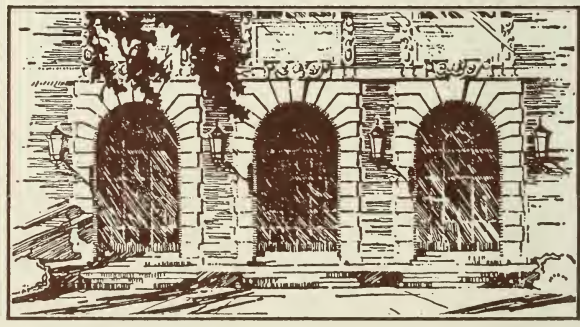


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THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

ALBERT C. L. G. GÜNTHER, M.A., M.D., Ph.D., F.R.S.,
WILLIAM CARRUTHERS, F.R.S., F.L.S., F.G.S.,
AND
WILLIAM FRANCIS, F.L.S.

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VOL. XVII.—SEVENTH SERIES.  
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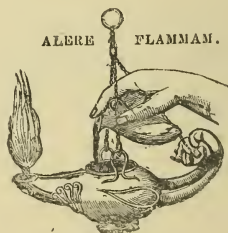
1906.

“Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatiæ 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.”—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

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

J. TAYLOR, *Norwich*, 1818.



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zoology

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ERRATUM.

Pages 61, 64, 65, for *Heterogramma commbræ*
 read *Heterogramma commbæ*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH 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 conchyliis succo.”
N. Parthenii Giannettusi, Ecl. 1.

No. 97. JANUARY 1906.

I.—*Preliminary Notice of the Schizopoda collected by H.M.S. 'Discovery' in the Antarctic Region.* By E. W. L. HOLT and W. M. TATTERSALL, B.Sc., Department of Agriculture and Technical Instruction, Fisheries Branch, Dublin.

THE full results of our examination of the material confided to us will be published by the authorities of the British Museum in a series specially devoted to the biological collections of the 'Discovery.' The Schizopoda, though immensely numerous in individuals of one species, comprise but a few species, of which five appear to have hitherto escaped description. After consultation with Dr. H. J. Hansen, who has charge of a much larger collection of the same group made by the Swedish and Belgian Expeditions, we have decided to publish diagnoses of the new forms, adopting his manuscript names for two which we found he had already worked out. We include a note of all species taken and some remarks on the characters of *Euphausia superba*, Dana, and *Thysanoëssa macrura*, G. O. Sars.

In describing the appendages of the thorax we call them
Ann. & Mag. N. Hist. Ser. 7. Vol. xvii. 1

thoracic limbs. Thus, the maxillipede or first maxillipede is termed the "first thoracic limb" and its endopod the "first thoracic leg," and so on.

Fam. Euphausiidæ.

Genus EUPHAUSIA, Dana.

Euphausia superba, Dana, 1852.

E. superba, G. O. Sars (1885).

E. Murrayi, G. O. Sars (1885).

E. antarctica, G. O. Sars (1885).

E. glacialis, Hodgson (1902).

E. australis, Hodgson (1902).

Of the five supposed species mentioned above *E. superba* is the adult male, *E. Murrayi* and *E. australis* apply alike to the adult female and nearly adult male, while *E. glacialis* and *E. antarctica* represent youthful stages in which the larval characters are not wholly lost. The supposed distinctions arise from errors in Sars's descriptions and figures of all except the adult male.

E. antarctica is described as having no lateral denticle on the carapace. The type specimen has the side from which Sars took his drawing injured, but the denticle is perfect and quite conspicuous on the other side. It is a young form with the spine on the outer distal angle of the antennular peduncle well developed, as is usual in young *Euphausiæ*. 'Discovery' specimens lead from the *E. antarctica* stage to *E. glacialis*, Hodgson, in which the spine on the basal joint of the antennular peduncle has been reduced to about the adult proportions, while the lappet on the dorsal distal edge of the same joint is beginning to appear. At about 27 mm. specimens in other respects agreeing with *E. glacialis* have practically assumed the actual form of *E. Murrayi*.

The type of *E. Murrayi* differs from Sars's description and figures in the following particulars, which bring it into harmony with Hodgson's types of *E. australis*:—

(i) It has a pre-anal spine.

(ii) It has a small rather blunt spine at the outer distal corner of the first joint of the antennular peduncle.

(iii) It has a spine at the extremity of the outer margin of the antennal scale.

(iv) The extremity of the pleural plate of the fifth segment of the pleon is rounded rather than pointed.

E. Murrayi may reach 45 mm., but gradations of form

between that size and 27 mm. are most obviously matters of growth. The types of *E. australis* only differ from those of *E. Murrayi* in being more or less badly damaged.

As between the actual condition of *E. Murrayi* and the description and figures of *E. superba* (which are correct) the differences are only two: *E. superba* has no lateral denticle on the carapace, and has the lappet of the second joint of the antennular peduncle less conspicuous than in *E. Murrayi*.

Dana's types of *E. superba* are lost. Sars's type and only specimen is a male with the copulatory apparatus of the pleopods fully developed. The 'Discovery' collection, though fairly rich in the species, as we regard it, as a whole, contains only a few which exactly correspond to *E. superba*, Sars, and they are fully adult males. Males with the characters of *E. Murrayi* do not exceed 43 mm, and have not the full development of the copulatory apparatus, and we have no hesitation in regarding *E. superba* as the fully developed male of the series. *Nyctiphanes Couchi* presents an instance of the reduction in full-grown males of a process of the second joint of the antennular peduncle which is highly developed in younger males and is retained in that condition in full-grown females (Holt and Tattersall, 1905). In *Nematoscelis microps* (teste Hansen, 1905) the lateral denticle of the carapace is of merely sexual character, but as it is only found in the adult female the condition is quite different from that met with in *E. superba*.

Examination of the mouth-parts confirms the opinion we have expressed of the identity of the species now united.

The collection contains numerous specimens from larvæ to adults, though fully adult males are rare. All were taken outside the barrier ice, and as Mr. Hodgson seems to have fished the waters below the ice very thoroughly, it may be taken that *E. superba* is a creature of the open seas.

Euphausia Vallentini, Stebbing (1900).

Two specimens agreeing very well with Stebbing's description were taken on the way out to the Antarctic, lat. 56° 54' S., long. 170° 28' E.

None occur in gatherings made within the Antarctic Circle.

Euphausia crystallorophias, sp. n.

Form rather robust. *Carapace* with the anterior margin produced into a very acute rostrum extending to about the middle of the basal joints of the antennular peduncles;

lateral margins with a single prominent denticle, just above the insertion of the third thoracic limbs. *Pleon* without dorsal ridges or spines, none of the pleural plates much produced; sixth segment about one and a half times as long as the fifth. *Eyes* globose and rather large, greatest diameter exceeding half the length of the sixth segment of the pleon; pigment black. *Antennular peduncle* with the basal joint much the wider and as long as the second and third combined, and set on its distal half with about twelve curved setæ on a ridge terminating at the outer distal corner in a short stout spine more or less overhung and concealed by the setæ fringing the outer distal edge; no lappet on any of the joints. *Antennal scale* reaching to about the middle of the third joint of the antennular peduncle, about three times as long as broad; outer margin terminating in a spine, beyond which the apex is not produced. *Telson* about once and a half as long as the sixth segment of the pleon; apex acutely pointed; subapical spines extending for half their length beyond the apex and set on their inner margins with a few very minute spines; dorsal denticles usually in two pairs, the first about halfway towards, the second at the base of, the subapical spines. *Uropods*, inner reaching to about the insertion of the subapical spines, outer very slightly longer, with a prominent denticle at its outer extremity.

Length of the largest specimen 30 mm.

