and at sides broadly white, tomentose; second segment with white tomentose spot on each side, its upper angle pointing inwards and reaching three quarters of the width of the segment, and continued up the whole outer side of segment; the side spots on the four following segments are very similar, decreasing in size, the upper angles especially so; on the third segment the large white median spot is almost square, extending the whole width of segment; on the fourth it is rather smaller; all these spots are covered with grey tomentum and white pubescence, the pubescence on the dorsum is otherwise black, on the sides white; underside dull reddish yellow, blackish at sides and towards the apex, covered with short white pubescence. Legs blackish brown; the tibiæ yellowish, the fore tibiæ black on apical half; the femora with greyish

tomentum and white pubescence; the tibiæ with yellowish-white pubescence, black on dark apex of fore tibiæ and elsewhere. Wings clear, veins brown, stigma yellowish brown; the first posterior cell not narrowed; no appendix.

Tabanus fuscipes, ♂ ♀, sp. n.

The following specimens are in the British Museum collection:—

Type (female) from British Central Africa, 1906 (*E. L. Rhoades*); one female from Gadzima, Mashonaland, Dec. 1895 (*G. A. K. Marshall*), 1903. 17; one female from Salisbury, Mashonaland, Dec. 1899 (*G. A. K. Marshall*); one male from Estcourt, Natal, Jan. 1897 (*G. A. K. Marshall*), 1903. 17.

This species is very nearly related to *Tabanus ditæniatus*, Macq., and may be easily confused with it at first sight, but is a distinct species, recognized by the black coxæ and almost wholly blackish femora and by the absence of any grey tomentum in the centre of the median black stripe of abdomen.

Length 12–14 mm.

The antennæ are slightly darker at the apex. The eyes, face, palpi, and forehead similar to those of *T. ditæniatus*, with the two typical black spots on the forehead. There is no trace of grey triangles on the black stripe of abdomen in the females. The yellow legs are darker, the femora all being black for two thirds of their length, the apical third alone being yellow. The clear wings have a short appendix.

The male has yellowish eyes, brown below, the facettes all equal, except those on the lower third of eye which are smaller, no stripe apparent. Palpi club-shaped, yellow, transparent. The abdomen has the apex more widely black than in the females and a grey tomentose stripe is visible on the median black stripe; the legs are similar to those of the females, but the femora are almost wholly black, only their extreme apex being yellow.

Tabanus ruwenzorii, ♀, sp. n.

One female (type) from E. Ruwenzori, 5000–7000 feet, 22. i. 1906 (coll. by Hon. G. Legge and A. F. R. Woollaston), 1906. 153; another female from E. Ruwenzori, 600–1300 feet, 7. ii. 1906 (by same collectors).

A robust pubescent species with hairy eyes, black abdomen with the second segment reddish at the side, thorax shining black. Antennæ, face, and palpi black. Legs

black, tibiæ yellow. Wings clear, very slightly tinged yellowish brown.

Length 16 mm.

Face black, with dull brown tomentum and yellowish-brown pubescence, some black hairs on the upper part of cheeks and under antennæ; beard yellowish brown. Palpi dull brownish black with black pubescence, stout, ending in a short point. Antennæ black, with long and slender third joint and hardly any tooth; the first two joints with long black pubescence; the subcallus the same colour as the face. Forehead about three times as long as broad, the same width throughout, dull blackish brown with yellowish-brown tomentum and long black pubescence; the frontal callus small, reddish brown, oval, the line proceeding from it indistinct; the vertex black, with tubercle. Eyes covered with short yellowish-brown pubescence. Thorax black, shining, with no stripes; the dorsum nearly bare; shoulder-spots reddish with some yellowish-grey hairs, which are continued round the base of the thorax; sides with black pubescence; breast black, with greyish-yellow pubescence and some black hairs. Scutellum shining, black. Abdomen black, somewhat shining; the first segment narrowly red at the sides; the second segment broadly red at the sides with narrow reddish segmentations; the following segments with extremely narrow, grey-haired segmentations. Legs black; tibiæ yellowish with apices black; the femora with greyish pubescence; the tibiæ with dense whitish pubescence, on their black apices and on the tarsi it is black. Wings hyaline, the yellowish-brown colouring is chiefly round the longitudinal veins of the fore border and is very faint; veins and stigma brown.

L.—*Description of a new Elapine Snake from Australia.*

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

TWO years ago I described in these 'Annals'* a new Elapine snake discovered by Mr. W. Stalker near Alexandria, in the Northern Territory of the colony of South Australia, and which formed part of a small collection presented to the British Museum by Sir W. Ingram, Bart., and the Hon. John Forrest. That snake was named *Denisonia forresti*. Mr. Stalker has continued collecting in the same district, and

* Ser. 7, vol. xviii. 1906, p. 440.

I have now the pleasure of describing another snake of the same group, but of much larger size, and to connect with it the name of Sir W. Ingram.

Diemenia ingrami.

Eye rather small, its diameter equal to its distance from the oral border and one third the length of the snout. Snout rounded, strongly projecting beyond the lower jaw, with feeble canthus. Rostral broader than deep, the portion visible from above measuring about one half its distance from the frontal; internasals a little shorter than the præfrontals; frontal bell-shaped, as broad as the supraocular, once and two thirds as long as broad, as long as its distance from the end of the snout, three fourths the length of the parietals; nasal divided, separated from the single, deeply grooved præocular; two postoculars; temporals 1+2; six upper labials, second in contact with the præfrontal, third and fourth entering the eye, fifth narrowly separated from the parietal, sixth very large; four lower labials in contact with the anterior chin-shields, which are larger than the posterior. Scales in 17 rows on the body, in 21 on the neck. Ventrals 205; anal divided; subcaudals 65 pairs. Uniform dark brown above and on the outer ends of the ventral shields, some of the scales lighter in the centre, yellow beneath.

Total length 1510 mm.; tail 240.

A single specimen from Alexandria.

LI. — *Note on the Type Specimen of a Blind Snake, Helminthophis wilderi (Garman), from Brazil.* By A. G. HAMMAR.

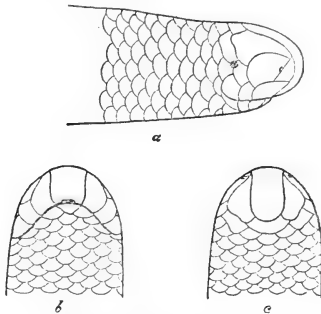
IN the course of studies of South-American snakes in the Museum of Cornell University, I had the opportunity to examine the type specimens of *Typhlops wilderi*, Garm. Since this species is not recognized in the literature, and has been referred to in Boulenger's 'Catalogue of Snakes,' i. p. 7, in a footnote, as insufficiently characterized, I have made a careful study of the specimens and give below a new description, which will bring it into its proper systematic position.

Due to the presence of two very large prefrontals, *Typhlops wilderi*, Garm., must be included under the genus *Helminthophis*, Peters, Boulenger, Cat. of Snakes, i. p. 4.

Helminthophis wilderi (Garman).

Typhlops wilderi, Garman, Science Observer, iv. 1883, p. 48.

Rostral large, extending to the level of the eyes, one third the width of the head; frontal twice as large as, or



Helminthophis wilderi (Garm.).

a, lateral view of the head; b, ventral view of the head;
c, dorsal view of the head.

larger than, scales on the back; one preocular; eyes under the sutures between the supra-ocular, preocular, and ocular; prefrontal very large, triangular, generally reaching the 1st nasal; labials 3, the 2nd and 3rd in contact with the ocular, the anterior largest, forming an acute angle between the nasal and the rostral; sublabials 3 (? 4); diameter of body 35 times in the total length; tail almost as wide as long, with 11 ventral scales; 20-22 scales round the body; anal plate slightly larger than ventrals.

Total length 170-185 mm.

Coloration according to Garman: "Back a rich lustrous brown; belly and head lighter. The head is the lightest-coloured portion of the body. The tail is darker beneath than the remainder of the ventral surface."

From *H. guentheri*, Boul., it can be distinguished by the presence of 3 labials instead of 4, and 3 sublabials instead of 5; by the small scale following the very large frontal. From *H. cancelli*, Mocquard, it differs by the presence of one preocular instead of two.

The two specimens in the Museum of Cornell University have been determined by Garman, and are the types of the species. Three specimens were collected in 1878-9 by Prof. J. C. Branner in Cyriaco, near Serra Providencia, Minas Geraes, Brazil.

LII.—A Note on *Loligo media* (L.). By ANNE L. MASSY, Department of Agriculture and Technical Instruction for Ireland, Fisheries Branch, Dublin.

I HAVE carefully examined the tentacular suckers in examples of this species, of both sexes, from the east and west coasts of Ireland, and find them in all cases to be plentifully armed with teeth. In this respect they differ from the diagnosis given by Hoyle*, who agrees with Jatta in saying that the horny ring of the tentacular suckers is perfectly smooth †. Dr. Allen and Mr. Todd, of the Marine Biological Association, have kindly sent me specimens from Plymouth and from off the coast of Lincolnshire. These also have toothed tentacular suckers. Through the courtesy of the Director of the Zoological Station at Naples I have been enabled to examine one of the specimens used by the late Dr. Jatta in his description of the species. It agrees, in the presence of teeth on the tentacular suckers, with the English and Irish examples mentioned above.

The specimens from off Trusthorpe, Lincolnshire, are the largest, and therefore offer the greatest facility for minute examination of the suckers. Each sucker appears to have about twenty-four large pointed teeth, with here and there a minute conical tooth between two large ones. The points of the large teeth are in many cases broken off.

Several authors have suspected that *L. marmoræ* ‡ was the female of *L. media*. Having read Joubin's paper in support of this view, I separated all the individuals in our collection having fins more or less in the position typical of *L. marmoræ*, and found them to be female, with two exceptions. The latter were very young males, and obviously their youth accounted for the position of their fins. All those with lengthened extremity proved to be without exception male.

* "Notes from the Manchester Museum.—No. 9. British Cephalopoda; their Nomenclature and Identification." P. 203: "Suckers of tentacular arms with a smooth ring—*Loligo media*."

† 'I Cephalopodi viventi nel Golfo di Napoli.' P. 186: "L'anello corneo delle ventose tentacolari è in tutto il suo ambito egualmente sviluppato liscio perfettamente sopra il margine libero."

‡ Bull. Soc. scient. médic. de l'Ouest, Rennes, xi. 1902: "Quelques observations sur *Loligo media*."

LIII.—*Descriptions and Records of Bees.*—XIX.
By T. D. A. COCKERELL, University of Colorado.*Dufourea* (?) *calidula*, sp. n.

♀.—Length about $7\frac{1}{2}$ mm.; anterior wing $5\frac{1}{2}$ mm.

Black, including legs (last tarsal joint dark reddish); pubescence dull white, not abundant; abdomen wholly without hair-bands; head subtriangular, the eyes long and converging below; malar space present, but very short; clypeus long, flattened, dullish, with very minute punctures and an exceedingly short and fine silvery tomentum, only visible in lateral view; sides of face with broad shining foveæ, which narrow below and extend about halfway down the sides of the clypeus as narrow grooves; antennæ black, short, ordinary; vertex dull; mesothorax very shiny posteriorly, anteriorly with a more sericeous surface; pleura with long hair; area of metathorax broad, dullish, with a minutely striatulate surface, its margin evident but rounded; tegulæ piceous. Wings perfectly hyaline, beautifully iridescent, the large stigma and the nervures piceous; lower section of b. n. strongly bent about its middle and falling some distance apical of t.-m.; t.-m. not or hardly oblique, slightly bowed outwards; two submarginal cells, the first about or nearly twice as long as the large second, the latter receiving both the recurrent nervures, the second nearer to its apex than the first to its base; third t.-c. bent in the middle; second r. n. with an outward bend in its upper part. Hair of legs dull white, more or less reddish on tarsi; hind spurs yellowish white, long and perfectly simple. Abdomen broad, with a dullish sericeous lustre, first segment with a slight boss on each side; apex with long hairs; venter sparsely hairy.

Hab. Hinterland of Benguella, Jan. 3, 1908 (*F. C. Wellman*).

Taken with other bees (*Cælixys benguellensis* &c.) at a small patch of flowering Compositæ, *Othonna* and *Geigeria*. No pollen had been collected. This is not a genuine *Dufourea*, nor is it a *Halictoides*; I believe it should be regarded as the type of a new genus, derived from the African Halictines, but I should like to see more material, and especially the male sex, before proposing a generic name. I have given the characters of the venation which separate it from the real *Dufourea*.

Heriades ekuivensis, sp. n.

♀.—Length about $8\frac{3}{4}$ mm.; anterior wing about $5\frac{3}{4}$ mm.

Black, with white pubescence; abdomen with the usual white bands; ventral scopa silvery white; basin of first abdominal segment with a sharp rim; wings dusky. General appearance like *H. truncorum*, L., but differing as follows:—Eyes much larger; cheeks less ample; clypeus with a median ridge on its upper half or more; mesothorax larger and broader; tegulae piceous; scutellum large, broad, and flat, its straight hind edge projecting; no teeth at sides of scutellum, and its sculpture entirely different from that of mesothorax, consisting of large deep pits close together, the whole surface being dull, contrasting with the shining mesothorax; hind tibiae more robust; marginal cell a little more pointed at apex. The principal characters are those of the scutellum; these and the clypeal ridge suggest affinity with *H. clypeatus*, Friese, from the Transvaal.

Hab. Ekuiva Valley, W. Africa, 1907 (*F. C. Wellman*).

Among other bees taken by Dr. Wellman in the Ekuiva Valley are *Serapistia denticulata* (Sm.), *Mesotrichia flavorufa* (De Geer), &c.

Heriades wellmani, sp. n.

♀.—Length $5\frac{1}{2}$ mm. or slightly more.

Black, with white pubescence; abdominal bands scarcely developed; ventral scopa creamy white; basin of first abdominal segment with a sharp rim. A small slender species, superficially just like *Chelostoma campanularum* (Kirby), but differing in the structure of the first abdominal segment and also as follows:—flagellum ordinary; punctures of face and front much larger; punctures of mesothorax very much larger; scutellum (which is ordinary, not projecting) with deep sparse punctures on a shining ground. Wings hyaline, dusky apically; second s.m. receiving second r. n. very near its apex, and the first about twice as far from its base; punctures of abdomen large and deep. Somewhat related to *H. eximius*, Friese, apparently.

Hab. Hinterland of Benguela, Jan. 3, 1908 (*F. C. Wellman*).

Taken with other bees (*Calioxys benguellensis* &c.) at a small patch of flowering Compositae, *Othonna* and *Geigeria*. No pollen had been collected.

Xylocopa valga, Gerst.

I received from the Museum of Comparative Zoology two

specimens of *Xylocopa* (♂ ♀), collected many years ago by the Rev. M. M. Carleton in the Koolloo Valley, near to the Himalayas, Northern India. The male was *X. fenestrata*, Fabr., but, to my surprise, the female proved to be *X. valga*, Gerst., not hitherto reported from India.

Chelynia pavonina, sp. n.

♂.—Length about 8 mm.

Looking like a small dark blue *Osmia*; the colour throughout, including legs and tegulæ, is a very fine dark purple-blue, shaded with green, the clypeus and mesothorax being nearly all green, while the upper side of the abdomen is largely green, with some crimson tints, the hind margins of the segments being purple. Mandibles tridentate; antennæ only moderately long, rather thick, resembling those of ♀ *Osmia*, but 13-jointed, the scape green; head and thorax densely punctured and with long coarse hair, which is black except on the mesothorax, where it is white; tegulæ large, densely punctured. Wings dusky, second submarginal cell receiving both recurrent nervures. Hair of legs and abdomen black; abdomen without light markings.

A very distinct and beautiful species, with peacock-colours; it most resembles *Stelis montana*, Cresson, but is easily known from that by the venation and other characters.

Hab. Boulder, Colorado, June (*G. M. Hite*).

CYRTAPIS, gen. nov.

Rather small; body *Halictus*-like; stigma large; three submarginal cells; first s.m. long, but not so long as the other two combined; second broad, receiving the first r. n. before its middle; third broader above than below, receiving the second r. n. a short distance from its base; second r. n. with an even but strong double curve; marginal cell large, pointed at apex; lower section of basal nervure strongly curved and much longer than upper; b. n. meeting t.-m., the latter oblique, its lower end more apicad; abdomen apparently with a narrow elongated black pygidial area, but this is a little uncertain.

Cyrtapis anomalus, sp. n.

Length about 8 mm., with head thrust forward.

Head about $1\frac{2}{3}$ mm. long, bluntly triangular, rather elongated; head and thorax apparently black; abdomen reddish, with broad entire bands, at least twice as broad as the pale intervals between them; antennæ cylindrical, not monili-

form, rather long (at least 3 mm.), width of flagellum about 170 μ ; abdomen as in *Halictus*, sessile, about 2 mm. broad. Wings hyaline, nervures and stigma pale testaceous; length of anterior wing about $4\frac{3}{4}$ mm.

The following wing-measurements are in μ :—

Depth of stigma 238; length of marginal cell 1615; width (or depth) of marginal cell 425; length of first submarginal 918; lower side of first s.m. 663; length of second s.m. (from one lower corner to the other) 629; second s.m. on marginal 391; third s.m. on marginal 663; third s.m. below 493; length of first discoidal 1224; upper side of second discoidal 765; lower side of second discoidal 884; length of third discoidal (from angle formed by first and second to lower apical corner) 1156; b. n. on first s.m. 255; b. n. on first discoidal (not allowing for curve) about 561.

Hab. Fossil in the Miocene shales of Florissant, Colorado, at Station 14 (*W. P. Cockerell*, 1907).

Without any clue to the mouth-parts it is difficult to place this singular genus in its correct systematic position. The general appearance, and the large stigma, marginal cell, and bent basal nervure are all as in the Halictines. The form of the second submarginal cell, with the first r. n. joining it before the middle, as well as the second r. n. with a double curve, suggest affinity with the Colletines. The really anomalous character is found in the third transverso-cubital nervure, which has a strong double curve, and has its upper section more apicad than the lower, just reversing the normal condition. This is quite clearly visible in both wings, and evidently not an abnormality.

Ceratina binghami, sp. n.

Ceratina viridissima, Bingham, Faun. Brit. India, Hymenoptera, vol. i. p. 501.—Not *C. viridissima*, Dalla Torre.

This Indian species has long passed as *Ceratina viridis*, Guér., as it agrees sufficiently with Guérin's short description. The name of the species was needlessly altered to *viridissima* by Dalla Torre on account of supposed preoccupation. The original *viridis* was from Senegal, W. Africa, and has not been found in that region since 1845, unless an insect reported by Meunier as a variety of his *C. congoensis* really belongs to it. I have just received from Dr. F. C. Wellman some specimens (2 ♀, 1 ♂) of a *Ceratina* collected by him in the Ekuiva Valley, 160 miles east of Benguella, and these I refer without hesitation to *C. viridis*. One of the females was visiting the flowers of an orchid. Compared with the Indian insect these *viridis* are more robust and much

less brilliantly coloured, and somewhat more coarsely punctured; there is no doubt that they represent a distinct species. My specimens of *C. binghami* are from Mr. Sladen, and were collected at Calcutta and Siliguri in 1897. The specimen from Calcutta is more blue than green.

PROTOMELECTA, gen. nov.

Form *Andrena*-like, with a rather long abdomen; wings short, not reaching tip of abdomen; flagellum thick, as in *Melecta*; eyes large and prominent; middle ocellus in a depression; scutellum apparently flat and *Crocisa*-like, the lateral posterior corners produced and angulate, but the interval between the points straight in the middle, not incised; stigma large; marginal cell long, ending in a rather blunt point not quite on costa; three submarginal cells, the first longest below, but not very greatly so; second submarginal cell very broad, receiving the first recurrent nervure beyond the middle; third s.m. greatly narrowed to marginal, receiving the second r. n. beyond the middle; second r. n. curved outwards, with a little band at middle of curve.

Protomelecta brevipennis, sp. n.

Length about 9 mm.

Black; anterior wing $5\frac{2}{3}$ mm.; abdomen 5 mm. long or nearly and about 3 wide, extending about 1 mm. beyond closed wings; wings fuliginous, stigma black, nervures brown; flagellum thick, about $340\ \mu$ diameter. Wings quite hairy; abdomen with sparse but evident hairs. Ocellar basin (for middle ocellus) oval, about $391\ \mu$ long and 255 broad. Basal nervure originating some distance from stigma, its lower part gently curved, but not at all as in the Halictines; third transverso-cubital with a double curve, formed about as in *Xenoglossa*; apex of first discoidal prolonged and sharply pointed.

The following wing-measurements are in μ :—

Depth of stigma 238; length of marginal cell 1598, its depth 459; length of first discoidal cell 1649; lower side of first submarginal cell 646, of second 595, of third 544; lower section of basal nervure 612, the upper very much shorter; lower side of first discoidal 969; first recurrent nervure 663; insertion of first r. n. to end of second s.m. 85; insertion of second r. n. to end of third s.m. about 85; upper side of second s.m. about 459, of third s.m. 187; distance between insertions of the recurrent nervures 493.

Hab. Fossil in the Miocene shales of Florissant, Colorado, Station 14 (*W. P. Cockerell*, 1907).

A very *Melecta*-like genus, but with the venation of the Eucerines and the large stigma of the Andrenids. In Ann. & Mag. Nat. Hist., July 1902, p. 45, the affinities of *Melecta* are discussed, and it is concluded that it is derived from the Anthophorine series, and is especially related to the Eucerines (*Xenoglossa* &c.). The genus now described would therefore fall into the series as a primitive Melectine, retaining, however, the large stigma characteristic of lower groups. Among the known fossil genera it has a rather close resemblance to *Lithandrena*, but the latter has not the *Melecta*-like antennæ and the proportions of the submarginal cells are different. *Protomelecta* is no doubt a parasitic genus, but there is no reason for supposing this of *Lithandrena*.

Cælioxyx benguellensis, sp. n.

♀.—Length about 16 mm.; anterior wing a little over 10 mm.

Black, including the legs and tegulæ, with dense snow-white pubescence on cheeks, sides of face, upper part and margins of pleura, &c. Hair on eyes only moderately long; clypeus with white hair, no keel on it or the supraclypeal region; mesothorax and scutellum dull, with very dense large punctures; scutellum with no median tubercle, teeth at its sides long, a little curved. Legs with white hair, but it is orange-ferruginous on inner side of tarsi. Anterior wings dark fuliginous, violaceous, hyaline at base; hind wings hyaline, with the apex broadly fuliginous. Abdomen strongly and quite closely punctured, with linear white hair-bands, broadening laterally; venter with three broad white hair-bands, failing more or less in the middle; margin of penultimate ventral segment covered with white hair; last dorsal segment keeled about $\frac{2}{3}$ of its length, its apex rather blunt; last ventral surpassing last dorsal by nearly a millimetre, narrow, with long fuscous hair on each margin and with a little sharp tooth on each side a little beyond level of apex of last dorsal; penultimate ventral segment rough with excessively minute punctures, giving way to larger ones at the base. In Friese's table of African *Cælioxyx* ('Arkiv för Zoologi,' 1904) this runs to *C. setosa*, Friese, but differs from that E.-African species in the colour of the hair on the clypeus and apical segment of abdomen. In the structure of the apex of the abdomen there is some analogy with *C. elongata*, Lep., but the apex of the last ventral is very much narrower than in that species, and the lateral teeth are not nearly so near the apex.

Hab. Hinterland of Benguella, W. Africa, Jan. 3, 1908
(*F. C. Wellman*).

It was taken, along with numerous other bees (*Anthophora cærulea*, Friese, ♀, *Crocisa picta*, Smith, ♀, *Apis adansonii*, Latr., worker, &c.) at a small patch of flowering Compositæ, species of *Othonna* and *Geigeria*.

Thrinchostoma orchidarum, sp. n.

♂.—Length a little over 11 mm. with the head thrust forward; anterior wing $8\frac{3}{4}$ mm.

Black, with the hair on head and thorax above mainly ferruginous, but on cheeks and pleura white; sides and middle of face with dense white hair; clypeus greatly produced as usual, its apical margin broadly light yellow; tongue long and slender, orange, very hairy; palpi clear ferruginous; last joint of maxillary palpi long and slender; antennæ ordinary, flagellum ferruginous beneath; eyes prominent; mesothorax and scutellum extremely closely and densely punctured; tegulæ clear ferruginous. Wings ample, ferruginous-tinted, stigma and nervures ferruginous; costal margin with short dark hair; apex of wings not infuscated; second s.m. large; second t.-c. with a patch of black hair as usual in the genus, but straight (not bent as in *T. bicometes*); third t.-c. almost straight (not curved as in *T. wellmani*); third s.m. receiving both recurrent nervures at about equal distances from apex and base; femora black; tibiæ with a yellow basal spot and more or less yellow apically; hind tibiæ broad, triangular, with a greatly produced and enlarged inner angle, on the lower side of which the two spurs are seen, widely separated; tarsi clear light yellow, the apical two or three joints ferruginous; abdomen black, with the hind margins of the segments broadly brilliant silvery, the apical segment with black hair.

From the structure and colour of the wings this cannot be the male of *T. wellmani*. It is also quite distinct from *T. bicometes* (*Diagonozus bicometes*, Enderlein) and *T. productum* (Smith). Its closest affinity is with *T. renitantely*, Saussure, from Madagascar, but it differs in several points of coloration.

Hab. Hinterland of Benguella, Jan. 1908, in flowers of a large orchid (*F. C. Wellman*).

Thrinchostoma orthonnæ, sp. n.

♀.—Length hardly 8 mm.; anterior wing 6 mm.
Shining black; head and thorax with white hair, a little

fuscous on scutellum; clypeus produced, but not so excessively as in some species, exceedingly shiny, very sparsely punctured; sides of face covered with white hair; malar space broader than long; antennæ black; front densely and minutely punctured; mesothorax with dense strong punctures, but shining; postscutellum covered with white tomentum and white hair in scutello-mesothoracic suture; area of metathorax broad, with a raised cancellate sculpture; tegulæ dark reddish. Wings reddish, stigma and nervures rather dilute brown; second s.m. very large; third s.m. receiving the recurrent nervures near apex and base; second and third transverso-cubital straight. Legs black, the tarsi ferruginous at apex. Abdomen black, the hind margins of the segments broadly hyaline, rather sparsely beset with silvery hairs; dark parts of abdomen with much black hair.

The smallest known species of the genus; nearest to *T. productum*, but malar space shorter, and the sculpture of the thorax very different.

Hab. Hinterland of Benguella, Jan. 3, 1908 (*F. C. Wellman*).

Taken with other bees (*Cælioxys benguellensis* &c.) at a small patch of flowering Compositæ, *Othonna* and *Geigeria*. The hind legs are loaded with the deep orange pollen.

Bombus ephippiatus montezumæ, n. n.

Bombus laboriosus, Smith, Journ. of Entom. 1861, p. 153 (not of Fabricius, 1804).—Mexico.

LIV.—*On the Synonymy and Systematic Position of some Species of Tabanidæ described by Thunberg and Lichtenstein.* By ERNEST E. AUSTEN.

In a recent paper on the "Nomenclature of Diptera" Prof. Bezzi* has called attention to certain forgotten writings of C. P. Thunberg and A. A. H. Lichtenstein, and has also (*loc. cit.* p. 84) expressed his conviction that, as has already been done in the case of other orders of insects, "a permanent and immutable nomenclature can be established for the Diptera also, after all generic and specific names, proposed by all the older authors without exception, have been completely elucidated and interpreted." The following notes are

* Wien. Ent. Z. xxvii. Jahrg., Heft ii. & iii. (20th Feb., 1908) pp. 77-83.

offered in the hope of expediting, in however small a degree, the advent of so desirable a consummation.

Bezzi is not strictly correct in stating (*loc. cit.* p. 80) that the species of Tabanidæ described by Thunberg (Nov. Act. R. Soc. Sci. Upsal. ix. 1827, pp. 53-75) are "entirely wanting" from Kertész's 'Catalogus Tabanidarum' (1900), since *Tabanus ruber*, Thunb. (*loc. cit.* p. 56.—Habitat unknown), and *Tabanus triceps*, Thunb. (*loc. cit.* p. 59.—Cayenne and Brazil), are duly recorded by Kertész. The inclusion of these species, however, in view of the exclusion of all the others, is certainly remarkable.

Tanyglossa cingulata, Thunb. (*loc. cit.* p. 70, tab. i. fig. 8.—Cape of Good Hope), = *Pangonia angulata*, Fabr.

From Thunberg's description and figure, *Pangonia conjuncta*, Walk. (List Dipt. Ins. in Coll. Brit. Mus. i. (1848) p. 135.—S. Africa), would appear to be identical with *Tanyglossa pulchra*, Thunb. (*loc. cit.* p. 72, tab. i. fig. 9), which, however, is stated to be from Brazil.

Tanyglossa rostrata, Thunb. (*loc. cit.* p. 75, tab. i. fig. 13.—Cape of Good Hope), apparently = *Pangonia (Tabanus) rostrata*, Linn.

Tanyglossa obscura, Thunb. (*loc. cit.* p. 73, tab. i. fig. 10.—Locality not given), is a *Pangonia*, as stated by Bezzi—perhaps *P. rostrata*, Linn.

[*Tanyglossa deusta*, Thunb. (*loc. cit.* p. 68, tab. i. fig. 7.—Brazil), is not a Nemestrinid, as suggested by Bezzi, but = *Heterostylum rufum*, Olivier (fam. Bombylidæ).]

Tanyglossa aethiopica, Thunb. (*loc. cit.* p. 67, tab. i. fig. 6.—Cape of Good Hope).—Apparently this is the species previously (Mus. Nat. Acad. Upsal. Dissertationes, Pars 7 (1789) p. 91) described by Thunberg as *Tabanus aethiopicus**. Be this as it may, there can be no doubt that it is a *Pangonia*, and not *P. rostrata*, L., as Bezzi believes, but *P. (Corizoneura) varicolor*, Wied. (Auss. Zw. Ins. i. (1828) p. 98: syn. *P. appendiculata*, Macq.). Wiedemann's name consequently becomes a synonym, and the species must henceforth be known as *Pangonia aethiopica*, Thunb.

Tanyglossa thoracica, Thunb. (*loc. cit.* p. 71.—Locality unknown), is a *Pangonia*, apparently allied to *P. angulata*, Fabr. If so, it must be from S. Africa.

According to Bezzi (*loc. cit.* p. 83, note 2), with the exception of *Mydas nitida*, none of the species of exotic Diptera

* Omitted by Bezzi, Wien. Ent. Z. xxvii. Jahrg., Heft ii. & iii. (Feb. 20th, 1908) p. 79.

described in Anton August Heinrich Lichtenstein's 'Catalogus'* have been noticed by Wiedemann or any other author. Bezzi (*loc. cit.* note 2) gives the number of the species under the genera under which they were described, but states that he has not yet seen the publication in question. This is not surprising, since, according to Sherborn (*Ann. & Mag. Nat. Hist.* ser. 7, vol. iii. 1899, p. 272), Lichtenstein's 'Catalogus' is "so rare that only two copies are known to exist, one in the British Museum and one in the University of Kiel." Lichtenstein's Tabanidæ were described as *Tabanus costalis* (*op. cit.* p. 213) and *Tabanus Hottentotus* and *T. charopus* (*ibid.* p. 214). The descriptions are exceedingly short, and since few dipterists are likely to be in a position to consult the originals, they are transcribed in their entirety below, with a note in each case on the systematic position of the species:—

"295. *Tabanus striatus*; n. 39 †. Item: *Tabanus costalis*; nobis. *Taban. oculis æneis*; ferrugineus, alis hyalinis costa flava. Habitat in Coromandel."

[Apparently a *Tabanus*, but precise species probably indeterminable.]

"304. *Tabanus Hottentotus*; nobis. *Tabanus ater*; thorace, & abdominis segmento tertio supra flavo macularis [*sic*]. Habitat ad Cap. bon. Spei. Haustellum longitudine capitis, alæ nigæ."

[Evidently a *Cadicera*, near, though apparently distinct from, *C. (Pangonia) chrysostigma*, Wied.]

"305. *Tabanus charopus*; nobis. *Tabanus oculis fuscis*, ater, lanugine alba, alis hyalinis. Habitat ad Cap. bon. Spei. Haustellum longitudine thoracis."

[Probably *Bombylius analis*, Fabr., ♂.]

LV.—*The Missing Premolar of the Chiroptera.*

By OLDFIELD THOMAS.

No bat has normally more than three premolars, above or below, and the question has naturally arisen as to which of the full mammalian set of four has disappeared in this group.

* 'Catalogus rerum naturalium rarissimarum Hamburgi . . . auctoris lege distrahendarum . . .' Sectio tertia [*Insecta*]. 8vo, Hamburg, 1796.

† The number under which *Tabanus striatus* was originally described by Fabricius, *Ent. Syst.* iv. 1794, p. 371.—E. E. A.

Hitherto authors have taken for granted that the anterior tooth, the protus * or p^1 , was the missing one; but they appear to have done this rather because it was the simplest theory than that they had any strong reason for it. Even Winge, who gives in most cases such full reasons for his conclusions, merely says "it is usually presumed that it is p^1 which is absent" †.

In such cases the arguments that are available are of three kinds, viz.: (1) relative position in the jaw, (2) the occasional recurrence of atavistic teeth, and (3) the presence or absence of milk-teeth corresponding to the permanent ones. The first two of these arguments may often be fallacious, while the third is a very important one; but if, as now, all three agree in pointing to one conclusion, that should be accepted even if it differs from the usual opinion on the subject.

It is, of course, certain that the two posterior premolars of bats are to be homologized as p^3 and p^4 , tritus and tetartus; and the question to be settled is as to whether the most anterior one is the protus or deuterus, p^1 or p^2 , and I have come to the conclusion that this tooth is the protus and that the deuterus is missing, for the following reasons:—

(1) As to relative position, attention may be drawn to the way in which the anterior tooth in *Pterocyon helvus*, in *Loucho glossa*, and others, stands close behind the canine, with a gap separating it from the other teeth.

(2) Dr. K. Andersen has shown me a skull of *Pteropus scapulatus* (B.M. no. 86. 11. 1. 1) in which the mandible possesses on one side a well-developed tooth standing in the gap thus formed, and, I would suggest, representing the missing p^2 . The additional premolar described by Peters ‡ in a specimen of *Anoura geoffroyi* is again in an exactly similar position, and may be equally of an atavistic nature.

(3) The really important test as to whether a tooth is a p^1 or p^2 is, among the Ferae, as to whether it does or does not have a milk predecessor, no protus in the group being known to change §, while the deuterus is always represented by both

* Cf. P. Biol. Soc. Wash. xviii. p. 196 (1905).

† "Pattedyrenes Tandskifte," in Vid. Medd. Nat. For. Copenhagen, 1882, p. 62.

‡ MB. Ak. Berl. 1869, p. 398.

§ A case contradicting this rule would appear to be represented by the mole's dentition as described by Tauber (Naturh. Tidsskr. (3) viii. p. 252, pl. xi., 1872), but, judging by the figure, his interpretations are palpably incorrect. Taking his own diagram, no one could hesitate in deciding that the teeth he calls *ml.* 1 in the upper jaw and *pm.* 1 in the lower correspond absolutely with each other, instead of one being milk and the other permanent. The true explanation of his drawing is evidently that

milk and permanent teeth. Now, with one exception, explained below, no bat has ever been recorded as having more than two milk-premolars, those belonging to the two posterior teeth, the tritus and tetartus. The anterior Chiropteran check-tooth therefore never changes, and is, *ipso facto*, p^1 (unless it is mp^1 , a possibility about which I cannot at present express any opinion, though I do not think it unlikely). That the absence of the milk-tooth cannot be correlated with the reduction that the anterior permanent tooth generally exhibits is shown by the fact that in *Pterocyon helvus* this premolar is decidedly larger than the incisors, and yet no trace of a milk-tooth belonging to it is to be found, while the milk-incisors are large and conspicuous.

The one exception referred to is Leche's record of three upper milk-premolars in *Glossophaga**, although the adult has only two permanent premolars. But this latter fact gives the clue to the apparent anomaly of the *Glossophaga* dentition, for to my mind it indicates without doubt that the anterior check-tooth regarded by Leche as a milk-tooth is simply the ordinary anterior premolar itself, somewhat premature in development and deciduous in the adult.

As I agree with Dr. Knud Andersen that it is the outer and not the median upper incisor that has disappeared in bats †, the following would be the full Chiropteran formula when at its maximum:—

$$I. \begin{Bmatrix} 1 & 2 & 0 \\ 1 & 2 & 0 \\ 1 & 2 & 3 \\ 1 & 2 & 3 \end{Bmatrix} C. \begin{Bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{Bmatrix} P. \begin{Bmatrix} 1 & 0 & 3 & 4 \\ 0 & 0 & 3 & 4 \\ 0 & 0 & 3 & 4 \\ 1 & 0 & 3 & 4 \end{Bmatrix} M. \begin{Bmatrix} 1 & 2 & 3 \\ \text{---} \\ 1 & 2 & 3 \end{Bmatrix} \times 2 = 22. 38.$$

the teeth just mentioned are the non-changing protus and protid, while the objects he labels as *pm*. 1 above and *md*. 1 below are not teeth at all, but soft structures which he has mistaken for such in the belief that teeth ought to be found there.

* Lunds Univ. Arsskr. xiv. p. 11, pl. ii. fig. vii. (1878).

† Partly because of the reduction of the third lower incisor in many bats, partly because of the way the lower canine bites on to the space where a missing i^3 would have stood, and partly on the analogy of such other members of the Feræ as *Centetes*, where this reduction can be clearly proved (see P. Z. S. 1892, p. 504). Mr. Miller's argument ('Genera of Bats,' p. 27, 1907) about the median imperfection of the premaxillæ appears to me quite fallacious, for the innermost incisor of three, in one geological epoch, would not be affected by the fact that in a later one, *after* the reduction to two incisors, the premaxillæ were *going* to become imperfect in the middle line of certain genera. The reduction from three to two must have taken place long before any tendency to premaxillary imperfection began to appear.

LVI.—A new Deer of the Brocket Group from Venezuela.
By OLDFIELD THOMAS.

Mazama bricenii, sp. n.

Similar in many respects to *M. tema*, Raf., the Central-American Brocket (commonly known as *M. sartorii* *), but distinguished by smaller size and deeper lacrymal pits.

Coloration practically the same as that of *M. tema*, the body rich chestnut-rufous, the head, ears, nape, fore limbs, and hind feet dark brown. Under surface rather lighter than upper, the bright rufous of the interramia and throat strongly contrasted with the dark brown of the cheeks. Tail short, with a few rufous and more brown hairs on its upper side, the hairs of its lower side white.

Skull, as compared with that of *M. tema*, smaller and more delicately built throughout. Premaxillæ with a long nasal articulation. Lacrymal vacuities rather small. Lacrymal pits unusually developed for a member of this group, about 7 or 8 mm. in depth, those of a *tema* of similar age and sex about 2 or 3 mm. Orbit conspicuously smaller than in the allied form.

Dimensions of the skull (the animal not having been measured in the flesh, and the skin being so prepared as to be useless for measurement):—

Greatest length 159 mm.; basal length 143; greatest breadth 70; nasals 43.5×22.5 ; interorbital breadth 34.5; height of orbit 25; muzzle to front of p^2 45; combined length of three upper premolars 23.5, of whole tooth-row 51.

Hab. Paramo de la Culata, Merida, Venezuela. Altitude 3000 m.

Type. Adult female. Collected 14th August, 1907, by S. Briceño, after whom I have named the species, in recognition of the immense number of mammals which he has been instrumental in discovering.

While of described species this animal is undoubtedly most nearly allied to *M. tema*, yet there is a skull in the Museum

* While Hernandez's *Temamazame* has been rightly referred by all authors, from Alston downwards, to the Central-American Brocket, the technical name based on it by Rafinesque in 1817, *M. tema*, has been, for some inscrutable reason, left attached to its larger S.-American ally (*M. rufinus*). Even Dr. Merriam, who in 1895 had written "the *Temamazame* of Mexico, which Rafinesque called *M. tema*" ('Science,' i. p. 18), speaks in 1901 (P. Biol. Soc. Wash. xiv. p. 105) of "*M. sartorii*" as the "only known species from Mexico," the name he uses being forty-three years later in date than *M. tema*.

which much more closely agrees with that of *M. bricenii*, namely that figured by de Winton as being the skull of his *Pudua mephistopheles* *. Since Mr. Söderström sent the first and typical specimen of *P. mephistopheles* he has been good enough to present two further examples to the British Museum, and these show that some mistake must have occurred in the allocation of the skull Mr. de Winton described. For the skulls of the fresh specimens, about which there can be no question, are very like that of *P. pudu* in most particulars, and show that *mephistopheles*, although a perfectly distinct species, is not so widely different from *P. pudu* as Mr. de Winton supposed. Curiously enough, like that figured, the true *mephistopheles* skull has a broad naso-premaxillary articulation, and, in addition, differs from that of *P. pudu* by the almost entire absence of the lacrymal pit so well marked in the Chilian form.

On the other hand, the skull wrongly supposed to be that of *P. mephistopheles* is closely similar to that of *Mazama bricenii*, and indicates the existence in Ecuador of a highland Brocket allied to, and perhaps identical with, the animal now described from Venezuela.

LVII.—*Description of a new remarkable Crustacean with Primitive Malacostracan Characters.* By O. A. SAYCE †.

(Read before the Field Naturalists' Club of Victoria, 8th October, 1907.)

THE new crustacean, of which I now offer a preliminary description, is a very important one, having in a major degree the character of the stalk-eyed forms, although possessing definitely sessile eyes, and also bearing other features which shed additional light on divergent groups. I consider it the most primitive sessile-eyed Malacostracan hitherto recorded. Its nearest ally is undoubtedly the stalk-eyed *Anaspides tasmaniae*, G. M. Thomson.

It has been easy to separate crustaceans, apart from the more primitive forms, such as the Entomostraca, into two divisions—one, possessing movably stalked eyes, Podophthalma, and another, with sessile eyes, Edriophthalma—and hitherto there has been no sharp merging of one into the

* P. Z. S. 1896, p. 510, figs. 2 & 4.

† From the 'Victorian Naturalist,' vol. xxiv. no. 7 (November 7, 1907), pp. 117-120.

other. This basis for classification was adopted by Leach in 1815, and is to-day the generally accepted one.

For some years past, however, some few carcinologists, notably Prof. Boas, and later Dr. H. J. Hansen, have conceived that in certain circumstances this is not a natural classification, and that in the more primitive forms of each division—viz. the stalk-eyed Schizopoda and the sessile-eyed Isopoda—some of the former are more closely related to the latter than are some Schizopod families to each other. Hansen differs in many points from Boas, and no subsequent writer seems to have adopted their recommendations until recently, when Dr. W. T. Calman* has conformed to Hansen's suggestion (with some modifications and additions), and done away with the Schizopoda as a natural group, uniting some, the Euphausiacea, to the Decapoda (crayfish, crabs, &c.), and the remainder, the Mysidacea, to a large group including all the sessile-eyed forms (Isopoda and Amphipoda).

This is not the place to enter into a detailed discussion as to the systematic position of the present species, but I shall do so in another place, and give a detailed description, with illustrations of its anatomy. Sufficient to say here that it cannot be placed in Calman's division Syncarida, composed of the single order Anaspidacea, to which the present species is rather closely allied, without considerable alteration of his diagnosis; for instance, it has not all the thoracic somites distinct, the anterior one being coalesced with the head, the eyes are not pedunculated, nor are the thoracic limbs flexed between the fifth and sixth joints, but between the fourth and fifth. I can, however, respect his order Anaspidacea, so far undefined, and in consequence of the present species I offer a diagnosis of it.

Should the opinion preponderate that the Schizopoda, with the Euphausid and Mysid types both included, be kept for the present as a natural group, then Anaspidacea may be included as a tribe of that group.

I am aware in joining the present species to Anaspidacea that it originates an order possessing both stalked and sessile-eyed forms, but I feel confident that the close relationship shown in other respects of this new species to *Anaspides* warrants such a union.

Fundamentally the present species has the well-known Schizopod characters, and, of the two rather widely divergent

* "On the Classification of the Crustacea Malacostraca," by W. T. Calman, D.Sc.: Ann. & Mag. Nat. Hist. (7) xiii. p. 144 (1904).

types of that order, it has marked affinities with the Euphausiid, and to a less degree with the Mysid type, as well as having a strong likeness to the primitive forms of Isopoda and Amphipoda.

Considering the stalked eye as a primitive character and dominant throughout the main stem of descent of the crustaceans, and the sessile-eyed forms as a lateral divergence, it appears to me that the present form is an early stage of such divergence.

It will not be disputed that the present species in general form and structure is like *Anaspides tasmaniae*, G. M. Thomson, a noteworthy species in freshwater pools on the summit of Mt. Wellington, Tasmania, and in Lake Field, situated 40 miles from the above situation, at an elevation of about 4000 feet.

Anaspides differs from other Schizopods in possessing no vestige of a carapace, and has eight distinct thoracic somites. The present species has marked affinities with it, but differs in a good many minor characters and fundamentally in the eyes being sessile, there being no antennal scale, and in the coalescence of the first thoracic somite with the head.

The loss of stalked eyes, carapace, and scale-like exopodite on the antenna—each, I think, acknowledged as primitive features—while in most other respects quite of a Schizopod type, marks the present species as the most primitive sessile-eyed Malacostracan at present known, and it is no doubt a very ancient type. I may also note that Calman has shown that *Anaspides* closely resembles some of the oldest fossil Malacostraca (*Uronectes* &c.).

Specimens were collected from small freshwater reedy pools beside a tiny little runnel which joins the Mullum Mullum Creek, Ringwood, near Melbourne, during an excursion of the Nature Study Class for teachers, under the direction of Mr. J. A. Leach, M.Sc., to whom I am indebted for specimens.

Order ANASPIDACEA, Calman, 1904.

This order, so far, has not been defined.

Body generally slender, of nearly cylindrical form, integument thin. Carapace absent. Thoracic somites distinct or with the anterior one fused with the head. Abdomen of about equal length to the cephalon and thorax combined; somites distinct, flexing evenly throughout. Eyes stalked or sessile. Antennary scale small or absent. Auditory organ at base of first antennæ. Peduncle of second antennæ four-jointed. Mandibles without a secondary cutting-edge

(*Iacinia mobilis* of Hansen). Maxillipeds and succeeding pairs of legs uniform in general structure and adapted for walking. Swimming-branches (exopods) on all but the last two or three pairs of legs. Branchiæ forming a double series on all but the last one or two pairs of legs, simple, lamellar, wholly uncovered. Pleopoda natatory, no *appendix interna*, inner branch (endopodite) rudimentary or wanting except in the males, when it is modified in the first two pairs for sexual purposes. Telson and uropoda normal, together forming a "fan." No marsupial plates (oostegites).

Fam. 1. *Anaspidæ*, Thomson, 1894.

Thorax of eight segments. Eyes pedunculated. Antennal scale arising from the second joint. Mandibles with single dentate cutting-edge, "spine-row" or setose ridge, and molar expansion. Maxillipeds with exopodite small, simple, and lamellar; epipodite quite small and simple; possessing also small gnathobasic lobes on the inner face. First five pairs of legs with well-developed swimming-branch. Branchiæ on all but the last pair of legs, which are without any appendages. Pleopoda with rudimentary endopodite.

Fam. 2. *Koonungidæ*, nov.

In general appearance like *Anaspidæ*. Thorax with anterior segment fused with the head, leaving seven distinct subequal segments. Eyes sessile. No antennal scale. Mandibles with a single dentate cutting-edge and molar expansion, no "spine-row" or its equivalent. Maxillipeds without any trace of gnathobasic lobes, otherwise like *Anaspidæ*. Branchiæ and swimming-branches of legs like *Anaspidæ*. Last pair of legs flexed in the opposite direction to the preceding ones. Pleopoda absolutely uniramous, except the first two pairs in the male.

Genus *KOONUNGA*, nov.

Cephalon of about equal length to the following two segments combined, possessing a short transverse sulcus on each side at about the middle distance, posteriorly to which the margins are produced downward and inwards. Frontal margin of cephalon scarcely produced, incised above the attachment of the second antennæ, forming a small lateral lobe. Eyes small, round, situated on the dorsal surface at the angles formed by the union of the frontal margin and the incisions. Antennæ long and filamentous, the upper with

basal joint of flagellum with sensory modification in the male, lower nearly as long as the upper.

Mandibles with a three-jointed palp. First maxillæ with a small but distinct palp. No swimming-branch on the last two pairs of thoracic limbs.

Remarks.—The name is derived from the aboriginal name of a creek which runs near where specimens were collected.

Koonunga cursor, sp. n.

Specific description.—Anterior portion of the body of sub-cylindric form, becoming gradually rather broader, deeper, and cylindrical posteriorly. All the segments of the thorax and abdomen subequal. Abdomen of equal length to the thorax, last segment not longer than the preceding one, with one or two dorsal spines close to the attachment of the telson. Telson entire, slightly broader than its length, of triangular form and rounded apex, margin fringed with a double or more series of stout spines. Uropoda with peduncle extending to half the length of the telson, its branches somewhat longer than the peduncle, inner one fringed along the inner margin with upturned spines, and three longer ones at the apex pointing outward; outer margin and apex fringed with very long feathered setæ; outer branch fringed with long feathered setæ, and the outer margin also with a row of upturned spines.

Mandibles each with a broad cutting-plate, that of the left side curving outwards, and the edge divided into six stout teeth; that of the right side also broad, curved in the reverse direction, and the edge divided into five stout teeth; molar process similar in each, forming a well-extended broad ridge clothed with short stout setæ, surrounding a minute triturating surface with chitinous papillæ.

Maxillipeds rather stouter than the legs, extending directly forwards about as far as the distal end of the peduncle of the upper antennæ; the seventh joint (dactylus) minute, stout, and bearing four claws on the rounded extremity. The seventh joint also of each of the other limbs minute, and bearing three long stout claws, the middle one rather longer than the other two, which are positioned closely on each side of it and quite similar to each other.

Colour.—General appearance marbled dark brown. Microscopically showing a yellowish stratum, thickly dotted over with rounded areas composed of black granules.

Length.—Largest specimen measured 9 mm. ($\frac{1}{3}$ inch).

Occurrence.—From freshwater reedy pools beside a tiny

runnel joining the Mullum Mullum Creek, Ringwood, near Melbourne.

Remarks.—It is remarkably active; usual form of locomotion running, but can spring forcibly forwards and also swim easily. It shuns strong light.

References.

- G. M. THOMSON.—“Description of a Remarkable Schizopod.” *Trans. Linn. Soc., Zool.* (2) vi. 3.
W. T. CALMAN.—“On the Genus *Anaspides*.” *Trans. Roy. Soc. Edinburgh*, xxxviii. pt. iv.

[*Note.*—By the kindness of Mr. Sayce, the British Museum has now received specimens of the very remarkable crustacean described above. From an examination of these I am able to bear witness to the accuracy, in all essential points, of his description. I believe, however, that the difference from *Anaspides* in the flexure of the thoracic legs will prove to be more apparent than real, and I do not think that the alterations now necessary in the diagnosis of the Syncarida in any way impair the status of that group as a natural division of the Malacostraca. A discussion of these and similar points must, however, be deferred until the appearance of Mr. Sayce’s promised memoir.—W. T. CALMAN.]

LVIII.—*On some New and Curious Thysanoptera (Tubulifera) from Papua.* By RICHARD S. BAGNALL, F.E.S.

[Plates XIV. & XV.]

THE present small contribution to our knowledge of the world’s Thysanoptera is based upon four specimens collected at Dorey, Papua (New Guinea), by Dr. A. R. Wallace, F.R.S., which were presented by him to the late Mr. W. Wilson Saunders, and are now in the British Museum*. Unfortunately only one specimen of each species exists, and as they are gummed on cards the descriptions are of necessity incomplete. Dr. Wallace is under the impression that he took these creatures from under bark.

Apart from the general interest attached to insects so

* I have withheld the description of a fifth species, which is not in very good condition.

curious as the first three herein described, two of which are giants of their order, one feels that there is also a considerable historical interest in connexion with this collection, associated not only with a naturalist of world-wide fame, but with that portion of the Eastern Hemisphere whereon is based one of his most widely read works, the 'Malay Archipelago.' It is therefore a pleasure to me to have this opportunity of naming one of the most important species in this small but valuable collection in Dr. Wallace's honour.

I would also express my gratitude to Mr. C. O. Waterhouse for the kindly help rendered me in examining the collections of Thysanoptera belonging to the British Museum.

Order THYSANOPTERA.

Suborder TUBULIFERA, Haliday.

A knowledge of the species of the suborder Tubulifera outside Europe leads one to believe that it might with advantage be divided into two families, Phlæothripidæ and Idolothripidæ, the characters given by Haliday for his two genera, *Phlæothrips* and *Idolothrips*, being in themselves sufficient to warrant such a division.

Ocelli tres æquidistantes, in alatis saltem : haustellum inter coxas anticæ subdeflexum : palpi labiales ovati : alæ anticæ vena unica nonnisi inchoata (vel abbreviatæ aut nullæ). [Caput oblongum, depressum : abdomen depressum.].....	[Uzel. Fam. Phlæothripidæ,
Ocellus anterior remotus ab basi antennarum : haustellum basin prosterni attingens : palpi labiales papilliformes : alæ anticæ vena unica obsolete dimidiata, aut abbreviata. [Caput longissimum, teres : abdomen excavatum.].....	[mih. Fam. Idolothripidæ,

The Phlæothripidæ contains several genera already well known, whilst the Idolothripidæ will contain the genus *Idolothrips* (s. s.), Haliday (type species *I. marginata*, Haliday, 1852), and other allied genera which it will be necessary to establish for the reception of certain species now in my hands.

Family Idolothripidæ, mihi.

Genus MECYNOTHRIPS*, nov.

Head more or less cylindrical, three times as long as

* *Mecyno* = prolonged.

the prothorax; posterior third widened to base; fore-part much produced beyond the eyes, elevated, and bearing the anterior ocellus (protected by two strong spine-bearing tubercles) midway between the anterior margin of eyes and the extreme apex of head, which is widened for the seating of the antennæ; *cheeks* set with spine-bearing warts. *Eyes* large and prominent. *Antennæ* slender and nearly as long as the head and prothorax together, furnished with long hairs and sense-cones. *Mouth-cone*

Prothorax strongly and rugosely sculptured, raised slightly to posterior edge; a large spine-set wart at each posterior angle, and anterior angles produced, forming a pair of strong recurved horns. Fore femora much enlarged, each armed with a tooth having its base above the mid-line beneath; fore tibiæ broadened, with one or more small blunt teeth at apices and each tarsus armed with a large tooth. *Wings* present.

Abdomen very long, slender, and tapering; simple; *tube* less in length than the ninth abdominal segment*.

Species large.

Type. *Mecynothrips wallacei*, mihi.

Mecynothrips may be separated from allied genera by the abnormally produced head, the form of pronotum, the elongate ninth segment of abdomen, and the short tube. In known species of this group the tube is about three times as long as the preceding segment, which is comparatively short.

Mecynothrips wallacei, sp. n. (Pl. XIV. figs. 1-8.)

♂. *Length* 12 to 13 mm., breadth of mesothorax about 1.5 mm.

Colour shining black, juncture of meso- and metascutum and ill-defined patches on the lateral edges of intermediate abdominal segments almost blood-red. Intermediate and hind femora brownish black; all tibiæ brownish black, reddish yellow at knees, and shaded to yellow at apices; anterior tarsi reddish brown, others yellowish brown, and all tipped with black. *Antennæ* yellow, two basal and three apical joints dark brown, joints three to five tipped with the same colour.

Head long, finely and transversely striate, reticulate near base; widest at base and five times the length of its greatest width; only as wide immediately beyond eyes as width between them, but widening to the apex. *Cheeks* with a

* These generic characters are, perforce, drawn from the male sex.

number of strong spines set in warts. *Eyes* large, finely faceted, bulging anteriorly and apparently extending further on under side than on upper. *Ocelli* large, posterior pair on a line with centre of eyes and close to their margins, widely separated from the anterior ocellus, which is borne between two spine-bearing warts midway betwixt the extreme apex of head and the anterior margin of eyes. *Antennæ* inserted above the apex; joints 3 to 6 elongate and claviform, 7 and 8 fusiform. Third joint twice the length of the two basal joints together, fourth four-fifths of third, fifth three-quarters of fourth, sixth much shorter than the preceding and equal in length to the penultimate and apical joints together. *Antennal spines* at the apex of each joint very long, especially on the outer side, dark brown; *sense-cones* light and therefore inconspicuous, slender and acute, at least two on each of the joints 3 to 7, three or more on the fourth.

Prothorax one-third as long as head, disk deeply sculptured, upper surface strongly narrowed from middle to base, and two large tubercles, set low down, forming posterior angles, and another pair within and above this pair; each anterior angle produced, thus forming a very strong recurved horn, which is striated transversely and bluntly toothed near apex.

Anterior coxa not greatly enlarged, plainly reticulate, and armed with one fairly conspicuous spine. *Pterothorax* much broader than head, apparently longer than broad, with *metasternum* laterally rounded, narrowed, and armed with several strong white bristles. *Wings* present, short in comparison with the great length of the body, apparently reaching to fifth abdominal segment. *Legs* long: fore femora much enlarged and each armed with a strong tooth which has its base above the mid-line beneath; fore tibiæ broad and flattened, one or two small blunt teeth at apices and each fore tarsus armed with an exceedingly stout long tooth. Intermediate legs comparatively slender, set with a number of long light-coloured bristles.

Abdomen simple, extremely long and slender, being two-thirds the length of the whole insect and about one-eighth as wide at base as it is long. Tapered very gradually to tube. *Tube* only two-thirds the length of ninth abdominal segment and only one-third the length of head; terminal hairs short and weak, and spines on abdomen comparatively short. *Surface* transversely striate and in parts plainly reticulate.

Type. One male in British Museum (ex coll. Saunders).

Hab. Dorey, New Guinea (Wallace).

Family Phlæothripidæ, Uzel.

Genus MACROTHRIPS *, nov.

Head at least twice as long as broad and longer than the length of the prothorax; *cheeks* set with long spines. *Eyes* comparatively small; ocelli present. *Antennæ* longer than head; intermediate joints much elongated; sense-cones small and inconspicuous; hairs very small and fine, giving the joints the appearance of being naked. *Mouth-cone*
Prothorax not more than two-thirds the length of head, very abruptly raised to the posterior edge, thus throwing the disk into a vertical position; posterior edge forming a strongly sculptured corona terminated at each posterior angle by a large spine-set tubercle. *Anterior coxæ* (of male) abnormally produced; apices of fore tibiæ and tarsi armed with teeth. *Fore legs* of male greatly enlarged, femora thickened and each with a large broad-seated tubercle or blunt tooth at the base within. *Wings* present.

Abdomen comparatively broad and heavy.

Species large and massive.

Type. *M. papuensis*, mihi.

There are two carded specimens in this collection, one of each sex. At first I was inclined to regard them as the sexes of one species, but, owing to the strong and divergent characters, which, I think, cannot be only sexual, they must be described as separate species. Further, the male specimen is very much larger than the female, whereas the males in the Phlæothripidæ are almost invariably smaller than the females.

Macrothrips papuensis, sp. n. (Pl. XV. figs. 9-11.)

♂. *Length* 11 mm., breadth of mesothorax 2 mm.

General colour very dark brown, tibiæ and tarsi reddish brown.

Head three times as long as width of cheeks; immediately behind eyes narrower than the width across eyes, but filling out gradually and narrowing again before base; *cheeks* full and set with long white bristles or spines; vertex raised. Surface shining, finely and transversely striate, base faintly reticulate, a belt of close punctures across centre, wrinkled transversely behind eyes and narrowly sculptured between ocelli. A strong backwardly curved protuberance set with a short stout spine behind each eye. *Eyes* comparatively

* *Macro*=large.

small, finely faceted. *Ocelli* rather large, posterior pair placed immediately behind line drawn across the head at the posterior margin of the eyes. *Antennæ* separated at their base, longer than head and prothorax together. Basal joints cylindrical, first longer and wider than the second; three to six much elongated and mildly claviform, seven and eight fusiform. Third joint twice the length of basal joints together, fourth five-sixths of third, fifth three-quarters of fourth, sixth a little more than two-thirds of fifth and slightly less than the penultimate and apical joints together. *Hairs* and *sense-cones* lightly coloured, small and inconspicuous. *Prothorax* two-thirds the length of head, shortly and abruptly raised to posterior edge. Anterior edge defined, widely emarginate, and set with short inwardly directed bristles, mid-lateral and posterior marginal spines also small. Disk slightly rugose, more strongly rugose laterally; the raised edge wide and very strongly though evenly sculptured; a series of tubercles immediately behind this channelling and two large upwardly directed tubercles forming posterior angles.

Anterior *legs* very massive and outwardly set with long white bristles; *coxa* abnormally produced, forming a geniculate horn which lies over the femur; femur longer than the head, very broad and slightly flattened, produced to a blunt tooth at base within; tibia broad and flat, granulate, armed with two fairly stout teeth at apex within; tarsus armed with a long dagger-like tooth. Hind and intermediate legs simple, hirsute, two or three bristles at knee especially long. *Pterothorax* broader than prothorax and about as long as broad.

Wings coriaceous, reaching to sixth abdominal segment; fringes short, especially at apices.

Abdomen almost as broad as pterothorax and somewhat heavy; narrowing to base of tube from the sixth segment; wing-retaining bristles short. A peculiar brush-like patch on lateral edges of *metasternum*, and similar but smaller patches, composed of shorter and finer bristles, on lateral edges of the abdominal segments 2 to 6, these patches diminishing in size till those on segment 6 are scarcely perceptible. Spines light-coloured and comparatively long, terminal hairs very long. *Tube* The apex of the ninth segment is ventrally produced. *Dorsal surface* shining and very finely striate, a broad belt at base of each segment very finely reticulate.

Type. One male in British Museum (ex coll. Saunders).

Hab. Dorey, New Guinea (Wallace).

Macrothrips dubius, sp. n. (Pl. XV. figs. 12-14.)

♀. Length 7 mm., breadth of mesothorax about 1.5 mm.

Colour and general form as in *M. papuensis*.

Head only twice as long as broad, sides parallel, not narrowed behind eyes, very finely and transversely striate; postocular spines present, but tubercles absent or obsolete; space between eyes wider; ocelli similar, but posterior pair placed well above the line of the posterior margin of eyes.

Prothorax more gradually raised, with the disk less defined and the posterior edge comparatively narrower and not nearly so strongly or evenly sculptured. Anterior legs small; femora thickened, simple; each tibia with a very small straight tooth shortly before the apex within; tarsal tooth long and narrow. Head and legs more sparsely setose. Fore coxa simple, armed with a long spine. Wings reaching to seventh abdominal segment. Tube much longer than head; terminal hairs weak, but hairs on the ninth segment much longer than the tube.

Type. One female in British Museum (ex coll. Saunders).

Hab. Dorey, New Guinea (Wallace).

Genus ACANTHOTHIRIPS, Uzel.

Head longer than broad; cheeks with spine-bearing warts. Antennæ twice as long as head, intermediate joints elongate and possessing sense-cones more than usually long. Mouth-cone slender and much longer than its breadth at base. Fore femora enlarged in both sexes, and, as a rule, each furnished with one or two teeth at apex within; tarsus armed with a stout tooth. Wings present in both sexes. Male without scale at base of tube.

This genus was created by Uzel* for the reception of Reuter's *Phalothrips nodicornis* †, and more recently Hinds ‡ has described a second species, *A. magnafemoralis*, from a single male taken at Miami, Florida.

The species about to be described, *A. sanguineus*, must be provisionally regarded as belonging to this genus, though the fore femora are not really characteristic of a true *Acantho-*

* 'Monographie der Ordnung Thysanoptera,' 1895, pp. 260-261, pl. iv. fig. 28, pl. vii. fig. 145.

† "Thysanoptera Fennica, I. Tubulifera," Bidrag till Kännedom af Finlands Natur och Folk, 40, 1880, p. 16.

‡ "Contribution to a Monograph of the North-American Thysanoptera," Proc. U.S. Nat. Museum, vol. xxvi. pp. 199-200, pl. ix. figs. 93 & 94.

thrips. To meet the case I have slightly modified the above diagnoses, as it would be presumptuous to erect a new genus on such slight grounds.

Acanthothrips sanguineus, sp. n. (Pl. XV. fig. 15.)

♂. *Length* 2.9 mm.

General *colour* bright red, coxa (excepting fore pair, which are red) and all femora stone-coloured, and all tibiæ and tarsi testaceous.

Head at least one and one half times as long as wide, not much longer than prothorax. *Cheeks* gradually widening behind eyes and narrowing to the neck; set with three conspicuous lateral wart-set spines, two anterior and one posterior, and with smaller anterior spines above the extreme lateral row. *Eyes* fairly large and finely faceted. *Ocelli* on raised vertex, large, posterior pair above the centre line of eyes. *Antennæ* approximate, scarcely twice the length of head; testaceous, the three basal and two apical joints dark, joints 4 to 6 suffused near apex with brown. First joint cylindrical, second roughly globular, third obconical, dilated and much broader than the others, as long as the two basal joints together; fourth clavate, as long as third but much narrower; fifth clavate, slightly shorter than fourth; sixth to eighth almost filiform. *Spines* and *sense-cones* lightly coloured, long and slender.

Prothorax about two-thirds the length of head, widening rapidly to beyond middle and then more gradually to base. Surface roughened and dull, a few rather large rounded-off elevations unevenly scattered over dorsal surface. *Pterothorax* wider than prothorax. *Wings* long and slender. *Legs* fairly long; fore femora much broadened and each armed with a long, sharp, and slightly curved tooth from the base within; fore tibiæ bent outwards at base, rather long and slender, and thickened towards apex; tarsus armed with a sharp tooth. Hind and intermediate legs comparatively long and slender. All femora set with minute spine-set warts.

Abdomen much depressed, broadened laterally, and converging gradually from sixth segment to base of tube. *Tube* little more than one-half the length of head, hairs encircling tip short. Abdominal spines rather short and blunt.

Type. One male in British Museum (ex coll. Saunders).

Hab. Dorey, New Guinea (Wallace).

EXPLANATION OF THE PLATES.

PLATE XIV.

- Fig. 1.* *Mecynothrips wallacei*, gen. et sp. n., ♂. *a*, showing expansion of wings.
Fig. 2. Ditto. Lateral view of fore-part of head.
Fig. 3. Ditto. Antenna.
Fig. 4. Ditto. Apex of fourth antennal joint, showing sense-cones.
Fig. 5. Ditto. Prolongation of anterior thoracic angle.
Fig. 6. Ditto. Left fore leg from below.
Fig. 7. Ditto. Intermediate leg (right) from above.
Fig. 8. Ditto. Ninth abdominal segment and tube.

PLATE XV.

- Fig. 9.* *Macrothrips papuensis*, gen. et sp. n., ♂. Head, antennæ, fore legs, and prothorax.
Fig. 10. Ditto. Right fore coxa from above.
Fig. 11. Ditto. Apical prolongation of ninth abdominal segment, viewed from above (tube removed).
Fig. 12. *Macrothrips dubius*, sp. n., ♀. Right fore leg from above.
Fig. 13. Ditto. Right fore coxa from above.
Fig. 14. Ditto. Tube.
Fig. 15. *Acanthothrips sanguineus*, sp. n., ♂. Head, antennæ, fore legs, and prothorax.

LIX. — *Description of a Species of Palæmon from near Sydney, probably either a new Species or the Adult Form of Palæmon (Eupalæmon) danæ, Heller.* By Dr. J. G. DE MAN, of Ierseke (Holland).

[Plate XVI.]

? *Palæmon danæ*, Heller, *Crustaceen der Novara-Reise*, 1865, p. 120, pl. xi. fig. 3.

Palæmon ornatus, Haswell, *Catalogue of the Australian Stalk- and Sessile-eyed Crustacea*, 1882, p. 196 (nec *Pal. ornatus*, Oliv.) (teste McCulloch).

Some time ago Mr. Allan R. McCulloch, of the Australian Museum, Sydney, sent me a specimen of a species of the genus *Palæmon* from the neighbourhood of Sydney for examination, with the remark that it was a good representative of the species determined by Haswell as *Pal. ornatus*, Oliv. According to McCulloch, it is not uncommon in Queensland and New South Wales.

Our species belongs to the subgenus *Eupalæmon*, and is

closely related to *Pal. (Eupal.) longipes*, de Haan, from Japan, and to *Pal. (Eupal.) wolterstorffi*, Nob., from Surabaya, Java.

This specimen, which is a male, apparently adult, is 118 mm. long from tip of rostrum to the end of the telson; the carapace, rostrum included, measures $\frac{2}{3}$ of the whole length, viz. 46 mm. The stout large rostrum (Pl. XVI. fig. 1) is lanceolate and reaches to midway between the tips of the antennal scales and those of the spine at the far end of their outer margins. The rostrum rises with a crest just in front of the middle of the carapace and projects straight forward; the upper margin is slightly convex above the eyes and is armed with ten comparatively small teeth, of which three are on the carapace: the distance between the first and second teeth is one third longer than that between the second and third; the second to eighth teeth are equidistant, but the penultimate tooth is a little farther from the antepenultimate than are the preceding teeth from one another, and the penultimate tooth is placed also a little nearer to the tip of the rostrum than to the antepenultimate tooth; the foremost tooth, finally, which is smaller than the preceding, stands close to the tip. In this specimen the tip of the rostrum projects horizontally forward, but Mr. McCulloch wrote me that in some specimens the point may be a little bent upwards, in others the upper margin of the rostrum may be straight, and he says that the form and the length of the rostrum are variable. The slightly arcuate ascending part of the lower margin bears five equidistant teeth, which are a little smaller than those of the upper; the first tooth is situated just below the sixth of the upper margin, the fifth just below the penultimate tooth; the fifth tooth is therefore a little farther from the point of the rostrum than from the fourth. Whereas the rostrum proper is 19.5 mm. long, it is 5.5 mm. high, only $3\frac{1}{2}$ times as long as high; it shows therefore a *rather stout shape*. At the level of the first tooth of the lower margin that part which is situated above the lateral crest appears once and a half as high as that below it.

Antennular peduncles much shorter than the scaphocerites, reaching to midway between the fourth and fifth teeth of the lower edge.

Hepatic spine situated just behind the antennal spine, a little below it.

By means of a magnifying-glass one observes here and there on the carapace a few microscopical spinules of a yellow-brown colour (fig. 1); these spinules, only 0.16 mm.

long, are not sharp, but rather obtuse. Twenty or thirty of these spinules are seen just behind the hepatic spine, some occur also on the latter and on the crest of the antennal spine; several spinules are, moreover, scattered on the upper border of the carapace between the base of the rostrum and the posterior margin; the posterior branchial regions are, however, quite smooth. It is, of course, impossible to say whether these spinules are indeed always so sparse, or whether in this specimen they are worn off. Similar spinules occur close to the postero-inferior angles of the second to fifth abdominal pleura, as also on the tergum of the sixth somite, though they are here rather scanty, but the telson and the endopodite of the caudal fan are thickly covered with them; they exist, finally, also on the basal joint and on the hardened outer part of the exopodite.

The telson no doubt usually ends in an acute point, but the latter appears in our specimen, unfortunately, mutilated. McCulloch wrote me that the acuteness of the telson, which latter is sometimes almost rounded, is variable, and that the latero-terminal spines are sometimes wanting: in my opinion all such specimens are mutilated. In our specimen the latero-terminal spines, of which the inner are much longer than the outer, are well developed, as also the two pairs of spinules on the upper surface of the telson.

External maxillipedes reaching to the end of the penultimate joint of the antennular peduncles. The legs of the first pair are smooth and project with half their carpi beyond the tip of the antennal scales; the carpi (17 mm.) are about two and a half times as long as the chele (6.5 mm.), of which the fingers are a little shorter than the palm.

The legs of the second pair are *equal*, 187 mm. long, more than once and a half as long as the body, and four times as long as the carapace, rostrum included. The meri (fig. 2), 31 mm. long, project two thirds of their length beyond the tip of the scaphocerites. The meri gradually thicken, though at first very slowly, towards their distal extremity; looked at from above they appear to be 3 mm. thick at their proximal extremity, 3.25 mm. in the middle, and 3.9 mm. at the distal end, so that they are just eight times as long as thick at their distal extremity. The carpi (fig. 3), 58 mm. long, are exactly as long as all the preceding joints taken together and *almost twice as long as the meri*; viewed from above these *very slender* joints appear to be 2.75 mm. broad at their proximal extremity, 3 mm. in the middle, and 4.2 mm. at the distal end, so that the carpi are just *fourteen times as long as broad at the distal extremity*. The carpi are

cylindrical and, but for the proximal fourth part, gradually thicken to the distal articulation; they are not quite straight, but slightly curved inward at their proximal fourth, the inner margin appearing here, therefore, slightly concave, the outer slightly convex. The chela, also very slender, is 71 mm. long, about *one fourth longer than the carpus*; the palm, 52 mm. long, is but little shorter than the carpus and *almost three times as long* as the fingers, which measure 19 mm. Just in the middle the palm is 3 mm. broad, exactly as broad as the carpus in the middle; near the carpal articulation it is 3·25 mm. broad, appearing here a little less broad than the far end of the carpus; near the articulation of the fingers, finally, the palm is 3·7 mm. broad and 2·75 mm. thick, so that it appears here slightly compressed. Just in the middle the palm is also 2·75 mm. thick, and near the carpal articulation 3 mm., so that the palm may be described as cylindrical. Viewed from above (fig. 3) the fingers appear slightly curved inward. The immobile finger (fig. 4) very slightly narrows towards the tip, appearing near the latter hardly less broad than at its base; the dactylus, which is a little longer, tapers more distinctly, and appears therefore near the tip narrower than the immobile finger. At one third of its length from the articulation (figs. 4 & 5) the dactylus bears a small conical tooth, and midway between this tooth and the articulation another, also conical though somewhat compressed and more acute tooth, which is a little larger; immediately behind the distal tooth of the dactylus the immobile finger is armed with a somewhat larger conical and acute tooth, and between this tooth and the articulation with a long prominence, which is subdivided into five small teeth, of which the distal one is the largest, conical, like the fourth, which is smaller, whereas the first three are the smallest of all (fig. 5). The inner margins of the fingers are covered *with felted hairs*, which, as Mr. McCulloch informs me, may be very dense or almost absent. Palm and fingers carry (fig. 6) on their inner margin a double row of small subacute spinules similar to those of the body and 0·2 mm. long; similar spinules, though much smaller, are distributed on the upper and lower surface and on the outer margin of palm and fingers, those on the outer margin being also arranged in two rows. On the inner half of its surface the carpus is sparsely covered with similar subacute spinules as the palm, which are a little larger, viz. 0·28 mm.; those on the outer half are much smaller, but much more crowded. The spinules with which the merus is covered are of the same size as the larger ones of carpus and chela, except on

the upper border, where they are much smaller and rare. The upper border of the ischium-joints (fig. 2) is quite smooth, but the lower border and the sides are rather sparsely covered with subacute spinules. The second legs are glabrous, except the fingers.

The third legs (fig. 7) project with three-fifth parts of their propodites beyond the antennal scales; the propodites (16·5 mm.) are three times as long as the dactyli (5 mm.) and little shorter than the meropodites (17·5 mm.). The fourth legs are little shorter and extend with two fifths of their propodites beyond the scaphocerites; those of the fifth pair with one third of the penultimate joints. These legs are rather *slender*. The meropodites of the third legs, which are 17·5 mm. long, are 1·5 mm. broad in the middle, measured on their outer side, so that they are nearly twelve times as long as broad; the propodites, 16·5 mm. long, are 1 mm. broad, sixteen and a half times as long as broad. Along their lower margin the propodites of the third legs bear a row of eleven or twelve spinules which are 0·42 mm. long, whereas their upper border appears a little hairy and covered, not very thickly, with small stout spinules only 0·12 mm. long, the acute tip of which is curved forward. The carpi and the meropodites are also covered with similar microscopical spinules, except on their outer surface, which is nearly smooth.

Pal. (Eupalæmon) longipes, de Haan (*confer* de Man, in Zoolog. Jahrb. ix. Abth. f. Syst. 1897, p. 770, and x. 1898, pl. xxxvii. fig. 69), differs from our species in the following characters:—The carapace of de Haan's species is almost everywhere covered with thickly crowded acute spinules; the rostrum is shorter, more strongly convex above the eyes, and the lower edge bears only two or three teeth, which are placed on the distal half. The carpus of the second legs appears shorter in proportion to the merus, being little more than once and a half as long; the carpus appears quite straight and *less slender*, for it is only nine or ten times as long as thick at the distal end. The proportion between the length of the chela (which, like the carpus, has also a less slender shape than in our Sydney species) and the length of merus and carpus is nearly the same in both species, but the fingers of *Pal. longipes* are *slightly longer, not shorter (but a little longer), than half the length of the palm*. Both species are, however, easily distinguished by the three posterior legs, which in the Japanese species are *shorter* and with *less slender meropodites*; the third legs of *Pal. longipes*, e. g., project

with only their dactyli beyond the scaphocerites, and their meropodites are only seven times instead of twelve times as long as broad (compare de Man, *l. c.* fig. 69 *c*, with fig. 7 of this paper).

The examination of the type specimen of *Pal. (Eupalæmon) wolterstorffi*, Nob., kindly sent me by the Directors of the Museum at Magdeburg, enables me to add the following to Dr. Nobili's description in Bollet. Mus. Zoolog. di Torino, vol. xv. no. 379 (1900).

The palm of the left (larger) chelipede, 46 mm. long, is 4.7 mm. broad near the articulation of the fingers, 4.8 mm. in the middle, and 4.9 mm. near the carpal articulation; the palm is 4.6 mm. thick in the middle. The carpus, 52 mm. long, is 5.4 mm. broad at the distal extremity, 3.75 mm. in the middle, and 2.8 mm. at the proximal end; this joint is 5 mm. thick at the distal extremity. The carpus of the right leg, 43 mm. long, is 4 mm. broad and as many thick at the distal extremity; it is 2.75 mm. broad in the middle and 2.3 mm. near the proximal extremity. The palm, 34 mm. long, appears 3.5 mm. broad near the articulation of the fingers, 3 mm. in the middle, whereas the slightly thickened proximal extremity is also 3.5 mm. broad; the palm is 2.9 mm. thick in the middle. The regularly and distinctly tapering dactylus of the larger chelipede carries on *either side* and close to the cutting-edge (which is not at all prominent), between the tip of the finger and the second tooth (which is conical, compressed, and slightly larger than the first or basal tooth), *eight or nine small obtuse tubercles*, which much resemble those of *Pal. elegans*, de M., a species also inhabiting the island of Java. The immobile finger also gradually narrows towards the tip; its cutting-edge is more distinct, and one sees close to it, though only on one (namely, the lower) side, *eight similar small tubercles*. The fingers are glabrous and are almost smooth above and below. The distal tooth of the immobile finger is considerably larger than the teeth of the dactylus, but also acute and conical, and the elongate prominence close to the articulation is divided into four small obtuse teeth, which increase in size from the first or proximal one to the fourth.

The fingers of the smaller chelipede agree with those of the other. The dactylus carries, close to the cutting-edge, on the lower side of the chela, eight, on the upper side six tubercles, similar to those of the larger leg; the immobile finger bears seven of these tubercles on the lower side and one only on the upper side of the chela, close to the more

distinct cutting-edge. The legs of the third pair reach with their dactyli beyond the tip of the antennal scales. The meropodite of these legs is 15 mm. long and 1.5 mm. thick (or broad) on its outer side, appearing thus ten times as long as broad. The three following joints, measured from articulation to articulation, are respectively 7 mm., 13.5 mm., and 4 mm. long; the propodites are 0.84 mm. broad in the middle of their outer side, appearing sixteen times as long as broad.

The larger chelipede closely resembles that of *Pal. (Eupal.) longipes*, de Haan (*vide de Man, l. c. 1898, fig. 69 a*), as regards length and breadth of the joints, but both carpus and palm are slightly curved in the Java species, and the characteristic tubercles on the fingers are wanting on those of *Pal. longipes*. The latter species also differs in its *less slender* meropodites of the three posterior legs, in the shape and characters of the rostrum, &c.

Our Sydney species at first sight differs from *Pal. wolterstorffi* by the *considerably more slender* legs of the second pair; the palm appears almost straight, and the fingers, which are comparatively *shorter*, do *not* gape at all and, although the characteristic small tubercles are *wanting*, are more or less covered *with felted hairs* near their cutting-edges.

Pal. (Eupal.) acanthosoma, Nob. (in 'Annali Mus. Civico di Storia Natur. di Genova,' ser. 2^a, vol. xx. (xi.), Nov. 1899, p. 242), from Katau, New Guinea, may prove to be identical with our species from Queensland and New South Wales; but this question cannot be decided, because the legs of the second pair are unknown. In my opinion it is not advisable to describe species of this difficult genus when the legs of the second pair are wanting.

Another species from Sydney was described by me in Zoolog. Jahrb. ii. Abth. f. Syst. 1888, p. 711. This species, probably identical with Ortmann's *Pal. australis* (*op. cit.* v. 1890, p. 708), differs from that described in this paper by the legs of the second pair.

The specimen received from Mr. McCulloch may, however, eventually prove to be the adult male of *Pal. (Eupal.) danze*, Heller, a species discovered by the 'Novara' Expedition also at Sydney, about which the late Dr. Koelbel has furnished some interesting observations taken from the two type specimens, a male and a female, in the Museum at Vienna (*vide de Man, in Max Weber's 'Zool. Ergebnisse,'* ii. 1892, p. 438, footnote). The second legs of the female are wanting,

but the male still bore the right leg; of this leg, merus, carpus, palm, and fingers were respectively 7.1 mm., 10.3 mm., 6.4 mm., and 4.5 mm. long. According to these measurements the leg of the second pair has probably been wrongly shown in fig. 3 of plate xi. of the 'Novara-Reise,' for in that figure the chela appears once and a half as long as the carpus; the palm appears probably too broad. The rostrum appears in that figure a little longer and more slender than in our adult male, but, as has already been observed, the form and the length of the rostrum are variable in our species; the fact that the lower margin bears only three teeth may be a juvenile character, Heller's species being only 70 mm. long. According to Koelbel the dactylus of the second legs should carry five teeth near the articulation, the immobile finger hardly traces of two, or, perhaps, three small teeth—just the contrary of what is seen in our male.

The examination of a series of specimens of different ages is therefore necessary to decide this question of identity.

Should, however, our species eventually prove to be different from *Pal. danæ*, the name of *Pal. (Eupal.) novæ-hollandiæ* is proposed for it.

EXPLANATION OF PLATE XVI.

Fig. 1. Lateral view of rostrum and carapace, $\times 2$.

Fig. 2. Ischium and merus, $\times 1\frac{1}{3}$.

Fig. 3. Carpus and chela of the right leg of the second pair, $\times 1\frac{1}{3}$.

Fig. 4. Fingers of the same leg, $\times 2$.

Fig. 5. Toothing of these fingers, $\times 4$.

Fig. 6. View of a part of the palm of the same leg, just in the middle, the inner margin being at the left hand, $\times 12$.

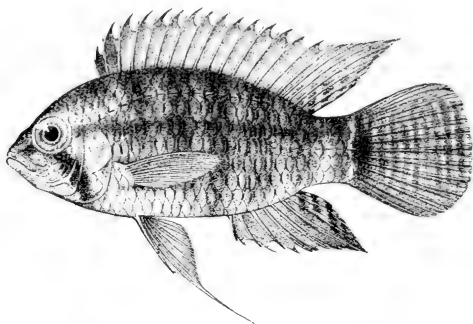
Fig. 7. Leg of the third pair, $\times 2$.

LX.—Description of a new Cichlid Fish of the Genus
Heterogramma from Demerara. By C. TATE REGAN, M.A.

Heterogramma steindachneri, sp. n.

Depth of body $2\frac{2}{5}$ to $2\frac{3}{5}$ in the length, length of head $2\frac{1}{5}$ to $\bar{3}$. Snout as long as diameter of eye, which is $3\frac{1}{5}$ to $3\frac{1}{2}$ in the length of head and equal to or a little greater than the interorbital width; depth of præorbital $\frac{2}{5}$ to $\frac{3}{5}$ the diameter of eye. Maxillary reaching the vertical from anterior edge of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 3 or 4 series of scales; not more than 5 or 6

gill-rakers of the outer series on the lower part of the anterior arch. Scales $24\frac{3}{8}$; upper lateral line extending to below end of spinous dorsal, from which it is separated by 1 or $1\frac{1}{2}$ series of scales for most of its course. Dorsal XV 7, the spines increasing in length to the last, which is more than $\frac{1}{2}$ the length of head; twelfth spine equal to or a little more than $\frac{1}{2}$ the length of head. Anal III 6; third spine less than $\frac{1}{2}$ the length of head. Pectoral a little shorter than the head,



Heterogramma steindachneri.

extending to above the origin of anal. Caudal rounded; caudal peduncle deeper than long. Brownish; a dark lateral stripe from eye to base of caudal; a dark stripe from eye to upper lip, another from eye to interoperculum; dark cross-bands on the posterior part of the body; vertical fins dusky; membrane between first three spines of the dorsal blackish; posterior part of soft dorsal and anal with oblique stripes; caudal with transverse stripes and with a dark spot at the base.

Hab. Georgetown, Demerara.

Two specimens, 70 and 75 mm. in total length.

Closely allied to *H. agassizii*, Sdr., and to *H. amoenum*, Cope, which have a different coloration, whilst the former is also distinguished by the more slender form, the latter by the lower spinous dorsal fin. This is probably the species described from the Amazon by Steindachner (Sitzungsb. Ak. Wien, lxxi. 1875, p. 115) as *Geophagus tenuatus*, Gthr., but which differs from the last-named species in the deeper body, shorter fin-spines, smaller eye, &c.

LXI.—Description of a new Fish of the Genus *Galaxias* from Chile. By C. TATE REGAN, M.A.*Galaxias bullocki*.

Depth of body about 5 in the length, length of head 4 to $4\frac{1}{2}$. Snout a little shorter than eye, the diameter of which is $3\frac{1}{2}$ in the length of head and less than the interorbital width. Mouth oblique; jaws equal anteriorly or the lower a little projecting; maxillary extending to below anterior edge or anterior $\frac{1}{4}$ of eye; no canine teeth. 6 branchiostegals; about 10 gill-rakers on the lower part of the anterior arch. Dorsal 9–11. Anal 13–16. Origin of anal well in advance of that of the dorsal; posterior end of base of anal vertically below that of the dorsal. Pectoral extending about $\frac{1}{2}$ of the distance from its base to that of the ventral. Ventrals 5-rayed, originating at a point a little nearer to the end of snout than to the base of caudal. Caudal emarginate. Caudal peduncle much longer than deep. Greenish; a broad orange longitudinal band along the lower half of the side; fins pale or tinged with orange.

Hab. Maguehue, Temuco, Southern Chile.

Numerous examples, measuring up to 60 mm. in total length, received from Mr. D. S. Bullock, who obtained them on April 6, 1907, from a pool of muddy water left by a dried-up creek.

This species differs from all others of the genus in having the origin of the anal fin in advance of that of the dorsal and the ventral fins 5-rayed.

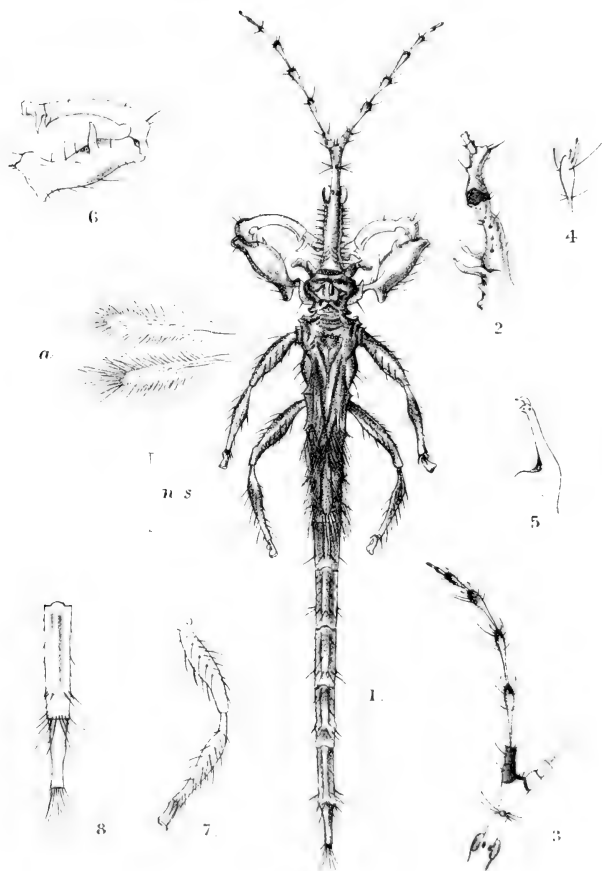
In my "Revision of the Galaxiidae" (Proc. Zool. Soc. 1905, ii. p. 363) six South-American species of *Galaxias* were recognized as valid. The only one since described, *G. titcombi*, Everm. & Kendall (Proc. U.S. Nat. Mus. xxxi. 1907, p. 92, fig.), from the Rio Trafal, Argentina, is, in my opinion, a synonym of *G. platei*, Stdr.



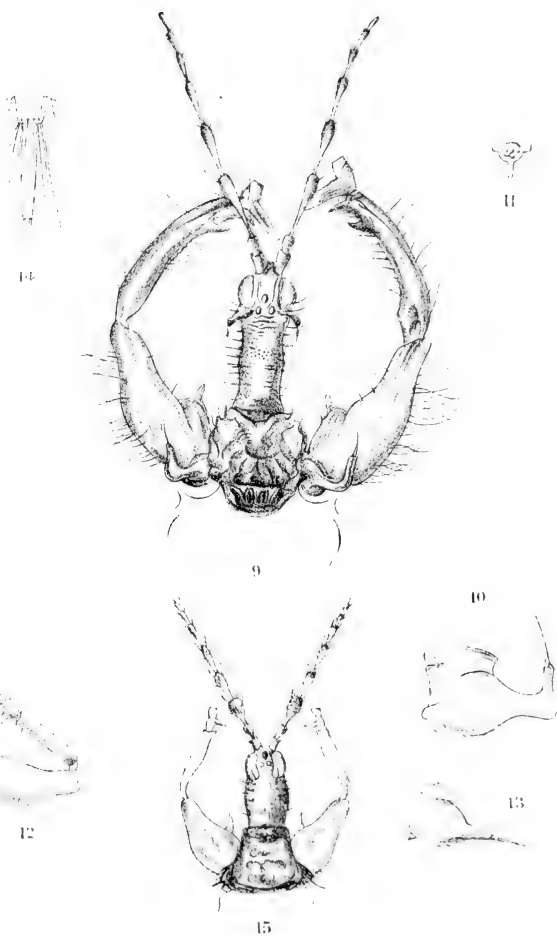




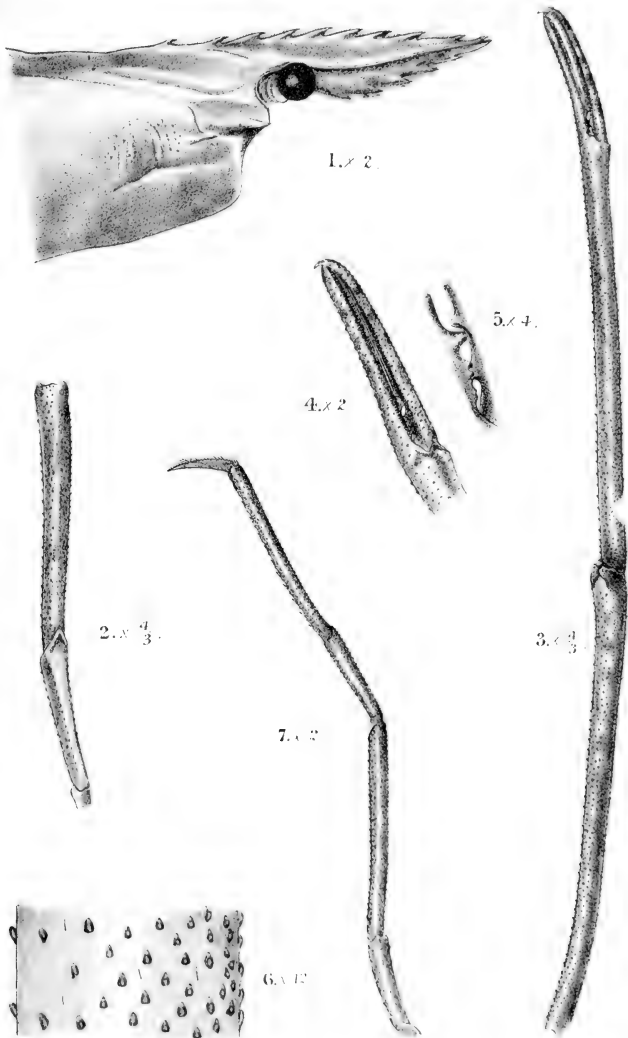














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LXII.—*Notes from the Gatty Marine Laboratory, St. Andrews.*—No. XXIX. By Prof. M'INTOSH, M.D., LL.D., F.R.S., &c.

[Plate XVII.]

1. On a Tumour in a Plaice.
2. On the British *Opheliidae*, *Scalibregmidæ*, and *Teletusæ*.
3. On the same Families in the 'Porcupine' Expeditions of 1869 and 1870.
4. On the foregoing Families dredged by Dr. Whiteaves in the Gulf of St. Lawrence, Canada.
5. On the same Groups dredged in Norwegian Waters and in Finmark by Canon Norman.

1. *On a Tumour in a Plaice.*

On the 13th November, 1907, a fisherman (James Gourlay) brought a plaice about $10\frac{1}{2}$ inches in length and normal in coloration which presented on the right side above the lateral line an elongated elastic swelling. The tumour was somewhat irregularly elevated, and at first sight it resembled, from the irregular prominences, the condition resulting from an injured or diseased spine. On the left or white surface the tumour was more uniformly elevated, forming an elongate-ovoid mass $3\frac{1}{4}$ inches in its long or antero-posterior diameter, and $1\frac{7}{8}$ inch in its transverse at the widest part, which was median. It was slightly narrowed at each end and of the same soft elastic nature as on the dorsum. On

section the tumour appeared to be more or less gelatinous, a pale fluid and blood escaping, and it was easily pierced by a blunt knife. It had hollowed out for itself an elongated cavity on the left side, extending over at least 20 neural spines, from 12 to 14 of which were distinctly curved, and this was deepest in front, where the densest part of the mass was, and moreover showed signs of degeneration with effusion of blood. The spines in this area had an unusually distinct convexity to the right. The upward (to the right) pressure of the tumour had by-and-by caused a portion to protrude between two neural spines, enlarging the space, and then it had spread over an area corresponding to four neural spines. The soft gelatinous nature of the tumour appeared to make the passage easy, and no affection of the bony tissues occurred. The tumour could be enucleated from the cavity, though muscular fibres and connective tissue slightly adhered to its capsule. Microscopically * the mass consisted of a vast number of small areolæ, with intervening small cells, apparently rapidly proliferating, the whole richly supplied with minutely ramified blood-vessels. The areolæ varied much in size, and in the sections appeared to be empty, the fluid or semifluid contents probably having escaped, and minute nuclei occurred in their walls. Larger nuclei abounded in the general cellular stroma, with traces of fibrillation. Moreover, larger cavities, surrounded by definite and more deeply stained walls, existed here and there, the contents being a minutely granular and apparently coagulable fluid without nuclei and occasionally with effused blood. Such probably was the gelatinous fluid which exuded on section. Other spaces presented sections of large blood-vessels, but these were less defined than those without blood-vessels and may have been partly caused by manipulation. In certain small areas the blood-vessel was kept *in situ* by bands of tissue radiating from the wall. The minute cells seemed to be in a transparent gelatinous matrix which lent cohesion when portions were separated by dissection, and also gave a streaked or fibroid aspect to the sections.

So far as could be observed the tumour, though apparently of tolerably rapid growth, did not affect the surrounding tissues, since the muscular fibres could readily be separated from its capsule, and there was no affection of the bony structures. The rapid proliferation of the cells appeared to be confined within the capsule, whilst the yielding mass

* I am indebted to Dr. J. R. Tosh for excellent sections variously stained.

pushed the latter before it to the upper (right) side, where expansion was making progress at the time of capture. On the whole it seemed to belong to the group of the myxoma or mucous tissue tumours, the great proportion of cells in its structure giving it the character of a medullary myxoma. Whether eventually it might have shown more harmful characters is conjectural, though its vascularity and the rapid cell-growth gave it a tendency to trouble in this respect. The fish was fairly well nourished and had recently taken food.

2. On the British *Opheliidæ*, *Scalibregmidæ*, and *Telethuseæ*.

In Dr. Johnston's Catalogue of the Collection in the British Museum the foregoing families are placed under the division *Limivora*, but it is doubtful if it would be distinctive to consider that in such a form as *Ophelia* the dissimilar rings divided the annelid into head, thorax, and abdomen, or that there was no proboscis.

The most conspicuous representative of the first family is *Ophelia limacina*, H. Rathke, which frequents such sandy bays as that of St. Andrews in numbers, and is tossed on shore in violent storms as an inert reddish-pink worm which exhibits comparatively little motion on irritation, though it is not devoid of hardihood. Almost all the examples thus stranded are adult, so that the habits or habitat of the young would seem to be different, and yet both abound in the stomach of the haddock. The feet are about thirty-four in number, the first ten having the pale iridescent bristles supported by a fillet in front and behind, but at the eleventh foot the posterior fillet is dorsally much enlarged as a lamella behind the bristles, and from it the long, tapering, branchial cirrus extends. The bristles are long, simple, longitudinally striated, and arranged in two tufts, the dorsal considerably longer than the ventral, and both curving outward and backward. The body diminishes abruptly posteriorly and ends in a vent surrounded by about a dozen short cirri, two on the ventral surface being much larger and in life coloured of a deep red hue. The range of this species is wide, viz. from Britain to Norway and Greenland, and, like other annelids, it is a favourite food of fishes.

A small form (which may provisionally be termed *Ophelia rathkei*) dredged by the late Dr. Gwyn Jeffreys in Valentia Harbour apparently adds another species to Britain. The

head is somewhat similar to that of *Ophelia limacina*, the snout being acutely conical, and the mouth forming a transverse slit behind it, as in that species. The enlarged anterior region of the body is longer in proportion to the rest, and there are only about twenty-three bristled segments, instead of thirty-five as in *O. limacina*. The branchiæ are proportionally shorter and do not quite reach the tail. The tail diverges, for it presents only a few blunt cirri dorsally and a rounded median and two short lateral cirri ventrally. When viewed from the rear this region shows a series of short blunt cirri, about nine in number, forming an arch over the large median bluntly rounded papilla on the ventral surface. One of the cirri forming the arch had a slender terminal process or papilla distally, but it is uncertain whether the others had such. The structure of the caudal region thus differs from that of *Ophelia limacina*, and is not a stage in the development of that form, nor does it approach that of *Ophelia neglecta*, Aimé Schneider, or other form. The structure of the foot is similar to that of the species just mentioned, with a shorter branchial cirrus, and beneath it two tufts of simple bristles. The example is a female with large ova in the cœlomic cavity in July.

Even more generally distributed than *Ophelia limacina* is the next form, viz. *Ammotrypane aulogaster*, H. R., which ranges along both eastern and western coasts of Britain and extends far north. Instead of the anterior region being devoid of a groove, as in *O. limacina*, in the present form the entire body is deeply grooved ventrally from end to end, and the setigerous region bears a single tuft of simple bristles, a large dorsal cirrus (branchia), and a small ventral cirrus. The anus terminates in a scoop-shaped hood opening ventrally, and with four cirri along each border, a pair of larger and rather thick cirri at its base, and with a slender cirrus between them.

A genus not hitherto known in Britain is *Armandia*, Filippi*, an example of which was dredged amongst sandy mud off one of the small islets in the Sound of Harris in 1872. It has been provisionally termed *A. robertianæ*. In this the head is obtuse and rounded, somewhat like that of *Ammotrypanella arctica*, M'I.†, marked dorsally by a constriction, whilst ventrally the prominent ridges of the ventral longitudinal muscles leave only a small free rim at the snout.

* Arch. per la Zool. l'Anat. e Fisolog. Genova, 1861, vol. i. p. 215.

† Trans. Linn. Soc. 2nd ser. vol. i. p. 505, pl. lxxv. fig. 12.

Minute nuchal organs are present on each side just in front of the termination of the lateral groove, but they are only distinct in life. The body is about 14 mm. in length, somewhat short and thick, tapered at each extremity, rounded dorsally and grooved ventrally, the powerful ventral longitudinal muscles forming a conspicuous ridge on each side, almost from end to end. The mouth opens as a small pit behind the isthmus of the longitudinal muscles towards the tip of the snout. The colour of the dorsum is greenish speckled with dark brownish points, a dark central transverse bar occurring at intervals, so as to give the dorsum a segmented appearance. Much of this pigment remains in the spirit-preparation. The ventral surface is pale greenish. The posterior end is abruptly diminished to an upturned caudal process, which is terminated by a slightly oblique border (the slope trending from below upward and forward) furnished with short and somewhat clavate cirri, two being dorsal and two ventral besides two or three lateral, the most conspicuous pair being the ventral. These form a fringe to the anal aperture, which thus opens into a small funnel. The diminished caudal region is marked by closely arranged circular striæ.

In the groove above each ventral ridge of the longitudinal muscles is a series of dark brown pigment-spots (so-called eyes) at regular intervals, but no bristles are visible except in the posterior region, where from five to seven tufts of slender curved glistening bristles form a fringe on each side, sloping downward and backward. Moreover, upon the narrow caudal process a few bristles occur distally on the sides, but their origin is uncertain. The bristles are translucent, taper to a fine point, and do not show evident striations. Small tufts occur considerably in front of those mentioned above, but are only visible under the microscope.

Like its congeners, it is an inhabitant of muddy sand and swims through the water actively like an eel.

Whilst the caudal region somewhat resembles that of De St. Joseph's *Armandia dollfussi* *, it differs in the structure of the head, which in the French species has a slender process (*tentaculaire mince*, De St. Joseph), in the absence of cirri, and in the inconspicuous nature of the bristles.

Another species new to Britain is *Polyophthalmus pictus*, which comes from various parts of the west coast of Ireland, from Kerry to Galway, and is well known on the French and

* Ann. Sc. Nat. 8^e sér. t. xviii, p. 114, pl. vi, figs. 148-151.

other southern coasts. The bluntly rounded head usually in the preparations is devoid of eyes, though three are described by De St. Joseph *, but has well-marked nuchal organs, each of which occasionally projects as a papilla on each side. In some examples the head is paler than the succeeding region and shows a pigment-speck (eye) on each side in front of the brown band at the neck. The body is about an inch in length, rounded dorsally and grooved ventrally, tapered at each end, especially posteriorly, where the caudal process forms a short cone with a few short terminal cirri (De St. Joseph says from eight to twelve unequal cirri). Dorsally the body shows about twenty-eight or thirty transverse brown bars, with a fine dusting of the same pigment between and beyond them. The bars seem to have a definite position, a line drawn from their extremities striking the middle of each space between the so-called eyes, and they thus nearly agree with the number of segments mentioned by De St. Joseph, viz. about thirty. These pigment-spots are the eyes of some and the photogenic organs of Hesse and Benham. They vary, according to De St. Joseph, from ten to sixteen, and commence on the seventh segment. The densest dusting of pigment appears to occur on the anterior and posterior ends, the base of the caudal process, indeed, having a continuous brown blotch. No example has a complete series of pigment-spots (eyes), for they have been more or less bleached by long preservation.

Though at first sight the bristles are not evident, yet they occur in a rudimentary condition in each segment as minute tufts of simple tapering bristles, best seen towards the caudal region. De St. Joseph, who had the opportunity of examining living specimens, observes that the bristles form dorsal and ventral tufts with the intermediate lateral organ of Meyer.

Grube, Filippi, and Claparède's view that this form is only a genus of the Opheliidæ would appear to be reasonable. It resembles the Opheliidæ in general aspect, in the iridescent skin, in the arrangement of the ventral longitudinal muscles, in the presence of the ventral groove between them and the lateral groove above them, as well as in the form of the caudal process and its papillæ. It is further interesting to note how closely the structure of the body-wall in *Polygordius* approaches that in the present group, as shown long ago, and as De St. Joseph more recently corroborates.

* Ann. Sc. Nat. 8^e sér. t. v. p. 386 (1898).

The widely distributed genus *Travisia* of Dr. Johnston, which ranges from Greenland to Kerguelen, is usually associated with the Opheliidæ, and for the present no objection is necessary. The common form, *Travisia forbesii*, occurs in great stretches of sand and sandy mud both on the east and the west coasts, from Shetland to St. Andrews, and ranges to Greenland and other northern waters. In five examples from Greenland the anterior runs into the posterior region without marked distinction, except the gradual disappearance of rings on the segments. Moreover, the total number of segments seems to be smaller than stated by Dr. Johnston, viz. from twenty-five to twenty-eight. In life the British form has a uniform pinkish colour, paler or straw-coloured laterally and posteriorly, and somewhat iridescent both dorsally and ventrally. A coil of intestine which protruded through a rupture was gamboge-yellow. The branchial cirrus has a streak of red. This form is the *Ammotrypane æstroïdes* of H. Rathke and the *Ophelia mammillata* of CErsted, both of these describing it a little later than Johnston.

The arrangement of the family Scalibregmidæ has recently been carefully attended to by Dr. Ashworth*, the two main groups being: (1) Those in which the head has antero-lateral tentacles, body enlarged anteriorly, feet (after the fifteenth) prominent, with a laminate dorsal and a ventral cirrus; gills on the anterior segments (*Scalibregma*) or none (*Pseudo-scalibregma*). In a subsection (B) the simple rounded feet do not form laminate appendages, and the ventral cirri, if present, are confined to the posterior region. Strong curved bristles on the first bristled segment (*Sclerocheilus* and *Asclerocheilus*). (2) The head has a median groove; no tentacles; body maggot-like, feet represented by dorsal and ventral papillæ. No anal cirri. Gills on the anterior segments present or absent (*Eumenia* and *Lipobranchus*). Baron de St. Joseph † had formerly grouped them into those with and those without branchiæ.

Nowhere does *Scalibregma inflatum*, H. Rathke, an example of the first group, flourish so well or attain so large a size as in the Outer Hebrides, where it was known more than forty years ago; yet its range is wide, for it is found on the east as well as the west coast, and extends to Norway, Spitzbergen, and Greenland. The peculiar tessellated appear-

* Quart. Journ. Micr. Sc. n. s. xlv. (1904).

† Ann. Sc. Nat. 8^e sér. t. xvii. p. 103.

ance of the rings, as if they were paved with minute red bricks, is a characteristic feature, and was shown by Rathke; yet they disappear in imperfectly preserved examples, and thus are absent from representations made from these. The body is terminated by a papillose vent, beneath which are four or five cirri, which are unusually long and slender in the small Norwegian specimens dredged by Canon Norman. In life the animal is of a dull brick-red throughout, the tessellated portions being minutely dotted with yellow. The posterior region of the body is often discoloured from the contents of the gut—being dull greyish, and thus throwing the paler lobes of the feet into relief. A slight iridescence occurs on the ventral surface, along which the large ventral blood-vessel passes. The branchiæ commence on the first bristled foot and increase in size from the first to the fifth and last. In small specimens from the west coast of Ireland only four branchiæ are present, but as the first, even in a large example in life, is very small, such may be due to retraction under the surface. Moreover, certain forms agree in all respects with the typical form, but the branchiæ are entirely absent, and Dr. Ashworth states that he has observed the same condition in a few American examples. It is a question whether these should be regarded as specifically different. The coloured sketch made from life in the Outer Hebrides in 1865 represents only four branchiæ.

The first bristles occur on the second body-segment, and in this and the following four are borne on conical processes, dorsally and ventrally, elevated on pads. The bristles are finely iridescent and form slightly radiate tufts. The next nine or ten are similar, but the pads are smaller. About the fifteenth or sixteenth foot a dorsal and a ventral cirrus are evident, and in the posterior region they form somewhat lanceolate lobes with the setigerous process at the inner base of each—that is, below the dorsal and above the ventral. In addition, a series of furcate bristles occur in each foot, but they scarcely project beyond the surface.

In this family is also *Eumenia (Lipobranchus) jeffreysi*, M'I., as described in 1869, a species dredged off the Hebrides and the Shetland Islands by Dr. Gwyn Jeffreys, and it also extends to Norway and probably to other northern regions. The specific distinction mainly rests on the absence of branchiæ, and if these organs may be absent or present in allied forms, such as *Scalibregma*, a reconsideration of the subject may be necessary. A new form to Britain is *Sclero-*

cheilus minutus, Grube *, first found in the Adriatic in 17-35 fathoms by its discoverer. It was procured on a valve of *Pecten* entangled by a trammel-net on the ground off Fermain Bay, Guernsey, and also between tide-marks at Herin. In this the head is furnished with two well-marked though not long tentacles and two brownish-red ocular bands which form an inverted \wedge by union in front. The body is about $\frac{3}{4}$ of an inch in length, is somewhat fusiform, resembling a miniature *Scalibregma*, slightly tapered anteriorly and more so posteriorly, the surface being minutely tessellated and marked by transverse furrows. It is flanked by a series of short foot-lobes, with rather long tufts of pale resplendent bristles. Posteriorly it terminates in an anal segment provided with five slender cirri. The body has a uniform dull brick-red colour or very pale brownish red, more deeply tinted on the dorsum here and there from the blood-vessel. The mouth opens on the under surface of the peristomial segment as a broad \wedge in the spirit-preparation, the angle directed forward.