E. crystallophias is chiefly distinguishable from *E. splendens*, Sars, by its much longer and more acute rostrum. It also lacks the lobe or lappet of the inner angle of the distal dorsal margin of the first joint of the antennular peduncle, present in Sars's two types of *E. splendens*, but overlooked in his descriptions and figures*.

Mr. Hodgson has favoured us with several thousand specimens taken through holes cut in the ice. Not a single specimen occurs in gatherings made in the open sea, and the species appears to be, as we have endeavoured to indicate in the specific name, exclusively a dweller beneath the roof of ice.

Euphausia triacantha, sp. n.

Form moderately slender, slightly compressed. *Carapace* with the anterior margin produced into a rather acute rostrum nearly extending to the end of the basal joint of

* This lobe is quite conspicuous, whether in dorsal or lateral view, in the female type. In the male, which is considerably smaller, the lobe is less developed and not conspicuous in dorsal view.

the antennular peduncle; lateral margins with a single rather prominent denticle, posterior to the middle. *Pleon* with the third, fourth, and fifth segments produced posteriorly into rather long, slender, very acute, and slightly curved median spines; sixth segment nearly twice as long as the fifth without the spine. *Eyes* (damaged in the specimen) apparently rather small. *Antennular peduncle* with a somewhat recurved bifid lappet at the inner distal angle of the extremity of the first joint; second joint with a single pointed lappet. *Antennal scale* broad, extending to the end of the second joint of the antennular peduncle; outer edge terminating in a spine; apex obtusely rounded. *Preanal spine* small and simple. *Telson* with acutely produced and smooth apex; subapical spines smooth; dorsal denticles in two pairs, the first at about two thirds of the distance from base to subapical spines, the second just above the spines. *Uropods* subequal in length, extending to about the insertion of the subapical spines.

Length of the single specimen 23 mm.

Locality. Lat. $66^{\circ} 52' 9''$ S., long. $178^{\circ} 8' 15''$ E. Soundings 2030 fath.

Thysanoëssa macrura, G. O. Sars (1885).

Numerous specimens, of which the largest reach a length of 28 mm., were taken both in the open sea and through holes in the ice. While agreeing in all other respects with Sars's description they almost all have elongate legs proportionally much longer, the merus extending to about the end of the antennular peduncle, instead of "scarcely reaching beyond the middle of antennal scale." This difference is not related to the size of the individuals, since it is equally manifest in specimens of the same size as Sars's types (13 mm.) and in larger forms. Two specimens alone agree in the proportional length of these legs with the types. There is no other distinction and it seems to us probable that the shorter-legged examples, including the type, have at some period lost their elongate limbs, which have been replaced, as is usual in the higher Decapoda, by smaller members. We have figured (1905, pl. xv. fig. 2) a *Thysanoëssa* in which one of the same legs is seen in an early stage of regeneration. Stebbing's record of *T. macrura* (1900) refers to a specimen in which the legs are longer than in the type.

Fam. *Petalophthalmidæ* *.Genus *HANSEMYYSIS*, Stebbing (1893).

Synon. *Arctomyysis*, Hansen (1887), *nec* Czerniavsky (1883).

The type of the genus and of *H. fyllæ*, the type species, was a solitary specimen without eyes, and Hansen was unable to decide whether these organs were naturally absent or had been torn out. In the specimens referred below to *Hansenomyysis* the eye-apparatus is perfect and does not look as if it could be very easily detached. Pending the capture of further specimens of *H. fyllæ* the generic importance of the eyes remains doubtful.

Hansenomyysis antarctica, sp. n.*

Form slender, tapering considerably towards the posterior end. *Carapace* submembranaceous, very short, leaving the last two thoracic segments quite exposed and free; produced in front into a broadly rounded but rather strongly upturned rostrum, antero-lateral corners broadly rounded and produced almost as much as the rostrum; a small median tooth is present just behind the rostrum and a larger lateral tooth on each side some little way behind the median tooth; cervical sulcus well marked. *Segments of the pleon* cylindrical; postero-inferior corners not at all produced; first segment arcuate in dorsal contour, its anterior margin raised slightly above the level of that of the last thoracic segment, its posterior margin broadly produced so as to partly cover the second segment; sixth segment not quite twice as long as the fifth. *Eyes* united together, forming a flattened pad, the anterior end of which is produced in front of the carapace into two short, thin, subtriangular, slightly diverging lappets not extending to the middle of the basal joint of the antennular peduncle. *Antennular peduncle* short, extending rather more than halfway along the antennal scale, the three joints subequal in length and rather broad; second and third joints with their inner margins densely armed with setæ; basal joint with a single seta on its inner distal corner, and a more or less continuous submarginal row of setæ across the dorsal region; below and slightly external to the eye-lappets is a slight semicircular ridge, marked by pigment, apparently

* We have defined this family in 'Fisheries, Ireland, Sci. Invest.,' 1904, v., now in the press. It comprises the genera *Petalophthalmus*, *Hansenomyysis*, *Scolophthalmus*, and *Ceratomyysis*.

bounding a membranous area which is overhung by a membranous flap apparently rising from its posterior border. *Antennal peduncle* longer than the antennular, and almost as long as the antennal scale, slender, distal joint shorter than the preceding. *Antennal scale* lanceolate in shape, about three and a half times as long as broad, tip evenly rounded, the whole of the inner margin and distal third of the outer margin setose; proximal two thirds of the outer margin without setæ, but bearing eleven strong spines, the first spine at about the end of the proximal quarter of the outer margin, the spines increasing in size distally. *Mouth-parts* agreeing in all particulars with those of *H. fyllæ*. *First thoracic limb* very much like that of *H. fyllæ*, without exopod but with a well-developed epipod, no inner meral lobe, seventh joint of endopod with four strong and rather long spines, sixth joint with two, fifth joint with three, and fourth joint with six short spines on their inner margins. *Remaining thoracic limbs* agreeing in their main points with those of *H. fyllæ*, all with rather slender endopods and well-developed exopods. *Marsupial pouch* of female composed of seven pairs of incubatory lamellæ. *Pleopods* of the female all uniramous, the rami of the first four pairs unarticulate, those of the fifth pair biarticulate; pleopods increase in size posteriorly, the fifth and longest pair reaching to the base of the telson. *Telson* longer and a little wider than the last segment of the pleon, almost oblong in shape, sides slightly arcuate; apex wider than the base, truncate or very slightly emarginate, with a median small spine and about six or seven long spines on each side; lateral margins armed with about twenty-five fairly long spines arranged more or less in series of three. *Outer uropod* nearly twice as long as the last segment of the pleon, two-jointed, terminal joint about one seventh as long as the basal; outer margin of the basal joint without setæ, but armed with twenty-one stout spines.

Length of adult female 20 mm.

Locality. Off Coulman, 100 fath., two females.

Apart from the eye-apparatus, which may possibly be entirely absent in *H. fyllæ*, the latter differs from *H. antarctica* chiefly in the characters of the antennal scale and outer uropods, and of so much of the telson as remains in Hansen's specimen. The peculiar structure which we have noted on the basal joint of the antennular peduncle in *H. antarctica* may prove to be an auditory organ.

Fam. Mysidæ.

Genus PSEUDOMMA, G. O. Sars.

Pseudomma Belgicæ, Hansen (MS.).

Form as usual in the genus. *Carapace* with the cervical sulcus well marked, evenly rounded in front, emarginate behind so as to expose the last thoracic segment. *Pleon* longer than the carapace, first five segments subequal in length, sixth about twice as long as the fifth. *Eye-plates* contiguous, slightly cleft in the median line, subquadrangular in shape, extending not quite to the end of the basal joint of the antennule, margins quite smooth, without teeth or armature of any kind. *Antennal scale* about three and a half times as long as broad, its apex extending very slightly beyond the terminal spine of the outer margin. *Mouth-parts and thoracic limbs* not differing in any salient point from those of *P. roseum*. *Telson* slightly shorter than the last segment of the pleon; apex evenly rounded, armed with four pairs of smooth spines, the inner pair about one sixth of the length of the telson, median setæ present; lateral margins armed along their distal halves with about five spines. *Inner uropod* about half as long again as the telson. *Outer uropod* about twice the length of the telson.

Length of an adult female 23 mm.*

Locality. Lat. 78° 25' 40'' S., long. 165° 39' 6'' E., one specimen.

This species is very closely allied to *P. Sarsi* described by Will.-Suhm from Kerguelen †. It differs, however, in two points: (i.) in having the eye-plates quite smooth, whereas in *P. Sarsi* they are toothed at their antero-lateral corners; (ii.) in having only four pairs of spines at the apex of the telson, which is more evenly rounded than in *P. Sarsi*. *P. Belgicæ* is, moreover, much larger than *P. Sarsi*, the type of which, a female with ovigerous lamellæ well developed, measures only 14 mm. Minor differences in the shape of the antennal scale may also be noticed.

Genus DACTYLAMBLYOPS, nov.

Characters generally as in *Amblyops*, G. O. Sars, except:—*Eyes* more or less pyriform in shape, not flattened, placed

* Dr. Hansen has shown us larger specimens.

† See G. O. Sars, "Voyage H.M.S. 'Challenger': Report on Schizopoda," Zool. vol. xiii.

close together but not contiguous, bearing on the inner dorsal face a short digitate process; visual elements imperfectly developed.

Telson without median setæ.

Second thoracic limbs with the endopods well developed and considerably longer than the endopods of the first limbs.

Type species, *D. Hodgsoni*.

As far as can be judged from Ohlin's description and figures of *Amblyops Sarsi* (Ohlin, 1901), that species should also be included in *Dactylamblyops*.

Dactylamblyops Hodgsoni, sp. n.

Form as usual in the genus *Amblyops*. *Carapace* submembranaceous, covering all the thoracic segments except the last; cervical sulcus well marked; evenly rounded in front and at the antero-lateral corners. *Eyes* rather small, placed close together in the median line, but not in any way contiguous; pyriform in shape, front end evenly rounded; a short digitate process arising from the inner dorsal face; visual elements imperfectly developed, apparently represented by minute granular bodies having a refractive centre. *Pleon* with the first five segments subequal in length, the sixth nearly twice as long as the fifth. *Antennules, antennæ, and scale* missing in the specimen. *Mandibles and maxillæ* not exhibiting any salient points of difference from those of *Amblyops abbreviata*. *First thoracic limb* with endopod of the same size and general structure as in *A. abbreviata*. *Second thoracic limb* with endopod slender and about twice as long as that of the first. *Pleopods* in the male agreeing essentially with those of the males of the genus *Amblyops*. *Telson* not quite as long as the last segment of the pleon, triangular in shape, tapering evenly to a narrowly rounded apex and about twice as long as it is broad at its base; the distal half of each lateral margin bearing about nineteen spines gradually increasing in length towards the apex; terminal spines about one tenth of the total length of the telson; median setæ absent. *Uropods* broken in the specimen.

Length of the single specimen, a male, 13 mm.

Locality. Lat. 66° 52' 9" S., long. 178° 8' 15" W., 2030 fath.

This species may be distinguished from its nearest ally and probable congener, *Amblyops Sarsi*, Ohlin, by the eye, which in the latter appears to be sharply pointed in front; and by the telson, which Ohlin describes in *A. Sarsi* as having the distal half of the lateral margins fringed with short setæ.

Genus *MYSIDETES*, Holt and Tattersall.

Mysidetes, of which we give a full diagnosis in a paper now in the press*, differs chiefly from *Mysideis*, G. O. Sars, in having the pleopods rudimentary in both sexes. The telson is cleft, the cleft armed with spines, and the inner uropod has a row of spines from the otocyst almost to the extremity. The antennal scale is setose on both margins. The first and third thoracic limbs have endopods of the usual type and serve respectively to distinguish the genus from *Heteromysis* and *Mysidella*, which resemble it in the other characters mentioned above.

Mysidetes posthon, sp. n.

Form robust. *Carapace* produced in front, with a short and very obtuse rostrum; emarginate behind, leaving the last thoracic segment exposed. *Pleon* with the first five segments subequal in length, sixth segment barely once and a half as long as the fifth. *Eyes* large, globose; pigment brown. *Antennular peduncle* with the outer distal corner of the basal joint produced into a long narrow process, which extends beyond the distal extremity of the second joint. *Antennal scale* lanceolate in shape, setose all round, about four times as long as broad. *Antennal peduncle* very little more than half of the length of the scale, third joint shorter than the second. *Mouth-parts* in all respects as in *Mysideis*. *First and second thoracic limbs* with the endopods substantially as in *Mysidopsis*. Remaining thoracic limbs having the tarsus of the endopod composed of six to eight joints; the endopods of the last pair much more slender than in the preceding pairs. *Male genital process* very long and narrow. *Pleopods* of both sexes rudimentary, consisting of a single short ramus bearing at its base a short external lateral process tipped with setæ. *Telson* about as long as or a little longer than the sixth segment of the pleon and about twice and a quarter as long as wide at base; tapering gradually to the apex, in which is a cleft equal in depth to nearly one fourth and in greatest width to about one seventh of the total length of the telson; cleft armed with about eighteen teeth on each side; apex of the telson with a pair of spines on each side of the cleft, the outer being the longer; lateral margins armed throughout with about seventy spines, which become arranged in series towards the apex. *Inner uropods* with about twenty-six spines from the otocyst to the last fourth

* 'Fisheries, Ireland, Sci. Invest.,' 1904, v.

of the total length of the uropod. *Outer uropods* about half as long again as the inner.

Length 25 mm.

Locality. Four specimens from holes in the ice at winter-quarters. One from 100 fathoms, off Coulman.

Mysis maxima, Hansen (MS.).

The 'Discovery' collection contains two Mysids, taken at lat. 78° 25' 40" S., long. 165° 39' 6" E., of which the largest is an immature male measuring 40 mm. In general these individuals agree, except in size, rather closely with the northern *Mysis mixta*, lately transferred by Norman (1902) to the new genus *Michtheimysis*. The pleopods of the male, however, though imperfectly developed, present a sharp distinction, in that the last pair are biramous; but do not as yet offer evidence of distinction in the adult from *Hemimysis*, while the mouth-parts differ in no important respect from those of *Mysis, sensu stricto*, and its immediate allies.

On visiting Dr. Hansen one of us found that he had already diagnosed the specific characters of this form, of which he possesses an abundant material, and some specimens which he was kind enough to lend us show that the adult is distinct from any of the genera recognized by Norman.

As we cannot from 'Discovery' material give an adequate account of the species in the adult form nor assign it to a properly diagnosed genus, we leave these tasks in the very capable hands of Hansen.

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II.—*Bryozoa* from Chatham Island and d'Urville Island, New Zealand, collected by Professor H. Schauinsland. By ARTHUR WM. WATERS, F.L.S.

[Plate I.]

THIS collection made by Professor Schauinsland is only small, but now that much attention is being paid to Antarctic and Subantarctic biological distribution it is interesting to have our knowledge somewhat extended to the east.

A species considered new and called *Lepralia clivosa* has furnished some interesting points in regard to its growth, and there is a *Plumatella* closely allied to common European species, in which, however, the statoblasts are larger than any previously recorded.

List of Species.