The first segment is achetous. The second has dorsally a foot-papilla bearing simple bristles, ventrally a papilla holding a series (five or six) of stout simple bristles finely tapered at the curved tip, though sometimes more or less abraded. De St. Joseph associates these with the making of its galleries in shells, just as in the case of the powerful hooks on the fifth segment of *Polydora*. Their function, whatever it may be, is certainly important, and they are moved by special muscles. They are brownish by transmitted light and have no longitudinal striæ. The next and succeeding segments have simple curved bristles of a fine pale golden sheen on the dorsal and ventral papillæ, which vary somewhat in the different parts of the body, forming shorter cones in front, longer posteriorly. At the base of these bristles and just projecting beyond the skin is a series of bifid forms, one limb of the fork being longer than the other, and the inner edge in both limbs is spinous. Towards the twenty-second segment a slender cirrus, about a third the diameter of the body at its longest, appears below the ventral papilla. According to De St. Joseph its tip is furnished with palpo-cils in life.

This is a southern type so far as present examples go, but it may yet be found on the western shores. It may have been overlooked from its small size and obscure habits. It bores actively with its snout amongst the mud.

* Arch. f. Naturges. xxix. i. p. 50 (1863), and 'Die Insel Lussin u. ihre Meeresfauna,' p. 85.

De St. Joseph* found it common on shell and oyster-grounds frequented by *Sabellaria spinulosa* off Dinard and St. Malo, at a depth of 7-25 mètres, and corrected Grube's view of the ocular points.

The family Telethusæ or Arenicolidæ is represented by three species, viz. *Arenicola marina*, L., *A. ecaudata*, Johnston, and *A. grubei*, Claparède, as recently and excellently described by Drs. Gamble and Ashworth in several publications, the first-mentioned representing the tailed group, the two latter those in which the branchiæ go to the posterior end. Constantly sought on every suitable beach for bait, no marine form could illustrate better than *Arenicola marina* the permanence of such a marine type, notwithstanding man's efforts to destroy it. Yet it is always easily reached by man, whereas the food-fishes have the wide ocean and all its manifold arrangements as safeguards. This species is ubiquitous in its distribution on the British shores, whereas *A. ecaudata* is a western and southern form, and so is *A. grubei*. Several stages in the development of *Arenicola ecaudata* may be referred to. The smallest example procured between tide-marks at Lochmaddy, North Uist, in August, measures about 4 mm. in spirit, but it would probably stretch considerably more in life. As Dr. Ashworth points out, there is no abrupt narrowing of the caudal region as in the pelagic young of *A. marina* procured at St. Andrews in the bottom-net. No branchiæ are present. The anterior rings are wide, the posterior narrow. There are between fifty and sixty bristled segments. The next stage is represented by a specimen 7 mm. in length from the same locality and on the same date. In front of the first bristle-tuft are the somewhat large blunt prostomium and five rings. The setigerous lobes are distinct, and the first gill arises on the sixteenth. As the anterior segments are much broader than the posterior, the branchial region occupies less than half the length and is characterized by a deep furrow on the dorsum. In the anterior half a single ring is interpolated between the setigerous lobes, but the feet are so crowded posteriorly that no more than one ring to each segment is present at this stage. The branchiæ, which number more than forty pairs, consist for the most part of simple filaments or a pair of filaments, and they appear to be largest anteriorly. The bristles are proportionally longer than in the adult and have a trace of a wing on each side.

* Ann. Sc. Nat. 8^e sér, t. xvii. p. 104.

The anus is median and is crenate from papillæ, and several of the caudal segments are devoid of gills.

The third stage, also obtained between tide-marks at Lochmaddy in August, is about 11·5 mm. in length, and the same general shape is maintained. It agrees with the form described by Prof. P. Fauvel* in his disquisition on the Clymenidian and Branchiomaldane stages in the development of *Arenicola*. There are about forty pairs of gills, but the caudal segments devoid of them are more numerous. Except the first simple gill, all show secondary processes, especially anteriorly, where they form short branched tufts. Moreover, another example of the same length had somewhat longer gills in front, whilst a third agreed with the first. The fourth stage is 16 mm. long, and the body is more attenuate. It also was found in August at Salthill, Co. Dublin. The pigment is boldly marked anteriorly, the snout in front of the nuchal grooves being dark brownish (in spirit), whilst the pale grooves form a broad \checkmark with the concavity forward. A dark brown belt succeeds, with a paler area behind. Then three blackish-brown segments follow, whilst the rest of the body is pale brown. The bristle-tufts and the rows of hooks are respectively marked by pale areas and pale bands, the latter continuing a considerable distance along the posterior or branchial region, which is now nearly half the entire length. The gills are longer and more distinctly branched.

3. On the same Families of Annelids in the 'Porcupine' Expeditions of 1869 and 1870.

Very few examples of the three families occurred in these collections, only *Ammotrypane aulogaster*, H. R., being present in the expedition of 1869; yet one or two rare forms were procured.

Thus a *Travisia*, viz. *T. gravieri*, sp. n., was dredged at Station 9 in the 'Porcupine' Expedition of 1870, lat. 48° 06' N., long. 9° 18' W., at a depth of 539 fathoms, on a bottom of grey mud and a temperature of 48°. It is a small form resembling the larva of one of the Diptera, and measuring about 5 mm. in length. The head terminates in a smooth pointed process, the body gently dilating thereafter and continuing as a rounded ringed sac to the posterior end, where a slight diminution occurs before it somewhat abruptly terminates. The rings in the contracted posterior region encircling the central caudal process are distinct. The dorsal

* Bullet. Sc. Fr. et Belg, t. xxxii. p. 287 (1899).

surface is convex, the ventral concave. The body is closely ringed from the base of the prostomium to the caudal process, and the anterior dorsal surface is tessellated as in *Scalibregma*, but the ventral surface is smooth. At first sight feet appear to be absent, but closer inspection shows a pair of minute papillæ on every third ring. No bristles were present.

Another species, apparently very near the *Ammotrypane cylindricaudatus* of Hansen*, from the "Norske Nordhavs-expedition i 1876," has an acutely conical head ending in a slender process with a clavate tip, as in *A. gracilis* of the 'Challenger' †, and thus agreeing with Ørsted's genus *Ophelina*. The ventral longitudinal muscles pass almost to the extremity of the snout. Mouth a short distance behind the latter. The body is very slender, with numerous branchial cirri, which are conspicuous posteriorly, as also are four setigerous processes in front of the caudal appendix, which is cylindrical or somewhat clavate, transversely marked by minute ribs, as also in the *Ammotrypane delapidans* of Kinberg ‡, first procured at Valparaiso, and afterwards described by Ehlers § from various parts of Chili, and with an uneven posterior margin—that is to say, the dorsal edge forms a prominent papilla, the ventral being less, whilst an elevation occurs between them. In the majority the process is gradually narrowed to its base, so that it is really somewhat clavate. The bristles are short, simple, and tapering. This form ranges from Station 17 a, at 795 fathoms, in the 'Porcupine' Expedition of 1870 to Norway and Canada. Hansen's description and figures leave some doubt as to the actual identity, but such may be partly due to the larger size and more perfect condition of his specimens. Thus he describes and figures the head as similar to that of *Ammotrypane aulogaster*, H. R., whereas in this it forms an acute cone ending in a slender process with a clavate tip. The caudal process in both is similar in general outline, and so with the four lateral setigerous processes in front of it; but the processes on the posterior margin differ in the small examples from the 'Porcupine,' it may be from friction or other injury. Moreover, the organ appears to be readily reproduced. On the whole, the two forms seem to be identical. The *Armandia weissenbornii* of Kükenthal ||, from Perim, is

* Nyt Mag. f. Naturvid. Bd. xxiv. p. 8, Taf. vi. figs. 1-8.

† Annel. 'Challenger,' p. 357, pl. xliii. figs. 9, 12.

‡ Öfvers. K. Vet.-Akad. Förh. 1865, no. 4, p. 258.

§ Polychæt. Magell. u. chil. Strandes, 1901, p. 173, Taf. xxii. fig. 9.

|| Jenaische Zeitsch. Bd. xxi. N. F. xiv. p. 366, Taf. xxi. fig. 6.

an allied form, the caudal process being as long as the last four segments and with numerous rings, but its tip has several slender papillæ. The *Ammotrypane langii*, of the same author*, from the Philippines, has a somewhat shorter ringed caudal cylinder.

A third form, *Ammotrypane (Ophelina) kükenhali* †, sp. n., was dredged in the 'Porcupine' Expedition of 1870, in 795 fathoms. It is distinguished by its pointed snout, with its slender clavate papilla projecting beyond it, and its slender elongated body, like that of *Polygordius*, about 25 mm. in length, tapered a little anteriorly and posteriorly, rounded dorsally, and grooved ventrally. The ventral longitudinal muscles run on each side from the region of the mouth to the base of the caudal process, and have the usual lateral groove above them, but, so far as observed, neither bristles nor pigment-specks are present. Posteriorly the body somewhat abruptly narrows to the short, cylindrical, caudal process, which has a smooth edge posteriorly—in one example oblique and in the other rounded; but as both seem to have been more or less dried, there is uncertainty on this point. The slender, smooth, glistening body, and the absence of bristles as well as of cirri and papillæ on the caudal process are features of moment.

4. On the foregoing Families dredged by Dr. Whiteaves in the Gulf of St. Lawrence, Canada.

The representatives of the foregoing are comparatively few, and, indeed, are confined to one family, viz. the Opheliidæ. The fact that little or no shore-collecting was done perhaps accounts for the absence of the Telethusæ, and, to some extent, of the Scalibregmidæ, though the representatives of the latter also occur in deep water. Of the Opheliidæ, *Ammotrypane aulogaster*, H. Rathke, is not uncommon and of good size, and *Ammotrypane cylindricaudatus*, Hansen, was also procured.

A fine example of *Ophelia radiata*, Della Chiaje (Pl. XVII. fig. 1), was dredged at Station 61, viz. north-north-east of Shediac Island, 4th September, 1873, probably in water not

* *Ibid.* p. 365, Taf. xxi. figs. 4 & 5.

† After Prof. Kükenhali, of Breslau, the author of a paper on the Opheliaceæ of the 'Vettore Pisani' Expedition, *Jenaische Zeitsch.* xxi. Bd. N. F. xiv. pp. 361-373, Taf. xxi. (1887).

more than 10 or 12 fathoms' depth, though this is not stated. It is distinguished superficially by the more regular and more definite cuticular ridges anteriorly (Pl. XVII. fig. 2), by the more elongated and more acute head, by the smoother and more glistening body throughout the posterior region, by the presence of two sets of cuticular ridges towards the tail, two occurring a little in front of the caudal hump and four on the edge of the downward slope to the caudal process, which generally agrees with that of *Ophelia limacina*, while differing in detail. The mouth is more posterior in position than in *O. limacina*, and the anterior region, viz. that in front of the cirri, is considerably longer. The cirri are much longer and have a warty aspect, from little papillæ or elevations—it may be due to extravasations. On the other hand, the bristles are less developed, a feature conspicuous posteriorly in *O. limacina*, where they form a fringe on each side of the dorsal groove of the caudal process. No well-marked groove occurs on the dorsum of this process in *O. radiata*, and the process itself is shorter. Ventrally both are deeply grooved to the tip, but the two ventral cirri of *O. limacina* are considerably smaller and terminated by two clavate or button-like processes, whereas the ventral cirri of *O. radiata* are broadly ovate flattened processes, conical posteriorly, and ending in a simple very slightly tapered filament (Pl. XVII. fig. 4). Della Chiaje shows fourteen cirri, forming the upper arch of the tail, whereas Claparède * describes and figures only eight. On the other hand, Baron de St. Joseph † gives sixteen, including, however, the two median ventral, in his differentiation of the species from *Ophelia neglecta*. In the present example five occur on each side and a median cirrus dorsally, so that the total number is eleven ‡ (Pl. XVII. fig. 3). This species is the common one at Naples, and the sexes are distinguished by colour, the males being pale. The ova are greenish. Claparède gives considerable attention to its structure in the work just referred to, and puts a different interpretation on the diverticula on the dorsum of the œsophagus from that given by several of his predecessors, who varied in interpretation from salivary glands and respiratory organ to heart. This muscular organ he associated with the stiffening of the snout by the perivisceral fluid during its boring in the sand and muddy sand. De St.

* Annél. Chétop. Naples, p. 284, pl. xxvi. fig. 1 c.

† Ann. Sc. Nat. 9^e sér. t. iii. p. 231 (1906).

‡ The artist makes seven on each side of the median. It has not been possible to check these figures before publication.

Joseph * points out the distinctions of this species from *O. neglecta*, A. Schneider, in his detailed description of that form, which has eighteen anal papillæ besides the two larger ventral cirri.

5. *On the same Groups dredged in Norwegian Waters and in Finmark by Canon Norman.*

Both *Ophelia limacina*, H. R., *Ammotrypane aulogaster*, H. R., and the widely distributed *Travisia forbesii*, Johnston, are not uncommon in the fiords. Moreover, the finest example of the second comes from Finmark. *Ammotrypane* (*Ophelina*) *cylindricaudatus*, Hansen, likewise occurs in the same fiords near Bergen. *Scalibregma inflatum*, H. R., is often dredged in the same seas, but all the examples are small, especially in contrast with the large specimens from Lochmaddy, North Uist. No example of the Telethusæ is present, the absence of these littoral annelids being due to the fact that dredging alone was resorted to, and this in water of considerable depth.

EXPLANATION OF PLATE XVII. †

- Fig. 1.* *Ophelia radiata*, Delle Chiaje, in profile. Enlarged under a lens.
Fig. 2. Anterior end from the dorsum, to show the acutely conical snout and the ridges of the skin. Enlarged under a lens.
Fig. 3. Caudal processes from the dorsum. Enlarged under a lens.
Fig. 4. Caudal processes from the ventral surface. Similarly enlarged.

LXIII.—*On certain African and S.-American Otters.*
 By OLDFIELD THOMAS.

SINCE I wrote my paper on the arrangement of the otters in 1889 ‡, opinion has changed as to the value of the characters which should justify generic distinction between different groups, and I am now prepared to admit, with other authors, that the clawless otters (*Aonyx*) and the margined-tailed otter of Brazil (*Pteronura*) should be recognized as generically different from the ordinary otters of the genus *Lutra*. The two species of *Aonyx*, *A. capensis* and *cinerea*, widely different

* Ann. Sc. Nat. 8^e sér. t. v. p. 369, pl. xxi. figs. 181–195, and pl. xxii. figs. 196–199.

† I am indebted to the courtesy of the Carnegie Trust for the figures on this Plate.

‡ P. Z. S. 1889, p. 190.

as they are in size and habitat, undoubtedly have a certain agreement in the shape of their skulls and teeth, so that their common non-possession of claws is evidently a genuine connecting character, and not a parallelism, as was formerly supposed to be the case.

Descriptions of a new subspecies of *Aonyx* and of the South-American species of the *Lutra platensis* group follow.

Aonyx capensis angolæ, subsp. n.

External characters much as in true *capensis*, though with rather a greater tendency to a whitening of the bases of the wool-hairs. Hairs of head and nape tipped with whitish. Ears with light edges. Hairs of chin and throat white to their bases, the brown round the angles of the mouth at a minimum. Second and third phalanges of fingers quite naked above.

Skull indicating affinity with *capensis* and *meneleki* rather than with *hindei*, agreeing with the two former by its greater size, as judged by length, its large flattened bullæ, and other characters. But it is conspicuously narrower in every breadth-measurement, the difference being so great as quite to alter the general proportions of the skull. Unfortunately the typical skull is that of a female, and allowance for this has to be made in comparing it with the other skulls and with those measured by Dr. Lönnberg. Interorbital region narrow, the interorbital breadth only about three fourths of that in a male *capensis*, the difference against the female being only about one-ninth in a pair of *hindei*. Post-orbital processes little developed, not projecting more than in a female *hindei*. Brain-case elongate-oval, longer and less broadened posteriorly and externally than in any others of the present group, its sides, when viewed from behind, more nearly vertical than in the other forms; its surface smooth and little ridged, though there is a fairly distinct median crest, and the lambdoid crests are well developed, meeting the sagittal one at a well-marked re-entrant angle. Zygomata unusually little spread, the zygomatic actually less than the mastoid breadth, while even the latter breadth is markedly less than in the allied forms. Bullæ broad and low, a single large foramen on the inner edge of each. Molars large and heavy, as in true *capensis*.

Total length, measured in flesh, 1270 mm., of which, judging from skin, the proportions would appear to be about:—

Head and body 800 mm.; tail 470.

Skull: basal length 128 mm.; zygomatic breadth 91·5; mastoid breadth 92·5; breadth of brain-case exclusive of mastoid flange 66; breadth of nasal opening 18; interorbital breadth 27; tip to tip of postorbital processes 30·5; intertemporal breadth 25·5; palate length 66; antero-posterior diameter of p^4 12·9; greatest diameter of m^1 18, antero-posterior diameter of its inner lobe 13; greatest height of zygomatic arch 10.

Hab. Coporole R., Angola.

Type. Adult female. B.M. no. 98. 3. 20. 1. Collected by Mr. G. W. Penrice.

I have hitherto not ventured to determine definitely this fine otter, partly owing to its being a female and partly for want of good S.-African material for comparison.

Now, however, that the Museum possesses a good adult pair of skulls of the nearly allied *A. c. hindei* of E. Africa, from which the differences due to sex can be estimated, and a good skull of the true S.-African *capensis* has been described and measured in Prof. Einar Lönnberg's recent interesting paper on the subject*, I am in a position to determine the Angolan form.

So far as sex is concerned, there appears to be remarkably little difference between male and female in the general outlines of the skull, the male having merely much more heavily roughened bones and larger crests and processes for the attachment of muscles. But the breadth as compared with the length measurements are practically the same in both sexes.

If therefore, as we may presume, the male *L. c. angolæ* has the same general proportions as the female, it will be readily seen from the above measurements and from those given in Prof. Lönnberg's paper how markedly the new form differs from any African otter hitherto described. As it happens, the chief length measurement is exactly the same in the type of *angolæ* and in Prof. Lönnberg's Natal example, while the zygomatic breadth is actually 13 mm. and the mastoid breadth 10 mm. less in the former than in the latter, a difference which naturally produces a very considerable alteration in general outline. But I suspect that the roughening of the bones and increase of the processes in the male will result in enough assimilation to *A. capensis* to justify my considering the Angolan otter as only a subspecies of that widely spread form.

* 'Arkiv för Zoologi,' iv. no. 12 (1908).

The Lutra platensis Group.

The difficulties presented by the members of this South-American group of otters were the chief reason for the incomplete state of the 1889 paper above quoted, and but little progress has been made in their elucidation to the present date.

The only two points that have been published about them are that Nehring * has shown the earliest name, *paranensis*, Rengger, to have been based on the large *Pteronura brasiliensis*, so as to remove that name from the group, and that Dr. Major has described the Central-American form as a distinct species, *L. annectens*.

Material has, however, been gradually accumulating, and I am now in a position to sort this difficult group into seven fairly distinct forms, of which the characters and distribution are as follows :—

1. *Lutra annectens*, Maj.

Ann. & Mag. Nat. Hist. (6) xix. p. 618 (1897); Zool. Anz. 1897, pp. 136-142.

Nose-pad quite naked, its upper line of demarcation with a distinct upward projection in the centre, as in the European otter, *L. lutra*.

Skull very broad and low, with broad flattened brain-case and widely expanded mastoid processes. Nasal opening fairly narrow, its breadth less than its slanting internal height-length diameter. Bullæ well swollen.

Upper carnassial not very large, the hinder edge of its inner lobe not touching the front of m^1 .

A male skull measures in condylo-basal length 117 mm.; zygomatic breadth 80; mastoid breadth 78; antero-posterior diameter of p^1 10.2.

Hab. Central America: Tepic, Jalisco, Mexico (*Buller*); Guatemala (*Salvin*).

Type in British Museum, no. 92. 3. 17. 8.

2. *Lutra emerita*, sp. n.

Nose-pad as in *annectens*.

Size rather less than in that species. Skull with comparatively large, rounded, and high brain-case, the height greater and the breadth less than in the Central-American species. Upper profile convex. Sagittal crest little developed;

* SB. Ges. nat. Freund. Berl. 1900, p. 221.

lambdoid crests well-marked, and, owing to the shape of the brain-case, surpassing behind the back of the condyles. Mastoid flanges not excessively developed. Nasal opening small, its proportions about as in *annectens*. Bullæ rising to a high and rather narrower ridge than in *annectens*. Teeth about as in that species.

Skull-measurements (adult male): condylo-basal length 110 mm.; basal length 101; zygomatic breadth 77.5; mastoid breadth 71; interorbital breadth 22.6; brain-case, breadth 62; height from between bullæ to crown 41; palatal length 49; antero-posterior diameter of p^4 10.1; greatest diagonal diameter of m^1 11.4.

Hab. Merida, Venezuela. Type from the Rio Chama at 2000 m. altitude.

Type. Adult male. Collected 13th August, 1907, by S. Briceño. Two specimens examined.

This species is readily distinguishable from all the members of the group by its high rounded brain-case, and from the two which share the structure of its nose-pad by its markedly smaller size.

3. *Lutra provocax*, sp. n.

Nose-pad as in *annectens*, therefore markedly different from that of the geographically nearer *L. platensis*.

Skull about as large as in *annectens*, its frontal region particularly flat and the upper profile comparatively straight. Nasal opening, owing to the flattening of the muzzle, broader in proportion to its height, its breadth more than its internal height-length diameter. Sagittal crest little developed, and the lambdoid not projected far back. Bullæ rather small. Teeth of medium strength, the inner lobe of p^4 not excessively large, but touching the front of m^1 owing to a projection at its postero-external border.

Skull-dimensions of type (old male): condylo-basal length 115 mm.; basal length 106; zygomatic breadth 78.5; mastoid breadth 74; interorbital breadth 25; brain-case, breadth 58, height 38; palatal length 56; antero-posterior diameter of p^4 11.7; greatest diagonal diameter of m^1 13.5.

A female skull has condylo-basal length 109 mm.; mastoid breadth 74; p^4 101.

Hab. Southern Chili and Patagonia. Type from south of Lake Nahuel Huapi, Patagonia. Other specimens from Temuco, S. Chili (*Bullock*), and Magellan Straits (Voyages of H.M.S.S. 'Challenger' and 'Alert,' and of Lord Crawford's yacht the 'Valhalla').

Type. Old male. B.M. no. 3. 11. 5. 14. Collected during

the Chili-Argentine Frontier Commission, and presented by Sir Thomas Holdich.

This otter occurs side by side with *L. felina* along the coasts of Southern Chili and in the Straits of Magellan, where it was first obtained during the voyage of the 'Challenger,' and later on in the same region by Dr. Coppinger of H.M.S. 'Alert.' I have long doubted my provisional reference of it to *L. platensis*, from which I now find it can always be distinguished by the different structure of its nose-pad and the flattening of its muzzle, with the consequent alteration in the form of the nasal opening in the skull.

4. *Lutra platensis*, Waterh.

Voy. Beagle, Mamm. p. 21, pl. xxxv. fig. 4 (skull) (1838). (Maldonado, Uruguay.)

Lutra solitaria, Wagn. Arch. f. Nat. 1842, p. 358. (Ypanema, São Paulo.)

Lutra latifrons, Nehr. SB. Ges. nat. Berl. 1887, p. 23. ("S. America, east of Andes.")

Nose-pad naked, its upper line of demarcation running either straight across or even curving somewhat downwards towards the septum, its definition always sharp and well marked.

Skull larger and well ridged, not unusually flattened. Nasal opening comparatively narrow, its breadth distinctly less than its interior height-length diameter. Bullæ well swollen. p^4 large, with broadly expanded inner lobe.

In an old male the skull-measurements are: condylo-basal length 114·5 mm.; mastoid breadth 72·5; antero-posterior diameter of p^4 12·5.

Hab. Southern Brazil, Uruguay, and Argentina; inland to Matto Grosso. Examples in Museum from Rio Grande do Sul (*Ihering*), Uruguay (*Darwin*, *Aplin*), and Buenos Ayres (*Lord Lilford*).

Type skull in British Museum, no. 55. 12. 26. 215.

5. *Lutra incarum*, sp. n.

Nose-pad ill-defined, the hairy part from above projecting downwards in the middle without any very clear line of demarcation, and in some cases almost or quite meeting a corresponding upward projection from below. There is, however, never a broad continuous band of hair down the septum as there is in *L. enudris*. In old specimens a good deal of the hair may be worn off, but traces of it are to be seen with a lens.

General colour rather paler than usual.

Skull and teeth large and heavy, apparently quite similar to those of *L. platensis*, though the inner lobe of p^4 averages rather smaller.

The type skull (young) has a p^4 measurement of 12.4 mm.

An old male skull from Eten gives the following dimensions:—Condyllo-basal length 118 mm.; zygomatic breadth 77.5; mastoid breadth 72; interorbital breadth 24.8; palate length 54.

Hab. Peru. Type from Marcapata, Prov. Cuzco. Other specimens from Eten on the N.W. coast (*P. O. Simons*).

This otter is most nearly allied to *L. platensis*, of which it may hereafter prove to be a subspecies, when specimens from intermediate localities are available for comparison.

Two other otters have been described from Peru, *L. peruviansis*, Gervais, and *L. montana*, Tschudi. The former was based on a skull picked up on San Lorenzo Island, off Callao, and has long been synonymized with *L. cinerea*, Molina, the small Chilean otter. That this reference is correct is now proved by the examination of a specimen obtained by Mr. Perry Simons on that very island, a specimen which precisely agrees with Gervais's figure and also with specimens of *L. cinerea* from Chili.

With regard to *L. montana*, it is difficult to believe that the animal Tschudi described was an otter at all, as of no member of the genus can it be said that "der Unterleib ist schwarzlich," that "die Füße sind schwarz," or that "die Wollhaare sind glänzend schwarz." Possibly Tschudi heard accounts of the "Lebensweise und geographische Verbreitung" of this species, and then had palmed off on him as an otter an imperfect skin of some other animal altogether, possibly a Tayra, which he described.

No specimen is preserved under the name of *L. montana* in the Museum at Neuchâtel, where I have been able to examine the majority of Tschudi's types.

6. *Lutra mitis*, sp. n.

Nose-pad as in *L. incarum*, but rather more hairy, the hair above generally connected by a narrow mesial line with that below, though often more or less worn off in old specimens. In the most hairy specimens the band may attain at its narrowest part a breadth of about 2-3 mm., but it is more often about 1 mm. in breadth when not worn down.

General colour dark.

Skull smaller and lighter than in any other of the present

group of otters, with comparatively narrow interorbital region, small nasal opening, little expanded mastoid flanges, and small though well-swollen bullæ. Teeth light and delicate, the inner lobe of p^4 small.

Dimensions of the type skull (adult male):—Condylobasal length 103·5 mm.; basal length 94·5; zygomatic breadth 68; mastoid breadth 65; breadth of nasal opening 11·5; interorbital breadth 20; height of brain-case 37; palate length 47; antero-posterior diameter of p^4 10·6; greatest diameter of m^1 12·7.

Hab. Guiana and Eastern Brazil. Type from Surinam, other specimens from Cayenne (*Stevens*), Para (*Robert*), and Porto Real, Rio Janeiro (*Hardy du Déneuf*).

Type. Adult male. B.M. no. 86. 5. 12. 1*. Collected by Kappler.

This otter was considered by Gray to be F. Cuvier's *L. enudris* (*L. "enhydris"*), but the particulars which Prof. Trouessart has been so good as to give me of the typical skull of that species indicate that the latter is the larger and not the smaller Guianan otter.

7. *Lutra enudris*, F. Cuv.

Dict. Sci. Nat. xxvii. p. 242 (1823). (Guiana.)

Lutra insularis, id. t. c. p. 243. (Trinidad.)

Lutra enhydris, auct. (emend.).

Nose-pad with an unbroken band of hair passing down the nasal septum between the nostrils, 3–5 mm. in breadth at its narrowest point.

Size comparatively large, about as in *L. platensis*.

Skull much as in *L. platensis*, neither specially high nor flattened. Bullæ well swollen. Teeth large and heavy, the antero-posterior diameter of p^4 exceeding that of any other species of the group.

Dimensions of the type skull in the Paris Museum, kindly furnished me by Prof. Trouessart:—Length 112 mm.; breadth 80; p^4 , external length 14, greatest diameter (diagonally) 15, antero-posterior diameter 13.

Hab. Guiana and Trinidad.

Type skull in the Paris Museum.

Of this fine species the British Museum possesses an adult male skull from Demerara belonging to a specimen now

* Skull and skin having come separately, and a certain doubt being possible as to their belonging to each other, I would definitely select the skull as the type. The nose-pad of this specimen is damaged, but another skin that came with it shows the hairy structure particularly well.

mounted in the British Guiana Museum which I examined some years ago, and noted the characters of its nose-pad. This skull closely agrees with the dimensions of F. Cuvier's type kindly supplied to me by Prof. Trouessart.

In addition we have a skin without skull from Trinidad, therefore a topotype of F. Cuvier's *L. insularis*, which it may be taken to represent.

Unfortunately, as Prof. Trouessart informs me, the typical mounted skins of neither *L. enudris* nor *L. insularis* are now to be found in the Paris Museum. Happily by the help of the type skull of the former and the British Museum topotype of the latter we are able to identify both with practical certainty.

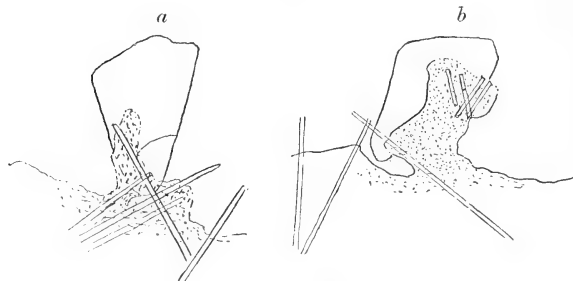
LXIV.—*The Inclusion of Foreign Bodies by Sponges, with a Description of a new Genus and Species of Monaxonida.*
By IGERNA B. J. SOLLAS.

OWING to the kindness of the captain of the 'Durham Castle' the Members of the British Association were allowed to land at Mozambique and at Mombasa on the homeward journey from South Africa in September 1905. An opportunity of half an hour's shore-collecting was thus afforded, and at Mozambique there was a rich growth of sponges, particularly of *Cinachyra voeltzkowi*, Lfd. One sponge, *Migas porphyron*, gen. et sp. n., which, owing to its consistency and general appearance, I supposed would prove to be a member of the Ceratosa, is, in fact, an interesting form of Monaxonida which possesses a skeleton consisting of both "proper" spicules and foreign bodies. Certain features in the cortex of this specimen seem to me to throw some light on the method by which foreign bodies are included in this case and possibly also in the case of other sponges.

Migas porphyron is a massive sponge; the surface is raised into a system of low ridges. The single specimen which I possess measures 4.5 × 2.5 cm. A fine individual of *Cinachyra voeltzkowi* has fixed and grown upon a part of its surface. The colour when living was dark purple, outwardly buff in the deeper parts; in spirit the purple has turned to grey. The dark pigment is contained in the granular cells of the cortex. The cortex is .8 mm. at its greatest thickness and contains large cavities. The chambers are very small, .015 mm. in diameter, few and aphodal.

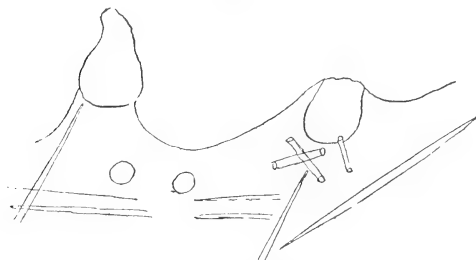
The proper skeleton consists of not very numerous oxeas measuring $\cdot96 \times \cdot016$ mm., and arranged partly in loose strands, partly irregularly. The strands run up to the surface and their free ends project. This spicular skeleton is supplemented by sand-grains scattered through the tissues and quite unconnected with one another. Most of them have a covering of some brown substance.

Fig. 1.



a and *b*. Portions of the surface of *Migas porphyrion*, showing the inclusion of sand-grains by pseudopodia-like extensions of the surface-tissue.

Fig. 2.



Portion of the surface of *Migas porphyrion*, showing a sand-grain seated on a pillar of cortical tissue.

The incorporation of foreign bodies occurs commonly among Ceratosa, and in the Monaxonida it is found in the Gelliodine genera *Phoriospongia* and *Sigmatella*, in the

Dendrocin species *Tedania commixta*, R. & D., and in the Ectyonine genus *Aulena*. In *Psammopemma* among *Ceratosa* and in *Tedania commixta* the foreign bodies are not enclosed in fibres, but lie in the ground-substance. Professor Minchin* speaks of this phenomenon as a "remarkable property possessed by the spongin fibres," and says, "Sand-grains . . . and such-like bodies which fall on to the surface of the sponge-body become included in the fibres, apparently by adhering to the tip of the fibre at its growing point, where it is continuous in all probability with the external cuticle of the sponge-body. The absorption of foreign particles into the spongin fibre is therefore not so much a question of their travelling down into it as of their being passively surrounded by spongin as the fibre grows upwards."

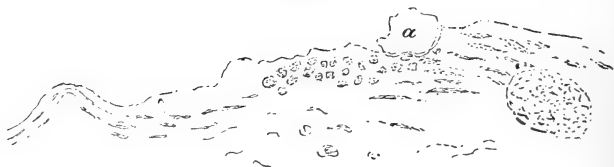
The appearance of the surface of the present species suggests that here, at any rate, inclusion takes place in a different manner. In thick freehand sections the sand-grains lying on the surface are seen to be enveloped by the superficial tissue of the sponge, which is raised up round them and adheres to them. Sometimes pseudopodia-like extensions of the sponge-tissue are found partially enwrapping the grain (fig. 1). When sand-grains are found, as in fig. 2, attached to the apex of a conulus, I believe that this results from a flow of material to the neighbourhood of the irritant grain, not from the sand-grain having fallen upon the summit of a conulus.

The abundance of sand-contents makes it difficult to cut thin sections while the grains are in place, the tissues were therefore demineralized with hydrofluoric acid. In sections of material treated for a day or two with this reagent some remnants of siliceous fragments were still present, but the outer layers were sufficiently free to admit of fairly thin sections being cut. In these sections it is seen that in the cortex there are numerous cells containing coloured granules; of these some are confined to the cortex, others aggregated in oval cell-clusters occur throughout the tissues. In both cases the granules conceal the nucleus. The granular cells are frequently elongated and fusiform; sometimes, particularly beneath remnants of foreign bodies (fig. 3) and on the flat summits of the low ridges of the cortex, they are of irregular rounded shape or lobed, and they are massed together in numbers. The surface of the sponge appears to me to be absolutely devoid of cuticle and to be bounded by granular cells. This observation was found to hold good also in

* 'A Treatise on Zoology' (edited by E. Ray Lankester), 1900, p. 42.

sections of selected bits of cortex which, owing to their comparative freedom from sand-contents, could be cut without desilicification. I cannot doubt that the inclusion of sand-grains is due to the activity of these small granular amœbocytes; and I think it is worth while to consider whether some similar cellular activity is not responsible for the inclusion of foreign bodies in sponges generally, for, on the hypothesis that this phenomenon is a property of the spongin-fibre, the fact of selection of particular kinds of foreign bodies by various species remains unexplained. Why, for example, do fibres of *Phyllospongia silicata* contain foreign spicule fragments, while in various other species of *Phyllospongia* sand-grains are found as the fibre-core? or, again, in *Hippospongia* why should one group of species possess fibres free from foreign bodies, while in a second and third group the fibres contain foreign spicules and sand-grains respectively? It seems to me still more difficult to account for the skeleton of some

Fig. 3.



Thin section of the desilicified cortex of *Migas porphyron*.
α, partially dissolved sand-grain.

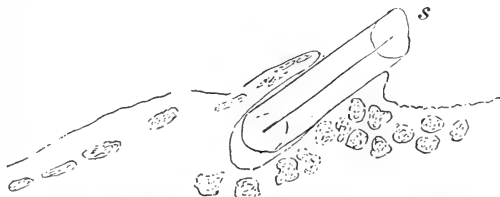
species of *Aulena* without the assumption of the selection of fibre-contents by cellular activity. Thus in *Aulena gigantea* in addition to the supporting skeleton, which is cored by sand-grains, there is a surface skeleton consisting of (1) siliceous spicules lying irregularly in the "skin," (2) a tangential network of stout fibres cored with an axial series of sand-grains, (3) echinated fibres running from these to the surface and cored with spicules. "The spicules in the skin are partly foreign, like those which are found in the axis of the echinated fibres" (Lendenfeld's description). The tangential network (2) being remote from the surface, surely the sand-grains must be carried to it.

Again, when foreign spicules are included in the fibre they are arranged with their long axes parallel to the axis of the

fibre. It can hardly be supposed that they fall on to the fibre-tip and adhere in this position.

In a sponge which I have described elsewhere as *Euspongia officinalis*, ? var. *rotunda*, the following points are to be noted:—The cortex is closely like that of *Migas porphyrion*, but deeper, and, being free from loose sand-grains, is easy to cut. The whole appearance suggests a tissue of which the cells are in active motion. There is an abundance of amœboid granular cells (like the smaller granular cells of *Migas porphyrion*); in places these form, as it were, streams of fusiform cells, but in other places the cell-bodies are more massive and crowded together. Often when the aggregation occurs at the surface the latter has minute irregularities, suggesting pseudopodia. Where foreign spicules are to be found just beginning to pass into the sponge there are clustered lobose granular cells (fig. 4). An argument which seems to me to be worth

Fig. 4.

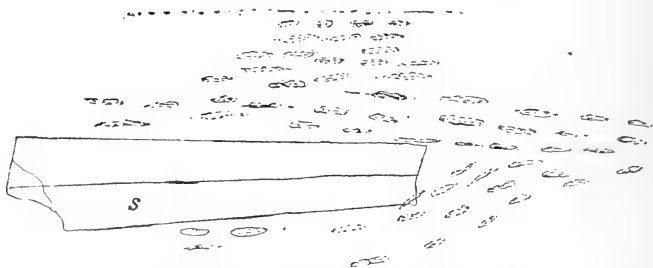


From the surface of *Euspongia officinalis*, ? var. *rotunda*.
s, foreign spicule fragment.

considering is this: within the cortex are scattered spicular fragments lying more or less parallel to the surface and obviously occupying the position which they had in the living sponge (fig. 5). Now the main fibres alone contain foreign bodies, and there are no free spicule fragments in the deeper parts of the sponge. What, then, is the meaning of this temporary position of the spicule fragments if it is not that they are on their way to the main fibres to which they are being carried by the granular cells? It is difficult to understand the concerted action of amœbocytes, but it is not more difficult in this case than in that of the wonderful migrations of cells carrying spicules with them which Evans has shown to occur during the formation of the gemmule-coat of *Spongilla*. Cotte attributes the excavating power of

Cliona to the action of amœboid cells at its surface; so that the foregoing suggestions are not without precedent, and, seeing that amœboid action within the sponge-body is well established, it would not be surprising if in such lowly creatures it should also occur at the outer surface.

Fig. 5.

External surface

From the cortex of *Euspongia officinalis*, var. *rotunda*.
s, foreign spicule fragment.

When I wrote the foregoing remarks I was unaware that the subject had already been discussed. The following statement of the position of the discussion is taken from von Lendenfeld's 'Monograph of Horny Sponges,' 1889, p. 768:—
" . . . The sponge *selects* from the material deposited [by currents and waves] such particles as it requires, and allows them to sink into the skin. Haeckel originally assumed that an active selection took place. This was contested by Schulze, who was of opinion that the selection, about the existence of which there cannot be any doubt, was not active but passive, and he compared the differences in the size and nature of the foreign bodies in different sponges and their uniformity in one and the same specimen with an ordinary sedimentary process, as the deposit of rough gravel in one part of a river-bed and the deposit of fine sand in the other. If Schulze's hypothesis be correct, that the nature of foreign bodies in sponges is the result of (1) the *physical* properties of the sponge, and (2) the circumstances of its surroundings, then, of course, the nature of the foreign bodies would change if the surrounding circumstances (premiss 2) changed. But this is not the case. In whatever circumstance the sponge grows

it always takes in the same kind of foreign matter. The sponges from widely different localities and depths are in this respect the same. We must therefore assume that a sponge *selects* from the numerous foreign bodies which fall on and adhere to its surface a certain kind only, and uses them to build up its fibres."

In conclusion, the case of *Tedania commixta* deserves a word of mention in that it shows that the inclusion of the sand-grains may occur as a result of more than one kind of activity of the sponge-tissues. In this species, of which I was fortunate enough to obtain a fragment through the kindness of Mr. Kirkpatrick, the body is divisible into (i.) an upper region, which has a well-developed spicular skeleton with a few sand-grains of small size scattered in the flesh and apparently taken in at the upper surface of the sponge, and (ii.) a lower region, in which the spicular skeleton is still present and more irregular, and in which numerous foreign bodies of various kinds and often of large size occur. So abundant is the foreign matter, and so large the size of many of the fragments, that there can hardly be any question of these included substances having passed through the upper region of the sponge; rather, the sponge has grown downwards, including as it grew the constituents of its substratum. Thus both the tissues of the free surface and of the basal surface appear in this case to engulf foreign matter.

LXV. — *New African Phlebotomic Diptera in the British Museum (Natural History)*.—Part II. *Tabanidae (continued)*. By ERNEST E. AUSTEN*.

GENUS HÆMATOPOTA, Meigen.

The following pages contain descriptions of twelve new species from Tropical Africa belonging to this genus, and at least as many more, examples of which are included in the National Collection, have yet to be described. Of most of these, descriptions will appear in the next instalment of this series of papers. Owing to the complicated nature of the wing-markings in *Hæmatopota*, which in most cases present valuable specific characters, the drawing-up of recognizable

* For Part I. see Ann. & Mag. Nat. Hist. ser. 8, vol. i. (March 1908 pp. 209-228).

descriptions of species, unaccompanied by figures, is a task of no little difficulty. It is hoped, however, that the following descriptions, if carefully studied, will be found to have achieved their object, and also that in any given case a perusal of the diagnosis in italics will suffice to show whether it be necessary to read the detailed description. In studying descriptions of wings regard should always be paid to the most important characters, such as the "*rosettes*" (which, if present, will be found surrounding the distal extremities of the basal and discal cells, and the fork of the third longitudinal vein), the *markings of the discal cell and of the wing-tip*, the nature of the *stigma*, and the presence or absence of a *large unbroken dark blotch beneath it*.

In order to characterize new species belonging to a fauna which has been well studied, it is frequently sufficient to indicate the points in which they differ from those already known. In studying *Hæmatopota*-material from Tropical Africa, however, we are breaking almost entirely new ground, and if descriptions of new species are to be recognizable it is impossible for them to be *short*. Allusion has already been made, in the introduction to the first paper in this series, to the peculiar richness of the Ethiopian Region in species of *Hæmatopota*. With the opening-up of Tropical Africa at present in progress new representatives of this genus are coming to hand almost every week, and it is probable that the species already known represent but a small minority as compared with those still to be discovered. As yet, therefore, it would be futile to attempt anything in the nature of a key to the African species of *Hæmatopota*: what is of far greater importance is to draw up such careful descriptions of new species, supported where practicable by a comparison with allied forms, that when the time arrives for the preparation of such a key it may be possible to construct it with reliability and precision.

The types of all the new species described below are in the British Museum (Natural History).

Hæmatopota pallidipennis, sp. n.

♀.—Length (9 specimens) 9 to 9·8 mm.; width of head 3·25 to 3·5 mm.; width of front at vertex 1·2 mm.; length of wing 8 to 8·3 mm.

*Smoke-grey**; *dorsum of thorax mouse-grey, abdominal segments, except last, on each side of middle line with an olive-*

* For names of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, & Company, 1886).

brown ring, enclosing a grey spot; antennæ russet, frontal callus clove-brown; wings pale smoke-grey, light markings milky; hind tibiæ with two light rings.

Head rather broad, lateral frontal and median frontal dark brown spots well marked; *frontal callus* of moderate depth, upper margin nearly straight, very slightly concave on each side of middle line; face and jowls pearl-grey, clothed with white hair; *palpi* pale cream-buff or greyish buff, clothed with white or yellowish-white hair, interspersed on outer side of terminal joint with minute black hairs; first joint of *antennæ* somewhat incrassated, first and second joints clothed with black hair, upper angle of second joint conspicuously produced, last three annuli of third joint dark brown, length of last annulus less than that of the two preceding annuli taken together. *Thorax*: dorsum with an olive-grey median stripe running from front to hind margin and a pair of admedian stripes, generally becoming indistinct behind transverse suture, but reappearing near hind margin; dorsum clothed with whitish hair. *Abdomen*: olive-brown rings on dorsum in contact with front margins of segments, but leaving well-marked hind borders of smoke-grey, and usually a smoke-grey median stripe; venter light grey, hind margins of segments cream-coloured. *Wings* with the darker ground-colour very pale, markings of the usual type; extreme tips, from end of second vein to that of main stem of third, with a milky border, in connexion with sinuous mark running down from end of second vein; markings rather coarse, more or less distinct rosettes in the usual places—round fork of third vein and ends of discal and basal cells; markings running obliquely across posterior cells and ending on hind border immediately behind terminations of veins; two milky marks across discal cell, and usually two across each basal cell; the two latter markings are continued more or less distinctly across the anal and axillary cells; mediantinal (or auxiliary) and first longitudinal veins ochraceous; veins bounding distal extremities of both basal cells and base of upper branch of third longitudinal vein infuscated; *stigma* short, light brown, sometimes paler. *Halteres* straw-yellow, knob brown or brownish above and below. *Legs*: coxæ clothed with whitish hair, front coxæ whitish grey, middle and hind coxæ dark grey; femora ochraceous buff; tibiæ cream-coloured, distal half of front tibiæ dark brown, middle and hind tibiæ with brown bands at base, in middle, and at tips; front tarsi black, middle of hind tarsi brown, basal two thirds of first joints of middle tarsi, basal half of first joints of hind tarsi cream-coloured.

Northern Nigeria: type and six other specimens from Zaria, 1905 (*Captain F. U. Carr, A.V.D.*); one specimen from Kontagora, 1907 (*J. Brand*); one specimen from above Bajibo, left bank of R. Niger, Nupe Province, 12. xi. 1906 (*Major C. B. Simonds, R.G.A., Anglo-French Boundary Commission*), "biting native paddler in canoe."

Hæmatopota pallidipennis is allied to *H. brunnescens*, Ricardo, which is found in Uganda and the Nyasaland Protectorate; it is distinguished, *inter alia*, by the colour of the frontal callus, the presence of a well-marked median frontal spot, the narrower and more elongated basal portion of the third joint of the antennæ, the coarser wing-markings, and the milky border to the extreme tip of the wing.

Hæmatopota inflaticornis, sp. n.

♀.—Length (7 specimens) 8 to 8.75 mm.; width of head 2.6 to 3.2 mm.; width of front at vertex 1 to 1.2 mm.; length of wing 7 to 7.75 mm.

Stoutly built thick-set species, with somewhat broad body; dorsum of thorax olive-brown, with three narrow olive-grey longitudinal stripes; abdomen broadly bordered on each side and at distal extremity with olive-grey, and with a broad median dark brown stripe, diminishing in width from base to sixth segment, where it terminates, narrowly interrupted on hind margins of segments; first joint of antennæ elongate and conspicuously incrassate, especially when viewed from above; hind tibiæ with two pale bands.

Head smoke-grey, median frontal as well as lateral frontal dark brown spots usually well marked, but former sometimes inconspicuous, a pair of subquadrate admedian dark sepia-coloured spots on vertex, separated by an olive-grey stripe running upwards from median frontal spot; *frontal callus* black, of moderate depth, its upper margin straight; face and jowls clothed with yellowish-white hair, a few dark brown hairs on each side of face; *palpi* olive-grey, clothed with rather long pale yellowish hair, terminal joint not much thickened towards base, and on upper portion of outer side of distal half sometimes with black hairs interspersed with the pale hair; *antennæ* black, first joint dull olive-grey polli-nose, distal extremity (sometimes including as much as distal third) usually shining black, first joint clothed with rough pale yellowish hair, with some black hairs above and at tip, upper angle of second joint strongly produced, third joint ending bluntly, annuli of considerable relative depth, terminal annulus rather shorter than two preceding annuli taken

together. *Thorax*: pleuræ, pectus, and anterior border of dorsum smoke-grey; dorsum clothed with short, deciduous, shining, pale yellow hairs, pleuræ clothed mainly with yellowish-white hair, præalar calli clothed below with blackish-brown hair; *scutellum* mouse-grey, with a dark olive-brown blotch on each side of middle line. *Abdomen*: olive-grey border of dorsum somewhat olive-brown on sides of distal half and at tip, median line usually more or less distinctly marked with mouse-grey, hind borders of segments smoke-grey to mouse-grey on basal, light olive-brown on distal half; dorsum clothed with short pale yellow hair on grey borders, in centre of first segment, and on hind margins of all segments, and with brownish hair on dark brown area; venter uniform smoke-grey, clothed with whitish-yellow hair. *Wings* pale brown, light markings of usual type but rather coarse, and often running together in such a way as to produce a very confused pattern, markings extending throughout whole area from base of basal cells and axillary incision to end of second longitudinal vein; *stigma* light brown, not sharply marked, but with a distinct quadrate brown patch below it extending to third vein, and there sending off a narrower process which reaches fourth vein where it forms upper boundary of distal half of discal cell; distal portion of marginal cell beyond stigma often almost entirely pale; each end of discal cell often occupied by a more or less complete pale loop, separated by a brown band across centre of cell, and each with a centre of dark ground-colour; the three usual rosettes generally more or less distinct, but sometimes partly obliterated owing to fusion of markings; sinuous V-shaped mark beyond fork of third vein usually distinct; along posterior margin of wing a row of light markings often, but not always, present in distal angles of some or all posterior cells; basal cells each with a more or less complete pale loop at each end; anal angle with a more or less complete broad pale border, one extremity of which runs inwards, as usual, across anal cell, while the other ends in the usual loop in angle formed by axillary incision and sixth longitudinal vein. *Halteres* straw-yellow, knob brown above and below. *Legs*: coxæ and femora mouse-grey, tibiæ ochraceous buff, with brown rings; front tibiæ brownish at extreme base, dark brown at tip, and with a brownish band below middle, partly in contact with dark brown tip; middle and hind tibiæ with three brown bands, situate respectively at base, apex, and in middle; front tarsi dark brown, basal half or two-thirds of first joint

russet; middle and hind tarsi buff, last joint and tips of remaining joints dark brown.

Angola: type and five other specimens from Bihé, November–December 1904 (Dr. F. Creighton Wellman); a sixth specimen from Benguella, 1905 (Dr. F. C. Wellman). Dr. Wellman's field-note on this species states:—"About 60 specimens in plains and edges of bush, 300 miles from coast. Active."

H. inflaticornis is sufficiently distinguished from its African congeners at present known by the broad grey lateral border to the abdomen. In the case of one specimen in Dr. Wellman's series, on the third and following segments there is a dark mark in the grey border on each side, which would appear to indicate that the border has been produced by the fusion with the grey lateral edging of a dorsal series of paired grey spots.

Hæmatopota brevicornis, sp. n.

♀.—Length (12 specimens) 6.75 to 8.75 mm.; width of head 2.3 to 3 mm.; width of front at vertex 1 mm.; length of wing 7 to 8.5 mm.

Olive-brown; dorsum of thorax with three olive-grey or smoke-grey longitudinal stripes, dorsum of abdomen with lateral borders, a double series of spots often more or less merged in the lateral borders, hind margins of segments, and a more or less distinctly marked narrow median stripe smoke-grey; antennæ (except tips) and legs ochraceous, front tarsi, and front tibiæ except basal third brown, middle and hind tibiæ slightly brownish, with two faintly marked paler bands; frontal callus like yellow horn, forming a prominent transverse ridge.

Head drab-grey, clothed with pale yellowish hair, lateral frontal dark brown spots well marked, median frontal spot very small or wanting, a brownish mark usually visible between eye and base of antenna on each side; upper margin of frontal callus curved, convex, or angulate in middle; palpi cream-buff, clothed below with yellowish hair, terminal joint thickly clothed on outer side with minute black hairs; antennæ short, first joint somewhat incrassate, terminal annuli of third joint short, black (sometimes brown), ending bluntly and of practically same depth throughout, length of last annulus less than that of two preceding annuli taken together, first and second joints of antennæ and upper margin of part of basal portion of third joint clothed with black hair. Thorax: dorsum with a pair of conspicuous crescentic pearl-grey marks on hind border, one in front of each basal angle

of scutellum; hind margin of latter olive-grey, olive-brown area on disk sometimes divided; pectus and pleuræ drab-grey. *Abdomen* clothed for the most part with minute ochraceous hairs, darker parts of dorsum with brownish hair; venter yellowish grey, unicolorous. *Wings* brownish, pale markings clearly defined throughout, from base of basal cells to end of fork of third longitudinal vein, but coarse and much broken up, especially in apical portion; *stigma* russet or pale ochraceous, elongate, and well defined; pale loop at distal end of stigma rather narrow; first submarginal cell crossed by pale marks at subequal intervals, and sometimes with a relatively rather large pale blotch at its distal extremity, in angle formed by upper branch of third vein with costa; second submarginal cell crossed by three pale streaks, and in addition usually with a pale mark immediately below tip of upper branch of third vein; posterior cells with a distal series of oblique detached pale marks, running at an angle of about 45° to hind margin, and sometimes also with a series of pale marks along hind margin itself, in the proximal angles formed by the veins; rosettes round distal extremities of discal and basal cells more or less distinct; discal cell with two pale marks across central portion and usually a third pale mark in distal extremity; markings in basal, anal, and axillary cells normal, an almost complete loop at base of axillary cell, in angle formed by sixth longitudinal vein. *Halteres* light mummy-brown, stalk cream-coloured. *Legs*: middle and hind tarsi brown, except basal three-fourths of first joints, front tarsi as usual darker.

Angola: type and eleven other specimens from Benguela, 1905 (*Dr. F. Creighton Wellman*).

In the abdominal markings, at any rate, *Hematopota brevicornis*, like *H. pallidipennis*, presents a certain resemblance to *H. brunescens*, Ricardo, alluded to above; but, apart from its usually smaller size, it may be distinguished, *inter alia*, by the shortness of the terminal annuli of the third antennal joint and by the coarseness of the pale markings of the wings.

Hematopota bullatifrons, sp. n.

♀.—Length (5 specimens) 8.6 to 10 mm.; width of head 3.25 to 3.5 mm.; width of front at vertex 1 to 1.3 mm.; length of wing 8 to 9 mm.