- Atea recta*, Hincks. D'Urville Island, New Zealand. Page 12.
Membranipora hians, Hincks. Chatham Island. Page 13.
 — *pilosa*, var. *flagellum*, MacG. Chatham Island. Page 14.
 — *trifolium*, form *minor*, Hincks. Chatham Island. Page 14.
Beania magellanica (Busk). D'Urville Island. Page 14.
 — *bilaminata* (Hincks). D'Urville Island. Page 15.
 — *intermedia* (Hincks). Chatham Island. Page 15.
Hiantopora monoceros (Busk). Chatham Island. Page 16.
Microporella Malusii (Aud.). Chatham Island. Page 17.
 — *ciliata*, L. Chatham Island. Page 17.
Lepralia clivosa, sp. n. Chatham Island. Page 17.
Hippothoa hyalina (L.). Chatham Island. Page 19.
Snittia maunganuiensis, sp. n. Chatham Island. Page 19.
 — *præstans* (Hincks). Chatham Island. Page 20.
 — *longirostris* (Jullien). Chatham Island. Page 20.
Diastopora sp. Chatham Island. Page 21.
Plumatella princeps, Kraepelin. Chatham Island. Page 21.

Ætea recta, Hincks. (Pl. I. fig. 13.)

- Ætea recta*, Hincks, Ann. & Mag. Nat. Hist. ser. 3, vol. ix. p. 291, pl. vii. fig. 3, and synonyms Miss Jelly's Catalogue; and add:
Ætea anguina, form *recta*, Waters, Journ. Linn. Soc., Zool. vol. xxvi. p. 5, pl. i. figs. 1-5.

This is in most particulars very similar to *Æ. anguina*, L., but whether it is called a species or form is a matter of no importance.

The upper part of the oral tube of this and other species has been incorrectly described as punctate or punctulate, whereas the dotted structure is caused by small protuberances, as can be well seen at the border, and also where the

ringed structure ceases. The last few rings are broken up, in the lower ones into long ridges, but at each succeeding ring into shorter ones, so that for a short distance the line of rings can be distinctly traced, though ultimately the dots seem to be irregularly placed.

The genus *Ætea* requires elucidation on living or well-preserved specimens, as it has often been imperfectly understood. Busk, Hincks, and other authors have supposed that the polypide lived only in the oral tube, and regarded the zoëcium as merely a part of the stolon. Smitt figured the growth correctly, and I referred to the position of the zoëcium and gave a figure in my paper on the Bryozoa of Naples* ; and Jullien, overlooking what had been written, again called attention to the mistake made by so many authors. In many cases there seems to be but little room for the polypide in the zoëcium, so that then it may be seldom or never entirely withdrawn, though in the specimen figured by me from Naples the zoëcial chamber is very large and the polypide has ample room. However, other specimens have convinced me that, although *Æ. recta* occurs from Naples, the one I figured is a new species which it is proposed to call *Æ. lepadiformis*, as the appendages, which are usually on very short ringed stalks, are somewhat similar in shape to the head of *Lepas*.

Hab. Arctic ; Europe ; Madeira ; Australia ; New Zealand ; French Pass, d'Urville Island, New Zealand.

Membranipora hians, Hincks. (Pl. I. fig. 12.)

Membranipora hians, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xv. p. 248, pl. vii. fig. 5 ; Waters, Journ. Linn. Soc., Zool. vol. xxvi. p. 687.

Membranipora cyclops, Busk, Cat. Mar. Polyzoa, p. 61, pl. lxxv. fig. 3.

Zoarium unilaminar ; area large, nearly round ; a broad calcareous wall between the zoëcia, the wall is more or less flat on the top, and upon it there are small triangular avicularia, which, although often appearing to be irregularly placed, are really below the area ; usually two avicularia, but sometimes only one.

The operculum projecting beyond the ridge is characteristic and has been figured by me (*loc. cit.* fig. 16, pl. xlviii.).

The specimen now described and figured is from the maturer part of the colony, and we do not often find so solid a calcareous growth between the zoëcia ; but Hincks's

* Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 114, pl. xv. fig. 7.

description of "margin thin" only relates to the younger zoœcia.

There are about 16 tentacles.

Hab. New Zealand (*Hincks*); Dunedin (*Hamilton*); Red Bluff, Chatham Island.

Membranipora pilosa, L., var. *flagellum*, MacG.

This differs from specimens from Victoria in having the central spine below the area much shorter, being usually shorter than the length of the area. The zoarium is growing on the stalk of a seaweed, and in parts it is seen to be in regularly transverse series, but in other parts the zoœcia are in irregular quincunx; however, this is probably caused by the shape of the stalk upon which it is growing. There is on each side a stout marginal spine near the upper end of the margin, and also near the base of the margin a small spine, which is often absent, in this respect corresponding with specimens from Victoria sent over by MacGillivray. The "deep arched vault" above the area is large and conspicuous, as described by MacGillivray; but this is also very marked in a specimen of *M. pilosa*, L., from Norway. The central spine is sometimes, but not always, to one side, and I do not attach as much importance to this as MacGillivray did.

Hab. Victoria; Maunganui, Chatham Island.

Membranipora trifolium, form *minor*, Hincks.

Membranipora trifolium, form *minor*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 87, pl. xi. fig. 6; *op. cit.* ser. 5, vol. xv. p. 255, pl. viii. fig. 7.

From Maunganui, Chatham Island, there is a small fragment which seems to be the variety described by Hincks as occurring from Bahia and Tahiti.

Beania magellanica (Busk). (Pl. I. fig. 22.)

For synonyms, see my memoir on the "Bryozoa," Expéd. Antarct. Belge, p. 28, pl. viii. figs. 7 *a-c*, and since then Calvet, in "Bryozoen," Hamburger Magal. Sammelreise, p. 8, has given some fresh localities from the Straits of Magellan, Tierra del Fuego, and Falkland Islands.

In the d'Urville-Island specimens there are 28 tentacles. The zoœcia are much nearer together than in most specimens of *B. magellanica*, forming a close mat, both the zoœcia and avicularia being larger than is usual. The four projections on the distal end are very small and the stout radicle starts from close up to the distal end.

Hab. French Pass, d'Urville Island, New Zealand.

Beania bilaminata (Hincks). (Pl. I. figs. 19-21.)

Diachoris bilaminata, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 157, pl. viii. figs. 7, 7 a.

Flustra papyracea, Hutton, Cat. New Zeal. Mollusca, p. 187 (*vide* Jelly).

The colonies commence with a unilaminar growth, covering stalks of seaweed, often growing for a considerable distance attached, then they become free, usually bilaminar, but sometimes portions are unilaminar. The free portion is frondose. The zoecia are slightly free at the ends, and the long thick radicles from the other layer frequently appear between the zoecia, for the only attachment of the two layers is by means of the radicles, so that it is not bilaminar in the same sense as *Flustra* and many other Bryozoa. The lateral connexions are through a round disk without connecting-tubes.

The avicularia and mandibles are smaller than those of *B. magellanica*, B., from d'Urville Island, and in no case have I found two avicularia to the same zoecium, nor are the avicularia ever abundant. I have already* called attention to the double columella which occurs in this species as well as in *B. magellanica*, Busk, and *B. erecta*, Waters. The avicularium is placed rather higher than shown in Hincks's figure, which was from a dried specimen. At each side of the oral aperture there is a spinous process and at the distal end there is often a small notched process, but this is at a lower level than the border of the zoecium and is not always seen.

There are 27-28 tentacles.

Hab. New Zealand (*H.*); Napier and Wanganui (*Hamilton & Waters*); French Pass, d'Urville Island, New Zealand.

Beania intermedia (Hincks). (Pl. I. figs. 16-18.)

Diachoris intermedia, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 74, pl. v. fig. 8.

Beania intermedia, MacG. Prod. Zool. Vict. dec. xx. p. 346, pl. cxv. fig. 3.

The zoarium is uniserial, creeping over the stalks of seaweeds. There is a connecting-tube to each zoecium distally and proximally, but only one tube on each side, and these tubes are always formed even when there is no lateral growth. This has not been shown in previous figures, which have

* "On the Use of the Avicularian Mandible in the Determination of the Cheilostomatous Bryozoa," Journ. Roy. Micr. Soc. ser. 2, vol. v. p. 3; Expéd. Antarct. Belge, Bryozoa, pp. 29, 30.

been from dried specimens. The radicle is small, occurring about the middle of the zoëcium.

Most *Beania* have six tubular connexions, whereas this has only four, and in some respects recalls the growth of *Paludicella*.

There are 20 tentacles.

Hab. Tasmania (*Hincks*); Port Phillip Heads (*MacG.*); Napier and Wellington (*Hamilton*); Maunganui, Chatham Island.

Hiantopora monoceros (Busk). (Pl. I. fig. 11.)

For synonyms, see Miss Jelly's Catalogue, and Waters, Expéd. Ant. Belge, Bryozoa, p. 42.

Cribrilina monoceros, Calvet, Bryozoen, Hamb. Magal. Sammelreise, p. 16.

The protecting calcareous wall on the front is formed by irregular large calcareous processes arising from the margins of the zoëcium, and these meet, leaving the large round pores open. The proximal margin of the oral aperture is not always formed first, as stated by *Hincks*, but may be closed in last, as seen in the left-hand zoëcium (fig. 11, *a*), though in any case this margin is formed by a growth from the two sides coalescing.

In most incrusting forms, such as *Lepralia*, *Schizoporella*, *Smittia*, &c., there is a membrane over the whole of the front, and in this the calcareous wall grows regularly, leaving a suboral free space, which gradually becomes smaller, through the formation of calcareous deposit. As is well known, the basal and lateral walls are formed first, and it is only later that the zoëcia are separated off by the proximal walls. Norman* has given some interesting details concerning the growth of the front wall in *Cribrilina*, and it is a subject inviting further study. In *C. Balzaci*, Aud., and *C. radiata*, Moll., the growth takes place regularly from the side, leaving an oval space free.

There are 17 tentacles.

In some Chatham-Island specimens there are usually three large pores, whereas *H. monoceros* usually has several, though, as they correspond in other respects, I have not separated it from *monoceros*. There is little doubt that this is the *Hiantopora Liversidgei* of MacGillivray †. The figure

* "Notes on the Natural History of East Finmark," Ann. & Mag. Nat. Hist. ser. 7, vol. xii. p. 101.

† "Monograph of the Tertiary Polyzoa of Victoria," p. 62. pl. ix. figs. 21, 22, Trans. Roy. Soc. Vict. vol. iv.

of *Eschara Liversidgei* of Tenison-Woods is so poor that we cannot now be sure what he described. MacGillivray has made a slip in uniting my *Microporella ferrea* with *H. Liversidgei*, as my species was *Diporala* as we now understand it. Perhaps we shall have to consider *Liversidgei* as a variety of *monoceros*.

From the "Chatham Island, Jan. 1897," there are specimens with only the three large pores and some with many pores, and in these the zoëcia are somewhat smaller. In both there are large avicularia with obtuse triangular avicularia. The avicularian chamber is about as large as a zoëcium. The specimen from Maunganui, Chatham Island, has three to five large pores. In neither do I find any ovicells, but the large articulated spine is at the side of the mouth within the peristome, as is usual in *H. monoceros*.

Microporella Malusii (Aud.).

A specimen from Maunganui, Chatham Island, has much smaller pores than are usual in *M. Malusii*, Aud., and they are not completely stellate, though there are some denticles, indicating a commencement of the stellate structure. The pores are usually in a single row near the margin of the zoëcium, and there is a row under the oral aperture. In some respects this approaches to *M. parvipora*, Waters.

From French Pass, d'Urville Island, New Zealand, the pores are larger, with indications of stellate structure, and there is a line forming an area within which the stellate pores occur much the same as in the specimen from Chili figured in my "Bryozoa," Expéd. Antarct. Belge, p. 42, pl. iii. figs. 4a-d. Since then Calvet has added several Magellan and Tierra del Fuego localities.

Microporella ciliata, L.

Hab. Maunganui, Chatham Island.

Lepralia clivosa, sp. n. (Pl. I. figs. 1-7.)

Zoarium adnate on stone. Zoëcia quincuncially arranged, subhexagonal; in the older zoëcia the divisions are indistinct; the front of the zoëcium is much raised, with a very thick, tall, calcareous process, and up to these there are indistinct ribs with a pore between them near the border, while in the younger zoëcia there are pores at the border. The oral aperture is very large, nearly circular, with large semicircular avicularium within the aperture, and scattered over the

surface there are fairly large avicularia with semicircular or spatulate mandibles. The mound over the middle of the zoëcium contains the avicularian chambers. There are oral as well as avicularian glands and 13 tentacles. The ovicell is depressed, usually umbonate. The appearance is very similar to that of *Lepralia margaritifera*, Q. & G., but in that species the umbo is an avicularian chamber opening forwards, whereas in *L. clivosa* there is an avicularium within the aperture. The ovicell is much raised in *L. margaritifera* and has not a marked umbo like that of *clivosa*. Sections of the growing end show several interesting points. At the distal end of the young zoëcia there is a dark cellular structure bounded by a row of transparent cells, showing in some cases a nucleus at the base. From this arise outgrowths also surrounded by similar transparent cells (fig. 5), and in several cases one or two such outgrowths are seen near the corner of the distal wall, but in one case (fig. 6) there are three outgrowths. At the position of these outgrowths the rosette-plates will be formed, but as yet it is too early to speak of rosette-plates. These outgrowths as they increase coalesce, and thus the basal wall of the next zoëcium is formed. At the lateral walls similar but more numerous outgrowths are formed, which also coalesce. As I have in previous papers indicated, we must compare this with the growth in *Beania* and other species connected by tubes; and as explaining this I again refer to an exact drawing of a specimen of *Beania magellanica*, Busk ("On the Bryozoa of the Bay of Naples," Ann. & Mag. Nat. Hist. ser. 5, vol. iii. pl. xii. fig. 1, 1879). There is, however, an important difference, for in *L. clivosa* the calcareous* basal wall and the lateral walls are formed before this new growth from the zoëcial chamber commences; and this may be taken as typical of the zoëcial growth of a large section of the Bryozoa.

Even in zoëcia in which there is still this growing tissue there are ovaria touching this tissue and thus showing at what a very early stage the ovaria commence to grow. In *Smittia præstans*, Hincks, ovaria also are found near the growing end of the young zoëcia.

The oral glands show little or no lumen (fig. 4) in the sections cut. In various species oral glands have only been seen with small cells on the inner wall, in others they contain a considerable mass of homogeneous matter, so that

* Compare Nitsche, "Beiträge zur Kenntniss der Bryozoen," Zeitsch. für wissensch. Zool. vol. xxi. pl. i. fig. 5.

the oral glands may appear very different in various species and under various conditions. It is as yet not always possible to decide what differences are of specific value.

In *L. clivosa* the avicularian glands are filled with a homogeneous mass.

Both this and *L. margaritifera*, Q. & G., will ultimately have to be removed from *Lepralia*.

Hab. Chatham Island, Jan. 1897.

Hippothoa hyalina (L.).

This cosmopolitan species occurs from Maunganui, Chatham Island. The shell is calcareous, and there are 12 tentacles.

Smittia maunganuiensis, sp. n. (Pl. I. figs. 8-10.)