Dark-coloured species, with grey-striped thorax and dark brown, very distinctly marked wings.—Head smoke-grey, frontal callus a shining clove-brown or black knob, not ex-

tending beyond antenna on each side; thorax seal-brown; scutellum smoke-grey, hind border seal-brown; abdomen clove-brown or black, hind borders of segments cinereous; legs black or blackish brown, middle femora lighter, front tibiæ with a cream-buff band close to base, two bands on middle and hind tibiæ (often incomplete or indistinct in case of latter) and base of first joint of middle and hind tarsi buff, front and hind tibiæ expanded, front and hind femora and hind tibiæ fringed above and below with long black hair, middle femora and outer side of hind femora and tibiæ also clothed with greyish-white hair.

Head: lateral frontal dark brown spots large, conspicuous, not in contact with eyes, median frontal spot small, inconspicuous, vertex with a large seal-brown spot on each side of middle line; a large clove-brown or black spot below and in contact with inner angle of each eye, on a level with antennæ, and a third spot of same colour between antennæ below callus, with which it is in contact; frontal callus widely separated from eyes, its upper margin convex; lower part of face and jowls clothed with yellowish-white hair; palpi smoke-grey, clothed with yellowish-white hair, distal half of last joint black, clothed with minute black hairs, last joint but little expanded at base; first joint of antennæ buff, expanded towards tip, which is dark brown, second joint clove-brown, third joint seal-brown or dark brown, extreme base buff, basal portion elongate, slender, and tapering, last annulus equal in length to two preceding annuli taken together. *Thorax*: median dorsal stripe stopping short of hind margin, admedian stripes expanding posteriorly, curving outwards on hind margin and running forwards again as far or nearly as far as transverse suture, with a backward process on each side on to postalar callus; pleuræ and pectus smoke-grey. *Abdomen*: cinereous hind border of second segment expanded in middle line into a narrow forwardly-directed triangle, hind borders of all segments expanded on sides, sixth and seventh segments each with a pair of admedian grey spots; abdomen clothed above with short blackish hair, except hind borders and sides of segments, which are clothed with whitish hair; venter cinereous, clothed with minute appressed whitish hair, last three segments except hind margins black and clothed with black hair. *Wings*: a very conspicuous, quadrate, dark brown blotch extends downwards from stigma; as far as third longitudinal vein it is usually unbroken, below this its continuation widens out and includes rosette round distal end of discal cell, the markings composing which are slender and sharply defined; another,

somewhat triangular and rather paler brown blotch, extends downwards from tip of marginal cell, its apex reaching lower branch of third vein; a third, basad, dark brown blotch extends from second longitudinal vein in middle of first basal cell to anal angle, widening out below; in tip of wing a sinuous light mark, broadest above, runs from end of second vein to distal extremity of second posterior cell; beyond this, in extreme tip of second submarginal cell, is a second light mark, sometimes connected with former above, in other cases fused with it to form a large light mark close to tip of wing; markings forming rosettes on each side of blotch below stigma usually more or less coalescent above, where they reach costa, so that there is a light area of some extent at each end of stigma; a large light area in distal extremity of first posterior cell, in connexion with rosette round fork of third vein; a series of narrow disconnected curved marks running across middle of second and following posterior cells, and a series of pale blotches on hind margin, one in distal angle of each posterior cell except fourth; proximal extremity of discal cell, distal extremities of both basal cells (partly) and of anal and axillary cells, as well as a narrow sinuous mark running from hind margin of axillary cell to fifth vein, a curved mark in anal angle with concave side basad, a mark across second basal cell near its base, and usually another in first basal cell nearer its middle, pale; extreme bases of both basal cells generally with pale markings; alula uniformly dark brown. *Halteres* dark brown, stalk buff. *Legs*: middle and hind femora partly ochraceous buff, greyish pollinose; greyish-white hair mingling with upper part of fringe on outer side of hind tibiae.

Northern Nigeria: type and one other specimen from Zungeru, June-July 1905 (*Dr. Dalziel*, per Dr. J. H. Ashworth); three specimens from Zungeru, July 1907, Marca, 4. vii. 1907, and Katsena Allah, August 1907, respectively (*J. Brand*).

While presenting a certain superficial resemblance in *facies* to *Hematopota decora*, Walk. (syn. *H. dorsalis*, Lw.), *H. bullatifrons* is not closely allied to any of its African congeners known to me, from which, apart from other characters, it can at once be distinguished by its swollen and fringed hind tibiae.

Hematopota torquens, sp. n.

♀.—Length (2 specimens) 9 to 9.2 mm.; width of head

3 mm.; width of front at vertex just under 1 mm.; length of wing 8 mm.

Brown; *frontal callus* large, clove-brown or black; *dorsum* of *thorax* bistre, of *abdomen* mummy-brown, darker towards tip, hind margins of segments lighter, greyish buff; *wings* sepia-coloured, light markings buff, largely moniliform, rosettes rather indistinct; *femora* ochraceous buff, tips brown; *front tarsi* and *distal half* of *front tibiæ* black or blackish brown, *basal half* of *front tibiæ* cream-coloured, clothed with white hair; *middle and hind tibiæ* and *tarsi* dark mummy-brown, two bands on *tibiæ* and *basal two-thirds* of *first tarsal joints* buff or cream-buff; *distal half* of *front tibiæ* expanded.

Head: front yellowish grey, face and jowls light grey, latter clothed with white hair, lateral frontal dark brown spots large, conspicuous, in contact with eyes when seen from below, median frontal spot very small or wanting; *frontal callus* extending from eye to eye, depth of its sides equal to half its width, upper margin rising to a point in middle line; a clove-brown spot in middle line below callus, with which it is in contact; *palpi* buff, last joint elongate, not greatly expanded at base, clothed on outer side with minute black hairs, intermixed with some yellowish hairs towards base; *antennæ* cinnamon-coloured, basal portion of third joint except extreme base browner, terminal annuli dark brown, last annulus equal or almost equal in length to two preceding annuli taken together, first joint of antennæ somewhat expanded towards tip, but not markedly incrassate, basal portion of third joint elongate. *Thorax*: *dorsum*, including scutellum, clothed with minute shining yellow hairs, easily rubbed off; *dorsum* marked with three narrow smoke-grey stripes, more or less indistinct except in front, continuation of admedian stripe on each side marked by a spot behind transverse suture and usual crescentic mark on hind margin; *pleuræ* and *pectus* smoke-grey, clothed with whitish hair. *Abdomen*: *dorsum* clothed with minute brownish hairs; hind margins of segments with yellowish hair, median portion of front margin of second segment sometimes narrowly grey; *venter* smoke-grey, clothed with minute appressed whitish hairs, hind margins of segments except last lighter. *Wings*: *stigma* dark mummy-brown, distinct, but brown blotch below it not conspicuous or sharply defined, on other hand brown colour in tip of wing, that is beyond rosette round fork of third vein, somewhat darker than elsewhere; in extreme tip of wing an irregular curved mark, with its concavity towards apex of wing, runs down from below end of second longitudinal vein, and is indistinctly connected with margin in

middle of end of second submarginal cell; light mark (upper margin of rosette) immediately beyond stigma small and narrow; posterior cells crossed diagonally by several series of disconnected or semi-disconnected moniliform marks, and all except fourth with a light mark in distal angle on wing-margin; discal cell with a minute light mark in proximal angle, a transverse mark before middle, and a more or less incomplete loop in distal half; markings in basal and axillary cells of normal type, apex of anal cell not light-coloured. *Halteres* cream-buff, base of knob brownish above and below.

Ashanti: Insu, Gold Coast Government Railway, 17. viii. 1906 (*Dr. W. M. Graham*).

Hæmatopota torquens is closely allied to *H. cordigera*, Bigot (Ann. Soc. Ent. Fr. lx. 1891, p. 369*—*nec* Bigot, Mém. Soc. Zool. Fr. v. 1892, p. 626), the type of which from Assini, Ivory Coast, I have been enabled to examine through the courtesy of Mr. G. H. Verrall, in whose possession it now is. These two species present a strong similarity to each other in certain details, such as the shape of the frontal callus and antennæ, but *H. torquens* is distinguished, *inter alia*, by the disk of the scutellum being brown, like the remainder of the dorsum of the thorax, instead of smoke-grey, by the deeper yellow colour of the hair clothing the dorsum of the thorax, the paler femora, the first joint of the hind tarsi being cream-buff except the distal third, instead

* Syn. *H. guineensis*, Bigot, Bull. Soc. Zool. Fr. xvi. 1891, p. 76. Although the name *guineensis* was published before *cordigera*, Bigot (Ann. Soc. Ent. Fr. *loc. cit.*), the description (only two lines) is too short to be recognizable. In the original label on the type of *H. cordigera* (Ann. Soc. Ent. Fr. *loc. cit.*) the word *cordigera* has been struck out and *guineensis* inserted below in Bigot's handwriting. It is evident that Bigot, after reading (February 11, 1891) his paper on the Diptera collected by M. Ch. Alluaud in Assini, in which the original *H. cordigera* was described (Ann. Soc. Ent. Fr. *loc. cit.*), thought that the name *cordigera* would be more appropriate to the species from India to which it was applied by him (without, however, a recognizable description) in the "Tableau Synoptique" of the species of the genus *Hæmatopota*, read before the Société Zoologique de France on February 24, 1891 (Bull. Soc. Zool. Fr. *loc. cit.*), in which the West-African species styled *cordigera* in the paper read thirteen days previously is called *guineensis*. Although read later, the paper in the Bull. Soc. Zool. Fr. was actually published some months earlier (certainly before the end of May 1891) than that in the Ann. Soc. Ent. Fr., which did not appear until December 23, 1891; but, as has already been stated, *H. guineensis*, Bigot, is insufficiently characterized. It follows from this that the name *cordigera*, Bigot, must be reserved for the West-African species and that *H. cordigera*, Bigot, Mém. Soc. Zool. Fr. 1892, p. 626, from Bengal, must be renamed. I would propose to term the latter species *Hæmatopota fuscifrons*.

of entirely brown, as well as by certain differences in the wing-markings.

Hæmatopota vexans, sp. n.

♀.—Length (1 specimen) 6·5 mm.; width of head 2·25 mm.; width of front at vertex 1 mm.; length of wing 6·6 mm.

Small brown species, with dark brown distinctly marked wings; thorax dark sepia-coloured, front part of dorsum with beginnings of three narrow grey stripes; scutellum smoke-grey; abdomen uniform clove-brown, dorsum with hind margins of segments except last narrowly pearl-grey; wings with cream-coloured light markings, rosettes somewhat confused, a conspicuous transverse light mark connecting tip of second and that of lower branch of third vein, and a light mark in distal angle of each posterior cell, on hind margin; legs dark brown, all tibiæ with narrow indistinct pale band close to base, middle tibiæ with a second indistinct pale band below middle, first joint of middle and hind tarsi except tip cream or cream-buff, other joints pale at base, first joint of front tarsi except tip mummy-brown; front tibiæ incrassate.

Head: front wide, mouse-grey, face and jowls pearl-grey, latter clothed with whitish hair, face on each side with a narrow, horizontal, dark brown streak below level of antennæ; lateral frontal dark brown spots large, conspicuous, each surrounded by a distinct light grey ring and narrowly separated from eye, median frontal spot small, inconspicuous; *frontal callus* seal-brown, narrow from above downwards in centre, but deeper at sides, running straight across from eye to eye, upper margin straight, a conspicuous quadrate clove-brown spot in middle line below, in contact with lower margin of callus; basal joint of *palpi* dark brown, clothed with long whitish hairs below and black hairs on outer side, terminal joint drab-grey or mouse-grey, relatively large, elongate, somewhat swollen, blunt at tip, clothed on outer side with blackish and below with yellowish hair; first and second joints of *antennæ* russet, third joint mummy-brown, last three annuli clove-brown, first joint somewhat elongate, not incrassate, curved, with concave side outwards, upper angle of second joint blunt, basal portion of third joint elliptical, terminal annuli flattened from side to side. *Thorax*: dorsum (including scutellum) clothed with minute pale yellowish hairs, continuation of admedian stripes in shape of a small grey spot on each side behind transverse suture, and usual crescentic marks on hind margin, continuation of median stripe distinct from midway between

suture and hind margin; pleuræ and pectus mouse-grey. *Abdomen* clothed with blackish hair, dorsum with sides of second and third segments and hind margins of all segments except last two clothed with minute whitish hairs. *Wings*: dark brown blotch below stigma clearly defined, extending unbroken to below third vein, with an oblique prolongation across first posterior and discal cells; in marginal cell immediately beyond stigma a complete flattened light ring enclosing a centre of brown colour; a series of disconnected oblique light markings running across all posterior cells; a light marking in each extremity of discal cell and of both basal cells, and a large light marking occupying distal half of anal cell; similar light markings (remains of rosette) at base of first submarginal and first, fourth, and fifth posterior cells; a small indistinct light mark at distal extremity of second costal cell; a large light loop in anal angle, with narrow opening above, below sixth vein, and a continuation each way along latter; *alula* with a light border. *Halteres* brownish, stalk cream-coloured. *Legs*: black hair on outer side of hind tibiæ fairly thick.

Congo Free State, 1904 (*Drs. Dutton, Todd, and Christy*).

In some respects, such as coloration of body and width of front, this species resembles *Hematopota longa*, Ricardo, the type of which is from the Nyasaland Protectorate; apart from its much smaller size, however, *H. vexans* may be distinguished, *inter alia*, by the fact that in the wing the stigma is not conspicuous, being lost in the dark colour of the brown blotch below it, and by the absence of a second light band on the hind tibia.

Hematopota brucei, sp. n.

♀.—Length (1 specimen) 11 mm.; width of head 4 mm.; width of front at vertex 1.2 mm.; length of wing 10.75 mm.

Clove-brown, abdomen blackish brown or black, hind margins of segments except first light grey on dorsum; face with a deep black transverse band above, white below; hind margin of thorax greyish white, with forwardly-directed processes; anterior half of disk of scutellum greyish white; wings black or blackish brown, light markings much reduced; legs black, all tibiæ with a broad white or cream-coloured band close to base, middle tibiæ with a second band on distal half; hind tarsi entirely black.

Head: front clove-brown, a narrow greyish-white edging on each side above lateral frontal blackish-brown spot,

below which is also a small light fleck, greyish-white edging broader on vertex, narrower in middle; lateral frontal blackish-brown spots large, conspicuous, and broadly in contact with eyes, median spot also distinct; *frontal callus* very narrow from above downwards, running straight across from eye to eye, upper margin straight; upper edge of black transverse band on face in contact with callus, lower edge level with lowest part of margin of eye on each side; jowls and lower part of face clothed with white hair; *palpi* cream-coloured, basal joint brownish below, terminal joint not greatly elongate, clothed with whitish hair, mixed on outer side of distal half with minute black hairs; *antennæ* clove-brown, first joint cylindrical, somewhat incrassate, notched above near tip, clothed with black hair and shining on outer side, second joint with upper angle greatly produced, basal portion of third joint somewhat elongate, deep at base and tapering to distal extremity. *Thorax*: dorsum in front with commencement of a pair of narrow greyish-white admedian stripes, in line with each of which and behind transverse suture is a greyish-white spot; greyish-white hind border, which includes inner halves of postalar calli, clothed with yellowish hair and produced forwards into a broad pointed process on each side and a narrow median pointed prolongation; between median and each lateral process is a small angulate process, tips of three longer processes in line with each other; a small elongate greyish-white fleck on each side behind humeral callus; pleuræ with a broad longitudinal greyish-white stripe covering upper portion of mesopleura and extending on to pteropleura, sternopleura also with an oval greyish-white spot on posterior half of its upper margin. *Abdomen*: first segment light grey on posterior angles, second segment light grey on sides, its grey hind margin deeper than that of other segments; sixth segment with a pair of grey spots in front; venter grey on first three segments except anterior angles and with a grey blotch on each side of next three segments, leaving anterior angles blackish brown; ventral surface of seventh segment, except extreme hind margin, which, like that of the two preceding segments, is cream-buff, and lateral edges, which are grey, wholly blackish brown; venter clothed on grey areas with short yellowish hair, elsewhere, like dorsum, with black hair. *Wings* black or blackish brown from extreme base, *stigma* dark seal-brown, large, sharply defined, and conspicuous; usual rosette round distal extremity of discal cell wanting, so that blackish-brown blotch below stigma extends almost unbroken to posterior margin; light mark in extreme

tip of wing below end of second vein very faint, indistinctly bifurcate in first submarginal cell; a group of three somewhat more distinct light marks in basal half of second submarginal cell, proximal mark the longest, continued across first submarginal cell to second longitudinal vein, middle mark connecting the two branches of third vein, distal mark a mere spot on lower branch of latter; a small, roughly circular, light mark in marginal cell at distal extremity of stigma, enclosing a darker centre and with a nearly straight prolongation running downwards across first submarginal cell to third vein before its bifurcation; a large light blotch occupying distal extremity of first posterior cell, and a small, sharply defined, light spot on lower side of third vein, below end of appendix to upper branch of latter; usual series of oblique, disconnected, light markings running across posterior cells scarcely indicated, but a series of light blotches on hind margin in or near distal angles of second, third, and fifth posterior cells, and a larger light blotch round end of sixth vein and in apex of anal cell; rosette round distal extremities of basal cells incomplete but well defined, a large curved light mark near tip of second basal cell especially noticeable; first and second costal cells but very slightly infuscated; *discal cell* entirely dark, except a single, well-defined, transverse light mark before middle; axillary cell with a small light spot near centre of its hind margin; alula entirely dark. *Halteres* cream-coloured. *Legs* clothed with whitish hair on light bands, elsewhere with black hair; first joint of middle tarsi cream-buff at extreme base.

Uganda: Unyoro, 1903 (*Colonel David Bruce, C.B., R.A.M.C., F.R.S.*).

This handsome species, which I have much pleasure in naming in honour of its discoverer, is closely allied to *Hæmatopota decora*, Walk. (syn. *H. dorsalis*, Lw.), which also occurs in Uganda, though its type is from Natal. The following summary may serve to indicate the chief points in which *H. brucei* differs from *H. decora*:—front almost entirely clove-brown, grey colour confined to lateral margins of upper half, and a minute fleck below each lateral frontal blackish-brown spot (in *H. decora* the front is grey, with brown markings); median process from grey hind border of thorax pointed instead of usually ending bluntly, lateral processes of same larger, not divided, and extending as far forward as median process; hind tarsi entirely black, instead of first joint having broad cream-coloured band at base; much greater extent of dark colour in wing, pale marking close to apex quite small and indistinct, discal cell entirely

dark with exception of a single transverse light mark before middle.

Hæmatopota cruenta, sp. n.

♀.—Length (1 specimen) 9 mm. ; width of head 3·2 mm. ; width of front at vertex just under 1 mm. ; length of wing 7 mm.

Clove-brown, dorsum of abdomen with hind margins of segments and a double series of spots grey; frontal callus large, black, extending from eye to eye, upper margin produced upwards into a blunt median process; a large, circular, shining black median tubercle on face below antennæ; posterior margin of thorax and base of scutellum light grey; infuscation of wings uniform and extending to base, but not dark, light markings distinct, rosettes more or less broken up into spots; legs black, all tibiæ with a broad white band close to base, middle tibiæ with a second narrower band on distal half, first joint of middle and hind tarsi cream-coloured at base.

Head smoke-grey, front with a brownish mark on each side above lateral spot, sides of face with black blotches (partly denuded?) and clothed like jowls with whitish hair, lateral frontal and median frontal dark brown spots small, former in contact with or scarcely separated from eyes; *palpi* mouse-grey, lighter at extreme tips, clothed with shining whitish hair; *antennæ* clove-brown, basal portion of third joint somewhat lighter and elongate-ovate, first joint short, not or scarcely incrassate, pollinose, clothed with whitish hairs beneath. *Thorax*: dorsum with commencements of three pearl-grey stripes in front, further back continuation of each admedian stripe is represented by a small pearl-grey spot behind transverse suture and usual crescentic mark on hind margin, a very narrow continuation of median stripe runs forward from hind margin rather more than halfway to transverse suture; humeral calli pearl-grey above; pleuræ and pectus mouse-grey, former clothed with whitish hair; dorsum sparsely clothed with minute shining yellowish hairs. *Abdomen*: grey hind margin of dorsum of second segment the deepest, first four segments grey on sides, spots on third and fourth segments larger than rest; first three (really first four) segments of venter grey, remainder clove-brown with grey hind margins; grey areas above and below clothed with minute whitish hairs, elsewhere abdomen clothed for most part with blackish hair, last segment of dorsum with longer whitish hair on hind margin. *Wings* with conspicuous

dark brown *stigma*, below which a small quadrate brownish blotch descends to third vein; light mark beyond *stigma* also conspicuous, roughly circular, with small dark centre; apical sinuous light mark from tip of second longitudinal vein to lower branch of third distinct, as also mark in second submarginal cell, between former and rosette round fork of third vein; usual three rosettes distinct, though broken up as stated above; hind margin of wing with large light blotches in distal angles of first, second, third, and fifth posterior cells and axillary cell; usual oblique markings across posterior cells in form of more or less detached spots; discal cell with a small light spot in or near proximal and distal angles, a transverse light mark at end of basal third, and a second transverse light mark (broken up into two spots in typical specimen) at commencement of distal third; light marking in apex of each basal cell in form of an imperfect loop, and each of these cells with usual transverse mark before middle; an incomplete double loop at commencement of distal third of anal cell; markings in axillary cell of usual type, but incomplete. *Halteres* cream-coloured, knob seal-brown at base above and below. *Legs*: front tibiae slightly incrassated; hind femora with some silvery hairs on distal half of upper side; hind tibiae with a faint indication of a lighter mark (a rudimentary or vestigial band) on outer side of distal half.

S.-E. Congo Free State: Ruwe, Lualaba River (circa 11° S., 26° E.), February 1906 (*Dr. A. Yale Massey*).

Hematopota cruenta is not closely allied to any other African species at present known to me; although agreeing with *H. decora*, Walk., in the markings of the tibiae, it is easily distinguishable from that species by, *inter alia*, the shape of the frontal callus, the short and non-swollen first joint of the antennae, the facial markings, and the marking of the dorsum of the thorax.

Hematopota sanguinaria, sp. n.

♀.—Length (3 specimens) 8 to 8.6 mm.; width of head 2.8 mm.; width of front at vertex 0.75 mm.; length of wing 7.3 to 7.5 mm.

Mummy-brown, with darker brown grey-spotted abdomen, last joint of antennae tawny ochraceous, distal portion of scutellum conspicuously ochraceous buff.

Head yellowish grey, clothed below with yellowish hair, sides of front nearly parallel, front but little expanded below; lateral frontal dark brown spots well marked, in

contact with or narrowly separated from eyes, median frontal spot very small; *frontal callus* mummy-brown to clove-brown, relatively deep, extending from eye to eye, lower margin straight, upper margin usually slightly convex; no distinct spot below callus, between bases of antennæ; *palpi* buff or cream-buff, terminal joint elongate, clothed on outer side with minute black hairs and on under side of basal portion with yellowish hair; first joint of *antennæ* shining ochraceous, incrassate when viewed from above, clothed like second joint with short black hair, upper angle of second joint greatly produced, basal portion of third joint elongate-ovate, *last three annuli of same colour as basal portion*, terminal annulus brownish only at extreme tip. *Thorax*: usual three stripes on dorsum smoke-grey, median stripe entire, admedian stripes sometimes more or less interrupted behind expansions on posterior margin of transverse suture; humeral calli drab-grey, adjacent area smoke-grey; pectus and pleuræ smoke-grey, clothed with whitish hair; dorsum (including scutellum) sparsely clothed with minute shining yellowish hairs; scutellum with a narrow mouse-grey transverse band close to base. *Abdomen*: dorsum of each segment, except sometimes first or first and last, with a pair of conspicuous admedian smoke-grey or drab-grey spots, except on first and second segments applied to front margins of segments, forming a double series extending throughout entire length of abdomen; hind margins of segments and a more or less conspicuous median longitudinal stripe on each segment except first and last yellowish grey; venter greyish buff, clothed with minute yellowish hairs. *Wings*: infuscation pale brown, uniform, rosettes and other light markings distinct, though markings forming rosettes largely broken up into spots; *stigma* well-marked, pale brown to dark brown, with light marking at each extremity small but well defined, that at distal extremity of stigma roughly circular or oval, with dark centre; apical sinuous marking, from tip of second longitudinal to lower branch of third vein widely interrupted in second submarginal cell; usual oblique marks across posterior cells sometimes more or less broken up into spots; light marks along hind margin, in distal angles of first, second, third, and fifth posterior cells, and axillary cell small; discal cell with two light marks across its central portion, and sometimes a minute light fleck in its proximal angle; light markings in basal, anal, and axillary cells of normal type but not extensive, those at distal extremity of each basal cell sometimes merely consisting of a transverse mark at commencement of distal third. *Halteres* cream-coloured, knob brownish at

base above and below. *Legs*: femora buff; front tibiæ and tarsi dark brown, with a whitish or cream-buff band on former near base; middle and hind tibiæ and tarsi light brown or brownish, two bands on tibiæ and first joint of tarsi except tip cream-buff; front tibiæ not or scarcely incrassate.

North-western Rhodesia: Luuga River, Kasempa District, 7. ix. 1907; on roan antelope (*Hippotragus equinus*, Geoff.) (Dr. A. Yale Massey).

In the marking and coloration of the legs, as also in having a spotted abdomen, *Hæmatopota sanguinaria* agrees with *H. brunnescens*, Ricardo, the type of which is from Uganda; *H. sanguinaria*, however, apart from its usually smaller size, may be distinguished from the species in question by the shape of its antennæ* (especially by the terminal annuli of the third joint not being sharply marked off from each other), by the much narrower front and the absence of a dark brown band between each antenna and the eye, by the grey stripes on the thorax being broader and not so sharply defined, by the ochraceous buff tip to the scutellum, and by the wing-markings being broken up into spots. The conspicuous ochraceous buff colour of the greater part of the scutellum in *H. sanguinaria* will serve to distinguish the species from any other described African *Hæmatopota* at present known to me.

Hæmatopota fusca, sp. n.

♀.—Length (6 specimens) 8.4 to 9 mm.; width of head 2.6 to 2.8 mm.; width of front at vertex just under 1 mm. to 1 mm.; length of wing 8.25 to 8.75 mm.

Body and wings dark brown; stripes on thorax inconspicuous; dorsum of second, third, fourth, and fifth abdominal segments sometimes with a pair of not very conspicuous mouse-grey spots; light markings in wings clearly defined, usual three rosettes present and each composed of a single series of markings, apical sinuous marking especially conspicuous, broad above immediately below end of second longitudinal vein, interrupted in second submarginal cell; front tibiæ with one broad pale band, middle and hind tibiæ each with two narrower pale bands.

Head: front dark brown, grey only on extreme lateral margins and immediately below lateral frontal spots, face and

* From the shape of its antennæ *Hæmatopota brunnescens*, Ricardo, would appear to belong to the genus *Parhæmatopota*, Grünberg ('Zoologischer Anzeiger,' xxx. Bd. nr. 11/12, July 3, 1906, p. 360), founded for *P. cognata*, Grünb. (*ibid.*), from German East Africa and Zanzibar.

jowls yellowish grey, a dark brown horizontal mark between antenna and eye on each side; clove-brown lateral frontal spots conspicuous, in contact with eyes, produced downwards and inwards towards frontal callus, which they often touch, median frontal spot small but distinct, a narrower lighter (sometimes olive-grey) median stripe extending upwards from it on to vertex; *frontal callus* dark mummy-brown, of moderate depth, extending from eye to eye, upper and lower margins nearly straight, dark brown spot in middle line below callus not very distinct; *palpi* dark brown or greyish brown, clothed with brownish hairs, terminal joint elongate, more or less cylindrical, but little expanded at base; first joint of *antennæ* light mummy-brown, shining and strongly incrassate, inner margin convex when seen from above, second joint russet, its upper angle moderately prominent, third joint wanting. *Thorax*: dorsum with indications of three narrow lighter stripes, pleuræ and pectus mouse-grey. *Abdomen*: venter greyish brown; extreme hind margins of segments on ventral as well as dorsal surfaces usually paler; dorsal and ventral surfaces clothed with short brownish hair, with sparse yellowish hairs, longer towards distal extremity, near hind margins of segments. *Wings*: oblique light marks across first four posterior cells usually broken up into two spots in each cell; light markings along hind margin, if present, small and inconspicuous, sometimes distinguishable in distal angles of first, second, third, and fifth posterior cells and at tip of sixth longitudinal vein; *stigma* well-marked, long, dark brown, no light mark at its proximal extremity (except a minute and scarcely visible fleck at extreme tip of second costal cell), but a clearly defined though incomplete circular or oval light mark immediately beyond it; discal cell with a very small light fleck in its proximal angle and with two widely separated transverse light marks, the proximal mark curved, with its concave side towards base of wing, the distal mark broken up into a pair of spots; basal cells each with a pair of transverse light marks, wider apart in case of second basal cell, near tip of which there is sometimes also an ill-defined light mark; an angulate and sinuous light streak running across axillary and anal cells, and a semicircular light mark in proximal angle of axillary cell. *Halteres* seal-brown, stalk cream-buff. *Legs*: femora dark brown; front tibiæ and tarsi clove-brown, with a broad cream-coloured band close to base of former; middle and hind tibiæ and tarsi brown, two bands on tibiæ, first joints of tarsi except tips, and bases of next two joints cream-buff; front tibiæ not incrassate.

Uganda: type and three other specimens received from Colonel David Bruce, C.B., R.A.M.C., F.R.S., 1903; one specimen from Uganda, 1904, and another from Nimule, Uganda, November 1904, "on cattle" (Captain E. D. W. Greig, I.M.S.).

Although agreeing as regards its leg-markings with many other African species, *Hæmatopota fusca* may be distinguished from any of its African congeners at present known to me by the uniformly sombre colour of the body, by the fact that the light rosettes in the dark brown wings each consist of but a single series of marks, and by the very conspicuous upper portion of the light mark near the apex of the wing.

Hæmatopota lacessens, sp. n.

♀.—Length (6 specimens) 6·8 to 7·4 mm. ; width of head 2·25 to 2·4 mm. ; width of front at vertex 1 mm. ; length of wing 6·6 to 7·2 mm.

Body and wings dark sepia-coloured; dorsum of thorax with three narrow, smoke-grey, longitudinal stripes, conspicuous in front, less distinct towards hind margin; abdomen sometimes with grey spots or blotches on dorsum, hind margins of segments lighter; light markings in wings clearly defined, usually more or less moniliform, rosettes fairly distinct, a series of light streaks along hind margin, one in each posterior cell and at distal extremity of axillary cell; legs dark brown, front tibiæ paler (cream-buff to ochraceous buff) at base, middle tibiæ sometimes with a pair of indistinct paler bands, hind tibiæ without bands.

Head: front mouse-grey to dark brown, light grey only on extreme lateral margins and round lateral frontal spots, a narrow pearl-grey median stripe running from median frontal spot to vertex; face and jowls light grey, a seal-brown band running from antenna to eye on each side; front broad, widening slightly below; clove-brown lateral frontal spots large, conspicuous, in contact with or narrowly separated from eyes, median frontal spot small; *frontal callus* clove-brown, narrow from above downwards, extending straight across from eye to eye; *palpi* mouse-grey, terminal joint elongate, but little expanded at base, clothed with blackish hair; first joint of *antennæ* swollen, shining mummy-brown, second joint and basal portion of third joint chestnut, upper angle of former not produced, basal portion of third joint truncate cylindrical-ovate, not markedly elongate, terminal annuli clove-brown, flattened from side to side, last annulus approximately equal in length to two preceding

annuli taken together. *Thorax*: on dorsum, in addition to grey stripes, humeral calli, an area behind them, and posterior border of transverse suture on each side are also grey; pleuræ and pectus mouse-grey; dorsum sparsely clothed with minute yellowish hairs; posterior border (sometimes distal half) of scutellum smoke-grey. *Abdomen*: dorsum clothed with minute yellowish hairs, extreme hind margins of segment except first usually smoke-grey, second, third, fourth, and fifth segments sometimes with a pair of large, admedian, basal, smoke-grey spots, and also with a median, basal, smoke-grey spot, sometimes more or less triangular, and, like the admedian spots, not extending to hind margin; venter dark brown, extreme hind margins of segments smoke-grey. *Wings*: *second submarginal cell* usually with *four transverse light marks*, apical mark, which is close to tip of wing, sometimes large and conspicuous, sometimes indistinct or obsolete; *stigma* dark brown, well defined, no conspicuous light mark before it, light mark beyond it a thin semicircular or oval curve; a second light mark often present in marginal cell in shape of a small fleck immediately above second longitudinal vein, close to distal extremity of cell; discal cell usually with two transverse light marks (one or both sometimes broken up into two spots), and a curved mark close to distal extremity of cell, but not in contact with veins forming its distal boundary; oblique marks across posterior cells often more or less broken up into spots: markings in basal, anal, and axillary cells of normal type, light mark in upper proximal angle of axillary cell very distinct, sometimes a complete circle. *Halteres* seal-brown, stalk ochraceous buff. *Legs*: first joint of middle and hind tarsi (sometimes also second and third joints) ochraceous buff at base (in some cases ochraceous buff except distal extremity); front tibiæ incrassate.

Northern Nigeria: type from Keffi, Nassarawa Province, 4. ix. 1907, "on horse" (Dr. R. F. Williams); other specimens from Zungeru, Zaria Province, 12. vii. 1905 (Dr. Dalziel), Zaria, Zaria Province, 15. vii. 1907 (J. Brand), Allowa, Zaria Province, 19. vii. 1907 (J. Brand), and Kontagora, Kontagora Province, 2. ix. 1903 (Dr. J. J. A. Raye, per Sir Patrick Manson, K.C.M.G., F.R.S.).

This species, which is said by Dr. Raye to swarm at Kontagora, would appear to be particularly bloodthirsty. Dr. R. F. Williams writes that it is "a very aggressive biter both of horse and man," and the specimen from Kontagora bit Dr. Raye and sucked his blood inside a mosquito-net.

Hæmutopota lacessens is not closely allied to any of the

hitherto described African species of its genus at present known to me, from almost all of which it can at once be distinguished by the absence of bands on the hind tibiæ. The Museum series, however, includes a single damaged female of an undescribed species from Akwacha, Bassa Province, N. Nigeria, June 1906 (*Dr. G. J. Pirie*), which, in addition to presenting some resemblance to *H. lacessens* in *facies*, also has no bands on the hind tibiæ; still this species cannot be mistaken for *H. lacessens*, since in it the front tibiæ are not swollen.

Hæmatopota pertinens, sp. n.

♀.—Length (55 specimens) 7·3 to 10 mm.; width of head 2·4 to 3 mm.; width of front at vertex just under 1 mm. to 1·2 mm.; length of wing 7 to 9 mm.

Somewhat narrow and elongate in shape, olive-grey to smoke-grey or yellowish grey, dorsum of thorax with four complete and strongly marked olive-brown longitudinal stripes, dorsum of abdomen with a quadrate olive-brown blotch on each segment after the first, on each side of middle line, blotches not reaching hind margins of segments and each enclosing a yellowish grey spot; wings sepia-coloured, darkest at distal extremity, somewhat lighter towards base, light markings tinged with buff, clearly defined and extending to base, but close together, so that rosettes are indistinct; legs russet, tips of femora sometimes brown, front tarsi, tips of middle and hind tarsi, and front tibiæ except base dark brown; middle and hind tibiæ without bands.

Head: front mouse-grey or brownish, lighter round clove-brown lateral frontal spots, which are large, conspicuous, and not in contact with eyes, median frontal spot small, usually distinct; a quadrate seal-brown spot below frontal callus in middle line; face and jowls light smoke-grey, under side of head clothed with whitish or pale yellowish hair; *frontal callus* raw-umber-coloured, of moderate depth, extending from eye to eye, upper margin straight, with a slight prominence in median line; *eyes* (in spirit-specimens) bronze-green, upper and lower angles and usual three transverse bands clove-brown, bands separate from each other and sharply defined, broader and more or less straight on posterior half of eye, narrower and sinuous or jagged towards inner margin; *palpi* cream-buff to ochraceous buff, terminal joint elongate, moderately expanded at base, clothed above and on outer side with black hairs, below with yellowish hairs; *antennæ* ochraceous, terminal annuli of third joint

clove-brown (penultimate and antepenultimate annulus often paler), flattened from side to side, last annulus as long as or slightly longer than two preceding annuli taken together, basal portion of third joint about one third longer than first joint, which is only moderately swollen, upper angle of second joint not much produced, first and second joints clothed with black hair. *Thorax*: scutellum with an olive-brown spot on each side (in specimens not in perfect condition usually uniform olive-grey or smoke-grey). *Abdomen* clothed with minute pale yellow or ochraceous hairs; venter uniform smoke-grey or drab-grey; dorsum of first segment with an olive-brown, although not a quadrate blotch on each side of middle line. *Wings*: curved light mark in marginal cell at distal end of stigma semioval (rarely semicircular), occasionally with a prolongation along costa to end of second longitudinal vein; generally four light spots (centre of rosette) round fork of third vein, and groups of similar but larger and coalescent spots round distal extremities of discal and both basal cells; two sharply defined sinuous light streaks running across submarginal cells, usually separate but occasionally approximate or in contact on lower branch of third vein; sometimes a third less sharply defined light streak across second submarginal cell close to tip of wing; a series of detached oblique light marks running across posterior cells, sometimes in contact with marks representing portions of rosettes round distal extremities of discal and second basal cells; a series of (sometimes indistinct) light marks along hind margin of wing, in distal angles of posterior and axillary cells; *discal cell* normally with a large light spot or crescentic mark at each extremity, and a transverse mark, often large and occasionally divided or partially divided across middle; markings in basal, anal, and axillary cells of normal type, broad, often partly coalescent, and anal cell almost entirely light, when markings distinct a large light spot usually visible on sixth longitudinal vein near its distal extremity; first and second costal cells buff, no light mark running up to costa before *stigma*, distal portion alone of which is dark brown, rather less than proximal half being light ochraceous. *Halteres* cream-buff, knob seal-brown at base above and below.

Nyasaland Protectorate, Rhodesia, and Northern Nigeria: type and 40 other specimens from Nyasaland Protectorate, 1905, 1907 (*Dr. J. E. S. Old*), including a series taken 24 miles from Blantyre, between 6 and 7 A.M. on 22. i. 1905, concerning which the donor writes:—"In tall green reeds; bit myself and native servant; usually silent and very

sluggish": additional specimens from Lunyina River, Henga, W. of L. Nyasa, 3000 feet, 29. i. 1894 (*Captain Richard Crawshay*); Lilongwe, Nyasaland Protectorate, February 1907 (*Captain Hallam Hardy, R.A.M.C.*); Kabidi Valley, West Nyasa, June 1907 (*Dr. Prentice, per Captain H. Hardy, R.A.M.C.*); Kasempa District, N.-W. Rhodesia, Jan. 1908 (*E. A. Copeman*); Salisbury, Mashonaland, Southern Rhodesia, November 1899 (*G. A. K. Marshall*); and Anchon, Ruka, and Allowa, N. Nigeria, 10-19. vii. 1907 (*J. Brand*).

Hematopota pertinens, a widely distributed species, which is evidently exceedingly common in the Nyasaland Protectorate, is closely allied to *H. duttoni*, Newst. (see below), *H. brunnipennis*, Ricardo, and *H. unicolor*, Ricardo. These four species constitute a natural group within which the specific limits are not altogether easy to determine. *H. similis*, Ricardo, and *H. denshamii*, Austen, are more distantly connected with this group. From *H. duttoni*, Newst., which it resembles in the coloration of the body and legs, wing-markings, &c., *H. pertinens* is distinguished by the basal portion of the third joint of the antenna being shorter and the terminal annulus longer; in the type of *H. duttoni* the latter is scarcely longer than the preceding annulus. From *H. brunnipennis*, Ricardo, *H. pertinens* is distinguished, *inter alia*, by the shape and colour of the frontal callus, which in the latter is much deeper and paler, by the wing-markings being less coarse, closer together, and more yellowish, as also normally by the shape of the light mark beyond the stigma, which in the case of *H. brunnipennis* is semicircular. *H. unicolor*, Ricardo, which is found in Uganda, differs from *H. pertinens* in having the brown colour of the wing confined to the tip and hind border, the greater part of the proximal half of the wing being buff, while the mediastinal and first longitudinal veins are ochraceous buff.

Hematopota duttoni, Newstead.

(‘Annals of Tropical Medicine and Parasitology,’ vol. i. no. 1, Feb. 1, 1907, p. 41, pl. iv. fig. 3.—Congo Free State.)

Through the courtesy of Mr. Robert Newstead, of the Liverpool School of Tropical Medicine, I have been enabled to examine the type of this species, which, as stated above, is nearly allied to the foregoing. It is also closely allied to *H. unicolor*, Ricardo (not to *H. similis*, Ricardo, as stated by Newstead), with which it agrees in size and general coloration. *H. duttoni* is distinguished from *H. unicolor* by its

darker femora, which are dark brown at the tips, by its shorter stigma (the dark portion being confined to the distal half), by the light mark in the wing beyond the stigma being more elongate, by the palpi being clothed with black instead of yellowish or ochraceous hair, and by the first joint of the antennæ being rather more elongate and less swollen (the second and third joints are wanting in the type of *H. unicolor*). The frontal callus in the type of *H. duttoni* is similar to that of *H. unicolor* in colour and size, but has a well-marked median upward process; the median dark brown spot below the callus is also well-marked, though, as usual, of small size, and is apparently what Newstead means by "a broad rectangular spot of light rich chestnut between the eyes" (*op. cit.* p. 42), while the "clypeal spots" referred to by the author (*op. cit.* p. 42) are merely the usual punctured depressions on the face, which are common to the genus.

Genus TABANUS, Linn.

Tabanus williamsii, sp. n.

♀.—Length (1 specimen) 12·3 mm.; width of head 4·2 mm.; width of front at vertex 0·4 mm.; length of wing 10 mm.

Allied to *T. wellmanii* and *T. sharpei*, Austen, and *T. argenteus*, Surcouf.—*Front extremely narrow, upper part silvery white when viewed from above, a quadrate area on vertex clove-brown; dorsum of thorax clove-brown, with a transverse band of silvery white pile on hind border, and in front with a pair of light grey stripes scarcely extending beyond transverse suture; scutellum mouse-grey, extreme base olive-grey, entirely clothed with pale chrome-yellow mixed with longer yellowish or brownish hair; abdomen clove-brown, second segment dark seal-brown, hind angles of all segments except last clothed with short yellowish hair, third and fourth segments each with a large bluntly triangular or semicircular median spot clothed with similar hair.*

Head: face, jowls, and occiput light grey, pollinose, face and jowls clothed with silvery hair; frontal callus and subcallus (?denuded) dark brown, former elongate quadrate, extending from eye to eye; front between dark ocellar or vertical area and callus clothed with minute whitish hairs, its sides converging below; terminal joint of palpi fairly stout, fawn-coloured, clothed on outer side with minute appressed silvery hairs; first joint of antennæ smoke-grey, fawn-coloured on distal half of inner side, clothed with

minute silvery hairs, second joint dull cinnamon-rufous, third joint fairly broad, reddish brown, ferruginous at base, last four annuli clove-brown. *Thorax*: dorsum greyish in front between grey longitudinal stripes, which, as well as lateral margins, are clothed with minute, appressed, pale chrome-yellow hairs, remainder of dorsum clothed with dark brown hair; a light brown median stripe indistinctly visible in front between grey stripes; præalar calli fawn-coloured (as in *T. wellmanii* and *T. sharpei*, Austen), fringed behind with long dark brown hair; pectus and pleuræ greyish pollinose, clothed with whitish hair. *Abdomen*: sides of first segment greyish pollinose; median spots with their bases resting on hind margins of segments, spot on third segment not reaching to front margin; venter, except last two segments, greyish pollinose, clothed with minute, appressed, silvery hairs, hind margins of third and three following segments cream-coloured. *Wings* with a decided brownish tinge; stigma tolerably well-defined, brown; *squamæ* brownish. *Halteres* cream-buff, knobs seal-brown above and below. *Legs*: femora dark greyish brown; tibiæ except tips cream-buff; front tarsi and tips of front tibiæ clove-brown, second, third, and fourth joints of front tarsi strongly expanded; middle and hind tarsi and tips of middle and hind tibiæ seal-brown; femora and tibiæ (except tips) clothed with whitish hair.

Northern Nigeria: a single specimen from Jemaa, Nassarawa Province, N. Nigeria, 25. iv. 1907 (*Dr. R. F. Williams*), "on horse." I have much pleasure in naming this new species in honour of its discoverer, who has most kindly presented the type, together with a number of other blood-sucking Diptera collected by him in Nassarawa Province, to the National Collection.

Tabanus williamsii is closely allied to *T. wellmanii*, Austen (Ann. & Mag. Nat. Hist. ser. 8, vol. i., March 1908, p. 225), which is found in Angola, and with which it agrees in size, coloration, markings, and general appearance; it is distinguished from *T. wellmanii* by the shape and coloration of the palpi and basal portion of the third joint of the antennæ, the terminal joint of the palpi being less slender and fawn-coloured instead of dark brown or blackish slate-coloured, while the basal portion of the third joint of the antennæ is noticeably broader and reddish brown instead of clove-brown, as well as brighter ferruginous at the base; the front, too, is a shade narrower. *T. williamsii* is also near akin to *T. argenteus*, Surcouf (Bull. Mus. Nat. d'Hist. Nat. Paris, 1907, no. 4, p. 264), from the Gaboon, but (from a comparison with the

type of *T. argenteus*, for the opportunity of examining which I am indebted to the courtesy of M. Jacques Surcouf, of the Laboratoire Colonial of the Muséum National d'Histoire Naturelle, Paris) may be distinguished at once, *inter alia*, by the light grey stripes on the anterior half of the dorsum of the thorax, by the scutellum being entirely clothed with pale chrome-yellow hair, instead of having its basal half covered with silvery white and its distal half with brownish black hair, by the venter being, with the exception of the tip, entirely light grey, instead of the third and following segments being black with light grey hind margins, by the basal portion of the third joint of the antennæ being much broader and lighter in colour, and by the front femora being clothed on the outside and below with whitish instead of with blackish hair. From *T. sharpei*, Austen (*loc. cit.* p. 226. —Nyasaland Protectorate), *T. williamsii* is distinguished by the coloration of the antennæ, the more elongate basal portion of the third joint, the much narrower front, and the coat of yellow hair on the scutellum.

LXVI.—*On Philoscia patiencei, sp. n., a new Terrestrial Isopod.* By RICHARD S. BAGNALL, F.E.S.

[Plate XVIII.]

ONE day early in December, 1907, whilst staying in London with my friend Mr. H. St. J. K. Donisthorpe, we spent a few hours collecting in the hothouses of the Botanical Gardens, Kew, and were fortunate enough to secure many interesting invertebrates, amongst which were a spider (*Ischnothyreus velov.*, sp. n., Jackson), a Tartarid (*Trithyreus bagnallii*, sp. n., Jackson) *, and some species of woodlice previously undescribed. Our investigation of one house in particular was very promising. Most of the plants in this hothouse, which at the time of our visit registered 75° F., were of West-Indian origin; the known ants and beetles we found therein were also originally described from the West Indies, and it is therefore highly probable that the spider and Tartarid just mentioned are of a similar origin.

In this hothouse, then, a small woodlouse was particularly

* A. Randell Jackson, "On some rare Arachnids captured during 1907," *Trans. Nat. Hist. Soc. of Northumberland, Durham, and Newcastle-upon-Tyne*, n. s., iii. pt. i. pl. iv. pp. 49-78.

common, and as the species is apparently new I find much pleasure in naming it in honour of my good friend Mr. Alexander Patience, whose name is already familiar to those interested in the study of our terrestrial Isopod Crustacea.

Mr. Patience has very carefully dissected the species (some females of which were bearing ova) and figured it, and my sincere thanks are due to him for the invaluable help he has given me in preparing the present short paper.

Genus PHILOSCIA, Latreille, 1804.

Philoscia patiencei, sp. n.

Length of adult male and female 3 mm. ; greatest breadth about 1.2 mm.

Colour of the living animal more or less violaceous brown, marbled with white, and with a broken white median band along the back of mesosome.

Body elongate-ovate in form, about two and a half times as long as broad ; dorsal face moderately convex, quite smooth and polished. Lateral parts of the three posterior segments of mesosome rounded and acuminate. Metasome abruptly contracted, about one-fourth the length of body, the lateral parts of third to fifth segments adpressed and acuminate, the last segment with the terminal expansion broadly rounded at the tip and carrying two spicules, the sides very slightly insinuate. *Legs* in both sexes apparently similar in structure.

Cephalon with the frontal margin evenly rounded. *Eyes* comparatively large and convex. *Antennulae* with the last joint subequal in length to the penultimate and carrying three sensory filaments. *Antennae* densely spinulose, more than one-third the length of body, the last joint not so long as the preceding two together ; *flagellum* composed of three articulations, the last being the longest and terminating in a long stiff bristle.

Uropoda with the *outer ramus* lanceolate, not twice the length of basal part, carrying three strong spines on inner edge, several small spines on outer edge, and tipped by five strong and comparatively long bristles. *Inner ramus* originating at some distance from and about one half the length of the outer ramus, broadly exposed when viewed laterally, and carrying three stiff bristles which are subequal in length to the ramus. The inner edge is densely ciliated, with the hairs curled upwards, but sparse on each edge towards the distal end.

Remarks.—At first sight this pretty little creature might

quite readily be mistaken for a species of *Trichoniscus*, and it was only after dissection that its approximate position was made clear. I have described it as a *Philoscia*, as the oral parts certainly agree with those found in species of that genus, and the first and second pleopoda of the male are also of a somewhat similar character. Further, Dr. Budde-Lund, who was kind enough to give me his opinion of the species, states that it very closely approaches *P. couchii*, Kinnahan, in the structure of the mouth-parts, which are here figured by Mr. Patience. The legs, however, do not increase greatly posteriorly, and suggest some resemblance to those of the Trichoniscidae. The antenna, as well as its three-jointed flagellum with the long terminal bristle, too, does not add to one's belief of any strong or true affinity with the genus in question, whilst the curious structure of the uropoda, especially that of the inner ramus, is decidedly puzzling. *P. patiencei* is of further interest to us on account of its small size, and it would seem that a more critical examination of the constancy of generic characters in the known *Philoscie* will lead, most probably, to the establishment of a new genus for the reception of the species now under consideration.

Occurrence.—As I said before, *P. patiencei* occurred in large numbers in a hothouse of the Botanical Gardens, Kew, December 1907. It was found living under about an inch of a mixture of earth and ash upon which rows of plant-pots were set out; with constant watering a kind of ooze was formed beneath this layer, and *P. patiencei* appeared to live chiefly amongst this ooze and in the damper parts of the covering substance, running about like our common *Trichoniscus pusillus*, to which, indeed, it bears a very strong resemblance in colour, shape, size, and movements, and might have easily been overlooked as such. *P. patiencei* was not found to affect plants at all, *Trichoniscus stebbingi*, Patience, being the only woodlouse actually detected at the roots of the plants in this particular hothouse.

On examining the species something in its general facies appealed to me as being familiar, and I remembered a few examples of a puzzling form which I had found with *Trichoniscus pygmaeus*, Sars, in a garden at Winlaton, Co. Durham. This form was entered in my diary for October 1906 and February 1907 as "*Trichoniscus dilaticornis*, sp. nov.?" but, as the specimens were undoubtedly immature, I put them away, and they thus escaped my memory. I was very interested, therefore, to find upon re-examination that the species was apparently conspecific with the one just described, or, at least, very closely allied to it.

A preliminary account of *P. patiencei* was read before the Glasgow Natural History Society on January 28th, 1908.

EXPLANATION OF PLATE XVIII.

Philoscia patiencei, sp. n., ♀, about 3 mm. in length.

- a*¹. Antennulæ.
- A*. Antenna.
- plp*¹. First pair of pleopoda, ♂.
- plp*². One of the second pair of pleopoda, ♂.
- ppp*⁷. Seventh pereopod, ♂.
- M*. Mandibles.
- mp*. Maxilliped.
- m*¹. First maxilla.
- m*². Second maxilla.
- ur*. Uropoda.
- ur**. Inner ramus more highly magnified, viewed laterally.

LXVII.—On Four little-known Names of Chiropteran Genera. By KNUD ANDERSEN.

Eidolon, *Pteronotus*, and *Vampyrum*, Raf.

IN his 'Analyse de la Nature' (Palermo, 1815), p. 54, Rafinesque gives the following arrangement of the order "Chiropteria":—

- "II. O. *Chiropteria*. Les Chiroptères.
- 4. Famille. *Galeopia*. Les Galeopiens. Doigts des membres antérieurs peu allongés, pouce non séparé; point de canines. G. 1. *Galeopus* R. *Galeopithecus* Cuv.
- 5. Famille. *Vespertilia*. Les Vespertiliens. Doigts des membres antérieurs très-allongés, pouce séparé; des dents canines.
- 1. Sous-famille. *Lophinia*. Les Lophiniens. Des crêtes ou appendices sur la tête. G. 1. *Rhinolophus* Cuv. 2. *Phyllostoma* Geoff.
- 3. *Vampyrum* R. do. Geoff. sans queue. 4. *Megaderma* Geoff.
- 2. Sous-famille. *Nycteria*. Les Nyctériens. Aucunes crêtes ni appendices sur la tête. G. 5. *Pteropus* Bris. Erxl. 6. *Eidolon* R. do. à queue. 7. *Pteronotus* R. do. sp. 8. *Cephalotes* Geoff. 9. *Tadaris* R. 10. *Vespertilio* L. Geoff. 11. *Nycterus* Geoff. 12. *Noctilio* Geoff. 13. *Molossus* Geoff. 14. *Atalapha* R."

In p. 216 of the same book (under the heading "Abréviations") it is explained that "Sp. do." stands for "Espèces du genre précédent." The words "*Vampyrum* R. do. Geoff. sans queue" are therefore a quasi-stenographic abbreviation for: *Vampyrum*, Rafinesque, name proposed for those species of the genus *Phyllostoma*, as understood by E. Geoffroy,

which have no tail. The words "*Eidolon* R. do. à queue" mean: *Eidolon*, Raf., name proposed for those species of the genus *Pteropus*, as hitherto understood, which have a [short] tail. The abbreviation "*Pteronotus* R. do. sp." reads: *Pteronotus*, new generic name proposed by Rafinesque for some species of the genus *Pteropus*.—Bearing these explanations in mind, and considering what literature on Chiroptera could be at the disposal of an author writing in 1815, the identification of the genera now becomes an easy matter.

There is no doubt whatever that, so far as the genera *Pteropus*, *Eidolon*, *Pteronotus*, *Phyllostoma*, and *Vampyrum* are concerned, Rafinesque based his arrangement on E. Geoffroy's now classical papers, "Description des Roussettes et des Céphalotes, deux nouveaux genres de la famille des Chauve-souris" (Ann. Mus. d'Hist. Nat. xv. pp. 86-108; 1810) and "Sur les Phyllostomes et les Mégadermes, deux genres de la famille des Chauve-souris" (*ibid.* pp. 157-198). The evidence is this:—

(1) Rafinesque himself writes (*op. cit.* pp. 50-51): ". . . les travaux de Cuvier, Geoffroy, Desmaretz [*sic*], et Duméril sur la disposition naturelle des genres et leur formation ont servi de bases aux miens."

(2) The three genera *Pteropus*, *Eidolon* (for the species "à queue"), and *Pteronotus* correspond precisely to E. Geoffroy's three sections of "Roussettes (*Pteropus*)," viz. "Roussettes sans queue" (*op. cit.* p. 90; including the species *Pt. edulis*, *edwardsi*, *vulgaris*, *rubricollis*, and *griseus*), "Roussettes à queue" (*op. cit.* p. 94; the species *Pt. stramineus*, *egyptiacus*, *amplexicaudatus*, *marginatus*, and *minus*), and "Roussettes à ailes sur le dos" (p. 98; only species *Pt. pal[l]iatus*). In other words, Rafinesque raised these three sections to the rank of distinct genera, restricting *Pteropus* to the five species without tail, and proposing *Eidolon* as a new generic name for the five species with a short tail, and *Pteronotus* (πτέρων, "aile"; νῶτος, "dos") for the "Roussette à ailes sur le dos," viz. *Pt. palliatus* *.

Eidolon is technically valid, being sufficiently characterized by the words " [pour les espèces du genre précédent] à queue."

* The same idea, to separate the three sections of "*Pteropus*" as distinct genera, was independently arrived at, fourteen years later, by Gilbert T. Burnett ("The Quarterly Journal of Science, Literature, and Art," 1829, pt. i. (April-June) p. 269), who restricted the name *Pteropus* to the tailless species (only species mentioned: *vulgaris*, *edulis*), and proposed *Cercopterus* for the short-tailed species (*egyptiacus*, *amplexicaudatus*), and *Tribonophorus* (τρίβων, mantle, *pallium*; φορός, bearing) for the "Mantled Roussette, [*Pteropus*] *desnaresti*" (evidently a new

Of the five species included in this genus (see above), *Pt. stramineus*, Geoff. (i. e. *helvus*, Kerr*), as being the earliest known, may be fixed as the type of the genus. *Eidolon* thus antedates *Pterocyon*, Peters (1861), by forty-six years.

Pteronotus is technically a *nomen nudum*. As pointed out above, it was undoubtedly by its author intended to be a generic name of *Pt. palliatus*, E. Geof. [*Dobsonia palliata* of modern authors]; it is also evident why Rafinesque did not find it necessary to mention this species by name; there could in fact be no mistake whatever, since the word *Ptero-* (=aile) *notus* (=dos) was simply a translation of E. Geoffroy's diagnosis of the third section of *Pteropus*, viz. "[espèce] à ailes sur le dos," and this section contained only one species. Nevertheless, according to the now prevalent purely formal way of dealing with nomenclatural questions, *Pteronotus*, Raf., as being from the hand of its author without diagnosis and without definite indication of species, has no standing in technical nomenclature, and therefore does not invalidate *Pteronotus*, J. E. Gray (1838; Phyllostomatidæ), nor does it replace *Dobsonia*, Palmer (1898).

(3) The two genera "*Phyllostoma* Geof." and "*Vampyrum* R. do. Geof. sans queue," correspond precisely to E. Geoffroy's two sections of "*Phyllostome (Phyllostoma)*," viz. "*Phyll. avec une queue*" (*op. cit.* p. 184; the species *Ph. crenulatum*, *elongatum*, *hastatum*, *soricinum*), and "*Phyll. sans queue*" (*op. cit.* p. 185; the species *Ph. perspicillatum*, *lineatum*, *rotundum*, *lilium*, *spectrum*).

The name *Vampyrum* is technically valid, as being diagnosed by the words "[les espèces du genre *Phyllostoma*] sans queue." Of the five species for which the name was proposed (see above) *Phyllostoma spectrum* may be fixed as the type, on the strength of the tautology principle, this species being referred to by E. Geoffroy under the vernacular name "*Le Phyllostome vampire*." *Vampyrum*, Raf. (1815), thus replaces *Vampyrus*, Leach (1821).

name for *Pt. palliatus*, but technically a *nomen nudum*), though, as pointed out by T. S. Palmer (*Index Gen. Mamm.* p. 688; 1904), Burnett probably based not direct on E. Geoffroy's paper, but on J. E. Gray's account of the genus *Pteropus* in Griffith's '*Animal Kingdom*,' v. pp. 58-59 (1827). Also in this case the new generic name proposed for the single species of the third section, "*Rousettes à ailes sur le dos*," viz. *Tribonophorus*, is technically inadmissible, as based, without diagnosis, on a *nomen nudum*.

* K. Andersen, *Ann. & Mag. N. H.* (7) xix. p. 504 (1907).

Nyctalus, Bowdich.

The original description runs as follows (T. Ed. Bowdich, 'Excursions in Madeira and Porto Santo during the Autumn of 1823, while on his third voyage to Africa'; opus posthumum, edited by Mrs. Sara Bowdich, afterwards Sara Lee; London, 1825; p. 36):—

"Here [in Madeira] I had an opportunity of remarking . . . that the bat is more than specifically distinct from all those which have, as yet, been described, for it has four pointed incisors above (two by the side of each canine, with a large interval between), and six small incisors below, with three indentations in each. It forms a new sub-genus between *pharopus* and *cephalotes*, and may be named, *nyctalus verrucosus*. [The following as a footnote:—] The lower canines have a heel. The muzzle and *oreillettes* are simple; the ears are equal to the depth of the head in length, and present clusters of orange warts on the outer part, and a few within. It has a nail, and extra joint to the forefinger; three joints to the middle finger, two to the others. The interfemoral membrane (not notched, but triangular) reaches to within one line of the end of the tail, which is within it:—width, from the tip of one wing to the other, $11\frac{3}{4}$ in., from the muzzle to the tip of the tail $4\frac{1}{2}$ in., colour, dusky brown."

Palmer (Index Gen. Mamm. pp. 464, 804; 1904) quotes Bowdich's statement, "it forms a new subgenus between *pharopus* [misprint for *pteropus*] and *cephalotes*," and places the genus in the family Pteropodidæ.

A closer examination of the description of *Nyctalus verrucosus* leads, however, to the following conclusions:—

(1) Four of the characters given by Bowdich are evidence that *N. verrucosus* is not a fruit-bat, but a species of Microchiroptera, viz.:—two upper incisors by the side of each canine, with a large interval between (*i. e.* premaxillaries broadly separated anteriorly); six incisors below (no fruit-bat has more than four lower incisors); the presence of an "oreillette" (tragus); tail included in interfemoral, which is triangular, not notched.

(2) The following characters are valueless for an identification of the species:—"Clusters of orange warts" on the outer and inner surface of the ear-conch (hence the name *verrucosus*); these were evidently ticks. The meaning of the words "it has a nail, and extra joint to the forefinger," is not clear; the probable explanation is that "nail" applies to the nail of the pollex, the "extra joint to the forefinger" to the strong phalanx-like tendon connecting the end of the metacarpal of the second digit with the end of the first phalanx of the third digit; but other interpretations are possible. "Three joints" in the third digit, "two in the others," because Bowdich counted the long terminal rod of the third digit in Vespertilionid bats as a "phalanx," which

for all practical purposes it is. A conspicuous "heel" (cingulum posteriorly at base) in the lower canines is found in most Vespertilionid bats. The "simple" muzzle excludes any species of *Rhinolophus*, of which, however, none are known from Madeira, and which would be excluded also for other reasons (incisors, want of tragus).—There remain three characters to be tested on the Microchiroptera known to occur in Madeira, viz. the size of the ears, the projecting tip of the tail, the measurements.

(3) Four bats have been recorded from Madeira: *Pipistrellus pipistrellus*, *P. maderensis*, *Pterygistes madeiræ*, and *Nyctinomus tenuiotis*; to these may perhaps be added, though to my knowledge not recorded from the island, *Miniopterus schreibersi* and *Vespertilio serotinus*.—The two species of *Pipistrellus* are out of the question, owing to their size being much smaller than that of Bowdich's *N. verrucosus*. *Nyctinomus tenuiotis* is excluded on account of the long free portion of the tail and large size. *Miniopterus schreibersi*, because the tail is wholly included in the interfemoral. *Vespertilio serotinus*, because the length of the ears is much greater than the depth of the head, the general size of the animal too large, and the freely projecting tip of the tail much more than one line. *Pterygistes madeiræ*, Barr.-Ham. (Ann. & Mag. N. H. (7) xvii. pp. 98–99; 1906), is the only Madeiran bat for which the combination of the three characters holds good; the ears (whether viewed in profile or measured from the crown) are equal in length to the depth of the head; the extreme tip of the tail (1–2 mm.) projects beyond the interfemoral; the measurements of the type and paratypes (for many years preserved in alcohol; forearms mostly broken) cannot be taken exactly; in one specimen (paratype) the expanse is fully 11 in.; the total length, including tail, about 4 in.; and it should be remembered that Bowdich probably measured a freshly killed specimen, which can be stretched more freely; *Pt. madeiræ* is, judging from the length of the forearm, metacarpals, and phalanges, precisely of the same size as the *Pt. leisteri*, and of this latter Kolenati* gives as average measurements of the total length, including tail, 107·2 mm. (4·2 in.), of the expanse 291·5 mm. (11·6 in.), thus practically the same measurements as Bowdich's of *N. verrucosus*.

(4) According to the above, *Pterygistes madeiræ*, Barr.-Ham., is a synonym of *Nyctalus verrucosus*, Bowdich, and the generic name *Nyctalus* (1825) replaces *Pterygistes* (Kaup, 1829).

* "Monographie der europäischen Chiroptern," in Jahresh. mähr.-schles. Ges. f. 1859, table ad p. 46 (1860).

LXVIII.—*On the Extremity of the Tail in Ichthyosauria.*
By H. G. SEELEY, F.R.S., F.G.S., King's College, London.

As early as 1839 Sir Richard Owen described the small laterally compressed ribless terminal caudal vertebræ which supported the caudal fin in the *Ichthyosaurus*; but the caudal fin itself remained unknown till figured by Dr. Eberhard Fraas. Owen also mentions, in his general account of the osteology of the Ichthyosaurs from the Lias, that these vertebræ are preceded by three or four with the centrams more compressed, and their margins raised, in the region where the abrupt bend or distortion of the tail usually takes place. That abrupt bend was formerly regarded as a postmortem condition produced by the weight of the tail-fin. The specimens available in 1839 were all more or less imbedded in slabs of Lias.

In 1869, in a short account of the Ichthyosauria of the Cambridge Greensand, I gave some particulars of vertebræ from the terminal part of the tail which are free from matrix. The specimens suggest that there were probably three vertebræ between the caudal series supporting short caudal ribs and the caudal fin-series from which ribs are absent. As in the Lias specimens, these pivot-vertebræ are distinguished by their antero-posterior measurement being slightly diminished; it is less on the ventral than on the neural border; the central pit is much less deeply impressed in the centrum than in the earlier caudals; the lateral margins of the articular faces of the centrams are convex, and so rounded as almost to meet and nearly obliterate the lateral surfaces of the centrum; but this condition is not seen on the ventral margin. The largest of these pivot-vertebræ are $2\frac{1}{2}$ to $2\frac{3}{4}$ inches wide, $2\frac{1}{10}$ to $2\frac{1}{4}$ inches deep, and $\frac{7}{10}$ inch from front to back. The measurements and conditions show that the vertebræ from this point are directed downward, and that the angular bend in the Ichthyosaurian tail is a natural condition of downward angular flexure due to wedge-shaped form of these centrams. The rounded lateral tumid borders of these vertebræ show that the movement was from side to side, and that the caudal fin could only be used as a rudder or steering-organ when moved upon these pivot-vertebræ.

In the Cambridge Greensand species the caudal fin appears to have been very short, for the centrams which support it decrease in size very rapidly in vertical and transverse measurements, though there is a slight increase in length. The contraction in width is more rapid than the decrease in

depth, so that the centrums speedily become deeper than wide. This indicates lateral movement within the caudal fin itself, and that inference is supported by the interarticular borders of the centrum continuing rounded in examples $1\frac{2}{10}$ inch deep and $1\frac{1}{10}$ inch wide. In all the earlier vertebræ of this series the measurement along the neural canal is rather longer than upon the ventral border.

In an associated series of seven (F. ii. 75-81 Sedgwick Museum) the antero-posterior measurement decreases from little more than $\frac{8}{10}$ to $\frac{6}{10}$ inch, the depth from $1\frac{1}{10}$ to $\frac{5}{10}$ inch, and the width from 1 inch to $\frac{4}{10}$ inch. In every vertebra the posterior articular surface is appreciably smaller than the anterior end. The rapid decrease in size appears to indicate that the caudal fin was short and supported by few vertebræ, perhaps fewer than twenty. Many of the smaller vertebræ have sharp margins to the centrum, as though the extremity of the fin was nearly rigid.

In these vertebræ the neural canal is at first defined by an elevated lateral border, but after a time this contracts from front to back into a median process which is directed outward and shows no indication of having supported neurapophyses.

Subsequently, in the 'Aves, Ornithosauria, and Reptilia' (1869), I gave some account of an Ichthyosaurian skeleton from the Oxford Clay of Woodstone Lodge, near Peterborough, in which seven caudal vertebræ are present with convex margins to the centrum (f. 13-19) rapidly diminishing in size. The rib-facet is last seen on f. 15 (p. 113), so that the last true caudal vertebræ appear to show more than usual flexibility before the caudal rib is lost, and the four flexible pivot-vertebræ occur which are anterior to the caudal fin. Only eleven of the fin series are preserved, which resemble compressed dorsal vertebræ of a Plesiosaur. The smallest is half an inch in diameter. In a well-preserved skeleton in the Sedgwick Museum from the Oxford Clay of Whittlesea there are four modified centrums anterior to the caudal fin, followed by fifty-one centrums with smooth rounded external surfaces which have the same generalized character as other examples. But the series is imperfect, and five or six or more may be missing.

In January 1889 Mr. A. N. Leeds, F.G.S., submitted to me the extremity of the tail of an Oxford Clay Ichthyosaurian which I believed to be *Ophthalmosaurus*. On that specimen I made the following note, which shows the vertebræ supporting the tail to be substantially similar to other specimens from the Oxford Clay:—

As the caudal vertebræ approach towards the extremity of
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the region which carries caudal ribs the centrum rapidly becomes smaller, and the outline of its articular face is hexagonal. In the last three or four centrams the single rib-facet rises from the inferior position it has previously occupied towards the middle of the side of the centrum. It is a transverse tubercle extending between the anterior and posterior faces, with its articular portion towards the anterior margin. The neural canal remains large and wide, and, as in all other vertebræ, wider behind than in front. The margin of the intercentral articular surface is sharp anteriorly and convex posteriorly, and in harmony with this character the posterior surface becomes flattened, with a marked central concavity, very unlike the typical intervertebral cupped condition of an Ichthyosaur. Indeed, the facies of the centrum in the latest of these rib-bearing caudal vertebræ is essentially cetacean both in external form and in the manner in which the external lateral surfaces are perforated by innumerable close-set vascular foramina. In the last pivot-vertebra but one the base of the centrum develops on the anterior border, in the usual position of chevron bones in other animals, two tubercles which do not appear to be separate granules. In the centrum, which measures anteriorly 4.5 cm. deep, 5.2 cm. wide, and is 2.1 cm. from front to back, the transverse measurement over these granules is 2.5 cm. The last centrum of this series might almost be described as proœlous, the posterior surface being a well-rounded hemisphere with a small central pit. This ball is somewhat wider than deep, and occupies half the length of the centrum, which is 2.6 cm. long. The anterior surface is concave from above downward and less concave transversely, with a conspicuous central concavity which preserves the remnant of the Ichthyosaurian intervertebral type. This surface measures 4.7 cm. vertically, and 3.4 cm. transversely, so that the proportions of the centrum have now changed. This is chiefly owing to the development of the chevron granules into an inferior process. In the middle height of the sides are small facets adjacent to the posterior articular border, which, I suppose, supported the last pair of caudal ribs; they were probably very short.

The succeeding vertebra is of very irregular form, higher than wide, with the anterior surface flattened, with an elevated articular border and a central conical impression and a slight ridge midway between the central cup and the external border. The posterior surface is convex, but irregular and rugose. This is the pivot-vertebra of the caudal fin.

These vertebræ also make the joint in the tail at which the angular flexure commonly occurs in Lias specimens.

The remainder of the tail in *Ophthalmosaurus*, as preserved, comprises forty-one vertebræ, without any indication of the end being reached. These vertebræ are compressed from side to side and have the aspect of the bodies of dorsal vertebræ of Teleosaurs or Plesiosaurs, the antero-posterior measurement being relatively long compared with the transverse measurement. The centrum is free from lateral and inferior processes, gives a strong attachment to the neural arch, and has the articular faces moderately concave, but not approximating more than in many Plesiosaurs. Similar vertebræ support the caudal fin found in German specimens from the Lias.

The first of the Oxford Clay fin-series is about 3 cm. high, with a transverse width of about 2.6 cm. and antero-posterior extent of 1.7 cm. The size at first diminishes very slowly, but more by a decrease in the height of the centrum than by diminution in its length or width, though both of these vary. The measurements at the twenty-seventh centrum of this series are antero-posterior 1.5 cm., transverse 1.9 cm., and vertical 2 cm. The last vertebra preserved is 1.1 cm. long, 1.2 cm. wide in front and slightly less behind, and 1.2 cm. high to the neural canal; its posterior surface has a tendency to convexity, and the process for the neurapophysis on the right side is divided into anterior and posterior facets, as though the nerve passed through the middle of the neuro-central suture. The same condition is found in several of the late vertebræ, sometimes on one side, sometimes on the other. Probably many vertebræ are missing from the extremity of this tail.

It thus appears probable that the number of vertebræ supporting the caudal fin in Oxford Clay types exceeded 50 to 60.

By the kindness of the late Professor Oscar Fraas I had the opportunity of detailed examination of specimens from the Lias of Germany in the Royal Stuttgart Museum. In the specimen 3775 there are 101 vertebræ in the tail; caudal ribs are only found in the first twenty-nine, so that 72 may be regarded as supporting the caudal fin. The neural arch is seen in all the caudals except the last twenty-two, though it becomes very small, and the neural spine is short.

In no. 846 there are 115 caudal vertebræ. Of these 68 are posterior to the angular bend in the tail, and presumably supported the caudal fin.

No. 5792 is the *Ichthyosaurus multiscissus* (Quenst.). The tail is 4 feet 9½ inches long and includes 108 vertebræ, of which the last 75 appear to have supported the caudal fin.

In no. 5093, 127 caudal vertebræ are preserved, somewhat scattered towards the terminal end, but upwards of 90 appear to have supported the caudal fin.

The specimen 5094, named *I. tenuirostris*, which is only 3 feet 10 inches long, has 100 vertebræ in the tail, of which the last 70 supported the caudal fin.

I have a note of a specimen at Tübingen in which the first thirty caudal vertebræ have a length of less than 3 feet, and the remaining eighty-three vertebræ a length of 2 feet 8 inches in the region of the caudal fin.

In the Tübingen specimen 10,999 about 70 vertebræ support the caudal fin in a length of 2 feet.

In *Ichthyosaurus triscissus* there are 83 vertebræ in the tail, of which fifty are without ribs and appear to have supported the caudal fin; and in no. 7532 there are 105 caudal vertebræ, but only twenty-two are posterior to the angular bend in the tail.

In 1881 Sir Richard Owen counted 60 vertebræ in the deflected part of the tail in *Ichthyosaurus tenuirostris*.

One of the most interesting specimens is in the Leicester Museum marked 1892/4765, from Barrow-on-Soar. It is the detached whip-like termination of the tail of an Ichthyosaur which appears to be perfect, though the vertebræ are not absolutely free from a little matrix, which slightly masks their articular edges. The vertebræ are all exceptionally short. The first three are relatively large and appear to be from the position of the usual angular deflection. They are followed by eighty vertebræ, which progressively decrease in length and size and diminish till they become like coarse granules which still retain the vertebral form. The terminal vertebræ are smaller than in any other example of the caudal fin series.

The caudal fin series appear to be exceptionally long in the British Museum specimen from Württemberg, which contains several embryos.

It is thus evident that the number of these tail-fin vertebræ is variable in the different species from the Lias. On the whole the evidence appears to indicate that the caudal fin was longer in most of the Liassic than in the Lower Oxfordian types; and although the fragmentary remains from the Cambridge Greensand do not give any definite information, they suggest the inference that in the Cretaceous types the

tail-fin became shorter still. It is not without interest to find the extremity of the tail presenting so little variation in essentials of structure, as the order of animals is traced through the secondary strata.

LXIX.—*On the Interlocking of the Neural Arches in Ichthyosauria.* By H. G. SEELEY, F.R.S., F.G.S., King's College, London.

THE neural arches in Ichthyosaurs are never closely united with the centrums. When the centrums are isolated the arches are commonly lost. The characteristics of the arch are imperfectly known. They are illustrated by Cuvier in plate *celvi. Oss. Foss.*, but the figures are indefinite as to the interlocking of the arches, though the text indicates that Cuvier had seen and knew the structural relations of the bones. The excellent preservation of the vertebral column, with the vertebræ in natural sequence in skeletons imbedded in Lias slabs in the museums of this country and the Continent, is unfavourable to demonstration of the mutual relations of the neural arches. Exposed in side view they have a general resemblance to those of porpoises, for there is a manifest contact between them above the region of the neural canal by surfaces which enable the arches to support each other. But in *Ichthyosaurus* this zygapophysial surface does not project laterally, so that the lateral aspect of a neural arch is smooth and slightly concave from above downward, or only slightly tumid in the zygapophysial area. I have never seen any trace of laterally developed zygapophyses except in the cervical region.

It would appear that the cervical vertebræ is the part of the column most easily observed. Sir Richard Owen, in his 'Report on British Fossil Reptiles,' 1839, p. 100, speaking generally, states that "the neurapophyses are interlocked together by means of coadapted oblique processes." This is true for the neck, but not for the later vertebræ. In the account of *Ichthyosaurus platyodon* it is remarked in the same memoir: "the articular processes for mutual interlocking are well developed, especially at the anterior part of the spine." Forty-two years later lateral zygapophysial facets in *Ichthyosaurus* were figured by Owen in the Palæontographical

Society's Monograph, 1881, pl. xxi. In 1891 Dr. Eberhard Fraas figured two prezygapophyses in his memoir on Lias Ichthyosaurs (pl. iii. fig. 6).

In 1869 ('Index to Aves, Ornithosauria, and Reptilia,' p. 111), in describing *Ichthyosaurus megalodeirus* from the Oxford Clay, I found the neural arches preserved in the sixth and seventh cervicals, and displaced laterally, so as to show the lateral zygapophyses, which are "long and oblique, looking upward and inward"; but I am unable to affirm that this characteristic prevailed in all the twenty-six cervical vertebræ, though the unusual length of the neck, permitting lateral movement, makes such a condition probable.

Examination of the skeletons from the Lias has shown that the antero-posterior articular union between adjacent neural arches is made by a single flat median facet, vertically ovate, inclined at an angle of 45° in the dorsal and caudal regions. The facet varies a little in proportion of length to width. It is always immediately above the neural canal. In some anterior examples the facet is indented by the neural canal beneath it, so that it acquires a horseshoe type of form. In such specimens the neural spine is short and depressed and the neural arch is small. Professor Eb. Fraas, in tab. v. fig. 11 'Ichthyosauria,' 1891, represents a single vertically ovate facet with an appearance of vertical division, in the neural arch of an Ichthyosaur.

In January 1889 Mr. A. N. Leeds, F.G.S., obtained and submitted to me the first known British example of an isolated neural arch from the Oxford Clay of Fletton, which since then has been referred to in my lectures as *Ophthalmosaurus icenicus* (figs. 1 & 2).

The specimen measures $4\frac{1}{2}$ inches from the neuro-central suture to summit of the neural spine. The neurapophyses are compressed from side to side, half an inch wide in front, where the neural interspace between them is eight-tenths of an inch wide. The processes are more compressed from side to side posteriorly. The neuro-central sutural border is convex from front to back (fig. 1). In axial aspect the processes converge upward to arch over the neural canal, which appears to have been triangular and rather higher than wide (fig. 2). In lateral aspect the processes are concave on both the front and back borders, to define the interspaces for the escape of the intervertebral nerves (fig. 1).

Above the neural canal is the single facet by which the

arches rest upon each other and interlock. The prezygapophysis is $1\frac{2}{10}$ inch deep and $\frac{4}{10}$ inch wide, flat, vertically ovate, and not appreciably raised above the level of the oblique zygapophysial surface, which extends backward above the neural canal, to the base of the neural spine. It is about $\frac{9}{10}$ inch above the neuro-central suture (fig. 2, A). The

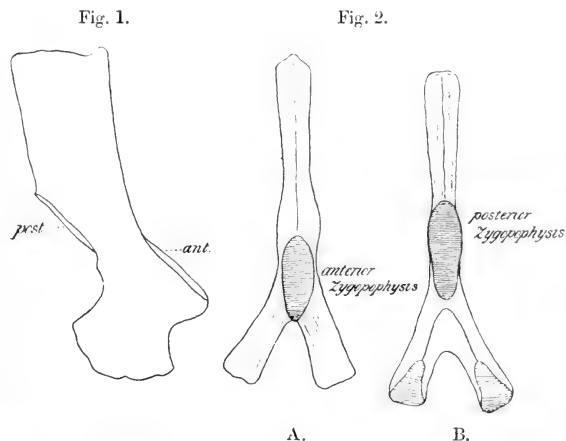


Fig. 1.—Lateral aspect of the neural arch in *Ophthalmosaurus*.

Fig. 2.—*Ophthalmosaurus icenicus*: neural arch. A, anterior; B, posterior. Half natural size.

corresponding posterior zygapophysial facet is parallel and entirely behind the anterior facet (fig. 1), but the vertical distance between the back of one and the front of the other is about $\frac{6}{10}$ inch. This posterior facet is a little longer and a little wider (fig. 2, B), giving a slight bulge to the posterior border of the neural spine at the articulation (fig. 2, A).

The neural spine is compressed from side to side, three to four tenths of an inch thick above these articular facets, and becoming a little thicker towards the free end. It is limited back and front by a sharp ridge. The antero-posterior measurement between these borders is $1\frac{2}{10}$ inch above the postzygapophysis, to $1\frac{3}{10}$ at the free termination. The

terminal surface is rough and irregular and appears to have been cartilaginous.

The structure here described I believe to be the typical Ichthyosaurian mode of articulation of the neural arch in vertebræ behind the neck, about as characteristic as is the presence of zygosphene and zygantrum in the neural arch of an Ophidian. It is not quite unique, being also met with in the neural arches of the caudal vertebræ of certain Plesiosaurs from the Kimeridge Clay, much as the Ophidian type of neural arch is met with in certain Lacertilia.

The physiological interest of the single zygapophysial facet is the evidence it affords as to the absence of lateral motion of the body, as indicated by absence of resistance to movement of the arches upon each other. The greater length of the postzygapophysis may show a small vertical gliding movement of the prezygapophysis against it, which would be consistent with a vertical movement of the tail, a diving habit, and a folding of the tail beneath the body in swimming.

LXX.—*Brachiopod Nomenclature: The Terebratulæ of the Crag.* By S. S. BUCKMAN, F.G.S.

THE English Tertiary deposits known as the Coralline Crag and the Red Crag are famous for yielding *Terebratulæ*, some of which attain very large dimensions. For many years, on the authority of Davidson, these Crag *Terebratulæ* have been regarded as one species, and have been identified with the Hanoverian *Terebratula grandis*, Blumenbach.

During some recent curatorial work, having occasion to examine these Crag *Terebratulæ* for the purpose of their exhibition, I came to the conclusion that the identification of any of them with *T. grandis* could not be sustained. Further, the material examined showed that there were at least four fairly distinct forms, which could be distinguished as follows:—

1. A large oval form.
2. A large elliptical form.
3. A medium-sized, narrow, elliptical form.
4. Small, aged forms, which are dwarfs.

Thus there are three forms which differ considerably in shape and one series of dwarfs, many of which are not the

young of the others: their aged appearance tells that. Of these four forms, 1 and 2 belong to the Coralline Crag; but their disunited valves are found in the Red Crag, where they are presumably derived shells; while 3 and 4 belong chiefly to the Red Crag, and are perhaps indigenous.

For these forms the following names seemed to be available:—1. *Terebratula spondylodes*, Smith; 2. *Terebratula maxima*, Charlesworth; 3. *Terebratula variabilis*, Sowerby; while 4 seems to have been unnamed.

These determinations were necessarily somewhat hurried. Since they were made, however, the consultation of Tertiary works in connexion with other species led to the finding of references to the naming of these Crag fossils. The authors who discussed them, it was pleasing to see, had already come to the conclusion that the Crag *Terebratulæ* were incorrectly named *T. grandis*; but they expressed other opinions regarding the names to be applied. Their conclusions may now be considered.

M. É. Vincent* says that the large *Terebratula* from the Lower Pliocene of Antwerp ordinarily called *T. grandis*, Blumenbach, is not that species, which is a fossil of the Middle Oligocene; and he suggests that the name *Terebratula variabilis*, Sowerby, is the correct denomination.

MM. Dautzenberg and Dollfuss† discussed this determination three years later. They agree that the name *T. grandis* is not applicable, but they say that the name *T. variabilis* cannot be used because it was forestalled by a pre-existing *T. variabilis*, Schlothheim. They further say that Nyst‡, noticing this double, proposed the name *T. sowerbyana*, but that this name was unfortunate, for it was already occupied by a *T. sowerbyana*, Defrance, which was named in 1828. They go on to say that the name to be applied is *T. perforata*, Defrance, which was given in Desnoyers§ in 1825, founded on figures of a Crag *Terebratula* published by Dale|| in 1730.

All these authors, as well as Davidson and others, have

* Contrib. pal. Terr. Tert. Belg. Brach.; Ann. Soc. roy. Malac. Belg. xxviii. (1893) p. 55.

† "Du nom à adopter pour le grande Térébratule du Pliocène inférieure d'Anvers;" Pr. verb. Soc. Malac. Belg. xxv. 1896, p. xxi.

‡ Coq. & Polypiers foss. Belg. 1843, p. 335.

§ Desnoyers, "Terr. tert. et cré. du Cotentin;" Soc. d'Hist. Nat. de Paris, ii. p. 239 (64) (1825).

|| Dale, 'History and Antiquities of Harwich and Dovercourt' (1730), p. 204, pl. xi. fig. 9. It is not pl. ii., as quoted by Desnoyers and by MM. Dautzenberg and Dollfuss.

overlooked the fact that there is a still earlier name which was properly applied to the Crag *Terebratulæ*—that of *Terebratula spondylodes*, given, with a description, by William Smith * in 1817. His remarks may be reproduced here:—

“Crag, Inequivalved Bivalves.

“*Terebratula spondylodes*.

“Oval, rather depressed, with sharp transverse lines of growth; a large circular foramen in the beak; two projecting thick teeth in the lower valve; shell thin, depressed on each side of the beak.

“ [p. 13] Foxhole.
Newborn.

Aldborough, an upper valve?

“The large perforation in the beak is grooved circularly, and also the recess beneath the beak, shell thin except at the teeth of the hinge.”

Smith gave no figures, but he evidently had various specimens of Crag *Terebratulæ* before him; and as they formed part of the collection of the British Museum, it may reasonably be expected that Smith's types of *T. spondylodes* are in the safe custody of that institution now. Apart from that, however, the description, with the formation and the localities, fully indicate in a general way what *Terebratula* was named.

If all the Crag *Terebratulæ* be regarded as one species, then Smith's name has priority, and it is the one to apply to these fossils; but if they be regarded as forms deserving of separate names, then Smith's name is applicable to one of the forms. There are two characters in his description which suggest that the form called no. 1 above should have Smith's name—that the shape is oval and that the shell is thin. No. 1 is oval and the shell is thin; in the other forms the shell is a good deal thickened.

The next name is *Terebratula perforata*, DeFrance, 1825. Dale's figures, on which it is founded, are not good; they show two views of a damaged ventral valve. This form seems to be intermediate in breadth between nos. 2 and 3, and it appears to be the same as the broad form figured by J. de C. Sowerby as *T. variabilis* †.

The next name is *T. variabilis*, J. de C. Sowerby, 1827,

* ‘Stratigraphical System of Organized Fossils, with reference to the Specimens of the original Geological Collection in the British Museum’ (1817), p. 12.

† Min. Conch. pl. 576. fig. 4 (1827).

applied to four specimens. Of these, fig. 2 of pl. 576 may be taken as the type, distinguished from *T. perforata* by its very narrowly elliptical form. The name *T. variabilis* of Sowerby may be now retained for it without confusion, because Schlothheim's *T. variabilis* is a *Rhynchonella*.

The next name is *T. maxima*, Charlesworth*. The large example which he figures may be taken as the type; the smaller shell is much narrower and is of the shape of *T. variabilis*. The large *T. maxima* is somewhat narrower and more elliptical than *T. spondylodes*, and is rather broader than *T. perforata*. The shells which Davidson figures in his 'Monograph of Tertiary Brachiopoda,' pl. ii. figs. 1-4, represent *T. maxima*, while his fig. 5 is a young example of *T. variabilis*.

Whatever opinions may be held as to the advisability of distinguishing all these forms by name, yet placed in this order—*T. spondylodes*, *T. maxima*, *T. perforata*, *T. variabilis*—the forms indicate a sequence passing from broadly oval to narrowly elliptical, the broadly oval stage giving place to the elliptical earlier and earlier in each form, so that while nearly adult *T. maxima* shows broadly oval growth-lines, the quite youthful *T. variabilis* shows elongately elliptical growth-lines.

Besides these forms there are the dwarfs, which may be the final expression of the series; mixed with them may be some of the young of the other forms which came to a premature end.

LXXI.—New Asiatic Apodemus, Evotomys, and Lepus.

By OLDFIELD THOMAS.

Apodemus † *semotus*, sp. n.

27. *Mus* —, Swinhoe, P. Z. S. 1864, p. 382.

65. ? *Mus badius*, Hodgson, id. P. Z. S. 1870, p. 637 (*nec* Hodgs.).

Like "*Mus sylvaticus draco*," B.-Ham., but much darker coloured.

Similar in general proportions to the Fo-kien *draco*. Fur thin, not spinous, at least in winter, 7-8 mm. in length on the back. General colour dark brownish, something between "bistre" and "Prout's brown," quite different to the rufous or fulvous of the Chinese forms *chevrieri* and *draco*. Under surface soiled grey, the hairs slaty for four-fifths their length, their tips dull whitish. Ears rather large, almost

* Ann. & Mag. Nat. Hist. 1837, p. 92.

† Kaup, 1829. Antedating *Micromys*, Dehne, 1841. Type, *A. agrarius*.

naked, greyish brown. Hands and feet dull whitish. Tail rather longer than head and body, thinly haired, brown above, but little lighter below. Mammæ apparently only $1-2=6$, as in *A. sylvaticus*, the anterior pectoral pair absent in the two nursing females in the set.

Skull quite like that of *draco*; the front edge of the zygomatic plate slightly concave; the postero-internal or "x" cusp of m^1 and m^2 better developed than in most of the N.-Chinese and Japanese mice recently assigned by me to different subspecies of *A. speciosus*.

Dimensions of the type (measured on skin):—

Head and body (probably stretched) 103 mm.; tail 114; hind foot (wet) 24; ear (wet) 16.

Skull: tip of nasals to front corner of interparietal 25; zygomatic breadth 14; nasals 11; palatilar length 12.5; palatal foramina 5.6; diastema 8; length of upper molar series 4.1.

Hab. Mt. Arizan, Central Formosa.

Type. Adult female. B.M. no. 8. 4. 1. 48. Collected 13th November, 1906, by Mr. Alan Owston's native collectors. Three specimens examined.

As a nameable form, and irrespective of the mammæ, this mouse is readily distinguishable by its much darker general colour from its mainland neighbours, of which it is, perhaps, an insular "saturate" representative.

But some doubt is thrown on this view by the apparent presence of only $1-2=6$ mammæ, the number characteristic of the European and W.-Asiatic *A. sylvaticus*, while hitherto all the far eastern members of the group have been found to have $2-2=8$, which I have therefore supposed to be characteristic of them. All the Korean and Chinese examples of *A. speciosus* have the latter number, as also has the Fo-kien *A. s. draco*. The skull, however, is clearly that of the *speciosus* rather than of the *sylvaticus* group.

Evotomys frater, sp. n.

A large dark-coloured species, much browner than the only other Thian-Shan species, *E. centralis*, Miller.

Size fairly large. Fur soft, loose, not so long as in *centralis*, the hairs of the back about 13 mm. in length. General colour above approaching "mummy-brown," with only enough rufous suffusion to indicate that it is an *Evotomys*. Head and sides rather clearer brown. Rump smoky grey, almost blackish near the root of the tail. Under surface unusually dark, little lighter than "hair-brown," not defined on sides, the hairs slaty for four-fifths their length, with dull

"pinkish-buffy" tips. Hands and feet brownish white. Tail of medium length, longer than in *centralis*, and not so heavily haired as in that species; black above, dull whitish below.

Skull of the younger specimen rather larger than in the type of *E. centralis*, which is of about the same age, the roots of the molars being just commencing to form within their basal capsules.

Dimensions of the type:—

Head and body (measured on skin) 112 mm.; tail (vertebræ *in situ*) 48; hind foot (wet) 19; ear (wet) 14.

Skull: length from nasal tip to back of interparietal 23; zygomatic breadth 13; nasals 7; interorbital breadth 4; brain-case breadth 12; palatilar length 11; diastema 7; palatal foramina 5; upper molar series (crowns) 5.

Hab. Thian-Shan (probably near Przewalsk).

Type. Subadult female. B.M. no. 8. 3. 2. 18. Collected by A. A. Kutsenko. Two specimens.

The only species of *Evotomys* hitherto described from this part of Asia is Mr. Miller's *E. centralis*, of which the type is in the British Museum. That animal is smaller and shorter-tailed than *E. frater*, and its colour is that of an ordinary *Evotomys*, while *E. frater* is the brownest "red vole" as yet discovered.

Lepus formosus, sp. n.

Closely allied to *L. sinensis*, but the colour throughout paler and less warm.

Size rather less than in *sinensis*, though there seems less difference in the skulls than in the hind feet, the Formosan form being therefore proportionally shorter-footed. General colour above greyish, approximating to drab-grey of Ridgway, heavily lined with black, the subterminal rings on the hairs cream-buff; bases of hairs slaty. Face like back, an indistinct lighter line running through the eye. Nape pinkish buff as compared with ochraceous or tawny in *sinensis*. Chin and belly dull white, a wash of pale buffy passing down the sides of the latter. Band across throat pale drab. Limbs buffy, much paler than in *sinensis*. Ears short, the proectote grizzled greyish like the forehead, metectote pinkish buffy like nape proximally, the distal fourth blackish; metentote and the fringe along the anterior edge buffy whitish, a darker shade on its middle portion. Tail about as in *sinensis*, except that the colour is paler and greyer.

In summer pelage the colours are much the same throughout or perhaps a little browner.

Skull practically as in *sinensis*, though the bullæ appear to average rather smaller.

Dimensions of the type (measured on a rather shrunk skin):—

Head and body 380 mm.; tail 30; hind foot 83; ear 65.

Skull: greatest length 81; basilar length 59; zygomatic breadth 37·5; length of nasals (diagonally) 37; interorbital breadth 16; palatal foramina $19 \times 7\cdot5$; length of tooth-row (on alveoli) 14·7.

Another specimen has a hind foot measuring 87 mm.

Hab. Formosa; type from Baksa.

Type. Adult male. B.M. no. 93. 12. 5. 6. Collected 4th March, 1893, by P. A. Holst; presented by Henry Seebohm, Esq. Three young skins also received from the same source. Another specimen obtained on Mt. Arizan by Mr. A. Owston's collectors.

This hare may be readily distinguished from *L. sinensis* by its much paler colour, that animal having the pale rings on its dorsal hairs varying from buffy to ochraceous, thus giving a very much warmer tone to the whole animal.

It is, however, to be noticed that Consul Swinhoe recorded *L. sinensis* as a native of Formosa*, and that the one adult skin (no. 62. 12. 24. 16) of his collection sent as from the island is certainly more like *sinensis* than *formosus*. Whether, however, both forms occur in Formosa, or whether this specimen has been wrongly labelled, are questions which can only be settled when the mammal fauna of the island is more completely known. But considering the uniformity among themselves of all the specimens, young and old, that are unquestionably from Formosa, I am inclined to think that the specimen referred to has been incorrectly labelled.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 4th, 1907.—Sir Archibald Geikie, K.C.B., D.C.L., Sc.D., Sec.R.S., President, in the Chair.

The following communications were read:—

1. 'The Faunal Succession in the Carboniferous Limestone (Upper Avonian) of the Midland Area (North Derbyshire and North Staffordshire).' By Thomas Franklin Sibly, B.Sc., F.G.S.

The area dealt with is the irregularly-shaped periclinal mass

* P. Z. S. 1862, p. 359.

forming the southern end of the Pennine anticline, with a few small outliers. The base of the Limestone is not shown, and the whole series exposed constitutes a greatly-expanded development of the uppermost zone of the typical Avonian succession of the South-Western Province, namely, the *Dibunophyllum*-Zone. The most extensive section—that along the Midland Railway, between Longstone and Buxton—shows a thickness of about 1500 feet. Three subzonal divisions are distinguished, as follows:—

- D₃. Subzone of *Cyathaxonia rushiana*: represented in the South-Western Province by horizon ϵ and the lower part of the Millstone Grit.
- D₂. Subzone of *Lonsdalia floriformis*: correlated with the Upper *Dibunophyllum*-Zone (D₂) of the South-West.
- D₁. Subzone of *Dibunophyllum* θ : correlated with the Lower *Dibunophyllum*-Zone (D₁) of the South-West.

An abnormal development of the *Lonsdalia*-subzone, consisting of richly-fossiliferous brachiopod-beds, in which the typical coral-fauna has very little representation, forms a conspicuous local feature in various parts of the western half of the area. The passage-beds between the Carboniferous Limestone and the Pendleside Series are included in the *Cyathaxonia*-subzone. Locally, these passage-beds attain a thick development. A local unconformity between the Carboniferous Limestone and the Pendleside Series, indicating contemporaneous elevation and erosion, occurs in the eastern part of the area. A close general similarity exists between the *Dibunophyllum*-Zone of the Midland area and that of North Wales. These two areas should be regarded as constituting a Midland Province. A comparison of the *Dibunophyllum*-zone of the Midland with that of the South-Western Province brings out the following more important differences:—(a) The brachiopod-fauna of the *Lonsdalia*-subzone of the Midland Province is considerably richer than that of the equivalent part of the South-Western sequence. (b) The *Cyathaxonia*-subzone of the Midland Province, which attains a maximum development in Derbyshire and North Staffordshire, is practically undeveloped in the South-Western Province.

The paper concludes with a description of certain corals and brachiopods from the Midland area, some species and varieties being new.

2. 'Brachiopod Homœomorphy: "*Spirifer glaber*".' By S. S. Buckman, F.G.S.

The smooth, catagenetic, stage of shells may have been attained by the loss of different distinctive features, pointing to polygenetic origins. The series of shells figured by Davidson as *Spirifera glabra* do not all agree in being smooth; some are radially costate, some have a pronounced mesial fold, others hardly any, some are very transverse, others are narrow. There is good evidence that several of the forms ranged under this species are *Reticularia* (McCoy), more or less smooth. Thus *Sp. obtusus*, regarded by Davidson as a synonym of *Sp. glabra*, shows faint reticulation, has

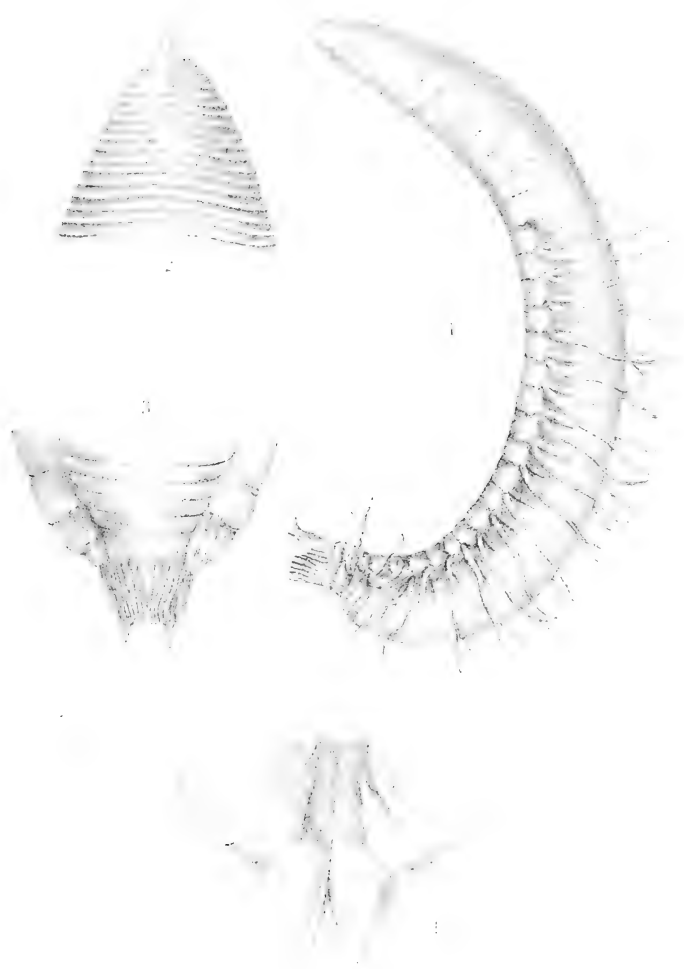
the dental plates, and must be classed as a *Reticularia*; while quite smooth forms with similar plates also occur (*Sp. lata*, Brown, and *Sp. glaberrimus*, de Koninck). But other forms called *Sp. glabra* seem to have been derived from radially costate ancestors. The use of the generic name *Martinia* for various smooth Spiriferids of the Devonian and Carboniferous thus becomes wholly unjustifiable, as it simply denotes a stage of catagenetic development at which several different stocks of Spirifers arrive. As the outcome of this study the Author restricts the genus *Spirifer*, and allocates several British and foreign species among the genera *Fusella*, *Choristites*, *Trigonotreta*, *Brachythyrus*, *Martinia*, and *Reticularia*. He also gives in an Appendix a revised explanation of Davidson's plates xi & xii of the Monograph of Carboniferous Brachiopods.

December 18th, 1907.—Sir Archibald Geikie, K.C.B., D.C.L., Sc.D.,
Sec.R.S., President, in the Chair.

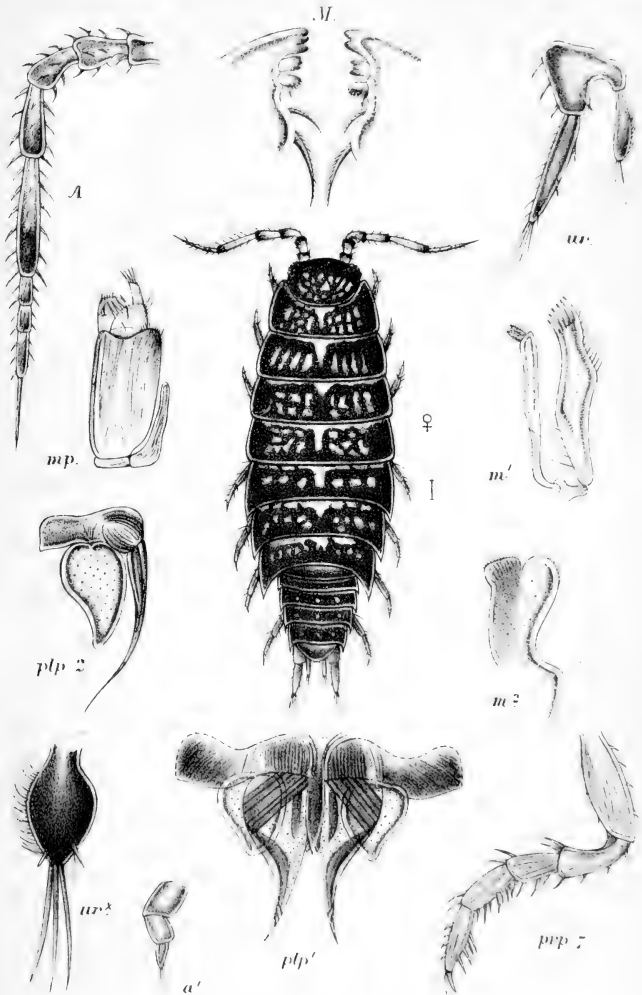
The following communication was read:—

'Some Recent Discoveries of Palæolithic Implements.' By
Sir John Evans, K.C.B., D.C.L., LL.D., F.R.S., For.Sec.G.S.

By the courtesy of Mr. Worthington Smith, the Author is enabled to call attention to some recent discoveries of Palæolithic implements on the southern borders of Bedfordshire and in the north-western part of Hertfordshire. In addition to the discovery of a Palæolithic floor at Caddington brickfield, at between 550 and 590 feet above sea-level, implements have since been found on the surface of the ground at 600 and 760 feet respectively; while a good ovate implement was found in thin, water-laid material, at 651 feet O.D. In Hertfordshire, Palæolithic implements have been found at Great Gaddesdon, at a brickfield about $1\frac{1}{2}$ miles north-east of Hemel Hempstead, and at Bedmond, 2 to $2\frac{1}{4}$ miles south-east of the last locality. The drifts which cap the hills in North-West Hertfordshire seem to be of very variable origin; and a great part of the material is derived from clay-deposits of Eocene age, but little remaniés. It seems to the Author that it is safest not to invoke river-action for the formation of the high-level deposits, which extend over a wide area and are in the main argillaceous and not gravelly or sandy in character, but to adopt Mr. Worthington Smith's view that in early times lakes or marshes existed in these implementiferous spots, the borders of which were inhabited by Palæolithic Man. The evidence that he has brought forward as to the implements having, in some of the Caddington pits, been manufactured on the spot, most fully corroborates this view.









THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 6. JUNE 1908.

LXXII.—*A Synopsis of the Sharks of the Family*
Scyliorhinidæ. By C. TATE REGAN, M.A.

THE *Scyliorhinidæ* may be diagnosed as sharks with two dorsal fins not preceded by spines, with an anal fin, with five gill-openings on each side, the last one or two above the base of the pectoral fin, with cuspidate teeth of small or moderate size, and without nictitating membranes or oro-nasal grooves.

Three genera may be recognized, which may be distinguished thus:—

I. First dorsal fin not in advance of the pelvics.

Dermal denticles on the upper surface of the caudal fin similar to those on the body or uniformly enlarged

1. *Scyliorhinus.*

A series of enlarged flattened denticles on each side of a strip of normal denticles on the upper edge of the caudal fin

2. *Pristiurus.*

II. First dorsal fin long and low, in advance of the pelvics.

3. *Pseudotriacis.*

I. SCYLIORHINUS.

Scyliorhinus, Blainville, Journ. Phys. 1816, p. 263.

Scyllium, Cuv. Règne Anim. ed. 1, 1817, p. 124.

Catulus, A. Smith, Proc. Zool. Soc. 1837, p. 85.

Poroderma, A. Smith, *l. c.*

Halæurus, Gill, Ann. Lyc. N. York, vii. 1861, p. 467.

Cephaloscyllium, Gill, *l. c.*

Twenty-seven species.

Synopsis of the Species.

- I. Upper lip overlapping the lower at the corner of the mouth; upper labial fold, if present, very short; lower labial fold short or of moderate length. Dorsal fins equal or the first larger than the second; first dorsal originating above or behind the posterior end of the base of pelvics; pelvic fins, in the males, with their posterior edges either united or contiguous at the base. (*Scyliorhinus*.)
- A. Anterior nasal valves well separated from each other and from the mouth, each with a cirrus; anal fin ending below the middle of second dorsal; pelvic fins not united.
1. First dorsal considerably larger than the second.
- Nasal cirri moderate, not reaching the mouth 1. *africanus*.
 Nasal cirri long, extending to the mouth 2. *pantherinus*.
2. First dorsal scarcely larger than the second; nasal cirri short, projecting but little beyond the edges of the valves.
 3. *stellaris*.
- B. Anterior nasal valves well separated from each other and from the mouth, each with a ridge which does not project as a free cirrus; anal fin ending below the anterior part of second dorsal.
1. First dorsal considerably larger than the second.
- Mouth about twice as wide as long*; base of first dorsal not or scarcely more than $\frac{1}{2}$ its distance from the second; pelvic fins, in the males, united at the base 4. *retifer*.
 Mouth about $2\frac{1}{2}$ as wide as long; base of first dorsal $1\frac{1}{2}$ to $1\frac{2}{3}$ in its distance from the second 5. *rudis*.
2. First dorsal scarcely larger than the second; pelvic fins, in the males, completely united 6. *capensis*.
- C. Anterior nasal valves separated from each other by a very short interspace and confluent with the upper lip; no trace of cirri; anal fin ending below the origin of second dorsal; pelvic fins, in the males, united for nearly the entire length of their posterior edges 7. *canicula*.
- II. Lower lip not overlapped by the upper; labial folds absent or vestigial. First dorsal fin considerably larger than the second, originating above or a little in advance of the middle of the base of pelvics; origin of second dorsal above anterior part of anal; pelvic fins not united. Anterior nasal valves separate from each other and from the mouth; no cirri. Head broad, depressed; snout short, obtuse; mouth wide; stomach inflatable. (*Cephaloscyllium*.)
- Pectoral fin extending $\frac{2}{3}$ to $\frac{3}{4}$ of the distance from its origin to that of the pelvics; end of anal a little before that of second dorsal 8. *laticeps*.

* The length of the mouth is measured from the symphysis of the lower jaw to a transverse line between the corners of the mouth.

- Pectoral fin extending nearly $\frac{2}{3}$ of the distance from its origin to that of the pelvics; end of anal below that of second dorsal 9. *ventriosus*.
- Pectoral fin extending $\frac{1}{2}$ of the distance from its origin to that of the pelvics 10. *umbratilis*.
- III. Lower lip not overlapped by the upper; usually a distinct labial fold at the angle of the mouth. Dorsal fins usually subequal, the first rarely longer than the second; pelvic fins not united. No nasal cirri. (*Halaelurus*.)
- A. Length of base of anal more than its distance from the caudal.
1. Anal from a little less than 2 to nearly 3 times as long as the second dorsal; dermal denticles on upper surface of tail not enlarged.
 - a. Labial fold extending along the lower jaw $\frac{1}{2}$ or a little less than $\frac{1}{2}$ of the distance to the symphysis.

Anal $2\frac{3}{4}$ as long as second dorsal, which is larger than the first 11. *indicus*.

Anal $2\frac{1}{2}$ as long as second dorsal, which is slightly larger than the first 12. *brunneus*.