Zoarium unilaminar or adnate. One piece forms a cup half an inch across, with the zoecia opening on the inside of the cup. The zoecia are indistinct, fairly flat, with large pits over the whole surface, and in the younger zoecia there is below the oral aperture a large semicircular avicularium on a raised prominence granulated immediately below the avicularian chamber; in older specimens the avicularium is within the oral aperture. The lyrula occurring deep down in the aperture is not readily seen and might easily be overlooked. The ovicell is much raised, elongate, with large pores on the front, but only in the central part, and in the older ovicells there is an area formed by a thickening of the sides.

This is somewhat like *Porella formosa**, MacG., but differs in having the zoecial pits over the whole surface, and MacGillivray says there is no internal denticle.

S. maunganuiensis also occurs foliaceous from Wanganui, New Zealand, being in two layers in my specimen; but the two layers are only adherent in places, so that it should perhaps be called Hemescharan growth. There are two distal rosette-plates in the angle near the basal wall and about 17 tentacles.

Hab. Maunganui, Chatham Island, and Wanganui, New Zealand.

* "New or Little-known Polyzoa: pt. xi.," Trans. Roy. Soc. Vict. vol. xxii. p. 5, pl. ii. fig. 6 (1886).

Smittia præstans (Hincks).

Mucronella præstans, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 99, pl. vii. fig. 1 (1882); Waters, Quart. Journ. Geol. Soc. vol. xliii. p. 56; MacG. Tert. Polyzoa Vict. p. 98, pl. xiii. fig. 6.

Mucronella duplicata, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 328, pl. xvi. figs. 4, 5; *op. cit.* vol. xxxviii. p. 266.

Lepralia angela, Hutton, Manual of New Zealand Mollusca, p. 191.

There are 15-16 tentacles, and ovaria very near the growing ends.

In the Chatham-Island specimen the peristome does not project so much as in specimens from New Zealand, and in some respects approaches the variety which I described and figured from Green Point, Sydney*.

Hab. New Zealand, Napier and Wanganui (*Hamilton*); Maunganui, Chatham Island.

Fossil: Victoria, South Australia, Gippsland, New Zealand.

Smittia longirostris (Jullien). (Pl. I. fig. 23.)

Erochella longirostris, Jullien, Mission Scient. du Cap Horn, p. 55, pl. iii. figs. 1-4, pl. ix. fig. 2; Calvet, Hamb. Magal. Sammelreise, p. 29.

The specimens from Maunganui, Chatham Island, are slightly more strongly calcified than Jullien's specimens or any others of this group which I have seen, and the mucro is well developed, spreading out at the extremity in small mammillations. From this mucro the lyrula is directed inwards, frequently joining with the cardella so as to form a pore on each side.

In the *Smittia tricuspis*, Hincks, a tube is sometimes formed on each side of the lyrula by the junction of the lyrula with the cardellæ; and this I have described in recent specimens from Port Phillip ("Bry. from New Zealand," Quart. Journ. Geol. Soc. vol. xliii. p. 59), and when the peristome is somewhat worn then the appearance is as figured for my fossil *Mucronella tricuspis*, var. *waipukerensis* (*loc. cit.* p. 57).

In *Mucronella munita*, MacG., from Australia, the zoecia are areolated round the margin and the surface is moderately calcified, while in *M. tricuspis*, from Australia, the front is hyaline and the pores round the margin are not seen, though in both these last the peristome is raised as a neck and there are pore-chambers.

It would seem best to speak of *Smittia tricuspis*, var.

* Ann. & Mag. Nat. Hist. ser. 6, vol. iv. p. 17, pl. iii. figs. 9-11.

typica; var. *munita*; var. *longirostris*; but whether they are called species or varieties is not a matter of great importance. However, in all the character of the aperture and peristome shows considerable variation, so that there is no great break between the varieties.

In the Chatham-Island specimen there are 13 tentacles.

Hab. Maunganui, Chatham Island. The group occurs from Australia, New Zealand, S. Africa, Kerguelen, Patagonia, Japan.

Diastopora sp.

In a specimen from Maunganui, Chatham Island, the aperture of the zoëcia is 0.11–0.12 mm., which is about double the size of that of *D. concinna*, MacG., from Cape Horn, and is larger than that of *D. latomarginata*, d'Orb., from Naples.

There are no ovicells and I do not see any closures. The zoëcia are free for a long distance, but the semiradiate character of *D. latomarginata* is wanting. Without ovicells the determination is uncertain, but it is much like *D. latomarginata*.

Plumatella princeps, Kraepelin. (Pl. I. figs. 14, 15.)

Plumatella princeps, Kraepelin, Die deutschen Süßwasserbryozoen, p. 119 (1887).

The zoarium covering a piece of wood forms a pretty solid mat about 4 mm. thick, resembling *P. caespitosa* in appearance. Usually the branches dichotomize, but a few grow at right angles. At the growing end the zoëcia are transparent, so that looked upon from above the zoarium has a hyaline appearance, while lower down the cuticula is thick and dark brown; but this dark cuticula is only a continuation of the transparent hyaline ectocyst. The zoëcia are about 0.8 mm. wide.

The statoblasts are very large, some measuring as much as 0.70 mm. × 0.35 mm., namely, in the proportion 1:2, and this is larger than any statoblasts mentioned in Kraepelin's tables or elsewhere, so far as I am aware. However, I have some *Plumatella repens*, L., from the Davos Lake, Switzerland, and from the Laret Lake near Davos which have larger statoblasts than are mentioned by Kraepelin. A few statoblasts from Chatham Island without the swim-ring (annulus) measured 0.44 mm. × 0.26 mm., namely, in the proportion of 1:1.7. Whether these are merely partly developed statoblasts or winter statoblasts is not quite clear.

There seem to be usually 42 tentacles, though as many as 60 have been counted in a section; but this probably arose from some being folded inwards, and thus being twice cut through.