Anal more than twice as long as second dorsal, which is as large as the first 13. *spongiceps*.

Anal twice as long as second dorsal, which is as large as the first 14. *profundorum*.
 - b. Labial fold extending along the lower jaw $\frac{1}{3}$ the distance to the symphysis; anal nearly twice as long as either dorsal.

15. *analis*.
 - c. Labial fold extending along the lower jaw $\frac{1}{4}$ the distance to the symphysis; anal twice as long as either dorsal.

16. *hispidus*.
 2. Anal $1\frac{3}{5}$ as long as second dorsal; a band of enlarged dermal denticles on the upper surface of tail 17. *xanurus*.
 3. Anal not much longer than second dorsal; dermal denticles on upper surface of tail not enlarged; labial fold extending along the lower jaw about $\frac{1}{4}$ the distance to the symphysis.
- Second dorsal entirely above the anal 18. *cephalus*.
- Anal ending below the middle of second dorsal 19. *canescens*.
- B. Length of base of anal equal to or less than its distance from the caudal.
1. Anterior nasal valves separate from each other and from the mouth.
 - a. Labial fold extending along the lower jaw not more than $\frac{2}{3}$ the distance to the symphysis; anterior nasal valves nearly rectangular.
 - a. Snout rounded; labial fold very short or absent.

20. *buergeri*.
 - b. Snout pointed; labial fold distinct.

Interspace between the nasal valves a little more than $\frac{2}{3}$ the preoral length of snout; a short labial fold at the angle of the mouth 21. *quagga*.
- Interspace between the nasal valves not more than $\frac{1}{3}$ the preoral length of snout; a labial fold at

- the angle of the mouth, extending along the lower jaw $\frac{1}{3}$ to $\frac{2}{5}$ of the distance to the symphysis 22. *natalensis*.
- b. Labial fold extending along the lower jaw about $\frac{1}{2}$ the distance to the symphysis; anterior nasal valves acutely pointed and with notched posterior edges.
- No dorsal tubercles; anal $1\frac{1}{2}$ to $1\frac{4}{5}$ as long as first dorsal, which measures $\frac{1}{3}$ to $\frac{2}{5}$ of its distance from the second 23. *bivius*.
- Two series of tubercles on the back from head to first dorsal fin; anal $1\frac{1}{3}$ as long as first dorsal, which measures nearly $\frac{1}{2}$ of its distance from the second 24. *chilensis*.
- c. Labial fold extending along the lower jaw nearly to the symphysis 25. *maculatus*.
2. Anterior nasal valves overlying the edge of the upper lip.
- Labial fold extending along the lower jaw nearly to the symphysis; anterior nasal valves separated by a moderate interspace 26. *marmoratus*.
- Labial fold extending along the lower jaw nearly $\frac{1}{2}$ the distance to the symphysis; anterior nasal valves nearly or quite meeting in the middle line 27. *edwardsii*.

Section 1. SCYLIORHINUS.

(Incl. *Scyllium*, *Catulus*, and *Poroderma*.)1. *Scyliorhinus africanus*.*Squalus africanus*, Gmelin, Linn. Syst. Nat. i. p. 1494 (1793).*Scyllium africanum*, Cuv. Règne Anim. ed. 2, ii. p. 386 (1829); Müll. & Henle, Plagiost. p. 12, pl. vii. fig. (1841); Smith, Ill. Zool. S. Afr., Fish. pl. xxv. fig. 1 (1845); Duméril, Elasmobr. p. 321 (1865).*Scyllium africanum*, var. *africana* s. *striata*, Günth. Cat. Fish. viii. p. 406 (1870).

Five or seven broad dark longitudinal stripes from snout to caudal fin, one mid-dorsal and two or three on each side.

Hab. South Africa.

In the British Museum two specimens, 400 and 600 mm. in total length.

2. *Scyliorhinus pantherinus*.*Scyllium pantherinum* (Smith), Müll. & Henle, Plagiost. p. 13 (1841); Smith, Ill. Zool. S. Afr., Fish. pl. xxv. fig. 2 (1845); Duméril, Elasmobr. p. 322 (1865).*Scyllium variegatum* (Smith), Müll. & Henle, t. c. p. 14; Smith, t. c. pl. xxv. fig. 3; Duméril, l. c.*Scyllium africanum*, vars. *variegata* & *pantherina*, Günth. Cat. Fish. viii. p. 406 (1870).

Back and sides covered with blackish spots or vermiculations, which may unite to form rings or longitudinal stripes.

Hab. South Africa.

In the British Museum five specimens, 400 to 700 mm. in total length, including the types of the species and of *S. variegatum*.

3. *Scyliorhinus stellaris*.

Squalus stellaris, Linn. Syst. Nat. ed. 10, p. 235 (1758), and ed. 12, p. 399 (1766).

Scyllium catulus (non Linn.), Cuv. Règne Anim. ii. ed. 1, p. 124 (1817); Müll. & Henle, Plagiost. p. 9, pl. vii. (1841); Duméril, Elasmobr. p. 316 (1865).

Scyllium stellare, Günth. Cat. Fish. viii. p. 403 (1870).

Upper parts with numerous rounded dark spots.

Hab. Europe, from Scandinavia to the Mediterranean.

In the British Museum eight specimens, 140 to 900 mm. in total length.

4. *Scyliorhinus retifer*.

Scyllium retiferum, Garm. Bull. Mus. Comp. Zool. viii. 1881, p. 233.

Scyliorhinus retifer, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 16, pl. ii. fig. 6, and pl. iv. figs. 14 & 15.

Catulus retifer, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 25.

Catulus hækeli, Ribeiro, Arch. Mus. Rio Janeiro, xiv. 1907, p. 163, pl. viii.

Hab. Atlantic coasts of America from the United States to Brazil, in deep water (40 to 200 fathoms).

An example of 250 mm. in the British Museum, from the North Atlantic, shows the typical coloration of the species. The back is crossed by seven pairs of narrow blackish transverse stripes, the fourth and fifth of which pass through the bases of the first and second dorsal fins respectively; on the sides these stripes give rise to a network with large polygonal meshes. Goode and Bean give the name *S. boa* to a variety which appears to be identical with the recently described *C. hækeli*; the paired stripes are replaced by dark bars studded with darker spots, and the reticulations on the sides are broken up into spots and vermiculations.

5. *Scyliorhinus rudis*.

Scyliorhinus rudis, Pietschmann, Anz. Ak. Wien, 1908, p. 133.

Catulus torazame, Tanaka, Journ. Sci. Coll. Tokyo, xxiii. 1908, Art. 7, p. 6, pl. ii. fig. 2.

This species differs from *S. retifer* in the broader head,

shorter and blunter snout and wider mouth, as well as in coloration. Dark transverse bars on the back correspond to the interspaces between a series of dark bars or blotches on the lower part of the side, and there are scattered small round white spots on the body.

Hab. Japan.

6. *Scyliorhinus capensis*.

Scyllium capense, Müll. & Henle, *Plagiost.* p. 11 (1841); Duméril, *Elasmobr.* p. 320 (1865); Günth. *Cat. Fish.* viii. p. 404 (1870).

Upper parts greyish or brownish, with darker cross-bands and with numerous rounded whitish spots.

Hab. South Africa.

In the British Museum six specimens, 600 to 1000 mm. in total length.

7. *Scyliorhinus canicula*.

Squalus canicula, Linn. *Syst. Nat.* ed. 10, p. 234 (1758), and ed. 12, p. 399 (1766).

Squalus catulus, Linn. *t. c.* ed. 10, p. 235, and ed. 12, p. 400.

Scyllium canicula, Cuv. *Règne Anim.* ii. ed. 1, p. 124 (1817); Müll. & Henle, *Plagiost.* p. 6, pl. vii. fig. (1841); Duméril, *Elasmobr.* p. 315 (1865); Günth. *Cat. Fish.* viii. p. 402 (1870).

Upper parts of the body covered with numerous small dark spots.

Hab. Europe, from Scandinavia to the Mediterranean.

In the British Museum twenty-seven specimens, measuring up to 700 mm. in total length.

Section 2. CEPHALOSCYLLIUM.

8. *Scyliorhinus laticeps*.

Scyllium laticeps, Duméril, *Rev. et Mag. Zool.* 1853, p. 84, pl. iii. fig. 2, and *Elasmobr.* p. 323 (1865); Günth. *Cat. Fish.* viii. p. 404 (1870).

Upper surface brownish, with numerous rounded blackish spots; a broad blackish transverse band covering the region between the eyes and the last gill-openings; a less distinct dark band behind this; a few dark blotches on the sides and at the base of each dorsal fin; lower surface yellow.

Hab. Southern Australia, Tasmania, and New Zealand.

In the British Museum three specimens, 300 to 850 mm. in total length.

9. *Scyliorhinus ventriosus*.

Scyllium ventriosum, Garm. *Bull. Mus. Comp. Zool.* vi. 1880, p. 167.

Catulus uter, Jord. & Everm. *Bull. U.S. Nat. Mus.* xlvi. 1896, p. 25, and 1900, fig. 12.

Upper surface brownish, with scattered rounded dark brown spots and smaller bright yellow spots; back with several dark cross-bands or pairs of bands which are more or less broken up into double series of dark spots; lower surface yellow, with numerous dark spots. In structural characters differing but slightly from the preceding species.

Hab. Pacific Coast of America from California to Chile.

In the British Museum one example, 620 mm. in total length.

10. *Scyliorhinus umbratilis*.

Cephaloscyllium umbratile, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 602, fig. 1.

Brownish, spotted and marbled with darker; back with dark transverse bands, the first behind the eyes, the second between the pectorals, the fourth and fifth through the bases of the dorsal fins.

Hab. Japan.

In the British Museum one example, 1000 mm. in total length.

Section 3. HALÆLURUS.

11. *Scyliorhinus indicus*.

Scyliorhinus indicus, Brauer, 'Valdivia' Tiefsee-Fische, p. 8, pl. xiv. fig. 1 (1906).

Dr. A. Brauer has kindly informed me that in this species the labial fold extends along the lower jaw a little less than $\frac{1}{2}$ the distance to the symphysis. As in most of the deep-sea species of this genus, the coloration is nearly uniform.

Hab. Indian Ocean, at depths of 1289 to 1840 metres off East Africa and in the Gulf of Aden.

12. *Scyliorhinus brunneus*.

Catulus brunneus, Gilbert, Proc. U.S. Nat. Mus. 1891, p. 542; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 24.

Hab. Gulf of California, in deep water.

13. *Scyliorhinus spongiceps*.

Catulus spongiceps, Gilbert, Bull. U.S. Fish. Comm. 1903, p. 579 (1905).

Hab. Hawaii, 313 to 800 fathoms.

14. *Scyliorhinus profundorum*.

Scyliorhinus profundorum, Goode & Bean, Mem. Mus. Comp. Zool. xxii. 1896, p. 17, pl. v. fig. 16; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 22, and 1900, fig. 11.

Hab. North Atlantic, at a depth of 816 fathoms, in lat. 39° 9' N., long. 72° 3' 15" W.

15. *Scyliorhinus analis*.

Scyllium anale, Ogilby, Proc. Linn. Soc. N. S. Wales. x. 1885, p. 445.
Catulus analis, Waite, Mem. Austral. Mus. iv. 1899, pl. ii. fig. 1.

Brownish or greyish, with scattered round dark spots.

Hab. New South Wales.

In the British Museum one specimen, 460 mm. in total length.

16. *Scyliorhinus hispidus*.

Scyllium hispidum, Alcock, Ann. & Mag. Nat. Hist. (6) viii. 1891, p. 21; Ill. Zool. 'Investigator,' Fishes, pl. viii. fig. 3 (1894); Cat. Ind. Deep-sea Fish. p. 15 (1899).

Scyliorhinus hispidus, Brauer, 'Valdivia' Tiefsee-Fische, p. 7 (1906).

Greyish, with or without dark cross-bars on the back.

Hab. Indian Ocean, 185 to 419 fathoms.

In the British Museum one specimen, 260 mm. in total length.

17. *Scyliorhinus xaniurus*.

Catulus xaniurus, Gilbert, Proc. U.S. Nat. Mus. 1891, p. 540; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 24.

Hab. Coast of Southern California, at a depth of 184 to 684 fathoms.

18. *Scyliorhinus cephalus*.

Catulus cephalus, Gilbert, Proc. U.S. Nat. Mus. 1891, p. 541; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 24.

Hab. Gulf of California and Revillagigedo Islands, at a depth of 362 to 460 fathoms.

A small specimen in the British Museum received from the Smithsonian Institution as *C. xaniurus* probably belongs to this species, as there are no enlarged denticles on the upper surface of the tail and the anal is only $1\frac{1}{3}$ as long as the second dorsal.

19. *Scyliorhinus canescens*.

Scyllium canescens, Günth. Ann. & Mag. Nat. Hist. (5) ii. 1878, p. 18, and 'Challenger' Deep-sea Fish. p. 1, pl. i. fig. A (1887).

Hab. Chile, 400 fathoms.

In the British Museum a single specimen, type of the species, 285 mm. in total length.

Alcock (Cat. Ind. Deep-sea Fish. p. 16) has recorded *S. canescens* from the Indian Ocean, but from his notes it is evident that his specimen does not belong to this species.

20. *Scyliorhinus buergeri*.

Scyllium buergeri, Müll. & Henle, Plagiost. p. 8, pl. ii. (1841); Schleg. Faun. Japon., Poiss. p. 301 (1850); Duméril, Elasmobr. p. 320 (1865); Günth. Cat. Fish. viii. p. 404 (1870).

Halæurus buergeri, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 601.

Brownish, with darker cross-bars which are studded with blackish spots.

Hab. Japan to Amboyna.

In the British Museum five specimens, 390 to 480 mm. in total length.

21. *Scyliorhinus quagga*.

Scyllium quagga, Alcock, Cat. Ind. Deep-sea Fish. p. 17 (1899), and Ill. Zool. 'Investigator,' Fish. pl. xxvii. fig. 1 (1900).

Back with narrow dark cross-bands.

Hab. Malabar Coast, 102 fathoms.

22. *Scyliorhinus natalensis*.

Scyllium natalense, Regan, Ann. & Mag. Nat. Hist. (7) xiv. 1904, p. 128.

Greyish, with brown markings; back with cross-bands with dark edges, the anterior bands sometimes broken up into two or three large spots; interspaces between the anterior bands covered with reticulations; posteriorly narrower intermediate bands; a large dark spot on each of the dorsal, pectoral, and pelvic fins.

Hab. Natal and Cape Colony.

In the British Museum four specimens, 390 to 425 mm. in total length, including the type of the species.

23. *Scyliorhinus bivius*.

Scyllium bivium (Smith), Müll. & Henle, Plagiost. p. 8 (1841); Duméril, Elasmobr. p. 321 (1865); Günth. Cat. Fish. viii. p. 405 (1870).

Scyllium brevicolle, Philippi, An. Univ. Chile, lxxi. 1887, p. 558, pl. vii. fig. 5.

Scyllium gayi, Philippi, Zool. Garten, 1887, p. 86.

Scyllium chilense (non Guichen.), Vaill. Miss. Sci. Cap Horn, Poiss. p. 10, pl. i. fig. 1 (1891).

Back with dark blotches or transverse bars; upper parts with rounded blackish spots and usually with some pale spots.

Hab. Chile and Patagonia.

In the British Museum eight specimens, 280 to 750 mm. in total length, including the type of the species.

24. *Scyliorhinus chilensis*.

Scyllium chilense, Guichen. in Gay, Fauna Chilena, Pisces, p. 362 (1847); Günth. Cat. Fish. viii. p. 405 (1870); Philippi, An. Univ. Chile, lxxi. 1887, p. 556, pl. vii. fig. 4.

Coloration as in the preceding species, but no pale spots.

Hab. Chile.

In the British Museum four examples, 330 to 550 mm. in total length.

25. *Scyliorhinus maculatus*.

Squalus maculatus, Schneid. Bloch's System. Ichthyol. p. 130 (1801).

Scyllium maculatum, Günth. Cat. Fish. viii. p. 401 (1870).

Catulus labiosus, Waite, Rec. Austral. Mus. vi. 1906, p. 57, fig. 23.

Body with scattered rounded dark spots.

Hab. Australia.

The specimen in the British Museum, 550 mm. in total length, from Bramble Bay*, was erroneously described by Günther as having the nasal valves confluent in front of the mouth. Waite's figure, based on a specimen from Fremantle, Western Australia, shows very accurately the structure and position of the nasal valves, labial folds, &c.

26. *Scyliorhinus marmoratus*.

Scyllium marmoratum, Bennett, in 'Life of Raffles,' p. 693 (1830); Günth. Cat. Fish. viii. p. 400 (1870).

Scyllium maculatum (non Bl. Schn.), Gray, Ind. Zool. pl. xxviii. fig. 1 (1832); Müll. & Henle, Plagiost. p. 5, pl. vii. (1841); Duméril, Elasmobr. p. 319 (1865).

Upper parts with numerous brown spots which may unite to form undulating bands or rings enclosing pale spots.

Hab. India; Malay Archipelago.

In the British Museum eight specimens, 340 to 620 mm. in total length, including the type of *S. maculatum*, Gray.

* ? Bramble Cay, an island in the Gulf of Papua.

27. *Scyliorhinus edwardsii*.

Squalus catulus (non Linn.), Edwards, Glean. Nat. Hist. iii. pl. cclxxxix. (1764).

Scyllium edwardsii, Cuv. Règne Anim. ed. 2, p. 386 (1829); Müll. & Henle, Plagiost. p. 4, pl. i. (1841); Duméril, Elasmobr. p. 319 (1865); Günth. Cat. Fish. viii. p. 401 (1870).

Scyllium pictum, Müll. & Henle, t. c. pp. 4 & 189.

Upper parts of head, body, and paired fins with dark brown reticulations; back with several irregular dark cross-bars.

Hab. South Africa.

In the British Museum three specimens, 160 to 520 mm. in total length.

2. PRISTIURUS.

Pristiurus, Bonap. Faun. Ital., Pesc. (1834).

Differs from *Scyliorhinus* in having a series of enlarged dermal denticles on each side of the upper edge of the caudal fin.

Three species.

Synopsis of the Species.

I. Anal fin ending at a short distance from the caudal.

Base of anal fin considerably longer than the distance from anterior edge of eye to origin of pectoral fin. 1. *melanostomus*.

Base of anal fin equal to the distance from anterior edge of eye to origin of pectoral fin. 2. *murinus*.

II. Anal fin separated from the caudal by a distance not much less than the length of its base . . . 3. *eastmani*.

1. *Pristiurus melanostomus*.

Galeus melastomus, Rafin. Caratt. p. 13 (1810).

Pristiurus melanostomus, Bonap. Faun. Ital., Pesc. (1834); Müll. & Henle, Plagiost. p. 15 (1841); Duméril, Elasmobr. p. 325 (1865); Günth. Cat. Fish. viii. p. 407 (1870).

Pristiurus atlanticus, Vaill. Expéd. 'Travailleur' et 'Talisman,' Poiss. p. 59, pl. i. fig. 1 (1888).

Hab. Coasts of Europe, from Scandinavia to the Mediterranean.

In the British Museum twenty-four examples, measuring up to 650 mm. in total length.

2. *Pristiurus murinus*.

Pristiurus murinus, Coll. Forh. Vid. Selsk. Christian. 1904, no. 9, p. 4, and Rep. Norweg. Fish. ii. 1905, no. 3, p. 32, pl. i. fig. 3.

Hab. 150 kilomètres N.W. of the Hebrides, at a depth of 1100 to 1300 mètres.

3. *Pristiurus eastmani*.

Pristiurus eastmani, Jord. & Snyder. *Smithson. Coll.* xlv. 1903, p. 230, pl. ix. (1904).

Hab. Japan.

In the British Museum one specimen, 300 mm. in total length.

Garman has recently proposed a new genus *Parmaturus* (*Bull. Mus. Comp. Zool.* xlvi. 1906, p. 203) to include a new species, *Parmaturus pilosus*, from deep water off Japan, in addition to *Pristiurus eastmani* and *Scyliorhinus xaniurus*.

I have examined a specimen of *Pristiurus eastmani*, which I regard as congeneric with *P. melanostomus*. On the other hand, *S. xaniurus*, as described, does not appear to differ generically from *Scyliorhinus*. The systematic position of *Parmaturus pilosus* is therefore, at present, uncertain.

3. PSEUDOTRIACIS.

Pseudotriacis, Capello, *Jorn. Sc. Math. Phys. Lisboa*, iv. 1867, p. 321.

This genus is distinguished by the numerous small teeth and by the long and low first dorsal fin in advance of the pelvics.

Two species.

1. *Pseudotriacis microdon*.

Pseudotriakis microdon, Capello, *Jorn. Sci. Math. Lisboa*, iv. 1867, p. 321, pl. v. fig. 1; Bean, *Proc. U.S. Nat. Mus.* vi. 1883, p. 147; Jord. & Everm. *Bull. U.S. Nat. Mus.* xlvii. 1896, p. 27, and 1900, fig. 14.

Pseudotriacis microdon, Günth. *Cat. Fish.* viii. p. 395 (1870).

Length of head (to last gill-opening) $5\frac{1}{3}$ in the length of the fish.

Hab. North Atlantic.

In the British Museum one example, 1050 mm. in total length.

This species attains a length of 3000 mm. The skeleton has been well described by Jaquet (*Bull. Mus. Monaco*, 1905, no. 36) and does not differ notably from that of *Scyliorhinus*. The secondary calcification of the vertebrae is reduced to a thin peripheral layer, as in *Pristiurus* (Regan, *Proc. Zool. Soc.* 1906, p. 745).

2. *Pseudotriacis acrales*.

Pseudotriacis acrales, Jord. & Snyder. *Smithson. Coll.* xlv. 1903, p. 232, pl. lxii. (1904).

Length of head (to last gill-opening) $4\frac{1}{3}$ in the length of the fish.

Hab. Japan.

Jordan and Snyder give a comparative table of the supposed differences between this species and the preceding, but a specimen of *P. microdon* from the coast of Portugal in the British Museum has the characters assigned by them to the Japanese form, except for the shorter head.

LXXIII.—Description of a new Species of the Genus *Conus*.
By G. B. SOWERBY, F.L.S.

Conus excelsus, sp. n.

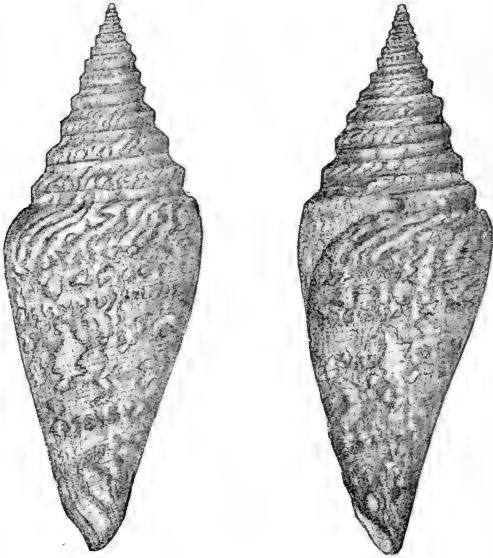
Testa fusiformis, elongata, angulata, utrinque acuminata, sulcis transversis numerosis haud profundis cingulata, longitudinaliter irregulariter dense plicata; fulva, maculis albis diversiformibus, et lineis rufo-fuscis irregularibus interruptis, plerumque in balteis transversis dispositis ornata; spira elatissima, acuta, gradata; anfractus 13-14, angulati, supra leviter concavi, bisulcati, oblique aurantio lineati et albo variegati, primi 8-9 minute nodulati; anfractus ultimus acuminatus, antice valde attenuatus, postice angulatus, ad angulum tenuiter carinatus, flammulis rufo-fuscis et albis oblique arcuatis pictus; apertura medioeriter lata; labrum tenue, arcuatum, postice profunde sinuatum.

Long. 93, maj. diam. 33 mm.

Hab. New Caledonia?

This magnificent shell, at present unique, defies comparison with any hitherto known species. The most prominent feature is the extraordinary height of its acutely conical spire, which is quite symmetrical and has no appearance of abnormality. The whorls are angular, a little concave above the angle, with two shallow spiral grooves; the first eight or nine are coronated with minute tubercles at the angle. The body-whorl is gracefully attenuated towards the base and slightly rounded at the angle, which is surmounted by a narrow keel. The surface is sculptured by rather numerous shallow spiral grooves and longitudinal minute irregular plicæ. In colour it is rather light fulvous yellow, with white patches of various sizes and shapes, outlined with reddish

brown; the brown flames and white spaces on the upper part of the body-whorl and crossing the angle have the obliquely arcuate form of the labial sinus. The aperture is of about



Conus excelsus.

the average width, with a thin sharp lip arcuately receding and forming quite a Pleurotomoid sinus.

The shell came to me from New Caledonia; but I have at present no certain information as to its habitat. It is now in the British Museum (South Kensington).

LXXIV.—*On a new Rhodesian Hare.*

By E. C. CHUBB.

Lepus zuluensis micklemi, subsp. n.

A small form of *L. zuluensis*.

General colour above drab-brown, pencilled with black,

flanks lighter. Hairs of back black, with subterminal ring of "ecru-drab"; underfur slaty grey, tipped with smoky brown. Under surface white, the fur in some parts grey at base. Throat-patch like back, more extensive than in *L. zuluensis*. Muzzle, interramia, and ring round eye dirty white; cheeks and forehead like back. Outer surface of ears similarly coloured to back, but rather darker than in *L. zuluensis*, margined with white and tipped with black. Nape-patch "ochraceous buff." Limbs white inside, outside similar to colour of back but lighter. Hind feet nearly white above. Tail white, with a broad black dorsal stripe.

Skull very similar to that of true *zuluensis*, but smaller. Incisors narrower than in typical *zuluensis*, with wider, shallower, more median grooves.

Dimensions of two co-types (measured in flesh) :—

Head and body 430, 435 mm.; tail 80, 87; hind foot 110, 108; ear 95, 95.

Skulls: greatest length 85, 88; basilar length 64, 67; zygomatic breadth 42, 41; nasals, oblique length 38, 37.5; greatest breadth 19, 19; interorbital breadth inside wings 18, 18.5; breadth of brain-case 28, 28.5; diastema 23.5, 25; palate length 34.5, 36; palatal foramina 21, 22 × 8, 9.5; length of cheek tooth series 14, 15.

Average measurements of six skins from Bulawayo :—

Head and body 435 mm.; tail 87; hind foot 107; ear 97.

Hab. Bulawayo, Southern Rhodesia.

Co-types. Nos. 11, 15, E.C.C. ♂, 12th April, 1907; ♂, 30th April, 1907.

Caught by natives near Bulawayo.

Matabele name "Umvundhla."

LXXV.—The Nomenclature of certain *Lorises*.

By OLDFIELD THOMAS.

IN a recent publication* Dr. A. Cabrera has made some remarks on the nomenclature of the Oriental Lemurines of the genera *Nycticebus* and *Loris*, but he comes to conclusions with which I am not prepared to agree, for the reasons explained below.

His chief contention is that Stone and Rehn † were wrong in assigning Linnaeus's "*Lemur tardigradus*" to the Cingha-

* Bol. Soc. españ. Hist. Nat. 1908, p. 135.

† P. Ac. Philad. 1902, p. 137.

lese Slender Lemur (*Loris*), instead of to *Nycticebus*, as had been previously done. His conclusion is based on the argument that Linnæus's description agrees better with *Nycticebus*, whatever his references may refer to, an argument that is quite natural for any one to use who has not been forced by hard experience to learn that certain formal rules are necessary to be followed in such cases, and that with regard to Linnæan names in particular there is no hope of anything like definiteness in our conclusions unless some formal routine is followed.

The only method that promises this definiteness is to trace back Linnæus's references through his own published works until the earliest is reached, and from that the original source of the name can be deduced. A description drawn up from some other specimen at a later date cannot be allowed to invalidate conclusions based on this formal method.

In the case of *Lemur tardigradus* Messrs. Stone and Rehn come to the right result, but only by the rather loose method of examining all the references and judging between their relative importance, a matter in which the personal equation might often come in with disconcerting results.

My conclusion would be obtained in the following way:—

1758. *Lemur tardigradus*, Linn. S. N. (10) i. p. 29.

“1. *L. ecaudatus*, Mus. Ad. Fr. i. p. 3.

Simia ecaudata, unguibus indicis subulatis. Syst. nat. 5.*
n. 2.

Animal cynocephalum tardigradum. Seb. mus. i. p. 55. &c.
Animal elegantissimum robinsoni. Rai. quadr. 161.”

Ignoring the other references, and taking the first of the two Linnæan ones, we get

1754. *Lemur tardigradus*, Linn. Mus. Ad. Frid. i. p. 3.

“*Lemur ecaudatus*.

Simia ecaudata Syst. Nat. 3. n. 2.”

Therefore a mere transference of the importance to the second reference, which would be in full—

1748. Linn. Syst. Nat. (6) p. 3. no. 2.

“*Simia ecaudata*, unguibus indicis subulatis. Seb. thes. i.
t. 35. f. 1. 2.”

The reference, as with the still earlier 1740 edition, is here

* Misprint for 3. These numbers, as with all Linnæus's 10th edition quotations, refer to the pages of the 6th edition.

solely to Seba's admirable figure of the Slender Loris, and this should therefore be taken as the basis of the Linnean name.

The fact that Linnæus many years afterwards referred to his *Lemur tardigradus* a specimen of a *Nycticebus* which he then described, should not be allowed to affect our judgment as to what was the original and essential basis of the name he gave.

Loris tardigradus will therefore be the proper name of the Cinghalese animal, while Dr. Cabrera is of course right in saying that of Mr. Lydekker's two subspecies of *Loris** it is the S.-Indian one which needs the new name. He gives to this that of *lydekkerianus*, the co-types of which would be those referred to by Mr. Lydekker, B.M. nos. 3. 2. 19. 1-2.

Further, I am at issue both with Dr. Cabrera and Mr. Lyon in their contention that the name *menagensis* is to be treated as "*non est*" in the group. For while this was the case on the description of the animal when first published by Nachtrieb without a generic name, its reference to the genus *Nycticebus* by Trouessart † has technically to be taken as a giving of the name *menagensis* to the animal described by Nachtrieb, the name therefore having now validity as *Nycticebus menagensis*, Trouessart. The latter's "?" does not affect the question, as, although with the query, the animal is put into the genus *Nycticebus*, and also without a query by Stone and Rehn ‡ and Lydekker §, on whose authority, again, *menagensis* would antedate the new name *philippinus* given by Dr. Cabrera.

LXXVI.—On a Stridulating-organ in certain African River-Crabs. By W. T. CALMAN, D.Sc., British Museum (Natural History).

IN examining a collection of river-crabs (Potamonidæ) recently brought to the British Museum from the Gaboon by Dr. W. J. Ansorge, I observed in one of the species a stridulating-organ of a type hitherto undescribed. A search among the Potamonidæ of the Museum collection revealed the fact that a similar organ is present, though less perfectly developed, in certain other species more or less closely related to the first.

The species which presents this structure in its fullest

* P. Z. S. 1904, ii. p. 345, pl. xxiii.

† Cat. Mamm. i. p. 63 (1898).

‡ L. c. p. 138.

§ L. c. p. 345.

development appears to be, without doubt, that described by A. Milne-Edwards, and more fully by Dr. de Man and Miss Rathbun, as *Potamon (Potamonautes) africanum**. I have examined three specimens, all males. The largest specimen, from which the following description is mainly taken, measures 80 mm. across the carapace. The stridulating-organ is formed by groups of modified spines on the upper surface of the coxæ of the first and second pairs of walking-legs and on parts of the free branchiostegal edge of the carapace immediately opposed to them. The upper surface of each coxal segment (fig. 2) is strongly convex, and the modified spines occupy its posterior part, which curves downwards towards the ridge separating the upper from the posterior surface. On the first leg the patch of spines measures about

Fig. 1.

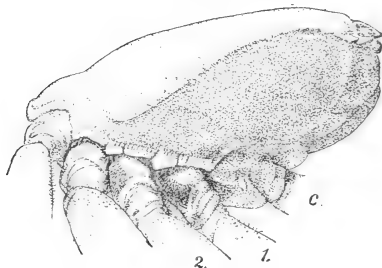


Fig. 1. *Potamon (Potamonautes) africanum*, male, from the right side (natural size). 1 and 2, the first two pairs of walking-legs, on the coxal segments of which are seen the patches of modified spines opposite the lobes on the branchiostegal edge of the carapace.

3.5 × 6.5 mm., and is conspicuous to the naked eye because of the dark brown colour of the closely-set spines. On the second leg the patch is less sharply defined and less conspicuous, owing to the fact that the spines are smaller and more widely spaced. In both cases the spines increase in size from the anterior edge of the patch, where they merge into the scattered setæ of the general surface of the limb, to the posterior edge,

* Descriptions and full synonymy of all the species referred to will be found in Miss Rathbun's monograph, "Les Crabes d'eau douce," Nouv. Arch. Mus. Paris, (4^e sér.) vols. vi.-viii. (1904-1906).

which they overhang slightly. Each spine curves over, so that its distal part is more or less parallel to the surface from which it springs, and the points are all directed backwards.

Fig. 2.

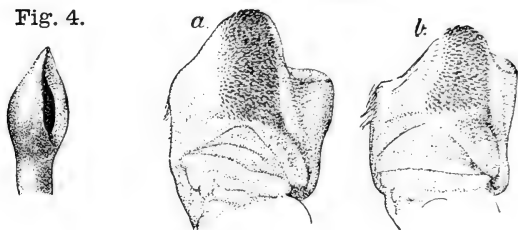


Fig. 3.

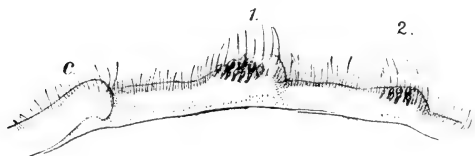


Fig. 5.

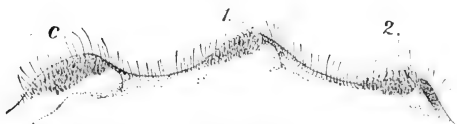


Fig. 2. Upper surface of coxal segments of (a) the first and (b) the second walking-legs (enlarged).

Fig. 3. Branchiostegal edge of carapace, viewed from below. 1 and 2, lobes opposite the coxæ of the first and second pairs of walking-legs respectively, bearing groups of stridulating-spines; c, portion of the edge which is opposed to the base of the cheliped and which in this species has no specialized spines.

Fig. 4. One of the branchiostegal stridulating-spines partly cut open to show the cavity within, further enlarged.

Fig. 5. *Potamon (Potamonautes) pobeguini*, female. Branchiostegal edge of carapace from below. Lettering as in fig. 3. In this species stridulating-spines are present opposite the coxa of the cheliped.

The free edge of the branchiostegite, immediately over the spinulose patches of the coxæ, is produced downwards into

two square-cut lobes, the distal margins of which nearly touch the surfaces of the coxæ (fig. 1). Each lobe is thickened and is defined in front and behind by a notch, running upwards as a short groove on the surface of the carapace. On the lower surface of each lobe (fig. 3) is a group of very peculiarly modified spines, unequal in size and dark brown in colour. These spines (fig. 4), of which there are ten on the anterior and eight on the posterior lobe in the specimen examined, are cylindrical for a short distance from the base, then dilating into a stout fusiform bulb and terminating in a sharp point. The dilated part is hollow and its cavity is filled with air. In the basal part the cavity contracts to a narrow canal.

When the coxa of either leg is rotated backwards and forwards about the vertical axis of the joint connecting it with the trunk, a hissing or creaking sound is produced in spirit-specimens, especially if the carapace be lightly pressed down so as to bring the branchiostegal spines into contact with those on the coxæ.

The species most nearly approaching *P. africanum* in the degree of development of this organ is one from the Camarons which I identify, not without hesitation, as *Potamon (Potamonautes) pobequini*, Rathbun. In this species the chelipeds, as well as the first and second walking-legs, share in the formation of the stridulating-apparatus, which is similarly developed in both sexes. The coxal spines on all three pairs of limbs are much smaller and less closely set than in *P. africanum*, and the areas which they occupy are less sharply defined. The free edge of the branchiostegite is slightly produced downwards between each of the successive pairs of legs, but does not present sharply defined lobes as in *P. africanum*. Viewed from below (fig. 5), the branchiostegal edge above the coxa of the cheliped is seen to carry a patch of numerous and closely-set spines, of which only the larger are distinctly clavate and hollow. The groups of branchiostegal spines corresponding to the first and second walking-legs resemble more nearly those of *P. africanum*, but the spines are much more numerous and present a transition from small, stout, but not clavate spines on the inner side to large, clavate, hollow spines on the outer side. None of the spines have the dark brown colour which renders conspicuous those of *P. africanum*.

In *Potamon (Potamonautes) floweri*, de Man (of which I have examined the type specimen), in *P. aubryi* (M.-E.), and in another closely allied species from Fernando Po (to which I do not venture to give a name), the apparatus is only represented on the chelipeds, of which the coxæ have on the upper

surface an area closely covered with very short spines, opposed to an oval area of similar spines, very short and not clavate, on the branchiostegite. On the coxæ of the first and second walking-legs and on the corresponding parts of the branchiostegal edge the spines and setæ, which are present in small numbers, present no evidence of modification.

In *Potamon* (*Potamonautes*) *latidactylum*, de Man, of which I have examined the types and numerous other specimens, the coxæ of the chelipeds and of the first two pairs of walking-legs have on the upper surface an oval area which comes into contact with the branchiostegite, but the spines with which it is covered are very minute and scattered. On the branchiostegal edge there are several rows of rather stout spines, often with a slender setiform tip, which are most developed over the bases of the three pairs of limbs just mentioned. In this case it seems very unlikely that the parts can have a stridulating function at all.

All the species mentioned above belong to "Group C" (of which *P. africanum* is the type) in Miss Rathbun's classification of the subgenus *Potamonautes*. The other West-African species referred to this group, *P. pelii* (Herklots) and *P. decazei* (A. M.-E.), are unknown to me, unless, indeed, the specimens which I have referred to *P. pobeguini* should really bear the name of Herklots's species. I regret especially that I have had no opportunity of examining any of the Oriental species which Miss Rathbun places in the same group. In no other members of the Potamonidæ have I found so far any indication of a similar apparatus.

Although it remains to be demonstrated by observation of the living animals that the structures here described are actually used in the production of sound, it can hardly be doubted that this will prove to be the case at least in *P. africanum* and *P. pobeguini*. So far as I am aware, no stridulating organs have hitherto been described in any members of the Potamonidæ. According to the summary given by Ortmann (Bronn's 'Thierreich,' Crustacea, ii. p. 1245), the only Brachyura known to stridulate or possessing organs supposed to have this function are species of *Matula*, *Ozius*, *Platyonychus*, *Ocypode*, *Macrophthalmus*, *Sesarma*, and some other Grapsidæ. In all these cases, however, and in the few Crustacea of other groups (Palinuridæ, Paguridea) which have stridulating-organs, the arrangement is very different from that described here. The main portion of the apparatus consists of ridges or granules on the surface of the exoskeleton, never of modified spines, although the latter are commonly found in the stridulating-organs of the Arachnida.

LXXVII.—*On the Moths collected during the Cruise of the 'Valhalla' during the Winter 1905-6 by Mr. E. G. B. Meade-Waldo.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

IN the following paper I have in the first place given a complete list of the moths collected on the various oceanic islands touched at under their several localities, as the fauna of these small islands is of special interest, and in the second part described the new species collected at various continental localities in their systematic order. The specimens collected have all been presented by the Rt. Hon. the Earl of Crawford, K.C.G., to the British Museum.

S. TRINIDAD.

Noctuidæ.

ACRONYCTINÆ.

Eriopus floridensis, Guen. Noct. ii. p. 292 (1852).

4 ♂, 1 ♀.

CATOCALINÆ.

Remigia repanda, Fabr. Ent. Syst. iii. (2) p. 49 (1792).

1 ♀.

Pyralidæ.

CRAMBINÆ.

Culladia niphosella, sp. n.

Pure white; palpi cupreous brown at sides; antennæ tinged with brown; fore legs fuscous brown in front. Fore wing with the costal edge blackish towards base; a more or less distinct cupreous yellow triangular mark on costa before apex; three black points on middle of termen.

4 ♂, 1 ♀ type. *Exp.* 10 mm.

PYRAUSTINÆ.

Zinckenia perspectalis, Hübn. Schmett. Eur. Pyr. fig. 101 (1827).

1 ♂, 5 ♀.

Pilocrocis sp.

1 ♀ in bad condition.

Condylorrhiza vestigialis, Guen. Delt. & Pyr. p. 321 (1854).

1 ♂.

COMORO IS.

Syntomidæ.

Euchromia formosa, Guér. Icon. R. Anim., Ins. p. 501,
pl. lxxxiv. bis, fig. 10 (1829).

Mayotta, 2 ♀.

Arctiadæ.

LITHOSIANÆ.

Ilema stictigrama, sp. n.

♂. Head and thorax grey-brown; abdomen pale ochreous brown. Fore wing grey, tinged with purplish brown; the postmedial line represented by a small black spot on costa and a very oblique series of four spots from below vein 6 towards termen to inner margin. Hind wing pale yellowish, the termen slightly tinged with brown.

Mayotta, 1 ♂ type. *Exp.* 22 mm.

Noctuidæ.

CATOCALINÆ.

Cylogramma latona, Cram. Pap. Exot. i. p. 20, pl. xiii. B
(1779).

Mayotta, 1 ♂.

Cylogramma fluctuosa, Drury, Ins. Exot. ii. p. 24, pl. xiv.
fig. 1 (1770).

Mayotta, 2 ♂, 2 ♀.

Spirama pardus, Guen. Noct. iii. p. 205 (1852).

Mayotta, 3 ♂, 1 ♀.

Ophiusa ebenani, Saalm. Lep. Madag. p. 464, pl. ix. fig. 153
(1891).

Mayotta, 1 ♀.

Chalciope hyppasia, Cram. Pap. Exot. iii. pl. ccl. E (1779).

Mayotta, 2 ♂.

Remigia repanda, Fabr. Ent. Syst. iii. (2) p. 49 (1792).

Mayotta, 1 ♂, 1 ♀.

Remigia frugalis, Fabr. Syst. Ent. vi. p. 601 (1775).

Mayotta, 2 ♀.

Remigia undata, Fabr. Syst. Ent. vi. p. 600 (1775).

Mayotta, 2 ♀.

ERASTRIANÆ.

Naranga diplogramma, sp. n.

♀. Head and thorax brownish white slightly irrorated with fuscous; pro- and mesothorax with slight paired dark spots; tarsi banded with brown; abdomen pale brownish, with indistinct brown dorsal bands. Fore wing brownish white, slightly irrorated with fuscous; antemedial line indistinct, double, oblique, irregularly waved, a black striga beyond it across submedian fold; a round grey spot in end of cell, defined by black at sides, and with small black spot above it on costa; a greyish streak beyond lower angle of cell; postmedial line double, black, filled in with white, bent outwards below costa, then irregularly waved, excurved to vein 4, then oblique to submedian fold and bent outwards again; subterminal line slight, whitish, defined by olive-brown on inner side, crossed by an oblique blackish shade from apex, and with slight blackish marks beyond it in the interspaces; a terminal series of fine black striæ; cilia grey, irrorated with black and with fine black line at middle. Hind wing fuscous brown; cilia ochreous, with brownish line near base and brownish tips; the underside whitish, thickly irrorated with brown, a slight discoidal spot and sinuous postmedial line.

Mayotta, 1 ♀ type. *Exp.* 18 mm.

Lymantriadæ.

Porthesia producta, Wlk. P. Z. S. 1863, p. 168.

Mayotta, 1 ♀.

Sphingidæ.

Cephonodes hylas, Linn. Mant. p. 539 (1771).

Mayotta, 1 ♀.

Geometridæ.

BOARMIANÆ.

Tephрина catalaunaria, Guen. Phal. ii. p. 108 (1857).

Mayotta, 3 ♂, 3 ♀.

GEOMETRINÆ.

Thalassodes quadraria, Guen. Phal. i. p. 360 (1857).

Mayotta, 1 ♀.

Hemithea albistrigula, Warr. Nov. Zool. iv. p. 39 (1897).

Mayotta, 1 ♀.

Pyralidæ.

SCHÆNOBIANÆ.

Scirpophaga gilviberbis, Zell. Mon. Chil. & Cramb. p. 2 (1863).

Mayotta, 2 ♂.

ANERASTIANÆ.

Enosima vectiferella, Rag. Rom. Mém. viii. p. 391, pl. xlii. fig. 24 (1901).

Mayotta, 1 ♀.

ENDOTRICHINÆ.

Endotricha vinolentalis, Rag. Ann. Soc. Ent. Fr. 1891, p. 525.

Mayotta, 1 ♂, 1 ♀.

HYDROCAMPINÆ.

Bradina admixtalis, Wlk. xviii. 665 (1859).

Mayotta, 1 ♂.

Zebronia phenice, Cram. Pap. Exot. iv. p. 185, pl. cccclxxxii. fig. G (1783).

Mayotta, 1 ♀.

PYRAUSTINÆ.

Zinckenia fascialis, Cram. Pap. Exot. iv. pl. cccxcviii. fig. O (1783).

Mayotta, 1 ♂.

Lygropia quaternalis, Zell. Lep. Caffr. p. 44 (1852).

Mayotta, 1 ♂.

Nacoleia argyropalis, sp. n.

♂. Bright yellow; palpi white, with dark brown bars at extremities of first and second joints, the third joint and frons brown; shoulders with brown streaks; pectus, legs, and ventral surface of abdomen white, the fore tibiæ with black band at extremity. Fore wing with the costal area tinged with rufous to beyond middle; a dark brown sub-basal striga from costa; a straight erect antemedial line conjoined to a brown spot with silvery-white centre in cell; a brown discoidal bar with silvery-white line in middle; a slightly sinuous postmedial brown line erect from costa to vein 2, then retracted to lower end of discoidal bar, and erect to inner margin; a brown terminal line; cilia yellow. Hind wing with brown discoidal bar; postmedial line fine, slightly sinuous, erect to vein 2, then retracted to lower angle of cell and oblique to inner margin; a brown terminal line; cilia yellow, with a slight brown line near base.

Mayotta, 1 ♂ type. *Exp.* 20 mm.

Sylepta melanopalis, sp. n.

♀. Fuscous brown, with a slight cupreous gloss; palpi white at base and with the third joint white; sides of frons with slight whitish streaks; pectus and legs white, the fore tibiæ with black band at extremity; abdomen with slight white segmental lines and the ventral surface white. Fore wing with dark antemedial line, with white band on inner side, excurved from costa to submedian fold, then slightly incurved; a black spot in middle of cell and discoidal lunule, with white spot before the former and rather quadrate spot between them; postmedial line dark, with white band on outer edge expanding into a triangular patch towards costa

and small round spot below vein 2, incurved from costa to vein 5, excurved to vein 2, then retracted towards lower angle of cell and again excurved; cilia whitish, with a dark line through them. Hind wing with oblique blackish discoidal bar; a dark postmedial line, with white band on its outer edge, bent outwards between veins 5 and 2, then retracted towards angle of cell and slightly angled outwards at vein 1; cilia whitish, with a dark line through them; the underside whitish, with the terminal area fuscous, the discoidal lunule and postmedial line strong.

Mayotta, 1 ♀ type. *Exp.* 24 mm.

Glyphodes indica, Saund. Trans. Ent. Soc. 1851, p. 163, pl. xii. figs. 5, 6, 7.

Mayotta, 1 ♂.

Glyphodes picticaudalis, sp. n.

♂. Head, tegulæ, and base of patagia yellowish suffused with metallic bronze; thorax white; palpi blackish, white at base; pectus and legs white, the fore tibiæ blackish at extremity; abdomen silvery white, with slight yellowish segmental dorsal lines, the extremity tinged with yellow, with fuscous and golden bands on penultimate segment and anal tuft. Fore wing white, the costal area and base of cell golden bronze, with raised scales; a small round bronze spot in middle of cell and elliptical discoidal patch from costal area to below cell with some silvery scales on it; an obsolescent brownish subterminal line with small black spots on it above veins 5 and 1. Hind wing white, with elliptical bronze discoidal patch extending to below cell; a brownish subterminal line, slightly sinuous and not reaching costa or inner margin.

♀. Abdomen without the fuscous and golden bands at extremity.

BR. E. AFRICA, Unyoro, Singema (*Betton*), 1 ♂ type; UGANDA, Kisingo (*Christy*), 1 ♂; COMORO IS., Mayotta (*Meade-Waldo*), 1 ♀. *Exp.* 28-32 mm.

Glyphodes mayottalis, sp. n.

Head and thorax rufous mixed with black; palpi white at base, then rufous with black bands; sides of frons, back of head, and tegulæ with white streaks; patagia with broad white upper edge; abdomen rufous, suffused with fuscous at middle and with slight white segmental lines and dorsal

streak; pectus, legs, and ventral surface of abdomen white. Fore wing rufous, with some black suffusion at base; a white streak on base of inner margin to the obliquely curved white antemedial line arising from below costa; an oblique wedge-shaped nacreous patch defined by black and with excised upper edge from subcostal nervure at middle of cell to submedian fold; a slight discoidal lunule with greyish centre and black patch below it, with grey scales on it; a white streak on medial part of inner margin; a large lunulate nacreous patch defined by black beyond the cell from below costa to vein 2; postmedial line greyish, defined on each side by black, expanding into a white wedge-shaped spot below costa, then slightly curved; a diffused black bar before middle of termen, which is grey; a fine black terminal line; cilia rufous. Hind wing hyaline white, with broad rufous terminal band with black line on its inner edge; a diffused black bar before middle of termen; a fine black terminal line; cilia rufous.

Mayotta, 1 ♂, 2 ♀. *Exp.* 30 mm.

Agathodes chrysalis, sp. n.

Head and thorax olive-grey; palpi white at base and tips; sides of frons, tegulae, upper edge and tips of patagia streaked with white; pectus and legs white; abdomen white, with dorsal patches of rufous on basal segments, the extremity tinged with olive in male and with rufous in female, the ventral surface white, the penultimate segment rufous. Fore wing pale olive; a white fascia on costa to beyond middle; a semicircular golden-fulvous patch with white edges on apical part of costa; the terminal area golden fulvous from vein 5 to inner margin; an indistinct very oblique line defined by white on inner side from costa before middle to submedian fold, then an inwardly oblique white line to inner margin; a narrow whitish discoidal lunule defined at sides by black, with white bar before it and orange spot defined by diffused black beyond it; a very oblique white band with diffused black on its inner side from below angle of cell to inner margin; cilia red, with fine white line at base from apex to vein 4, then yellow. Hind wing semihyaline golden yellow. Underside of fore wing golden yellow.

MAURITIUS, Curepipe (*Tulloch*), 1 ♀; COMORO IS., Mayotta (*Meade-Waldo*), 1 ♂, 2 ♀ type. *Exp.* 40 mm.

Hyalobathra argentiflalis, sp. n.

♂. Orange-yellow; palpi with crimson spots on first and

second joints, at tips of hair on second joint, and on maxillary palpi; frons above, tegulæ, shoulders, base of patagia, meso- and metathorax with crimson spots; pectus and legs white, the fore femora and tibiæ yellow in front, the tarsus with black bands at base and near tips; abdomen with crimson subdorsal spots, the extremity tinged with crimson and with white line on penultimate segment, the ventral surface white. Fore wing with subbasal crimson points on costa and inner margin; a slightly sinuous crimson antemedial line; a slight silvery discoidal lunule edged with rather diffused crimson; postmedial line fine, crimson, sinuous, excurved from costa to vein 2, then retracted to lower angle of cell and again somewhat excurved; a crimson subterminal band with silvery line on it and minutely waved edges, angled inwards at discal and submedian folds; a fine crimson terminal line; cilia yellow at base, with crimson medial line and white tips. Hind wing with fine crimson postmedial line, oblique from below costa to vein 2, then retracted to lower angle of cell and oblique to inner margin; a crimson terminal band with minutely waved silver line on it, its inner edge curved inwards below apex and at submedian fold; cilia yellow at base, with crimson medial line and white tips.

Mayotta, 1 ♂ type. *Exp.* 20 mm.

Pachyzancla bipunctalis, Fabr. Ent. Syst. iii. (2) p. 227 (1798).

Mayotta, 1 ♀.

Pionea holoxuthalis, sp. n. (*vide* Aldabra).

Mayotta, 1 ♀.

Pyrausta inco'oralis, Guen. Delt. & Pyr. p. 333 (1854).

Mayotta, 1 ♂, 2 ♀.

ALDABRA IS., ASSUMPTION, AND GLORIOSA.

Arctiadæ.

ARCTIANÆ.

Utetheisa lactea, Butl. Rep. Zool. Coll. 'Alert,' p. 577 (1884).

Subsp. 1.—Differs from the typical form from the Farquhar Is. in having the scarlet spots of fore wing strongly developed, the black spots more or less obsolete.

Gloriosa, 2 ♂, 2 ♀; Assumption, 1 ♂.

Subsp. 2.—Differs from the typical form in having both the black and scarlet spots of fore wing well developed.

Aldabra, 2 ♀.

Noctuidæ.

AGROTINÆ.

Chloridea assulta, Guen. Noct. ii. p. 178 (1852).

Assumption, 1 ♂, 1 ♀.

Euxoa microtica, sp. n.

♂. Head and thorax red-brown mixed with grey-white; palpi with patches of black on first and second joints; frons with lateral black patches; tegulæ black-brown at base; pectus mostly white; tarsi black ringed with white; abdomen white dorsally, tinged with ochreous, ventrally slightly irrorated with brown. Fore wing red-brown, largely suffused with white, the veins with black streaks; subbasal line represented by a black striga from costa and a small quadrate spot below the cell, with pale rufous patch beyond it and another above inner margin before the antemedial line, which is angled outwards below costa and in cell, excurved in submedian interspace, then almost obsolete; claviform moderate, fuscous defined by black; orbicular and reniform with fuscous centres and pale annuli defined by black, the former small, round; a curved medial shade; postmedial line indistinct, bent outwards below costa, then dentate and produced to black points on the veins, incurved at discal fold and oblique below vein 4, some black points beyond it on costa; subterminal line indistinct, pale, defined on inner side by small dentate red-brown marks, angled outwards at vein 7 and dentate at veins 4, 3, 2; a fine black terminal line; cilia pale rufous. Hind wing white, the veins and a terminal line brown; cilia ochreous, white at tips.

Assumption, 1 ♂. *Exp.* 26 mm.

Allied to *E. segetum*.

ACONTIANÆ.

Acontia malvæ, Esp. Schmett. iv. (2) p. 63, pl. cxcv. fig. 4 (1788).

Gloriosa, 1 ♀.

CATOCLINÆ.

Ophiusa algira, Linn. Syst. Nat. i. p. 836 (1766).

Gloriosa, 3 ♂, 3 ♀.

Grammodes delta, Boisd. Faun. Ent. Mad., Lép. p. 105,
pl. xiii. fig. 1 (1833).

Aldabra, 1 ♂.

Chalciope hyppasia, Cram. Pap. Exot. iii. pl. ccl. E (1779).
Gloriosa, 1 ♂.

ERASTRIANÆ.

Tarache rachiastis, sp. n.

Frons with corneous ridge across the middle and large plate below it.

♂. Head and thorax creamy white; palpi at tips and sides of frons tinged with brown; antennæ fuscous; tibiæ and tarsi banded with brown; abdomen creamy white, with pale brown dorsal bands. Fore wing creamy white; subbasal line represented by a slight ochreous striga from costa; ante-medial line ochreous, slightly curved, arising from a small brown spot on costa; medial line with slight brown spot on costa and ochreous line from it to a red-brown band from lower angle of cell to inner margin; postmedial line represented by a small brown spot on costa, then excurved and with brown spot on its inner side at vein 5, then bent inwards to lower angle of cell, represented by a whitish line with blackish scales on its inner edge, angled outwards at vein 1, followed by a diffused grey and red-brown band from apex to inner margin, leaving some cream-colour on termen; some black-brown points on termen at apex, middle, and above tornus; cilia with some grey and brown at apex, middle, and tornus. Hind wing ochreous white, with some diffused brown on terminal area from apex to vein 2 and towards tornus.

♀. Thorax and fore wing yellower, the latter with the markings more distinct and more olive in colour on the yellow area.

Aldabra, 1 ♂, 1 ♀ type. *Exp.* 20 mm.

Sphingidæ.

Chærocampa celerio, Linn. Syst. Nat. i. p. 491 (1758).

Gloriosa, 1 ♀.

Chærocampa aurora, Roths. Nov. Zool. ix., Suppl. p. 812 (1903).

Gloriosa, 4 ♂, 1 ♀.

Cephonodes hylas, Linn. Mant. p. 539 (1771).

Gloriosa, 2 ♀.

Pyraliidæ.

PYRAUSTINÆ.

Zinckenia fascialis, Cram. Pap. Exot. iv. pl. cccxcviii. fig. O (1783).

Gloriosa, 1 ♂, 1 ♀.

Pionea holoxuthalis, sp. n.

♀. Orange-yellow; palpi fulvous yellow, white at base; pectus and legs white, the fore and mid tibiæ yellow, the fore tibiæ with slight black band at extremity, the second and third joints of tarsi brown. Fore wing with faint minutely waved postmedial reddish line, oblique from costa to vein 5, excurved to vein 3, then bent inwards; traces of a curved reddish subterminal line; cilia with faint reddish medial line and whitish tips; the lines sometimes quite obsolete. Hind wing rather paler yellow; the cilia with faint reddish medial line and whitish tips.

COMORO Is., Mayotta, 1 ♀; GLORIOSA, 3 ♀ type. *Exp.* 20 mm.

SEYCHELLES Is.

Arctiidæ.

ARCTIANÆ.

Utetheisa elata, Fabr. Ent. Syst. p. 440 (1798).

Var. *diva*, Mab.—A very black form; hind wing with the white reduced to a patch in and below end of cell.

Mahé, 2 ♀.

Noctuidæ.

ACRONYCTINÆ.

Spodoptera abyssinia, Guen. Noct. i. p. 154 (1852).

Mahé, 2 ♀.

CATOCALINÆ.

Chalciope hyppasia, Cram. Pap. Exot. iii. pl. ccl. E (1779).

Mahé, 3 ♂, 1 ♀; Félicité, 2 ♂; The Cerf, 1 ♂, 2 ♀.

Remigia repanda, Fabr. Ent. Syst. iii. (2) p. 49 (1792).

Mahé, 1 ♂; Félicité, 1 ♀.

Remigia undata, Fabr. Syst. Ent. vi. p. 601 (1775).

Mahé, 5 ♂, 2 ♀; Félicité, 3 ♂, 1 ♀.

PLUSIANÆ.

Plusia chalcytes, Esp. Schmett. pl. cxli. fig. 3 (1789).

Mahé, 1 ♂, 1 ♀.

NOCTUINÆ.

Cosmophila erosa, Hübn. Zutr. Samml. exot. Schmett. ii. (19) figs. 287, 288 (1827).

Mahé, 1 ♂.

HYPENINÆ.

Hypena conscitalis, Wlk. xxxiv. 1509 (1865).

The Cerf, 1 ♀.

HYBLÆINÆ.

Hyblava puera, Cram. Pap. Exot. pl. ciii. D, E (1779).

Mahé, 1 ♀.

Hypsidæ.

Deilemera seychellensis, sp. n.

♀. Head and thorax black; palpi with the first two joints orange; sides of frons and a bar above it, spots behind antennæ, edges of tegulæ and patagia, sides of thorax and patches on pectus grey-white; legs grey, streaked with black; abdomen grey, with dorsal and lateral series of small black spots, the anal tuft orange, the ventral surface whitish. Fore wing pale brown, the basal half with slight whitish streaks on the veins, two in cell, two in submedian interspace, and one on inner margin; an oblique white band from costa beyond middle to termen at submedian fold, its inner edge rather irregular, its outer waved, the veins of terminal half dark; the interspaces at apex sometimes whitish; cilia whitish towards apex. Hind wing white, with broad pale brown terminal band, with curved waved inner edge, and the veins on it dark.

Mahé, 3 ♀. *Exp.* 50 mm.

Argina astræa, Drury, Ill. Exot. Ins. ii. p. 11, pl. vi. fig. 3 (1770).

Mahé, 1 ♂, 1 ♀.

Sphingidæ.

Acherontia atropos, Linn. Syst. Nat. i. p. 490 (1758).

Mahé, 2 ♀.

Daphnis nerii, Linn. Syst. Nat. i. p. 490 (1758).

Mahé, 1 ♀.

Chærocampa osiris, Dalm. Anal. Ent. p. 48 (1823).

Mahé, 1 ♂, 1 ♀.

Cephonodes hylas, Linn. Mant. p. 539 (1771).

Mahé, 1 ♂.

Pyralidæ.

CRAMBINÆ.

Culladia admigratella, Wlk. xxvii. 192 (1863).

Praslin, 1 ♂.

PYRALINÆ.

Pyralis farinalis, Linn. Syst. Nat. ed. x. p. 226 (1758).

Praslin, 1 ♂, 1 ♀.

HYDROCAMPINÆ.

Bradina aureolalis, de Joan. Bull. Soc. Ent. Fr. 1899, p. 198.

Praslin, 4 ♂, 1 ♀.

PYRAUSTINÆ.

Marasmia trebiusalis, Wlk. xviii. 718 (1859).

The Cerf, 1 ♂.

Marasmia trapezalis, Guen. Delt. & Pyr. p. 200 (1854).

The Cerf, 1 ♀.

Pagyda traducalis, Zell. Lep. Caffr. p. 54 (1852).

The Cerf, 1 ♀.

Sylepta derogata, Fabr. Syst. Ent. p. 641 (1775).

The Cerf, 1 ♀.

Glyphodes sericea, Drury, Ins. ii. p. 9, pl. vi. fig. 1 (1770).

Mahé, 1 ♂.

Glyphodes indica, Saund. Trans. Ent. Soc. 1851, p. 163,
pl. xii. figs. 5, 6, 7.

Mahé, 2 ♂.

Glyphodes sinuata, Fabr. Spec. Ins. ii. p. 267 (1781).

Mahé, 1 ♀.

DESCRIPTIONS OF NEW SPECIES FROM VARIOUS LOCALITIES.

Noctuidæ.

CATOCALINÆ.

Genus ACANTHODELTA, nov.

Proboscis fully developed; palpi obliquely upturned, the second joint reaching vertex of head and fringed with hair in front, the third moderate, rather porrect; frons smooth, with tuft of hair; eyes large, round; antennæ of male laminate; head and thorax clothed with hair only and without crests; all the tibiæ spined and smoothly scaled; pectus with long hair; abdomen smoothly scaled and without crests. Fore wing with the apex rectangular, the termen obliquely curved, crenulate; vein 3 from well before angle of cell; 5 from above angle; 6 from upper angle; 9 from 10 anastomosing with 8 to form the areole; 11 from cell. Fore wing with the costa extending well beyond tornus of fore wing, the termen crenulate; vein 3 from before angle of cell; 5 fully developed from above angle; 6, 7 from upper angle; 8 approximated to the cell to beyond middle.

Acanthodelta distriga, sp. n.

♂. Head and thorax fuscous brown with a reddish tinge; antennæ white above; tibiæ and tarsi greyish; abdomen greyish irrorated with brown. Fore wing fuscous brown irrorated with grey, the costal area tinged with purplish; a black discoidal point; a diffused white fascia in submedian fold from before to well beyond middle, with a postmedial black point on it; a slight white streak above vein 5 from

cell to towards termen; a terminal series of black striæ. Hind wing fuscous brown slightly irrorated with grey; the underside greyish thickly irrorated with brown; a black discoidal point.

CAPE COLONY, summit of Table Mt., 1 ♂ type. *Exp.* 42 mm.

NOCTUINÆ.

Genus MELAPERÀ, nov.

Proboscis aborted, minute; palpi with the second joint straight, porrect, extending about the length of head, the third upturned, very long and reaching above vertex of head, clothed with scales; frons smooth; eyes large, rounded; antennæ of female with bristles and cilia, roughly scaled above and with long hair on basal joint; head and thorax clothed with rough scales and hair; tibiæ moderately fringed with hair; abdomen with rough hair at base and loose crests of long scales on first two segments. Fore wing with the apex rounded, the termen evenly curved; veins 3 and 5 from near angle of cell; 6 from upper angle; 9, 10 both anastomosing with 8 to form the areole; 11 from cell. Hind wing with veins 3, 4 from angle of cell; 5 fully developed from above angle; 6, 7 from upper angle; 8 anastomosing with the cell at middle.

(*Singara*) *hyppoides*, Butl., belongs to an allied genus with the proboscis fully developed and the palpi upturned, the third joint tufted with hair behind.

(*Arctia*) *bicolor*, Mab., probably belongs to this latter genus, both from Madagascar.

Nearest to *Rhanidophora*, Wllgrn.

Melapera roastis, sp. n.

♀. Head and thorax orange-yellow; palpi black, yellow below at base; tegulæ with pinkish-white patches; patagia pale pink except at base; legs with the fore tibiæ on inner side, femoro-tibial joints, spurs, and tarsi black; abdomen orange-yellow, dorsally crimson except at base and extremity. Fore wing pale pink suffused with white, the terminal area yellow. Hind wing brighter pink, the terminal area yellow.

MADAGASCAR, Forêt d'Ambre, 1 ♀ type. *Exp.* 62 mm.

ERASTRIANÆ.

Eublemma glaucizona, sp. n.

Head and thorax pale ochreous brown, thorax suffused with grey except in front; pectus white; legs greyish; abdomen pale ochreous. Fore wing pale ochreous, tinged with yellow-brown towards the oblique medial line, the costal area dark towards base; a black point in middle of cell; a grey band beyond the medial line with black-brown patch beyond lower angle of cell, with whitish patch above it before the slight white postmedial line, which is bent outwards below costa, excurved to vein 4, then incurved, a red-brown band beyond it before the indistinct greyish subterminal line, with some black scales on its outer edge; terminal area brown suffused with grey, the apex brown with a whitish striga below it; cilia whitish, with fine brown lines through them. Hind wing grey; cilia white at tips; the underside white irrorated with brown, a dark discoidal spot and terminal series of black points.

CAPE COLONY, Simonstown (*de la Garde*), 1 ♂, Table Mt., 1500' (*Meade-Waldo*), 2 ♂ type. *Exp.* 20 mm.

Allied to *E. parva*.

Pyralidæ.

SCHÆNOBIANÆ.

Patissa vagilinealis, sp. n.

♂. White; palpi, maxillary palpi, and sides of frons black; fore femora, tibiæ, and first joint of tarsi black, the mid femora and tibiæ tinged with black. Fore wing with the base of costa black, conjoined to a small subbasal spot in cell; the lines yellow-brown irrorated with fuscous; antemedial line oblique from cell to inner margin; postmedial line straight from costa to vein 5, then retracted to below costa above angle of cell, then obliquely sinuous to origin of vein 2 and again sinuous to inner margin, passing above a small black spot at lower angle of cell; subterminal line slightly incurved below costa and ending at vein 3, on which it forms a wedge-shaped patch; a terminal series of yellowish points. Hind wing with yellow-brown markings irrorated with fuscous; some scales on median nervure; an interrupted antemedial line from cell to inner margin formed of two spots; postmedial line stronger and angled outwards at vein 4, then angled inwards to lower angle of cell and again excurved; subterminal line angled

inwards at veins 6 and 2, below which it ends on termen; a terminal series of points from apex to vein 2.

MADAGASCAR, Forêt d'Ambre, 2 ♂ type. *Exp.* 10-16 mm.

HYDROCAMPINÆ.

Ambia heptopalis, sp. n.

♂. Head brownish, the palpi and antennæ fulvous; thorax brownish white, the tarsi ringed with fuscous; abdomen whitish, with slight fuscous segmental bands. Fore wing whitish, tinged with golden yellow and slightly irrorated with fuscous, especially on costal area; two blackish antemedial points on costa and traces of a sinuous antemedial line; traces of a dark discoidal lunule; two curved dark subterminal lines from costa to vein 2, with the area beyond them white; some black points on termen; cilia golden yellow, with slight dark line at middle and black points at tips. Hind wing yellowish white, slightly irrorated with fuscous; a tuft of long black hair at lower angle of cell; a blackish postmedial line oblique from costa to submedian fold, where it is angled inwards, then excurved; a terminal orange band defined on inner side by a brown line bent outwards to termen near tornus, and with seven black points on termen from below apex to submedian fold, with silver scales between them; cilia whitish.

BRAZIL, Itaparica (*Meade-Waldo*), 1 ♂ type. *Exp.* 16 mm.

Allied to *A. metalophota*, Hmpsn.

PYRAUSTINÆ.

Pilocrocis xanthostictalis, sp. n.

♂. Head and thorax red-brown with a greyish tinge; palpi white at base; sides of frons with whitish streaks; vertex of head whitish; pectus and legs white, the fore tibiæ with brown bands at extremity; abdomen white, dorsally suffused with red-brown. Fore wing red-brown; a dark antemedial line, excurved from costa to submedian fold, then incurved, with a yellow band on its inner side from below costa to inner margin; a black spot in middle of cell and discoidal lunule, with quadrate white patch between them; a dark postmedial line, incurved from below costa to vein 5, where it is bent outwards, at vein 2 retracted to lower angle of cell, then recurved, with trifid dentate yellow mark on its outer edge below costa, three minute dentate spots between veins

5 and 2, and a lunule below angle of cell; a fine yellowish line at base of cilia. Hind wing yellow; a dark discoidal bar and some brown suffusion below end of cell; postmedial line brown, strongly bent outwards between veins 5 and 3, then retracted to vein 5 and forming a loop, then oblique to inner margin; a broad brown terminal band, its inner edge bent outwards and dentate between veins 5 and 2; cilia brown, with yellowish line at base from apex to submedian fold, then white, with some brown at base towards tornus.

MADAGASCAR, Forêt d'Ambre, 1 ♂ type. *Exp.* 26 mm.

Sylepta trifidalis, sp. n.

♂. Head and thorax bronze-brown; palpi black, white below; pectus and legs whitish; abdomen bronze-brown, the anal tuft and ventral surface white. Fore wing bronze-brown, with a slight purplish gloss; antemedial line dark, oblique; a quadrate hyaline spot in end of cell, followed by an indistinct dark discoidal spot, with pale bar on discocellulars; postmedial line dark, with trifid yellowish-white mark on its outer edge from costa, then slightly defined by whitish, slightly curved from costa to vein 2, then retracted to below angle of cell, and again slightly excurved; cilia with a fine yellowish-white line at base, followed by a dark line, the tips greyish. Hind wing bronze-brown with a slight purplish tinge, the base pale; a slight dark discoidal lunule; postmedial line dark, slightly defined by whitish on outer side, excurved between veins 5 and 2, then retracted to below angle of cell and oblique to tornus; cilia with dark line at base and whitish tips.

BR. E. AFRICA, Mukuniu (*Betton*), 1 ♂ type; ADEN (*Meade-Waldo*), 1 ♀. *Exp.* 24 mm.

Archernis flavidalis, sp. n.

♀. Orange-yellow; head paler; fore femora towards extremity, tibiae and tarsi banded with blackish. Fore wing with traces of brownish diffused antemedial line; traces of spots in end of cell and on discocellulars; a rather more distinct postmedial line bent outwards between veins 5 and 2, then retracted to below angle of cell, and ending in a fuscous spot on inner margin; traces of a maculate subterminal line. Hind wing rather paler, without markings.

NATAL, Durban, The Bluff, 1 ♀ type. *Exp.* 32 mm.

Pyrausta hæmapastalis, sp. n.

♂. Head and thorax deep ochreous, tinged with brown; palpi white below; abdomen deep ochreous; pectus, legs, and ventral surface of abdomen whitish. Fore wing orange-yellow; the basal area suffused with crimson; a diffused antemedial crimson line; an ill-defined discoidal bar; post-medial line forming a diffused crimson patch from costa to vein 3, then strongly incurved and becoming confluent with the antemedial line below cell; a diffused slightly sinuous subterminal band, confluent with the postmedial line at middle. Hind wing yellow; traces of a brownish postmedial line excurved between veins 5 and 2, then obsolete; a diffused brown terminal band rather broad at costa, narrowing to tornus; cilia whitish at tips.

BRAZIL, Itaparica, 3 ♂ type. *Exp.* 14 mm.

Pyrausta flavibrunnealis, sp. n.

♂. Head and thorax pale yellowish brown; frons with lateral white streaks; palpi white below; fore and mid tibiæ streaked with white, the tarsi and hind legs white; abdomen ochreous white. Fore wing narrow, the costa rather concave; ochreous yellow, the costal area suffused with brown and the costal edge white beyond middle; antemedial line brown, rather diffused, oblique from costa to submedian fold; rather diffused brown spots in end of cell and on discocellulars conjoined to the brown costal area; postmedial line brown, rather diffused, excurved from costa to vein 2, then retracted to lower angle of cell and erect to inner margin; terminal area suffused with brown; cilia white at tips. Hind wing ochreous yellow; traces of a diffused brownish postmedial line on costal half; termen suffused with brown except towards tornus; cilia white.

BRAZIL, Bahia, 1 ♂ type. *Exp.* 16 mm.

LXXVIII.—*On the Occurrence of the Hydroid Cordylophora in Egypt.* By CHARLES L. BOULENGER, B.A.

DURING our recent expedition to the Fayûm Province of Egypt, Dr. Cunnington and I found the hydroid *Cordylophora* to occur in great abundance in the brackish waters of Lake Qurun.

Since our return I have carefully examined the specimens we collected and compared them with material from the

Norfolk Broads; as the result I can unhesitatingly pronounce them to belong to the common species *C. lacustris*, originally discovered by Allman in the docks of London and Dublin.

This is the first record of the genus from Africa. In Lake Qurun the hydroid was found in a variety of positions: on water-weeds, on tamarisk-stumps, and on the under side of rocks and large stones at the water's edge; in the latter position, shaded from the light, the colonies reached their greatest development.

The chief feature of the *Cordylophora* from Lake Qurun is the great vigour of the colonies, the hydrocaulus in some attaining the height of 8 or 9 cm.; branches of the third order are common and as many as three or four gonophores are frequently found below one lateral hydranth. The great development of the colonies is no doubt due to the salinity of the water, which, although not very high (1·34 per cent.), evidently suits the hydroid admirably, and the *Cordylophora* certainly shows no tendency to invade the freshwater canals which enter the lake; I made a careful examination of reeds and logs of wood at the mouth of the "Wadi," and never found the hydroid in this situation.

Cordylophora lacustris has not been recorded from the Nile; its occurrence in the Birket el Qurun is therefore of great interest, the lake being nearly 150 miles inland, and at the present day without communication with the sea except by means of that river.

Geological evidence, however, shows that in late Pliocene times the depression in which Lake Qurun is situated must have been of the nature of a large brackish fjord in communication with the Mediterranean; it seems therefore possible that *Cordylophora* first established itself in the district at that period. This seems all the more probable when we consider the present habitat of the species in broads and estuaries.

LXXIX.—*A Synopsis of the Sharks of the Family Cestraciontidae.* By C. TATE REGAN, M.A.

THE Cestraciontidae may be diagnosed as sharks with two dorsal fins, each preceded by a spine, an anal fin, five gill-openings on each side, the last two or three above the base of the pectoral fin, oro-nasal grooves, and the pterygo-quadrate articulated to the praeorbital region of the cranium.

Two genera may be recognized.

1. GYROPLEURODUS.

Gyropleurodus, Gill, Proc. Ac. Philad. 1869, p. 482.
Tropidodus, Gill, l. c.

Anterior teeth cuspidate. Lateral teeth carinate, longer but not much broader than the anterior ones; jaws rounded anteriorly, the rami divergent from the short symphyses; supraorbital ridges ending abruptly a little behind the orbits.

Three species.

Synopsis of the Species.

I. Length of first gill-opening equal to its distance from the third.

Origin of first dorsal a little in advance of the posterior
 end of the base of pectoral..... 1. *francisci*.
 Origin of first dorsal far behind the base of pectoral..... 2. *quoyi*.

II. Length of first gill-opening not less than its distance
 from the fourth..... 3. *galeatus*.

1. *Gyropleurodus francisci*.

Cestracion francisci, Girard, Proc. Ac. Philad. 1854, p. 196; Günth. Cat. Fish. viii. p. 416 (1870).

Gyropleurodus francisci, Gill, Proc. Ac. Philad. 1862, p. 492; Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 20.

Heterodontus francisci, Macleay & Macleay, Proc. Linn. Soc. N. S. Wales, iii. 1878, p. 315, pl. xxvi.

Supraorbital ridges strong, nearly vertical. Origin of first dorsal a little in advance of the posterior end of the base of pectoral. Small rounded blackish spots on head, body, and fins.

Hab. California.

In the British Museum two specimens, 195 and 330 mm. in total length.

2. *Gyropleurodus quoyi*.

Cestracion quoyi, Fréminv. Mag. Zool. 1840, pl. iii.; Günth. Cat. Fish. viii. p. 416 (1870).

Cestracion pantherinus, Valenc. Zool. 'Venus,' Poiss. p. 320, pl. x. fig. 2 (1855).

Heterodontus quoyi, Macleay & Macleay, Proc. Linn. Soc. N. S. Wales, iii. 1878, p. 316.

Gyropleurodus quoyi, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1896, p. 21.

Evidently closely allied to *C. francisci*, but with larger spots and with the first dorsal much further back, its origin far behind the base of the pectoral.

Hab. Galapagos Islands.

3. *Gyropleurodus galeatus*.

Cestracion galeatus, Günth. Cat. Fish. viii. p. 416 (1870).

Heterodontus galeatus, Macleay & Macleay, Proc. Linn. Soc. N. S. Wales, iii. 1878, p. 313, pl. xxv.

Supraorbital ridges very strong, directed obliquely outwards. Origin of first dorsal above the posterior end of the base of pectoral. Interorbital region and back in front of dorsal fin blackish; a broad blackish bar below the eye; back with some dark transverse bars, one at the base of each dorsal fin most prominent.

Hab. New South Wales.

In the British Museum four specimens, 135 to 750 mm. in total length, including the type of the species.

2. CESTRACION.

Heterodontus (non *Heterodon*, Palisot de Beauvois), Blainville, Nouv. Bull. Sc. 1816, p. 121.

Cestracion, Cuv. Règne Anim. ii. p. 129 (1817).

Anterior teeth cuspidate, sometimes unicuspid in the adult; lateral teeth considerably enlarged, not keeled in the adult; rami of the jaws meeting in long symphyses, so that the anterior enlarged lateral teeth are near to those of the other side; supraorbital ridges gradually decreasing in height posteriorly.

Four species.

Synopsis of the Species.

I. Supraorbital ridges moderate, ending above first gill-opening; dorsal fins with free edges slightly concave posteriorly; interorbital region crossed by a single dark bar.

Back with a nearly continuous blackish longitudinal band.....

1. *phillippi*.

Back with dark cross-bars, alternately broad and narrow.....

2. *japonicus*.

II. Supraorbital ridges low, ending in advance of first gill-opening; dorsal fins with free edges more deeply concave posteriorly; interorbital region crossed by a pair of dark bars.

Extreme width of the pair of interorbital bars (from the anterior edge of the first to the posterior edge of the second) much greater than the diameter of eye.....

3. *zebra*.

Extreme width of the pair of interorbital bars equal to the diameter of eye.....

4. *amboinensis*.

1. *Cestracion phillippi*.

Squalus phillippi, Schneid. Bloch's Syst. Ichth. p. 134 (1801).

Heterodontus phillippi, Blainv. Nouv. Bull. Sc. 1816, p. 121; Duméril, Elasmobr. p. 424 (1865); Macleay & Macleay, Proc. Linn. Soc. N. S. Wales, iii. 1878, pls. xxii.-xxiv.

Cestracion philippi, Cuv. Règne Anim. ii. p. 129 (1817); McCoy, Prodr. Zool. Vict. pl. cxiii. (1886).

Cestracion philippi (part.), Günth. Cat. Fish. viii. p. 415 (1870).

Supraorbital ridges rather stronger, lateral teeth a little larger and dorsal fins a little lower than in *C. japonicus*. Greyish; a dark blotch on the snout; a blackish interorbital bar as broad as the eye, continued and expanded below the eye; a broad median blackish band from interorbital region to first dorsal fin, dividing posteriorly and giving rise on each side to a narrow vertical bar which expands on the pectoral fin; a longitudinal stripe from this bar to the pelvic fin; a broad median blackish band between the dorsals and from second dorsal to caudal.

Hab. New South Wales, Victoria, and Tasmania; New Zealand?

In the British Museum four specimens, 330 to 1000 mm. in total length.

2. *Cestracion japonicus*.

Cestracion philippi (non Schneid.), Müll. & Henle, Plagiost. p. 76, pl. xxxi. (1841); Schleg. Faun. Japon., Poiss. p. 304 (1850).

Heterodontus zebra (non Gray), Bleek. Verh. Bat. Gen. xxvi. 1854, p. 127.

Heterodontus philippi, var. *japonicus*, Duméril, Elasmobr. p. 424 (1865).

Cestracion philippi (part.), Günth. Cat. Fish. viii. p. 415 (1870).

Cestracion japonicus, Macleay & Macleay, Proc. Linn. Soc. N. S. Wales, viii. 1883, p. 428, pl. xx.

Heterodontus japonicus, Jord. & Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 599.

Very close to *C. philippi*, but with the coloration quite different. Pale yellowish or greyish; back with dark brown cross-bars, alternately broad and narrow; a dark blotch on the snout; an interorbital bar, broader than the eye, continued below the eye.

Hab. Japan.

In the British Museum four specimens, 390 to 680 mm. in total length.

3. *Cestracion zebra*.

Cestracion zebra, Gray, Zool. Misc. p. 5 (1831).

Heterodontus zebra, Macleay & Macleay, Proc. Linn. Soc. N. S. Wales, x. 1885, p. 673, pl. xlv.

Cestracion philippi (part.), Günth. Cat. Fish. viii. p. 415 (1870).

Yellowish, with alternate double and single dark brown transverse bars corresponding respectively to the broad and narrow bars of *C. japonicus*. A V-shaped mark on the snout, followed by a vertical bar on each side; a pair of

interorbital bars, continued below the eye, the anterior edge of the eye corresponding to the posterior part of the first bar.

Hab. China.

In the British Museum three specimens, 305 to 780 mm. in total length.

4. *Cestracion amboinensis*.

Heterodontus zebra (non Gray), Bleek. Act. Soc. Sc. Neerland. i. 1856, Amboyna, p. 71.

Cestracion philippi (part.), Günth. Cat. Fish. viii. p. 415 (1870).

Cestracion amboinensis, Regan, Ann. & Mag. Nat. Hist. (7) xviii. 1906, p. 436.

Dorsal fins more elevated than in any other species. Cross-bars narrower and separated by wider interspaces than in *C. zebra* and each split into two. Anterior edge of first interorbital bar corresponding to anterior edge of eye.

Hab. Amboyna.

In the British Museum one specimen, type of the species, 580 mm. in total length.

LXXX.—*Additions to the Hymenopterous Genera Myzine and Plesia.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

THE genera *Myzine* and *Plesia*, though differing widely in the female sex, are not distinguishable with any certainty in the males, though those species in which the basal segment of the abdomen is very long and slender or nodose towards the apex may be referred with certainty to *Plesia*, and those in which it is very short and as broad as the second, almost sessile, are equally certainly the males of *Myzine*. The genus *Myzine* does not occur in America, and there is little difficulty in distinguishing the males of the Asiatic species; but in South Africa, where both genera occur plentifully, some of the males cannot be assigned to either group with any confidence. The length of the basal joint of the posterior tarsi is no certain guide, as Saussure, who suggests that some use may be made of that character, recognizes.

The two genera are most strongly represented in Africa, but the species of *Plesia* are fairly numerous in America, and *Myzine* is well represented in the Mediterranean fauna and in Western Asia. No species of either genus is recorded from the Australian or Austro-Malayan regions; for *Myzine*

tenuicornis, Sm., described from Aru, is a *Thynnus*, coming near the subgenus *Aeolothynnus*, Ashmead.

The species described in the present paper are mostly from specimens in the British Museum collection.

Myzine diffinis, sp. n.

♂. Mandibles with a fringe of fine white pubescence on the outer margin near the base; the clypeus truncate broadly at the apex and sparsely punctured. Head rather small, rounded and narrowed behind the eyes, the vertex finely punctured, the front rugose; eyes broadly and shallowly emarginate, ocelli rather large; front between the antennæ prominent and transverse. Antennæ as long as the six basal segments of the abdomen, much more slender than is usual in the genus; the scape short, very little longer than the second joint of the flagellum; the first joint of the flagellum concealed by the scape, the second a little more than half as long as the third. Thorax rather closely punctured, the anterior margin of the pronotum transverse, with long greyish pubescence, the posterior margin almost smooth; the scutellum shining and sparsely punctured; propleuræ finely and sparsely, mesopleuræ coarsely punctured. Median segment short and transversely rugose. Abdomen shining and very sparsely punctured, with very sparse, short, grey pubescence; longer than the head, thorax, and median segment combined, the spine of the hypopygium only feebly recurved. The posterior tibiæ are nearly as long as the two basal joints of the tarsi combined. The neuration does not extend quite to the outer margin of the wing; the stigma is large, long, and straight; the radial cell broad, extending far beyond the third cubital cell and rounded at the apex; the second cubital cell half as long again as the third on the radial nervure and more than half as long again as the third on the cubital nervure; the first recurrent nervure is received at the middle of the second cubital cell, the second at the middle of the third. The second transverse cubital nervure is straight, the third oblique and slightly curved outwardly; the third cubital cell is much higher than its length on the cubital nervure and very short on the radial nervure.

Black; the mandibles (except at the apex), clypeus, the apex of the interantennal prominence, the anterior margin of the pronotum narrowly, the posterior margin broadly, a transverse mark near the middle of the mesonotum, the tegulæ, a vertical line on the mesopleuræ in front, a narrow band (broadened in the middle and again more strongly on

the sides) on the apical margin of the first six abdominal segments, a small spot on each side of the epipygium at the apical angles, the anterior tibiæ and tarsi in front, and the base of the intermediate and posterior tibiæ pale yellow; the apex of the mandibles and the legs pale dull ferruginous; the antennæ fusco-ferruginous, paler towards the apex. Wings hyaline, nervures black, the stigma ferruginous.

Length 7 mm.

Hab. St. Vincent, Cape Verde Islands ('Challenger' Expedition).

Type in B. M.

The difference from typical *Myzine* in the neuration and antennæ is marked, showing some approach to *Iswara*, but the ocelli are only very slightly enlarged. In the slender form it resembles *Plesia* rather than *Myzine*, the basal segment of the abdomen being somewhat longer and flatter, with a longer petiole than in typical *Myzine*.

Myzine (Pseudomeria) perornata, sp. n.

♀. Mandibles smooth and shining, with a shallow groove near the inner margin and a very feeble tooth on the inner margin near the apex, the outer margin fringed with sparse ferruginous hairs. Clypeus transverse and extremely short; head smooth and shining, quadrilateral, nearly half as broad again as long, the front produced over the base of the antennæ, forming a broad feebly bilobed prominence. Antennæ smooth, the scape alone with a few fulvous hairs beneath, shining and impunctate; the first joint of the flagellum narrowed at the base, the second joint fully half as long again as the first. Eyes oblique; the posterior ocelli very small, placed nearer to each other than to the posterior margin of the head. Thorax and propleuræ smooth and shining; the pronotum nearly as long as broad, rounded at the anterior angles, with a few setigerous punctures along the lateral margins; mesonotum with two longitudinal sulci on each side, very short, not more than one-third of the length of the pronotum; the scutellum as long as the mesonotum; mesopleuræ sparsely punctured. Median segment shining at the base, with a median longitudinal sulcus finely crenulate at the posterior angles, longer than the mesonotum, truncate posteriorly and transversely striated on the surface of the truncation; the sides of the segment concave and finely obliquely striated. Abdomen shining, very sparsely punctured; the petiole of the basal segment a little longer than broad, the apical segment almost impunctate, with a very

short longitudinal sulcus before the narrowly rounded apex. The wings when folded only reach to the apex of the second abdominal segment and the stigma is situated halfway between the base and the apex.

Head and thorax ferruginous red; the antennæ, prosternum, and anterior legs fusco-ferruginous; median segment, mesopleuræ, mesosternum, third, fourth, and fifth dorsal segments of the abdomen, and the intermediate and posterior legs black; the two apical joints of the tarsi and the base of the second and third joints testaceous; the first and second abdominal segments bright ferruginous, the ventral segments darker, the sixth dorsal segment black at the base, dark ferruginous at the apex; a spot on each side of segments 2-5 yellowish white. Wings pale fusco-hyaline; nervures fuscous.

Length 9 mm.

Hab. Piet Retief, Transvaal (*R. Crawshaw*); November.

Type in B. M.

The wings are rather longer than in *Pseudomeria græca* and the stigma further from the base, owing to the greater length of the basal cells. The pronotum is also longer than in *P. græca*. The wings are less deeply bilobed, so that the species shows a transition between *Pseudomeria* and *Hemimeria*.

Myzine (Hemimeria) sublevis, sp. n.

♀. Mandibles acute at the apex, with a groove on the inner margin not reaching the apex, the outer margin with a fringe of fulvous hairs. Clypeus transverse; the head smooth and shining, the front round the base of the antennæ strongly punctured and sparsely clothed with long fulvous hairs, three large setigerous punctures close to the summit of each eye. Posterior ocelli a little further from each other than from the eyes or from the posterior margin of the head. Pronotum narrower than the head, broadened posteriorly, sparsely punctured anteriorly, with a long grey hair springing from each puncture, the posterior margin smooth. Mesonotum, scutellum, and median segment smooth and shining; a transverse row of large setigerous punctures at the base of the scutellum; the pleuræ rather finely punctured, with long and thin cinereous pubescence on the mesopleuræ. Median segment with very short, fine, oblique striæ along the lateral margins, obliquely sloped posteriorly, the sides of the segment at the base concave, smooth, and shining. Abdomen shining; the segments with a feeble but broadly arched

depression at the apex, sparsely punctured before the depression, the basal third of segments 2-4 smooth and divided by a transverse line from the apical portion of the segment, the petiole of the basal segment a little longer than broad, the apical segment elongate and pointed, smooth and shining. Wings rather short, of about the same length as the abdomen, the stigma situated nearer to the base of the wing than to the apex, the cubital nervure produced a little beyond the apex of the cell and joined at its extremity by a strong scar extending to the margin of the wing.

Black; the mandibles and pronotum bright ferruginous; the apex of the fourth abdominal segment and the whole of the fifth and sixth testaceous red; the tarsi, the anterior tibiae, and the tegalæ ferruginous; the spines of the tibiae whitish; the antennæ fuscø-ferruginous. Wings hyaline, nervures pale ferruginous.

Length 8 mm.

Hab. Delagoa Bay.

Type in B. M.

This is a small and rather slender species, and the wings, though rather short, are quite sufficient for flight.

Myzine rufifrons, Fab.

Myzine (*Meira*) *violaceipennis*, Cam. Rec. Albany Museum, i. 5, p. 301, is undoubtedly a synonym.

Myzine dimidiaticornis, Bingham.

Myzine dimidiaticornis, Bingham. Journ. Linn. Soc., Zool. xxv. p. 423 (1896), ♂.

This is a *Myzine*, and not a *Plesia*, but is distinguished from other males of the genus by the very long pronotum.

Myzine binghami, sp. n.

♀. Head rectangular, about half as broad again as long, smooth and shining, with a few scattered punctures on the vertex and above the base of the antennæ; the clypeus transverse and depressed; the antennæ smooth and shining, the scape beneath with long golden hairs; a sulcus between the antennæ reaching more than halfway to the anterior ocellus. Pronotum rather narrower than the head, slightly narrowed anteriorly and a little broader than long, nearly as long as the scutellum and median segment combined; the whole thorax shining, with very large and sparse punctures, those on the pronotum setigerous; the propleuræ shining and very

sparsely punctured, mesopleuræ very coarsely punctured. Median segment broader than long, steeply sloped posteriorly but not abruptly truncate, finely rugose in the middle, with a short, double, longitudinal carina from the base, the sides obscurely obliquely striated; the metapleuræ shining, with obscure oblique striæ. Abdomen shining, finely and not very closely punctured, the apical segment long and large and almost entirely smooth, the petiole of the basal segment as broad as long. The stigma is a little nearer to the base than to the apex of the wing, the second cubital cell is very small, the height being very much less than the length of the petiole, it is very much contracted, the height being equal to twice the length of the cubital nervure; the first recurrent nervure is received beyond the middle, the second recurrent nervure is slightly curved outwardly in the middle.

Black; the antennæ, mandibles, and intermediate tibiæ and tarsi dark fusco-ferruginous; the anterior tibiæ and tarsi fusco-ferruginous; the spines of the tibiæ white, those of the tarsi fulvous; the two apical segments of the abdomen ferruginous red; a large creamy-white spot on each side near the apical angles of the second and third segments. Wings fusco-hyaline, nervures fuscous, the stigma black.

Length 10, exp. 14 mm.

Hab. Maulmain, Tenasserim (*Bingham*); August.

This is a true *Myzine*, and is the most eastern record for the genus.

Plesia (Mesa) disjuncta, sp. n.

♂. Clypeus rather large, broadly rounded at the apex, with a median carina from the base almost reaching the apex, opaque and minutely punctured, densely clothed with rather long silver-white pubescence. Front rugose, strongly produced between the antennæ and truncate at the apex, the vertex rather coarsely punctured. Antennæ inserted much further from each other than from the eyes, the scape about equal in length to the second joint of the flagellum, closely and finely punctured and subglobular, the first joint of the flagellum very short and almost concealed in the apex of the scape, the third more than half as long again as the second. Pronotum finely and not very closely punctured, very broadly emarginate anteriorly, the lateral angles very strongly produced; mesonotum and scutellum rather sparsely punctured, the mesonotum with a strong oblique depression on each side, meeting on the posterior margin, and a faint longitudinal sulca above the tegulæ; propleuræ finely and closely punctured, mesopleuræ coarsely rugose. Median segment rugose;

the sides closely punctured, striated at the base, the groove for the posterior femora shining and very strongly transversely striated. Abdomen minutely and closely punctured, with short, thin, white pubescence; the punctures on the apex of the sixth and the whole of the seventh segment large and very sparse; the apical two-thirds of the slender basal segment nodose, the narrow basal third with a longitudinal median sulcus. The second cubital cell is slightly longer than the third on the radial nervure, the first recurrent nervure is received at three-fifths from the base of the second cubital cell, the second (which is slightly curved outwardly in the middle) at one-third from the base of the third cubital cell.

Black; the pubescence white, cinereous on the front; the palpi, the mandibles (except at the apex), the anterior and intermediate tibiæ, tarsi, and femora light ferruginous; the spines of the posterior tibiæ and the tegulæ testaceous; abdominal segments 2-5 with strong blue tints. Wings hyaline, the apical third of the anterior pair flushed with purple; nervures black.

Length 18, length of wing 12 mm.

Hab. Sterkfontein, Transvaal (*H. P. Thomasset*).

Type in B. M.

Probably the male of *P. diapherogamia*, Sauss.

Specimens from Natal differ in having the apical half of the anterior wings and the apex of the posterior wings strongly fusco-hyaline, flushed with purple, and the blue tints on the abdomen are less developed. This may prove to be the male of *P. ruficeps*, Sm., of which *P. diapherogamia* is scarcely more than a local colour-variety.

Plesia (Mesa) adelogamia, sp. n.

♀. Clypeus broadly rounded at the apex, deeply and closely punctured at the apex, shallowly and very sparsely at the base, with a carina from the base to the apex. Mandibles shining, with a sparse fringe of long dark fulvous hairs on the lower margin. Scape shining, with a few scattered punctures and a few long fuscous hairs beneath, the first joint of the flagellum shining, the rest opaque. Front closely and very coarsely punctured, without a median sulcus, the tubercles at the base of the antennæ smooth and shining; the vertex and the space round the ocelli rather sparsely punctured. Pronotum coarsely but not very closely punctured; mesonotum smooth anteriorly, very sparsely punctured on the posterior two-thirds, with two longitudinal sulci on each side; scutellum sparsely punctured, the postscutellum

shining in the middle, with a few minute punctures, opaque at the sides. Propleuræ sparsely punctured, obliquely striated near the lower posterior angle; mesopleuræ coarsely punctured. Median segment finely and shallowly punctured, rugulose, with a shining and shallow sulcus from the base not reaching the apex, rather abruptly truncate posteriorly, the face of the truncation very finely rugose; the sides of the segment finely obliquely striated. Abdomen shining, finely and rather closely punctured, most finely at the base of the segments; the second and third segments marked with a slightly raised transverse line at about one-third from the base; the epipygium finely longitudinally striated and broadly rounded at the apex. Radial cell narrowly rounded at the apex, the second cubital cell about two-thirds of the length of the third on the radial nervure; the first recurrent nervure is received close to the middle of the second cubital cell, the second just beyond the middle of the third cubital cell. The third transverse cubital nervure is oblique and broadly curved outwardly.

Black; the mandibles (except at the apex), the extreme apex of the clypeus, the posterior margin of the head broadly (reaching to the posterior ocelli), and the pronotum ferruginous red; the tegulæ and the spines of the tarsi and tibiæ testaceous, the latter very pale; the extreme apex of the pygidium fusco-ferruginous. Wings fuscous, the posterior wings paler, the anterior slightly shot with purple; nervures black. Pubescence white, black on the head and thorax above.

Length 14, length of wing 9 mm.

Hab. Maseru, Basutoland (*R. Crawshay*).

Type in B. M.

Described from four specimens.

Plesia (Mesa) hova, sp. n.

♀. Mandibles acute at the apex, shining, and with a fringe of long fulvous hairs on the lower margin. Clypeus broadly rounded at the apex, closely punctured, the apical margin shining and smooth. Front closely and coarsely, vertex sparsely and shallowly punctured, the space round the ocelli smooth and shining; the scape of the antennæ is smooth and shining above, finely punctured beneath, with a few dark fulvous hairs; the flagellum is opaque, with the first joint shining. Pronotum coarsely and closely punctured, the anterior truncation smooth and shining, the propleuræ sparsely, the mesopleuræ very coarsely and closely punctured. Meso-

notum smooth anteriorly, punctured rugose posteriorly, the lateral sulci ill-defined; the scutellum sparsely punctured, smooth and shining in the middle at the base. Median segment minutely punctured at the base, more strongly at the apex, the posterior truncation slightly concave, shining, and almost smooth; a narrow and shallow sulcus, bordered on each side by a low carina, from the base of the segment to the base of the truncation, the sides of the segment obliquely striated. Abdomen shallowly and not very closely punctured; the petiole of the basal segment scarcely longer than broad, the epipygium closely and finely longitudinally striated and broadly rounded at the apex. The radial cell is narrowly rounded at the apex, the second cubital cell is a little more than half as long as the third on the radial nervure; the first recurrent nervure is received close to the middle of the second cubital cell, the second at one-quarter from the apex of the third cubital cell.

Black; the head rufo-ferruginous, the flagellum fusco-ferruginous, the apex of the mandibles black. The spines of the tibiæ and tarsi white, some of those on the tarsi testaceous, the tegulæ testaceous at the apex. Wings fuscous, flushed with blue, subhyaline at the base; nervures black.

Length 12-14, length of wing 8-9 mm.

Hab. Tamatave, Madagascar.

This will almost certainly prove to be the female of *P. nodosa*, Guér. Allied to *P. atopogamia*, Sauss.

Type in B. M. (ex coll. Turner).

A specimen from Betsileo, Madagascar, has the pronotum, the middle of the mesonotum, the apex of the scutellum, and the tarsi red, and the wings dark fulvo-hyaline. This appears to be a colour-variety only, but may possibly prove to be distinct.

Plesia (Mesa) erythropoda, sp. n.

♀. Clypeus slightly convex towards the middle and subcarinate, shining, very finely punctured. Mandibles acute at the apex, with a fringe of fulvous hairs on the lower margin. Head shining, rather sparsely punctured; the front between the antennæ bilobed, divided by a deep longitudinal sulcus which is shallowly continued halfway to the anterior ocellus, the space round the ocelli almost smooth. Scape shining, with a few long fulvous hairs beneath, smooth above; the second joint of the flagellum nearly half as long again as the first and much stouter. Pronotum shorter than the median segment, rather closely punctured, some of the punctures confluent longitudinally but not very deep, the pubescence

rather long but sparse; the lateral lobes of the mesonotum sparsely punctured, the middle shining, with two or three scattered punctures; a deep sulcus on each side, slightly convergent posteriorly; the anterior margin smooth and shining. Scutellum and postscutellum smooth and shining, with a few small and scattered punctures; the propleuræ obscurely striated at the base, almost smooth at the apex, the mesopleuræ closely punctured. Median segment opaque, very finely punctured, rugulose, with a narrow sulcus, bordered by a low carina on each side, from the base, gradually becoming narrower and shallower to the base of the oblique posterior slope. Abdomen shining, rather sparsely punctured, very slightly narrowed at the base; the petiole of the basal segment as broad as long, the apical segment finely and closely longitudinally striated. The sides of the median segment are closely obliquely striated.

Black; the mandibles, palpi, and legs (except the coxæ) bright ferruginous; the tegulæ testaceous, the antennæ fuscous beneath. Wings hyaline, nervures ferruginous. The extreme apex of the epipygium rufo-testaceous. The radial cell is rounded at the apex; the second cubital cell is about two-thirds of the length of the third on the radial nervure; the first recurrent nervure is received at the middle of the second cubital cell, the second just beyond the middle of the third. The pubescence on the whole insect is very sparse and greyish.

Length 11-12, length of wing 7 mm.

Hab. Lake Ngami.

Type in B. M.

Described from two specimens.

Plesia (Mesa) capensis, Lepel.

Tiphia capensis, Lepel. Hist. nat. Ins. Hym. iii. p. 554. n. 1, pl. xxxv. fig. 1 (1845), ♀.

The figure showing the neuration of the wing proves that this is not a *Tiphia*. I cannot identify it as having been subsequently described, though it must come very near *P. hottentota*, Sauss.

Plesia (Mesa) innotata, sp. n.

♀. Clypeus short and broad, punctured at the base, the apical margin slightly depressed and smooth; the apex of the labrum with a fringe of long, stiff, golden hairs. Mandibles smooth and shining, with a very sparse fringe of long golden hairs on the outer margin. Head strongly punctured,

closely on the front, where some of the punctures are longitudinally confluent, more sparsely on the vertex, the front between the antennæ deeply emarginate, with a narrow longitudinal sulcus nearly reaching the anterior ocellus. Scape shining, finely and rather closely punctured, smooth at the apex. Pronotum shorter than the median segment, deeply and closely punctured, almost reticulate; mesonotum very sparsely punctured, with two longitudinal sulci on each side; the scutellum rather more closely punctured, the post-scutellum very finely and closely punctured; propleuræ closely punctured, obscurely obliquely striated posteriorly; mesopleuræ coarsely punctured. Median segment finely punctured, rugose, with a rather broad sulcus from the base bordered by low carinæ, obliquely sloped posteriorly. Abdomen shining, sparsely punctured, more closely on the fourth and fifth segments, the apical segment strongly longitudinally striated. The sides of the median segments closely obliquely striated. The first recurrent nervure is received at the middle of the second cubital cell, the second at two-thirds from the base of the third cubital cell; the second cubital cell is produced on the cubital nervure towards the base and narrowly truncate at the extremity; the third cubital cell is half as long again as the second on the radial nervure; the third transverse cubital nervure is oblique, slightly curved outwardly near the cubital nervure; the radial cell is narrowly separated from the costa and narrowly rounded at the apex.

Black; the pubescence very sparse and white, thicker on the legs, which are punctured, the spines of the legs white; the lateral margins of the abdominal segments very narrowly testaceous. Wings hyaline, nervures black.

Length 13 mm.

Hab. East Loangwa district, N.E. Rhodesia, 2400 feet (*S. A. Neave*); February.

Type in Oxford University Museum.

Nearest to *P. hottentota*, Sauss., and *P. capensis*, Lep., but differs from the former in neurination and the colour of the antennæ, from the latter (which is very poorly described) in the colour of the wings and pubescence.

Plesia (Mesa) madraspatana, Sm.

Myzine madraspatana, Sm. Cat. Hym. B. M. iii. p. 72. n. 11 (1855), ♀.
Myzine violaceipennis, Cam. Mem. Manchester Phil. Soc. xlii. xi. p. 21 (1898), ♀.

If there are two species as Cameron states, he has identified them wrongly; the characters he gives for *madraspatana*,

Sm., do not exist in the type. Cameron's description is applicable to typical *madraspotana*, except that the type has the clypeus carinated. I have seen a specimen from Poona.

This species will probably prove to be the female of *Myzine dimidiata*, Guér.

Plesia (Mesa) dimidiata, Guér.

Myzine dimidiata, Guér. Dict. pitt. hist. nat. v. p. 584. n. 17, ♂.

Methoca orientalis, Sm. Cat. Hym. B. M. iii. p. 66. n. 3 (1855), ♂ (nec Smith, 1875).

Smith's type is not marked in the B.M., but his description agrees well with Guérin's species; and in describing *Methoca orientalis* in 1875, he states that it is the first species of the genus recorded from India. He has made a similar mistake in describing *Methoca mandibularis* (1869, Trans. Ent. Soc. London), which is also a *Plesia*.

Plesia (Mesa) purpureipennis, sp. n.

♀. Clypeus deeply but sparsely punctured, with an indistinct carina from the base, broadly subtruncate at the apex, the apical margin smooth and shining. Mandibles with a sparse fringe of fulvous hairs on the outer margin; scape shining and sparsely punctured, smooth at the apex, with a few long fulvous hairs beneath; the flagellum opaque, the first joint shining and sparsely punctured. Front coarsely, vertex sparsely and rather more finely punctured, a large space round the anterior ocellus smooth and shining. Pronotum and scutellum very coarsely punctured rugose; mesonotum sparsely punctured, with two sulci on each side, the inner sulcæ broad and converging towards the posterior margin. Median segment very finely rugulose, with a broad transversely striated sulcus from the base to the apex, the sides of the sulcus raised and forming carinæ, the posterior truncation of the segment shining, sparsely and shallowly marked with large punctures, the sides of the segment obliquely striated. Propleuræ rugose striated posteriorly, mesopleuræ exceedingly coarsely punctured. Abdomen shining, rather sparsely punctured, most strongly on the basal segment, very sparsely on the second; the epipygium finely and closely longitudinally striated, rounded at the apex, the hypopygium narrowly truncate at the apex. The second cubital cell is very little shorter than the third on the radial nervure, the first recurrent nervure is received close to the middle of the second cubital cell, the second at two-thirds from the base of the third cubital cell.

. Black; the extreme apex of the pygidium testaceous; the pubescence greyish, pale fulvous on the sides of the abdomen; the spines of the tibiæ and tarsi pale ferruginous. Wings dark fuscous, glossed with purple; nervures black.

Length 16–18 mm.

Hab. Entrance Island, China (*J. J. Walker*).

Type in B. M. Described from two specimens.

This seems to be the Chinese form of *P. madraspatana*, Sm., from which it differs by the entirely black colour of the abdomen. The second cubital cell is also rather longer on the radial nervure.

Plesia (Mesa) mandibularis, Sm.

Methoca mandibularis, Sm. Trans. Ent. Soc. London, p. 301 (1869), ♂.

This is probably the male of the last-described species. It is very near *dimidiata*, Guér., from which it may be distinguished by the paler colour of the wings and the rather shorter clypeus, also by the more distinct sulcus on the median segment.

Plesia (Mesa) opacifrons, sp. n.

♀. Clypeus short, very broadly truncated at the apex, the base punctured, the apex broadly depressed transversely, opaque and smooth. Scape smooth above, sparsely punctured beneath and with a few long fulvous hairs; flagellum opaque, the first joint smooth and shining. Front opaque, almost smooth, with a few large scattered punctures, the interantennal prominence strongly bilobed, divided by a sulcus which reaches more than halfway to the anterior ocellus; vertex shining, finely and very sparsely punctured, the space round the ocelli smooth. Thorax shining, sparsely and rather finely punctured; the mesonotum with two longitudinal sulci on each side, the inner sulci not very strongly convergent posteriorly. Propleuræ closely and finely punctured, mesopleuræ more strongly punctured. Median segment closely obliquely striated on the sides; the dorsal surface very closely and finely punctured, some of the punctures confluent, with a smooth shining space on each side near the middle; two parallel carinæ from the base not reaching the apex, very near together, the space between them finely rugose; the surface of the oblique posterior truncation finely aciculate, with scattered shallow punctures. Abdomen shining, evenly, but not very closely punctured; the second segment almost smooth; the anterior truncation

of the basal segment slightly concave; the epipygium sub-opaque, rather sparsely punctured, some of the punctures confluent longitudinally near the apex. The second cubital cell is full three-quarters as long as the third on the radial nervure, the radial cell is very narrowly separated from the costa at the apex, the second recurrent nervure is received at three-fifths from the base of the third cubital cell.

Black; the pubescence grey and very sparse; the apex of the pygidium narrowly testaceous; the spines of the tibiae white, those of the tarsi very pale ferruginous. Wings fusco-hyaline, flushed with purple, darkest towards the apex; nervures black.

Length 12 mm.

Hab. Salween Valley, Tenasserim (*Bingham*); July.

Type in B. M. (ex. coll. *Bingham*).

Plesia (Mesa) ustulata, sp. n.