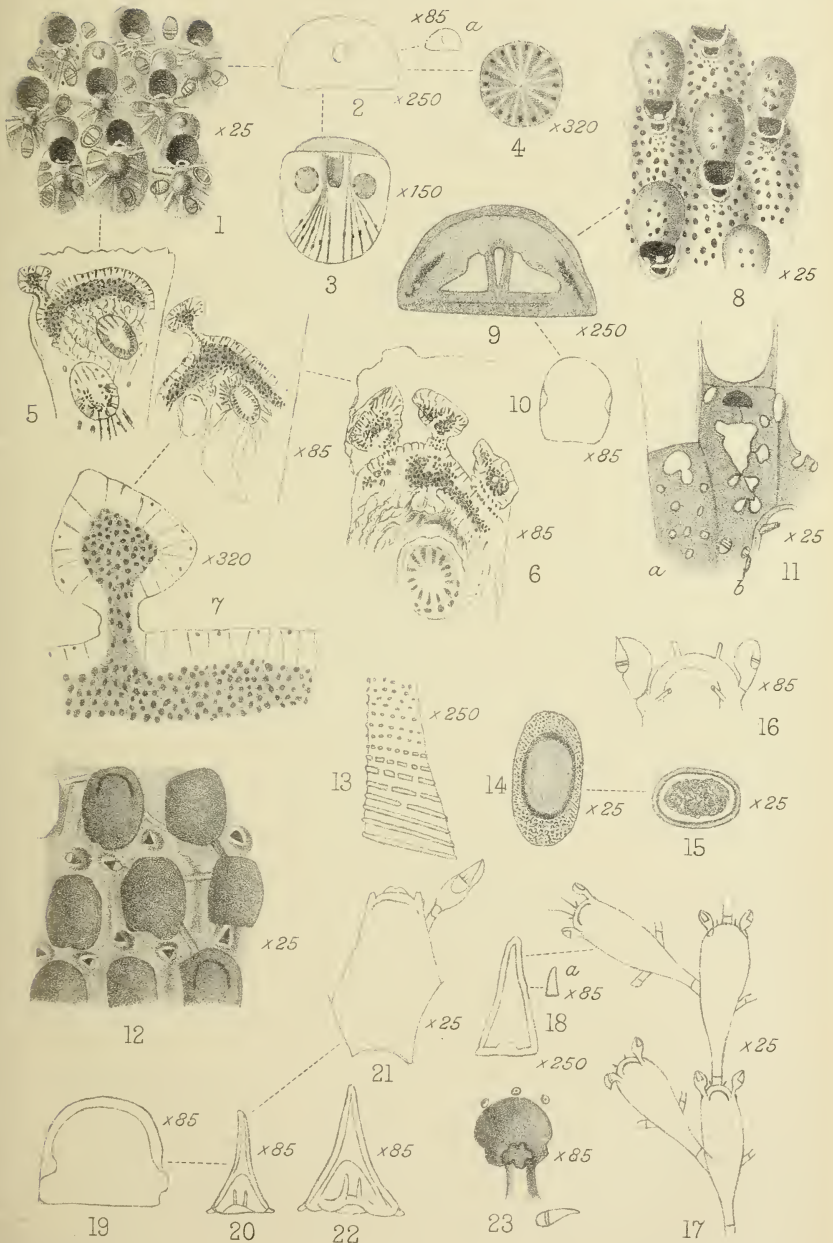
This seems to be nearest to the variety *muscosa* of *P. princeps*, Kraepelin, but I find it very difficult to see upon what satisfactory grounds *P. princeps* and *P. polymorpha*, Kr., are separated. Kraepelin, Braem, and other authorities have largely reduced the synonymy of the species, but Braem considers that Kraepelin went too far in the reductions he made. MacGillivray has described* *P. Aplini* from Victoria, Australia, but it is impossible to say whether that should be considered as the present variety of *P. princeps*.

Hab. Lake Huro, Chatham Island.

EXPLANATION OF PLATE I.

- Fig.* 1. *Lepralia clivosa*, sp. n., $\times 25$. From Chatham Island, Jan. 1897.
Fig. 2. Ditto. Mandible, $\times 250$. *a* $\times 85$.
Fig. 3. Ditto. Section through the suboral avicularian chamber, showing the avicularian glands. $\times 150$.
Fig. 4. Ditto. Section through the oral gland. $\times 320$.
Fig. 5. Ditto. Growing end of two terminal zoecia, showing new growth from each, which will be divided off by rosette-plates. $\times 85$.
Fig. 6. Ditto. Growing end of terminal zoecia, showing growth from three centres. $\times 85$.
Fig. 7. Ditto. Growing end with outgrowth. $\times 320$.
Fig. 8. *Smittia maunganuiensis*, sp. n., $\times 25$. From Maunganui, Chatham Island.
Fig. 9. Ditto. Mandible, $\times 250$.
Fig. 10. Ditto. Operculum, $\times 85$.
Fig. 11. *Hiantopora monoceros* (Busk), $\times 25$. Growing ends, showing the calcareous projections arising from the side, thus forming pores. In the left-hand zoecium (*a*) the lower calcareous wall below the oral aperture is not complete. Above the zoecia (distally) the basal and lateral walls are found before there is any other sign of growth, and in the division thus formed above the right-hand zoecium the calcareous front wall is commencing and has made a semicircular growth. Between the zoecia *a* and *b* there was another, but this has been omitted. The specimen figured is probably from Australia.
Fig. 12. *Membranipora lians*, Hincks, $\times 25$. From Red Bluff Chatham Island.
Fig. 13. *Altea recta*, Hincks, $\times 250$. Showing junction of ringed and dotted portion of the oral tube. From French Pass, D'Urville Island, New Zealand.

* MacGillivray, P. H., "Description of a new Species of *Plumatella*," Trans. Roy. Soc. Vict. vol. v. pp. 203-204 (1860).



A.W. Waters del.
A.T. Hollick lith.

West, Newman imp.

Chatham Island Bryozoa.

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- Fig. 14. *Plumatella princeps*, Kraep. Statoblast, $\times 25$. From Lake Huro, Chatham Island.
 Fig. 15. Ditto. Statoblast without swim-ring, $\times 25$.
 Fig. 16. *Beania intermedia* (Hincks), $\times 85$. From Maunganui, Chatham Island.
 Fig. 17. Ditto. $\times 25$.
 Fig. 18. Ditto. Mandibles, $\times 250$. *a* $\times 85$.
 Fig. 19. *Beania bilaminata* (Hincks). Opærculum, $\times 85$. D'Urville Island, New Zealand.
 Fig. 20. Ditto. Mandible, $\times 85$.
 Fig. 21. Ditto. Zoæcium, $\times 25$.
 Fig. 22. *Beania magellanica* (Busk). Mandible, $\times 85$. From d'Urville Island, New Zealand.
 Fig. 23. *Smittia longirostris* (Jull.). Aperture, with rostrum below, $\times 85$. From Maunganui, Chatham Island.

III.—*Descriptions and Records of Bees.*—VII.
 By T. D. A. COCKERELL, University of Colorado.

Paracolletes hobartensis, sp. n.

♀.—Length 12 mm.

Black, with black and greyish-white hair. Head broad, facial quadrangle very much broader than long; clypeus shining, with strong punctures, not very closely placed; anterior edge of clypeus with a fringe of straw-coloured hair; mandibles black, with a subapical dark reddish band; antennæ dark, the flagellum whitish pruinose except at base; hair of middle of face scanty and pale, but at sides, especially above, and on vertex it is black; hair of mesothorax and scutellums black, and black beneath the wings, but otherwise light; mesothorax impunctate and very shiny in the middle, but otherwise punctate and duller, quite dull in front; scutellum shining in the middle, but coarsely sculptured along hind margin; postscutellum and area of metathorax dull, the latter with a median impressed line but no transverse keel; pleura dullish, with a subsericeous surface and no distinct punctures; tegulæ shining black. Wings yellowish hyaline; stigma ferruginous, somewhat light-margined; nervures fuscous; b. n. meeting t.-m.; second s.m. narrowing above, receiving first r. n. at its middle; third s.m. receiving second r. n. very near its end. Legs black, with mostly pale hair, but the dense and abundant scopa on outer side of hind tibiæ is black; the hind legs carry much light orange pollen. Abdomen pitch-black, dullish, practically nude above, and wholly without hair-

bands ; on the venter there are white hair-fringes ; hair at apex black but small in amount.

Hab. Hobart, Tasmania (*J. J. Walker*, 3217).

Obtained on the 'Penguin' Expedition.

Close to *P. chalybeatus* and *P. obscurus*, but larger ; by the venation and the colour of the abdomen it is nearer to *chalybeatus*, by the colour of the stigma to *obscurus*. The Tasmanian *Paracolletes* of this group show much similarity (and no doubt real affinity) to some of the New Zealand forms.

Paracolletes Worsfoldi, sp. n.

♀.—Length about $10\frac{1}{2}$ mm.

Black, with greyish-white and black hair, the second to fourth abdominal segments with conspicuous but narrow white hair-bands.