♀. Clypeus very finely and closely punctured; the head punctured, finely and sparsely on the vertex and round the ocelli, closely and coarsely on the front, a shallow longitudinal sulcus between the antennae reaching halfway to the anterior ocellus; the scape shining and punctured, with sparse, pale, fulvous pubescence beneath, the flagellum except the basal joint opaque. Pronotum rather deeply, but not very closely punctured; mesonotum shining, very sparsely punctured, almost smooth on the disc, with two longitudinal sulci on each side, the outer one very shallow and indistinct; the scutellum shining and very sparsely punctured; propleuræ punctured rugulose, mesopleuræ closely and not very coarsely punctured. Median segment very finely and closely punctured, with a broad groove from the base to the base of the oblique posterior slope, which is not abruptly divided from the dorsal portion of the segment, the sides closely obliquely striated. Abdomen shining, finely punctured, sparsely on the two basal segments, more closely on the others; the epipygium finely punctured at the base, finely longitudinally striated before the apex, which is broadly rounded, the apical margin rather broadly smooth; the petiole of the basal segment broader than long. The first recurrent nervure is received at the middle of the second cubital cell, the second, which is broadly but not very strongly curved outwardly, a little beyond the middle of the third cubital cell. The second cubital cell is long on the radial nervure, slightly longer than the third; the second and third transverse cubital nervures oblique, very slightly bent close to the cubital nervure; the radial cell obliquely truncate at the apex.

Black; the mandibles, flagellum, and apex of the hypopygium dull fusco-ferruginous; the apex of the epipygium and the tegulae testaceous; the spines of the tibiae and tarsi whitish. Wings pale yellowish brown, fusco-ferruginous in the radial cell, nervures dark fuscous.

Length 12 mm.

Hab. Yunzalin Valley, Tenasserin (*Bingham*); November. Type in B. M.

Plesia (Mesa) extensa, sp. n.

♂. Clypeus convex and subcarinate in the middle, slightly advanced to the apex and very feebly and narrowly emarginate, finely punctured and clothed with white pubescence. Front punctured-rugose, vertex sparsely and rather shallowly punctured, the prominence between the antennae bilobed, widely but not deeply emarginate at the apex. Scape very finely punctured, short and swollen, the first joint of the flagellum concealed by the apex of the scape, the second not as long as the scape, the third half as long again as the second. Pronotum shining, finely and not very closely punctured, narrowed anteriorly, the posterior margin arched; mesonotum and scutellum shining and sparsely punctured, the mesonotum with two sulci on each side, the two inner sulci deep and converging towards the posterior margin. Median segment coarsely transversely rugose; propleurae very finely, mesopleurae more coarsely punctured. Abdomen shining, finely and sparsely punctured, slender and elongate; the basal segment smooth, fully as long as the second and third combined, the basal half very narrow and depressed, the apical half nodose, constricted at the apex; the second segment gradually widened from the base, a little longer than the third; the epipygium with a longitudinal carina. The third cubital cell is about one-quarter as long again as the second on the radial nervure; the first recurrent nervure is received just beyond the middle of the second cubital cell, the second at two-fifths from the base of the third cubital cell.

Black; the mandibles except at the apex, the extreme apex of the interantennal prominence, a short, narrow, transverse line on each side at the apical angles of the four basal abdominal segments, the basal joints of the tarsi, the anterior tibiae, and the base of the posterior and intermediate tibiae pale yellow, the apical joints of the tarsi fuscous. Wings very pale fusco-hyaline, nervures fuscous, the tegulae testaceous.

Length 12 mm.

Hab. Maymyo, Burma, 2000 ft. (*Bingham*); September. Type in B. M. (ex coll. *Bingham*). Nearest to *petiolata*, Sm.

Plesia (Mesa) petiolata, Sm.

Myzine petiolata, Sm. Cat. Hym. B. M. iii. p. 72. n. 10 (1855), ♂.

Myzine ceylonica, Cam. Ann. & Mag. Nat. Hist. (7) v. p. 18 (1900), ♀.

A pair taken *in coitu* by Mr. Lefroy at Pusa, Bengal, in June.

The female is very near *fuscipennis*, Sm., but in that insect the median segment is abruptly truncate, leaving a well-defined apical margin, which is not the case in *petiolata*; the mesonotum also is much more strongly punctured in *fuscipennis*, as noticed by Cameron.

Plesia (Mesa) hortata, Nurse.

Myzine hortata, Nurse, Journ. Bombay Nat. Hist. Soc. xiv. p. 81 (1902), ♀.

Hab. Deesa (*Nurse*); Pusa, Bengal (*Lefroy*).

Plesia dichroa, Perty.

Meria dichroa, Perty, Delect. anim. artic. Brasil. p. 139, pl. xxvii. fig. 13 (1833), ♀.

Plesia dorsalis, Lep. Hist. nat. Ins. Hym. iii. p. 576 (1845), ♀.

As I have not seen the types I cannot be absolutely certain as to the identity of these insects, but judging from the descriptions I have little doubt that they may be referred to the same species.

Plesia univittata, sp. n.

♀. Clypeus short, punctured, sparsely clothed with cinereous pubescence, with a faint, longitudinal, median carina. Mandibles subacute at the apex, with a sparse fringe of fulvous hairs on the outer margin. Front deeply and closely punctured, vertex sparsely punctured, cheeks smooth and shining. Pronotum as broad as the head, slightly emarginate anteriorly, deeply and rather closely punctured, the sides very delicately striated. Mesonotum and scutellum shining, with large sparse punctures. Median segment opaque, sparsely punctured, the sides finely striated, shorter than the scutellum, the angles rounded, truncate posteriorly and delicately rugulose. Abdomen shining, very shallowly

punctured; the first segment truncate anteriorly, about one-quarter narrower at the apex than the second segment. Epipygium longitudinally striated, rounded at the apex; hypopygium subtruncate at the apex. The first joint of the posterior tarsi is about twice as long as the second, spinose on the outer margin from the base to the apex and with a comb of short spines beneath.

Black; the abdomen with faint blue reflections; the inner margin of the eyes very narrowly, the postscutellum, a longitudinal mark on each side of the median segment near the apex, a broad band strongly emarginate posteriorly with a small black spot on each side of the emargination on the first abdominal segment and a narrow transverse band close to the base of the third segment yellow; the apex of the epipygium very narrowly testaceous; the spines of the tibiae whitish. Wings pale fusco-hyaline, tinged with violaceous, a much darker band broadening to the apex along the costa, nervures fuscous. First recurrent nervure received by the second cubital cell at three-fifths from the base, the second received by the third cubital cell at two-fifths from the base. Second cubital cell very long, more than half as long again on the cubital as on the radial nervure, one-third longer on the radial nervure than the third cubital cell and nearly twice as long on the cubital nervure. The third cubital cell is rhomboidal, broader than long, the third transverse cubital nervure very slightly arched, joining the radial cell at its extreme apex. ♂ unknown.

Length 16 mm.

Hab. Rio Grande do Sul.

Type in B. M., received from Dr. Ihering.

Allied to *P. dichroa*, Perty.

Plesia andina, sp. n.

♀. Clypeus very closely punctured, raised in the middle into an ill-defined, longitudinal carina and very broadly rounded at the apex. Front closely and coarsely punctured, the vertex more sparsely punctured, the area round the anterior ocellus almost smooth. The posterior ocelli are further from the eyes than from each other and a little further from each other than from the anterior ocellus; they are situated on the inner margin of a small depression. The inner margin of the eyes very broadly and shallowly emarginate. Scape very sparsely punctured beneath, with a few pale fulvous hairs, more closely punctured above; as long as joints 2-4 of the flagellum combined. Mandibles with a

sparse fringe of pale fulvous hairs on the basal half of the outer margin. Pronotum a little broader than the head, nearly three times as broad as long, rather sparsely punctured. Mesonotum and scutellum very sparsely punctured, the mesonotum with two longitudinal sulci on each side, the inner sulci slightly more convergent posteriorly than the outer. Mesopleuræ strongly, but not very closely punctured; the scutellum not quite as long as the mesonotum. Median segment finely rugose, punctured at the base, the sides of the segment finely striated; shorter than the mesonotum, steeply sloped posteriorly, the posterior surface finely obliquely striated and covered with short cinereous pubescence. Abdomen sparsely and rather finely punctured, the segments smooth at the base, the second and third segments with a slightly raised transverse line near the base; the first segment truncate at the base, the dorsal surface not more than half as long as the second segment. Epipygium longitudinally striated, rounded at the apex; the hypopygium projecting beyond the epipygium and narrowly truncate at the apex. The intermediate and posterior tibiæ very broad, flattened on the outer surface and very coarsely rugose, the margins closely serrated. The basal joint of the posterior tarsi is more than twice as long as the second joint, armed with two or three spines before the apex and with a comb of short, closely-set spines beneath. The first joint of the anterior tarsi is strongly emarginate at the base beneath. Black; the mandibles, a spot at the apex of the scape, a spot on the tegulæ, the apical joints of the tarsi and the apex of the pygidium dark fusco-ferruginous, the spines of the tibiæ whitish. Wings deep fulvo-hyaline, the apical third fusco-hyaline, dark fuscous in the third cubital cell and beyond the apex of the radial cell; nervures ferruginous. The first recurrent nervure is received by the second cubital cell at one-third from the apex, the second just before the middle of the third cubital cell. The second cubital cell is as long as the third on the radial nervure and nearly twice as long on the cubital nervure as on the radial. The third cubital cell is more than half as long again on the cubital as on the radial nervure and half as broad again at the apex as at the base. ♂ unknown.

Length 14–17 mm.

Hab. Mendoza, Argentina (December–March).

Described from three specimens purchased from H. Rolle.

LXXXI.—*Rhynchotal Notes*.—XLIV. By W. L. DISTANT.

HOMOPTERA.

Fam. Jassidæ.

Subfam. *TETTIGONIELLINÆ*.

THE following notes and descriptions principally refer to Neotropical genera and species, of which the British Museum possesses a very fine collection. Walker, as is well known, described many species, the types of which it contains; the very large Godman Collection from Central America, worked out by Canon Fowler, is also included in its cabinets, while the Museum purchased some years ago, through Herr Haensch, what purported to be the cotypes of Breddin's species in this subfamily. Unfortunately, a large number of these cotypes have never been described and represent MS. names only, and it is believed that even more have been distributed to Continental Museums, for some referred to by Prof. Jacobi* I learn from him are in that category. The British Museum, however, possesses, with few exceptions, cotypes of all the Neotropical Tettigoniellidæ of which Breddin has published descriptions, and I append a list of those which we received ascribed to Breddin of which no description can be traced. I forwarded Dr. Breddin a list of these nondescripts, and it is important that attention should be called to them.

I have to thank Prof. Jacobi, of the Dresden Museum, for kindly letting me see examples of all his Peruvian and Bolivian specimens which he described in 1905. The incidents of synonymy have thus been avoided, while the British Museum now possesses properly identified representatives or coloured drawings of all his species.

GENUS TRICHOGONIA.

Trichogonia, Bredd. Soc. entom. xvi. p. 75 (1901).

Type, *T. ardentula*.

Trichogonia boliviana, sp. n.

Black; disk of vertex connected with base by a narrow central line, and apical areas of tegmina (excluding margins) dull greyish.

Var. The apical areas of tegmina with the greyish coloration replaced by sanguineous.

* SB. Ges. naturf. Berlin, 1905, Nr. 6, pp. 163-185.

Vertex a little longer than half the breadth between eyes; pronotum sparingly punctate, transversely finely striate, centrally longitudinally sulcate, its basal margin angularly sinuate; scutellum with two small discal rounded foveations, its apical areas rugulose; tegmina smooth, shining, the veins prominent; posterior tibiae finely spinulose.

Long. 10 mm.

Hab. Bolivia; Toungas de la Paz (Brit. Mus.).

GENUS TETTIGONIELLA.

Tettigonia, Geoffr. Hist. Abrég. des Ins. i. p. 429 (1798-99) nom. præoce.

Tettigonia, Sign. Ann. Soc. Ent. Fr. 1853, p. 323 (part.); Stål, Hem. Fabr. ii. p. 61 (1869).

Subgen. *Amblyscarta*, Stål, Hem. Fabr. ii. p. 71 (1869).

Subgen. *Pæciloscarta*, Stål, loc. cit. p. 73.

Tettigoniella, Jacobi, Zool. Jahr. Syst. xix. p. 778 (1904) n. nom.; Dist. Faun. B. I., Rhynch. iv. p. 201 (1907).

Type, *T. viridis*, Linn.

The type of Stål's subgen. *Amblyscarta* is *A. modesta*, Fabr., and taking that species as a standard, *Amblyscarta* should rank as a distinct genus. But the mutations between *modesta*, Fabr., and *viridis*, Linn., the type of *Tettigoniella*, are so gradual that no actual generic demarcation can be made between them. As regards the subgen. *Pæciloscarta*, Stål, the type of which is *cardinalis*, Fabr., the distinction is less, while some of the species included by Stål in that subgenus belong to *Kolla*, Dist. It therefore seems best to follow Stål with the two above subgenera, though others may be recognised as of generic value.

Tettigoniella (Amblyscarta) fastuosa.

Cicada fastuosa, Fabr. Syst. Rhynch. p. 70. 43 (1803).

Tettigonia fastuosa, Sign. Ann. Soc. Ent. Fr. (3) i. p. 37, pl. ii. fig. 10 (1853).

Tettigonia (Amblyscarta) fastuosa, Stål, Hem. Fabr. ii. p. 73 (1869).

Tettigonia instans, Walk. List Hom., Suppl. p. 213 (1858).

Hab. Amazons; Ecuador; Bolivia (Brit. Mus.).

Tettigoniella (Amblyscarta) quinquesignata.

Tettigonia 5-signata, Walk. List Hom., Suppl. p. 194 (1858); Fowl.

Biol. Centr.-Am., Rhynch. Hom. ii. p. 239, t. xv. fig. 11 (1899).

Tettigonia multivirgata, Stål, Stett. Ent. Zeit. xxv. p. 73 (1864).

Hab. Central America.

Tettigoniella (Amblyscarta) picta, sp. n.

Vertex testaceous, thickly and finely spotted with ochraceous; pronotum carmine-red, thickly, finely, and indistinctly spotted with ochraceous, its anterior margin broadly testaceous spotted with ochraceous; scutellum testaceous, finely spotted with ochraceous; tegmina carmine-red thickly reticulate with bluish-grey markings, excepting basal angles and apices which are uniformly carmine-red; head beneath, sternum, and legs castaneous-brown, lateral margins of sternum greyish white; abdomen beneath ochraceous; face thickly and finely spotted with ochraceous; vertex about half as long as breadth between eyes, foveately impressed on each side before eyes; pronotum arcuately impressed before anterior margin; face a little broadly flattened, on each side narrowly transversely striate.

Long., incl. tegm., 9 mm.

Hab. Bolivia; Yungas de la Paz (Brit. Mus.).

Belonging to the group of species represented by *T. (A.) modesta*, Fabr.

Tettigoniella (Amblyscarta) cachabensis, sp. n.

Vertex, pronotum, and scutellum brownish ochraceous; body beneath and legs ochraceous; tibiæ and tarsi brownish ochraceous; abdomen beneath piceous, the lateral and posterior segmental margins, the last segment and anal appendage more or less ochraceous; tegmina black, posterior claval margin broadly and inner claval margin narrowly, and costal margin narrowly ochraceous, six or seven elongate stramineous spots, two on inner claval margin, two on disk before middle, and three subcostal; vertex broad, transverse, scarcely half as long as breadth between eyes, anterior margin rounded between eyes; pronotum foveately impressed behind each eye; scutellum finely transversely impressed before apical area; face with a central pale longitudinal line, the lateral areas finely obliquely striate; clypeus gibbous.

Long. $9\frac{1}{2}$ to 10 millim.

Hab. Ecuador; Cachabé (Rosenberg, Brit. Mus.).

Tettigoniella (Amblyscarta) inca, sp. n.

Head, pronotum, and scutellum brownish ochraceous; face pale ochraceous, cheeks, sternum, and legs greyish ochraceous; tibiæ and tarsi piceous; abdomen beneath orange-yellow, its apex black; tegmina black, a narrow transverse line at base, a broad transverse fascia before

middle and a similar fascia beyond middle, orange-yellow; wings dark fuliginous; head broad, transverse, about as long as breadth between eyes, rounded between, but a little perpendicular in front of eyes; pronotum somewhat strongly transversely impressed before anterior margin; face centrally, broadly, flattened and smooth, the lateral areas narrowly transversely striate; clypeus gibbous.

Long., incl. tegm., 10 to $10\frac{1}{2}$ mm.

Hab. Ecuador; Cachabé (*Rosenberg*, Brit. Mus.).

Tettigoniella (Amblyscarta) rosenbergi, sp. n.

Vertex, pronotum, and scutellum olivaceous brown, the posterior margin of the pronotum greyish; body beneath and legs olivaceous brown; anterior and intermediate tibiæ and tarsi, apex of posterior tibiæ, and apices of posterior tarsal joints, piceous; apex of abdomen beneath blackish; tegmina black, a narrow curved transverse fascia at base, a broad transverse fascia before middle, and a similar fascia beyond middle, greyish white; wings dark fuliginous; vertex broad, short, scarcely half as long as breadth between eyes, rounded between eyes, but a little perpendicular at anterior margins of eyes; pronotum finely and indistinctly transversely striate, transversely impressed before anterior margin, distinctly deflected near posterior margin; face centrally broadly smooth, transversely striate on each lateral area; clypeus distinctly gibbous.

Long., incl. tegm., 10 to $10\frac{1}{2}$ mm.

Hab. Ecuador; Cachabé and Paramba (*Rosenberg*, Brit. Mus.).

Tettigoniella (Amblyscarta) hulda, sp. n.

Head and pronotum ochraceous brown; lateral areas of the vertex in front of ocelli piceously carinate; posterior marginal area of pronotum castaneous; scutellum pale dull ochraceous; head beneath, sternum, and legs ochraceous-brown; abdomen beneath pale ochraceous, the segmental margins brown; tegmina dull subhyaline, largely irregularly shaded with bright ochraceous, the veins castaneous, and with three irregularly shaped castaneous spots, one somewhat elongate near base, the others subquadrate and situate near middle of claval margin and near middle of tegmen; vertex broad, transverse, much broader than long, truncately rounded in front; pronotum considerably longer than vertex, broadly transversely grooved or impressed near anterior margin; face broadly centrally ferruginous and thickly finely granulose, the lateral areas transversely striate

and piceous; anterior and intermediate tibiae piceous, all the tarsi piceous.

Long., incl. tegm., ♀ 14 mm.

Hab. Colombia (Brit. Mus.).

A robust and broad species and in that respect allied to *T. sanguinans*, Walk.

Tettigoniella spectabilis, sp. n.

Head and pronotum golden yellow; vertex with the basal margin very narrowly black, and an oblique black spot at inner margin of each eye; pronotum with the anterior and posterior margins broadly castaneous; scutellum brownish ochraceous, a black transverse fascia (medially widened) a little beyond base followed by a large transverse greyish arcuate spot on apical area; abdomen above ochraceous, the last two segments brownish, the margins of which are black, and a central longitudinal black fascia which is broadest on basal area; body beneath and legs yellowish grey; tibiae and tarsi slightly infuscate; face golden yellow; a small black spot on each side of clypeus; tegmina castaneous brown, the apical area pale brownish ochraceous, four large yellowish spots on the dark area, the first oblique near base, extending from near costa to near outer claval margin, the second smallest, in and near apex of claval area, the third discal and almost above claval apex, the fourth just before apical area; wings hyaline, slightly fuliginous, the apical margin blackish; vertex about half as long as breadth between eyes; face centrally smooth, the apical areas transversely striate.

Long., excl. tegm., ♀ 11 mm.; exp. tegm. 25 mm.

Hab. Bolivia, Toungas de la Paz (Brit. Mus.).

Allied to *T. pardalina*, Fowl.

Tettigoniella jemima, sp. n.

Vertex ochraceous, a transverse undulating line in front of eyes, from which two central lines proceed to apex, and a single central line connected with base, black; pronotum pale ochraceous, the base, from which proceed two central lines connected beyond middle and connected by a transverse line on each side to lateral margins, and three small central spots on anterior margin, castaneous; scutellum castaneous, the basal angles and apex pale greenish-ochraceous; body beneath and legs ochraceous, abdominal segmental margins, spots to connexivum, and tarsal claws, piceous; face and clypeus golden yellow, anterior margin of face, lateral margins of clypeus, and a posterior lateral line to cheeks, black; tegmina subhyaline, the veins, basal and apical areas

castaneous, the two last containing ochraceous spots; vertex a little shorter than breadth between eyes, subangulately rounded in front; lateral areas of face obliquely transversely striate.

Long., incl. tegm., $11\frac{1}{2}$ –12 mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Allied to *T. bracteata*, Jacobi.

Tettigoniella lenea, sp. n.

Pale ochraceous; vertex with a subapical marginal black line, a transverse central black line at base, and a more slender line of the same colour on each side before eyes; pronotum with two indistinct pale brownish transverse fasciæ, the broadest near base, the other waved before anterior margin; scutellum pale brownish, the basal angles and apex greenish yellow; tarsi piceous brown; tegmina subhyaline, the veins, costal margin, and extreme basal area pale brownish; vertex much shorter than breadth between eyes, anteriorly subangulate; scutellum strongly transversely impressed near middle; face broad, subglobose, the lateral areas transversely striate.

Long., incl. tegm., 10–11 mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella hydra, sp. n.

Vertex black, thickly spotted and marked with ochraceous; pronotum purplish brown, the anterior margin black spotted with ochraceous; scutellum black with pale ochraceous marginal and apical markings; body beneath black, dense linear markings to face, coxæ, legs, narrow abdominal segmental margins, and spots to connexivum, pale ochraceous, tibiæ and tarsi more or less brownish; tegmina purplish brown, narrow margins to clavus, narrow costal margin, and the apical area bronzy yellow; vertex broad, transverse, about half as long as breadth between eyes, anteriorly rounded, slightly transversely impressed in front of eyes; scutellum transversely impressed near middle.

Long. 10 mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Allied to *T. testudinaria*, Fowl.

Tettigoniella thea, sp. n.

Vertex, pronotum, and scutellum stramineous; vertex with a broad irregular brownish-ochraceous arcuate fascia between the eyes; pronotum with the anterior margin and

two transverse fasciæ, the first narrow before middle, the second broad before posterior margin, purplish red; scutellum with a purplish red transverse fascia imperfectly seen in the pinned typical specimen; head beneath and sternum pale stramineous; posterior margins of face, clypeus, a transverse spot between anterior and intermediate coxæ, and abdomen beneath, black, margins of the abdominal segments stramineous; tegmina purplish red, sparingly and somewhat minutely spotted with pale ochraceous, the extreme apical area obscure hyaline, the apical margin piceous; vertex about as long as breadth between eyes, angulately produced in front of eyes; face narrowly, laterally piceously striate on its posterior half.

Long. 10 mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Allied to *T. tractatula*, Jac., vertex more angulate anteriorly, markings to pronotum, spots to tegmina, and colour of face different.

Tettigoniella cornelia, sp. n.

Vertex stramineous, the anterior margin black; pronotum and scutellum purplish red, pronotum with the anterior margin medially interrupted and the posterior margin ochraceous; head beneath, including face, cheeks, and clypeus, black; sternum and legs pale ochraceous; abdomen beneath black, the segmental margins and the anal segment pale ochraceous; tegmina purplish red, clavus with two transverse fasciate spots, the first near base, the second near apex, pale ochraceous; wings fuliginous; vertex much broader than long, rounded in front; face somewhat globose.

Var. Vertex unicolorous, without the anterior black margin; head beneath uniformly pale ochraceous, not black.

Long., incl. tegm., 6 mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Tettigoniella tolosa, sp. n.

Vertex black, margins of the ocelli ochraceous; pronotum and scutellum reddish ochraceous, the first with a central broad black fascia not reaching the anterior margin and amplified posteriorly; scutellum with a blackish spot a little before each basal angle; body beneath black, margins of the abdominal segments pale ochraceous; anterior and intermediate legs pale ochraceous, bases of the femora black, posterior legs black, bases of tibiæ and the tarsi more or less

ochraceous; tegmina testaceous, a large oblique spot near middle of clavus piceous; vertex broader than long but angulately rounded anteriorly; face discally flattened, the lateral margins narrowly but somewhat coarsely transversely striate.

Long., incl. tegm., 9 mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella daeta, sp. n.

Vertex ochraceous, the lateral margins before eyes and a central longitudinal fascia not reaching apex, black; pronotum purplish red, the anterior margin black; scutellum black, extreme apex purplish red; head beneath, sternum and legs ochraceous; face (excluding basal area), clypeus, coxal spots, and abdomen beneath black, the abdominal segmental margins testaceous; apices of tarsal joints and the claws, piceous; tegmina purplish red, a transverse fascia near middle, another beyond middle, and the apical area, black; vertex about as long as breadth between eyes, somewhat conically rounded in front; face with the disk flattened, the lateral areas strongly transversely striate; pronotum and scutellum smooth.

Long., incl. tegm., $11\frac{1}{2}$ mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella vallonina, sp. n.

Vertex pale ochraceous with a broad irregular black fascia not reaching apex and bilobed anteriorly; pronotum and scutellum purplish red, the first piceously ochraceous at anterior margin; body beneath and legs ochraceous; face (excluding basal area), clypeus, coxal spots, and anal segment of abdomen, black; tegmina purplish red, apical area piceous inwardly and obscurely margined with dull ochraceous.

In structure allied to the preceding species, but vertex more broadly rounded in front; colour-markings altogether different.

Long., incl. tegm., $10\frac{1}{2}$ mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella ulla, sp. n.

Vertex ochraceous, lateral margins before eyes, a central fascia bilobed anteriorly, and lateral striations black; pronotum purplish red, anterior margin medially widened, and a large central triangular spot at base, black, the anterior black margin posteriorly bordered on each side with ochraceous; scutellum black; head beneath, sternum and legs

black; basal and lateral margins of face pale ochraceous, the former with two central black dots and the latter with transverse black striæ; abdomen beneath ochraceous, the segmental margins rosaceous, a basal spot and the anal segment black; tegmina purplish red, a broad transverse fascia near middle, and another beyond middle which is inwardly connected with the apical area, black; vertex a little shorter than breadth between eyes, subangularly rounded in front; face discally longitudinally flattened, the lateral areas transversely striate.

Long. incl. tegm. 10 mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella azeka, sp. n.

Vertex, pronotum, and scutellum pale testaceous; vertex with a central longitudinal fascia broadened anteriorly and a small spot before each eye, pronotum with the anterior and posterior marginal areas, the former medially interrupted, and the body beneath black; legs and abdominal segmental margins pale ochraceous, femora, excluding apices, black; tegmina black, basal and apical areas pale greenish ochraceous, posterior claval margin and a medial subcostal line testaceous; wings fuliginous; vertex slightly shorter than breadth between eyes, subangularly rounded in front, foveate on each side near eyes; face discally longitudinally flattened.

Long. 8 mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella apulia, sp. n.

Vertex black, narrow lateral margins bordering eyes, narrow basal margin and a somewhat large discal spot, sulphureous; pronotum sulphureous, a discal suffusion and a subbasal marginal line piceous; scutellum sulphureous, the basal area, excluding its lateral margins, black; body beneath and legs black; intermediate legs, apices of anterior femora and the anterior tibiae and tarsi, apices of posterior coxæ, bases and apices of posterior femora, and the spinules to posterior tibiae, ochraceous; tegmina black, basal and outer claval margins sulphureous, apical area pale fuscous brown; wings pale fuliginous, the veins black; vertex shorter than breadth between eyes, rounded in front, moderately foveate on each side before eyes; face longitudinally flattened, laterally shortly transversely carinate.

Long., incl. tegm., $7\frac{1}{2}$ mm.

Hab. Peru (*Rosenberg*, Brit. Mus.).

Tettigoniella espriella, sp. n.

Vertex, pronotum, and scutellum black; vertex with an irregular and medially interrupted transverse greyish fascia between the eyes and enclosing the ocelli; pronotum with a transverse ochraceous fascia a little behind the middle; head beneath and sternum black (abdomen mutilated in type), anterior lateral margins of face, and the legs pale stramineous; tarsi picceous; tegmina blackish, claval area for the greater part ochraceous, a subcostal line not extending to apical area, inner claval margin, and two short linear fasciæ on posterior disk greenish ochraceous; vertex about as long as breadth between eyes, broadly rounded in front; face centrally longitudinally flattened, laterally transversely striate.

Var. Vertex with a continuous greyish fascia between the eyes, the anterior margins also greyish; face with ochraceous suffusions.

Long., incl. tegm., $8\frac{1}{2}$ mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Tettigoniella areolata.

Tettigonia areolata, Sign. Ann. Soc. Ent. Fr. (3) i. p. 355, t. xi. fig. 4 (1853).

Tettigonia suavipennis, Walk. List Hom., Suppl. p. 196 (1858).

Hab. Central America.

Tettigoniella splendida.

Cicada splendida, Fabr. Syst. Rhynch. p. 68. 29 (1803).

Tettigonia splendida, Sign. Ann. Soc. Ent. Fr. (3) ii. p. 351, t. xi. fig. 15 (1854).

Tettigonia leucospila, Walk. List Hom., Suppl. p. 217 (1858).

Tettigoniella decorata.

Tettigonia decorata, Walk. List Hom. iii. p. 761 (1851).

Tettigonia walkeria, Sign. Ann. Soc. Ent. Fr. (3) i. p. 362 (1853), nec fig.

Signoret proposed the name *walkeri* for this species because he considered it preoccupied by *decora*, Fabr. The *Cicada decora*, Fabr., has been shown by Stål (Hem. Fabr. ii. p. 83) to belong to the genus *Calliscarta*, and therefore cannot invalidate Walker's specific cognomen. Signoret himself had previously (Rev. Mag. Zool. 1850, p. 285) described a species as *Dilobopterus decoratus*, which he subsequently included in *Tettigonia*. *Dilobopterus* being recognised as a distinct genus, Signoret's species (which = *dispar*, Germ.) does not apply.

Tettigoniella spinolæ.

Tettigonia spinolæ, Sign. Ann. Soc. Ent. Fr. (3) i. p. 365, t. xii. fig. 3 (1853).

Tettigonia discrepans, Walk. List Hom., Suppl. p. 212 (1858).

Tettigoniella? concinna.

Tettigonia concinna, Walk. List Hom. iii. p. 755 (1851).

As this species was described from a mutilated specimen without tegmina, it can only be regarded as a non-existent one so far as entomology is concerned.

APULIA, gen. nov.

Vertex somewhat conically produced, about as long as breadth between eyes, more or less distinctly foveate at inner margins of eyes; face globose, discally a little flattened on basal area; clypeus about half as long as face; pronotum elongate, narrowing from base to apex, about half as long again as vertex, the lateral margins oblique and moderately sinuate, the lateral areas more or less foveately depressed; scutellum centrally transversely impressed, the apical area more or less globose; abdomen elongate and somewhat slender; legs slender, anterior tibiae cylindrical; tegmina elongate, apically narrowed and rounded; wings ample; other characters as in *Tettigoniella*.

The long pronotum with its oblique lateral margins and its foveately depressed lateral areas and the globose apical area of the scutellum are typical characters of this genus.

Type, *A. quadrimacula*, Walk.

In this genus I include *T. marquardti*, Jac. and *T. hyacinthinula*, Jac.

Apulia quadrimacula.

Tettigonia quadrimacula, Walk. List Hom. iii. p. 741 (1851).

Tettigonia quadrimaculata, Sign. (part.) Ann. Soc. Ent. Fr. (3) ii. p. 495, pl. xvii. fig. 13 (1854).

Hab. Colombia.

Apulia excelsa, sp. n.

Vertex, pronotum, scutellum, body beneath, and legs stramineous; lateral margins and apex of face, and the clypeus pale castaneous; two large sternal spots between the anterior and intermediate coxæ castaneous, with their margins darker; scutellum with a triangular spot at each basal angle, a central line extending from base to transverse impression where it is amplified on each side, and a small linear spot at apex pale castaneous; abdomen above dull ochraceous, the segmental margins greyish brown, and a central longitudinal series of segmental piceous spots; tegmina dark violaceous, very finely and obscurely sprinkled with stramineous, the costal margin and the apical area stramineous; wings pale flavescent; vertex as long as

breadth between eyes, subconically produced in front, foveately impressed at inner margins of eyes; pronotum strongly foveately depressed on each lateral area; scutellum with the central disk sharply depressed to the transverse impression, the apical area globose.

Long., excl. tegm., $14\frac{1}{2}$ to 15 mm.; exp. tegm. 30 mm.

Hab. Bolivia; Toungas de la Paz (Brit. Mus.).

Apulia hyala, sp. n.

Vertex and pronotum stramineous; ocelli and two spots on the anterior area of the pronotum black; scutellum pale brownish, a large greyish cordate spot occupying the whole of the apical area, two small, sometimes replaced by one larger spot at transverse impression black; abdomen above fuscous brown, the segmental margins greyish, the apex stramineous; body beneath and legs stramineous, margins of face and the clypeus pale brownish; two large violaceous spots on sternum between anterior and intermediate coxæ; tarsi piceous brown; tegmina greyish, the costal and apical margins (the first narrowly, the latter more broadly) ochraceous, a longitudinal purplish subcostal fascia extending from near base to beyond middle, and an arcuate transverse fascia of the same colour a little before apex; wings fuscous; vertex as long as breadth between eyes, subconically anteriorly produced, foveately depressed at inner margins of eyes; pronotum foveately depressed on each lateral area; face globose, discally anteriorly flattened, the lateral areas transversely striate.

Var. Tegmina excluding costal margin and apical area wholly pale purplish.

Long., excl. tegm., 12 mm.; exp. tegm. 24 mm.

Hab. Bolivia; Toungas de la Paz (Brit. Mus.), Peru; Perené (Brit. Mus.).

Apulia flora, sp. n.

Vertex, pronotum, and scutellum testaceous red; vertex with a large inwardly angulated black spot at inner margin of each eye; pronotum with two transverse black spots on anterior margin which extend to the anterior angles; basal margin of the scutellum black; abdomen above bluish black, the segmental margins dull ochraceous, the apex testaceous red; body beneath and legs testaceous red; a broad apical transverse fascia to face, the clypeus, a sternal spot between anterior and intermediate coxæ, and a basal transverse fascia to anal segment, black; tegmina purplish violaceous, the apical margin pale ochraceous; wings fuli-

ginous, the veins darker, a linear spot on apical margin ochraceous; vertex slightly longer than breadth between eyes, moderately foveately depressed near inner margin of eyes, subconically produced in front; face centrally longitudinally flattened, the lateral areas rather coarsely transversely striate; pronotum about half as long again as vertex, the lateral margins oblique, scarcely sinuate, the lateral areas deeply foveately depressed.

Long., excl. tegm., ♀ 13 mm.; exp. tegm. 23 mm.

Hab. Ecuador; Paramba (*Rosenberg*, Brit. Mus.).

Apulia cleora, sp. n.

Vertex, pronotum, scutellum, head beneath, sternum, and legs ochraceous; ocelli, two somewhat large oblique transverse spots near anterior margin of pronotum, a large spot near each basal angle of scutellum, a lateral fascia on each side of face extending for about half its length, a spot between anterior and intermediate coxæ, and a marginal spot at anterior angle of mesosternum, black; abdomen above black, the base, apex, and posterior segmental margins, sanguineous; abdomen beneath sanguineous; tegmina dark brilliant violaceous, the apex brownish ochraceous; wings shining brownish ochraceous; vertex not longer than breadth between eyes, subconically produced anteriorly, foveately depressed on each side near inner margin of eyes; face discally longitudinally flattened, the lateral areas distinctly transversely striate; pronotum with the lateral margins oblique, foveolately depressed on each lateral area.

Long., excl. tegm., ♂, $10\frac{1}{2}$ mm.; exp. tegm. 21 mm.

Hab. Costa Rica; Mokri (Atlantic Slope) (*H. Pittier*, Coll. Dist.).

Apulia amalda, sp. n.

Vertex, pronotum, scutellum, body beneath, and legs ochraceous; posterior, lateral, and apical margins of face and the whole of the clypeus castaneous, cheeks with a piceous-brown spot behind the eyes, a transverse piceous spot between the anterior and the intermediate coxæ, apices of the tarsal joints piceous; abdomen above ochraceous, with discal, transverse, segmental, bluish-black spots; tegmina very pale ochraceous, the margins narrowly a little darker; wings brownish ochraceous; vertex about as long as breadth between eyes, subconically produced anteriorly, foveately impressed on each side before inner margins of eyes, ocelli black; face discally longitudinally flattened, transversely

striate on lateral areas; pronotum with the lateral margins obliquely sinuate, the lateral areas foveately depressed; scutellum more flavescens than ochraceous, the apical area globose.

Long., excl. tegm., ♀ 16 mm.; exp. tegm. 31 mm.

Hab. Colombia (Brit. Mus.).

ONEGA, gen. nov.

Vertex as long as breadth between eyes, more or less centrally anteriorly foveate, the anterior margin angularly rounded, ocelli almost as far apart from eyes as from each other; face moderately long, more or less centrally longitudinally foveate; clypeus robust, centrally longitudinally ridged; pronotum a little longer than the vertex, lateral margins oblique, more or less foveately depressed on each lateral area; scutellum broadly subtriangular, its apex globose; legs slender, anterior tibiæ cylindrical; tegmina slender, their apices more or less truncate, veins somewhat prominent, claval veins reticulate and very prominent.

The principal characters of this genus are the foveate vertex and face, the globose apex to the scutellum, and the coarse reticulate venation of the clavus.

Type, *O. avella*, Dist.

Onega avella, sp. n.

Vertex and pronotum testaceous; basal marginal area of vertex and anterior marginal area of pronotum palely piceous; scutellum greyish brown, the apex testaceous; abdomen above piceous, the segmental margins dull ochraceous; face, clypeus, legs, and abdomen beneath testaceous; cheeks, apices of femora, bases and apices of tibiæ, tarsi, disk of sternum, and central spots to abdomen blackish; tegmina testaceous, a broad blackish subcostal fascia extending from near base to beyond middle, the apical margin and the posterior claval margin both narrowly of the same colour; wings very pale fuliginous much mottled with greyish; vertex as long as breadth between eyes, centrally anteriorly foveate, angularly rounded in front; face longitudinally foveate, finely striate on each lateral area; scutellum with the apex globose; clavus with coarse reticulate venation which neither reaches its apex nor posterior margin.

Long., excl. tegm., 12 mm.; exp. tegm. 26 mm.

Hab. Ecuador; Baiza (*R. Haensch*, Brit. Mus.).

Onega stella, sp. n.

Body above dull purplish red; vertex with a somewhat

large greyish apical spot; scutellum with the basal area black, abdomen above centrally longitudinally pale piceous; body beneath and legs purplish red, tibiae and tarsi blackish; basal area of face pale ochraceous; tegmina pale dull-greyish subhyaline, with the veins darker, the whole of the claval area and the costal area (not reaching apex, but in part extending to middle of tegmen) purplish red, apical margin piceous; wings pale greyish, subhyaline, the veins darker; vertex more evenly and less angularly rounded than in *O. avella*; lateral areas of pronotum strongly foveately depressed; face longitudinally foveate, the lateral areas transversely striate; clavus coarsely reticulately veined for nearly its entire length and breadth.

Long., excl. tegm., 11 mm.

Hab. Ecuador; Baiza (*R. Haensch*, Brit. Mus.).

SERPA, gen. nov.

Vertex about half as long as breadth between eyes, irregularly rounded in front of eyes; ocelli on disk a little nearer to eyes than to each other; face with the disk broadly foveately flattened for its whole length, the margins of which interspace are somewhat strongly ridged, the lateral areas almost perpendicular and transversely ridged; pronotum transverse, considerably broader than long, concavely sinuate before scutellum, two small tubercles near anterior margin; lateral areas behind eyes somewhat broadly foveately depressed; tegmina longer than abdomen; wings broad and ample.

Allied to *Bhandara*, Dist.

Type, *S. plumbea*, Walk.

Serpa plumbea.

Tettigonia plumbea, Walk. List Hom. iii. p. 754 (1851); Sign. Ann. Soc. Ent. Fr. (3) i. p. 683 (1853).

Hab. Quito (Brit. Mus.).

Genus KOLLA.

Kolla, Dist. Faun. B. I., Rhynch. iv. p. 223 (1908).

Type, *K. insignis*, Dist.

Kolla herbida.

Tettigonia herbida, Walk. List Hom. iii. p. 769 (1851); Sign. Ann. Soc. Ent. Fr. 1854, p. 18, t. ii. fig. 4; Uhler, Proc. Zool. Soc. 1895, p. 77.

Tettigonia prolixa, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 275, t. xviii. fig. 18 (1900).

Helochara communis (part.), Van Duz. Tr. Am. Ent. Soc. xxi. p. 280 (1894); Ball (part.), Proc. Iowa Acad. Sci. viii. p. 62 (1901).

Walker is largely to blame for the confusion appertaining to this species. In 1852 (List Hom. iv. p. 1156) he sank his species as a synonym of *Helochara communis*, Fitch. In 1858 (*loc. cit.*, Suppl. p. 235) he again removed it. The real explanation seems to be that with his *T. herbida* he mixed up specimens of *H. communis*. It is not a Nearctic species, the unique type is without locality, and the North-American localities he gives are only applicable to the other specimens he confused with his species. *K. herbida* is a Neotropical species (*cf.* remarks under *Helochara communis*).

Kolla bifida.

Tettigonia bifida, Say, Journ. Acad. Nat. Sci. Phil. iv. p. 313 (1831); Van Duz. Trans. Am. Ent. Soc. xxi. p. 273 (1894); Ball, Proc. Iowa Acad. Sci. viii. p. 58, t. v. fig. 1 (1901).

Tettigonia tenella, Walk. List Hom. iii. p. 770 (1851).

? *Tettigonia fasciata*, Walk. *loc. cit.* p. 780 (1851).

Ball (*suprà*) adds, and no doubt correctly, *T. fasciata*, Walk., as a synonym of *bifida*, Say. Walker's type is, however, not now to be found, and therefore some slight uncertainty prevails. Its loss, however, causes no difficulty, as I, at least, suggest that when no type of a Walkerian species exists, such species is no longer to be recognized, excepting in a few cases where no difficulty can arise as to its identity.

Kolla geometrica.

Tettigonia geometrica, Sign. Ann. Soc. Ent. Fr. 1854, p. 12, t. i. fig. 12; Ball, Proc. Iowa Acad. Sci. viii. p. 59, t. v. fig. 2 (1901).

Tettigonia psittacella, Fowl. Biol. Centr.-Am., Rhynch. Hom. ii. p. 290, t. xix. fig. 26 (1900).

Ball states that this species occurs throughout all the Southern United States from Maryland and Illinois south to Florida and Texas, and on through Mexico to South America.

Kolla ithra, sp. n.

Vertex, pronotum, and scutellum pale greenish ochraceous, scutellum with a transverse black anterior marginal spot near each basal angle; body beneath and legs pale greyish ochraceous; tegmina purplish black, the claval area mostly pale greenish ochraceous, the claval margins narrowly black,

apical area dull ochraceous; vertex about as long as breadth between eyes, subangularly produced in front, longitudinally centrally impressed; face with the disk moderately longitudinally smooth and flat, the lateral margins at regions of eyes distinctly transversely striate, a small central black spot at middle of its basal margin.

Long., incl. tegm., $7\frac{1}{2}$ mm.

Hab. Peru (Rosenberg, Brit. Mus.).

Allied to *K. ferrugatula*, Bredd.

Genus SIGNORETIA.

Signoretia, Stål, Freg. Eug. Resa, p. 289 (1858).

Type, *S. malaya*, Stål.

Signoretia pacifica.

Tettigonia pacifica, Walk. List Hom., Suppl. p. 357 (1858).

Hab. West Africa.

Specimens purchased by the British Museum as "Breddin's Co-types," of which no description can be traced.

Tettigonia histicula, Bredd.
 — *nubicula*, Bredd.
 — *musividula*, Bredd.
 — *atrogantula*, Bredd.
 — *auromicantula*, Bredd.
 — *illuminatula*, Bredd.
 — *offuscabula*, Bredd.
 — *complutula*, Bredd.
 — *luctula*, Bredd.
 — *jocicula*, Bredd.

Tettigonia plebejula, Bredd.
 — *olivatula*, Bredd.
 — *ludicula*, Bredd.
 — *limbatula*, Bredd.
Oncometopia asperula, Bredd.
 — *venasuta*, Bredd.
 — *linialifrons*, Bredd.
 — *lividula*, Bredd.
Amblydisca incarnatula, Bredd.

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

March 4th, 1908.—Prof. W. J. Sollas, Sc.D., LL.D., F.R.S.,
 President, in the Chair.

The following communication was read:—

‘On *Metriorhynchus brachyrhynchus*, Deslong., from the Oxford Clay near Peterborough.’ By E. Thurlow Leeds, B.A.

This species was first described by E. E. Deslongchamps in 1868, and was based on an imperfect skull, obtained from the department of Calvados, Lower Normandy. He was led to distinguish it

from other species by the shortness of its snout. He mentions one other mutilated skull found near Poitiers, and there is a third in the Muséum de la Faculté des Sciences at Caen. Two skulls have recently been obtained by Mr. A. N. Leeds, F.G.S., from the Saurian zone of the Lower Oxford Clay, in the neighbourhood of Dogsthorpe, Peterborough. No other parts of the skeleton were found with them, even the mandibles being missing. The two specimens belong to the same species, and after comparison with descriptions, figures, and photographs of the specimens above mentioned, they have been referred to *Metriorhynchus brachyrhynchus*. This is believed to be the first recorded occurrence of the species in England; and the specimens help to throw additional light on the cranial osteology of the species, especially in the parts which are wanting in the type-specimen. They are, therefore, described in order to amplify Deslongchamps's description. The skulls are neither of them perfect, but one fortunately supplements the other, and both are perfect in one of the most interesting parts—the frontal region and the part from the nasals to the premaxillæ. The specimens are compared and contrasted throughout with *M. superciliosus*. It is found that these specimens possess the main characteristics determining Deslongchamps's species, although the prefrontals, which are in keeping with the general massive development of the skull, are wider than he supposed; and it is possible to reconstruct with almost absolute certainty the region of the posterior nares, showing the bifurcated opening with the vomerine element running back almost to the sphenoid, a feature which the Author thinks will prove to be common to all species of *Metriorhynchus*.

MISCELLANEOUS.

The Type of Cidaris.

To the Editors of the 'Annals and Magazine of Natural History.'

GENTLEMEN,—May I have space for a word in reply to Dr. Bather's article in the March 'Annals' concerning the type of *Cidaris*? He maintains that the type can and should be selected by the rule of "type by tautonomy"; but this seems to me simply impossible. Linné's species *cidaris* is a composite, equivalent undoubtedly to Leske's composite, *papillata*, but not by any means equivalent to *papillata* s. str. Indeed, there is no evidence that Linné ever saw *papillata* s. str., for there is no specimen of that cidaroid among the Linnean Echini, and Lovén simply assumed that Linné had seen it. I do not object to accepting *E. cidaris*, L., or *C. papillata*, Leske, as the type of *Cidaris*, simply because it will upset *Dorocidaris* (the motive Dr. Bather attributes to me), but because neither of those species is identifiable.

As regards Gray's paper (1825), I have not overlooked it, but I did not (and I do not) see that it has any bearing on the point. Although he established *Diadema*, he certainly did not revise *Cidaris*, and he gives no type. He simply mentions *C. imperialis*, Lamk., as an example of *Cidaris*, in contrast to *Diadema*, and the International Code particularly says: "The meaning of the expression 'select a type' is to be rigidly construed. Mention of a species as an illustration or example of a genus does not constitute a selection of a type." It seems to me absurd to suppose that Brandt (1835) expected or intended that both his "Section A" and "Section B" of *Cidaris* were to be called *Phyllacanthus*, as I understand Dr. Bather maintains. While Brandt's footnote is ambiguous, it seems to me clear that he selected *dubia* (= *imperialis*) as the type of *Phyllacanthus*, and *tribuloides* as the type of Section A, which, as he gives it no name, he obviously expected would be called *Cidaris*. However, there is room for difference of opinion as to whether he really selected a type, so that it may be necessary to seek the type of *Cidaris* among later writers. In that case we reach the following simple conclusion: Dr. Bather agrees that Leske's "species" (or, more properly, "group") *papillata* includes three species, and none of his other species are *Cidaridæ* at all. These three species are *imperialis*, *papillata* s. str., and *tribuloides*. Obviously one of these must be the type of *Cidaris*, and granting that neither Gray nor Brandt designated a type, we find that Desor in 1854 removed *imperialis* to *Leiocidaris* (= *Phyllacanthus*), and A. Agassiz in 1869 removed *papillata* s. str. to *Dorocidaris*. Consequently *tribuloides* alone remains to be the type of *Cidaris*.

My whole contention is simply for stability of nomenclature. The names accepted by Alexander Agassiz after most exhaustive study and published in his classic 'Revision of the Echini' have been universally accepted until within the past five years, except in so far as Lovén's critical study of the Linnean Echini (1887) necessitated a few changes. But Lovén's work does not affect any of the *Cidaridæ*, and I maintain that no reasonable and unquestionable application of our now generally accepted Code of Nomenclature requires the overturning and confusion of the commonly used names in that family, such as results from the attempt to make some other species than *tribuloides* the type of *Cidaris*.

HUBERT LYMAN CLARK.

Museum of Comparative Zoology,
Cambridge, Mass.,
April 3, 1908.

The Cahow: Discovery in Bermuda of Fossil Bones and Feathers supposed to belong to the Extinct Bird called "Cahow" by the early Settlers. By A. E. VERRILL.

In a letter just received from Mr. Louis Mowbray, who is now in charge of the new Marine Biological Station and Aquarium at Bermuda, he tells of his recent very important and interesting

discovery of remains of the mysterious cahow, which the writer, in several former articles *, has considered an extinct bird, unknown to zoologists, while others have tried to identify it with the shearwater (*Puffinus obscurus* or *auduboni*), which still breeds at Bermuda in small numbers.

The following is an extract from Mr. Mowbray's letter:—

"I have found the bones of the Cahow, together with feathers answering identically the description of 'russet colour and white' [the colours mentioned by the writers of 1612-20]. The bird is closely related to the petrels. The beak is sharp, hooked. The enomial process of the tarsus is well developed, more so than in *Puffinus obscurus*, of which I have also taken several pairs. The bones found certainly do not belong to the shearwaters. I have found the beak and bones of the shearwater in the same locality, and they can easily be separated one from the other. I found the bones in a cave, some of them buried 3 inches deep in the calcite of the floor, which will testify as to their age. The feathers are imbedded from $\frac{1}{16}$ to $\frac{1}{8}$ of an inch under the surface of a large stalactite. By holding the stalactite to the light one can see five or six feathers imbedded, with the shafts of the feathers all pointing one way downward.

"The cave is a new one, found only a few months ago. I had the pleasure of exploring it thoroughly, and found many skeletons. When the different bones are selected, I think almost the whole skeleton can be made up. Measuring the stained portion of the snow-white calcite floor around the bones, I should say that the bird was about 12 to 14 inches long, not more. I hope the finding of these remains may interest you. . . . The Aquarium is proving a great success. The Biological Station is getting into fine shape.

(Signed) "LOUIS L. MOWBRAY."

"Hamilton, Berm.,
March 15, 1908."

This remarkable discovery ought to settle the status of the cahow, when the bones have been carefully studied by an expert osteologist. The fact that the bird discovered is distinct from the shearwater, found with it, is of itself an important point. The colours of the cahow seem to have been similar to those of the exceedingly rare, if not extinct, "Scaled Petrel."—*Amer. Journ. Sci.*, April 1908, p. 361. (Communicated by the Author.)

* "The Story of the Cahow, the Mysterious Extinct Bird of the Bermudas," *Popular Science Monthly*, ix. pp. 23-30 (1901); and 'Zoology of Bermuda,' vol. i.

"The Cahow of the Bermudas, an Extinct Bird," *Ann. & Mag. Nat. Hist.* ix. pp. 26-31 (1902).

'The Bermuda Islands,' vol. i. p. 260, ed. 2, Supplement, p. 572 (1907).

For the adverse view, H. B. Tristram, *Ann. & Mag. Nat. Hist.* ix. June 1902, p. 447.

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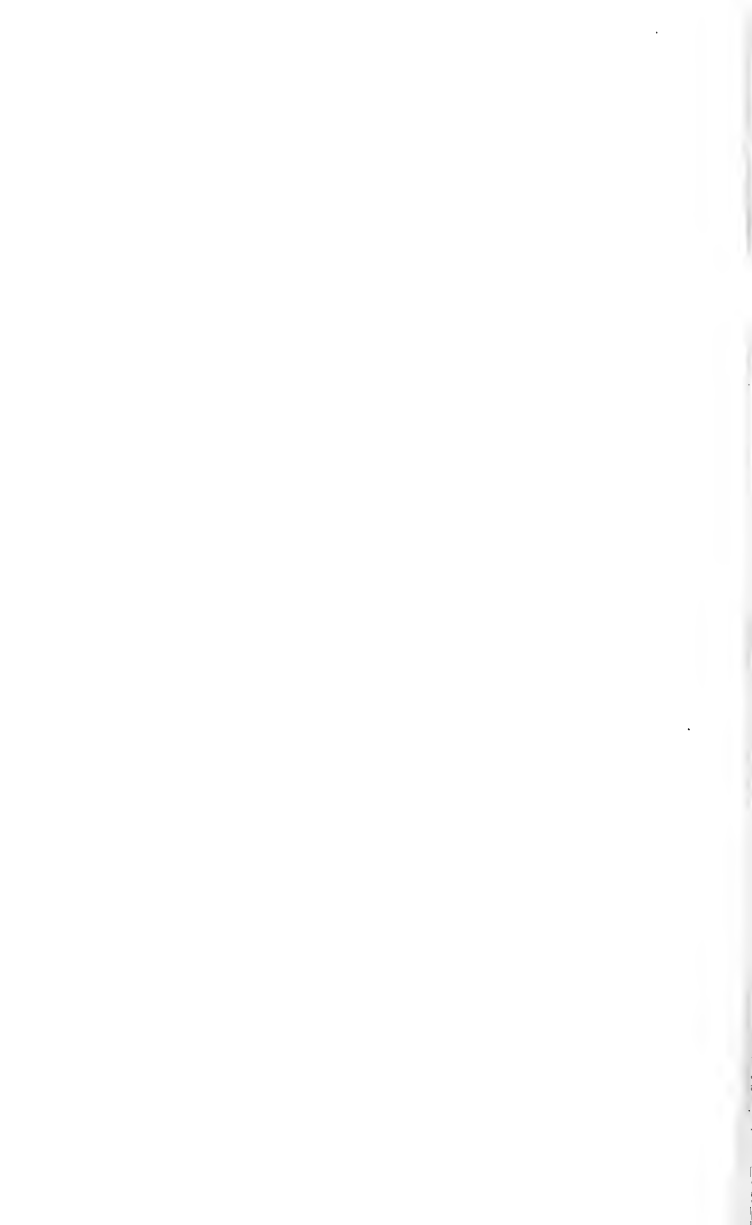
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