This is the species which I formerly regarded as *P. obscurus* (Sm.), but further studies have convinced me that it is distinct ; it differs from the description of *obscurus* principally by the banded abdomen, but also by the mandibles having only a dark ferruginous subapical ring, the hairy sides of face, and the hair on under (or inner) side of tibiæ white. It is allied to *P. hobartensis*, from which it differs in the smaller size, banded abdomen, more closely punctured clypeus, greyish-white (instead of black) hair at sides of face ; also by the reddened last antennal joint (the antennæ otherwise dark) ; the middle of mesothorax less shining and not wholly unsculptured ; the rufous tegulæ ; the post-scutellum with wholly light hair ; the sides and anterior part of mesothorax with much light hair ; the black hair of scutellum and middle of mesothorax very coarsely plumose ; the abdomen hairy, especially the first segment ; the black hair at apex abundant ; and the venter covered with light hair. The hair of the vertex and outside of hind tibiæ is black. The wings are dusky ; stigma very narrow, dark-margined with a reddish central streak ; b. n. meeting t.-m. ; second s.m. broad, receiving the first r. n. a little before its middle ; third s.m. receiving second r. n. a fair distance from its end.

Hab. W. Australia (*C. M. Worsfold*, 1903-368).

The labial palpi of *P. hobartensis* are large and dark (the first joint at least as long as the next two together) ; those of *P. Worsfoldi* are smaller and ferruginous.

Paracolletes rudis, sp. n.

♀.—Length 10 mm. or a little less.

Black, with the general form and appearance of *P. Worsfoldi*, the only conspicuous difference being in the lack of abdominal bands. Upon more minute examination many differences appear, namely: the mesothorax and scutellum are entirely dull and granular, with a honeycomb-like surface as seen with the compound microscope (*P. Worsfoldi* under the compound microscope shows a minutely tessellate surface, like a mosaic pavement, with conspicuous punctures as well); the abdomen is duller, with the hind margins of the segments obscurely reddish, those of the third and fourth segments also with fine appressed pale golden hairs, not dense enough to form distinct bands; the tegulæ are piceous; the hair of the hind tibiæ is entirely sordid white, except a blackish suffusion extending downwards from the knee-plate; the palpi are rufo-fuscous. Antennæ ferruginous at tip; b. n. meeting t.-c.; second s.m. broad, receiving the first r. n. a little before its middle; third s.m. receiving the second r. n. almost as far from its end as the first r. n. is from the first t.-c.; area of metathorax granular, without a transverse keel or longitudinal impressed line; clypeus as densely punctured as is possible.

Hab. Swan River, Australia, 69.50.

Easily known from *P. obscurus* by the dull mesothorax.

Paracolletes perfasciatus, sp. n.

♀.—Length nearly 12 mm.

Black: the abdomen narrow, depressed, very shiny, with broad, entire, sordid white hair-bands covering the broadly depressed hind margins of segments 2 to 4, and one also at the base of 2; fifth segment covered with coarse black hair, except at the extreme sides, where it is white. Head broad; facial quadrangle very much broader than long; mandibles broad, black, dark ferruginous at apex, obscurely bidentate; antennæ black, with the flagellum coffee-brown beneath, the apical joint redder; a short but distinct malar space, shining and punctured; clypeus shining, coarsely punctured; front shining and punctured at sides, dull and coarsely rugulose in middle; face with much white hair; hair of thorax mainly pale, but probably some black above as also on vertex (the pubescence is largely spoiled by wetting); mesothorax very shiny, with strong irregularly placed punctures; scutellum densely punctured; area of metathorax with the lower part

shiny, the upper roughly sculptured, with fine transverse lines in the middle, but no transverse keel; legs dark, with light hair; anterior tibiæ with a peculiar elongate, shining, bright ferruginous mark near the base in front; hind tibiæ with the hair all light, except a dark stain going part way down the outer edge; tegulæ piceous. Wings hyaline or very faintly dusky; stigma and nervures black, stigma small; b. n. meeting t.-m. on the outer side; first s.m. rather longer than the other two combined; second s.m. rather large, receiving the first r. n. a short distance from its beginning; third s.m. receiving second r. n. a short distance from its end; hind margin of first abdominal segment obscurely reddish; hind spur of hind tibia finely pectinate.

Hab. Western Australia, 68.6.

Not very close to any species.

Paracolletes subfuscus, sp. n.

♂.—Length about 13 mm.

Black, hairy, looking like a large *Colletes*, such as *C. cunicularius* (L.). Hair of head and thorax abundant, greyish white (a sort of very pale mouse-colour), but darker on the vertex, and strongly greyish fuscous all over the mesothorax; face densely covered with hair; facial quadrangle much longer than broad; no malar space; mandibles bluntly bidentate, black, with a dark red subapical spot; antennæ long, black, the flagellum brownish beneath, with some red on the underside of the last two or three segments; disk of mesothorax shining, with sparse punctures; area of metathorax smooth and very shiny, with no impressed longitudinal line or transverse keel. Legs rather dark ferruginous, covered with pale hair; the femora blackish; the hind tibiæ quite bright red in front; spurs ferruginous; tegulæ rufous. Wings hyaline, nearly clear; stigma and nervures dark reddish; stigma so small as to be practically obsolete; wings hairy; b. n. meeting t.-m. on the outer side; second s.m. very broad, oblique, not narrowed above, receiving the first r. n. at its middle; third s.m. receiving the second r. n. at its end. Abdomen subconical, shining but punctured, each segment having a broad, subapical, reddish band, upon which is a thin band of quite long, closely appressed, pallid hairs, which shine golden in some lights, the whole effect closely resembling the abdomen of some forms of the honey-bee; last segment with a bright ferruginous subapical spot, and on each side of this some short black hair; venter normal; the last segment with a faint median ridge.

Hab. Adelaide, Australia, 63.82.

Paracolletes thornleighensis, sp. n.

♂.—Length a little over 7 mm.

Black, quite hairy, especially on the head and thorax. Face densely covered with light yellowish hair; hair of cheeks yellowish white, but of vertex and occiput, of mesothorax except in front, and of the scutellums for the most part nigro-fuscous; hair of thorax otherwise greyish white and of legs dull white; facial quadrangle as broad above as its length, but eyes converging below; mandibles black, with a faintly reddish subapical spot; vertex punctured, but a broad space on each side of ocelli is impunctate and very shiny; flagellum dark brownish and crenulate beneath; mesothorax and scutellum shining, with distinct scattered punctures; area of metathorax smooth and very shiny, with an impressed longitudinal line, but no transverse keel; legs brown-black; spurs yellowish white; tegulæ rufo-piceous. Wings hyaline, iridescent, the stigma and nervures sepia-brown; stigma rather large; b. n. curved and falling a little short of t.-m., which is very oblique; second s.m. twice as broad below as above, receiving first r. n. a little beyond its middle; third s.m. receiving second r. n. a short distance from its end. Abdomen shining and strongly punctured, with the apical margins of the segments depressed and more or less reddened; the short erect hair of the abdomen is pale about as far as the middle of the third segment, after that black or grey-black; the apical half has long pale hairs showing at the sides, but they are attached to the ventral surface; genitalia peculiar, seen from above they present a pair of very large approximately hemispherical plates, not contiguous; behind these are the strongly divergent stipites, with hairy ends; between these is a dark object something like the head of a nail, with a slender stem, which consists of the sagittæ, apparently completely fused. The tongue is very broad, ferruginous, with the apical margin gently convex, not at all emarginate, and beset with minute protuberances. Palpi normal.

Hab. Thornleigh, Australia (*Froggatt*); 1890. 91. They bear the collector's number 32.

Two specimens. The tongue of this species offers what looks like a transition between the Colletid and the Halictid types, though properly belonging to the former.

The forms of *Paracolletes* (sens. lat.) described in this

series of papers may be readily separated by means of the following table:—

Abdomen ferruginous red, with a black spot on each side of second segment; second submarginal cell very small ..	<i>bimaculatus</i> (Smith).
Abdomen not ferruginous red.....	1.
1. Scutellum covered with long dense fulvous-yellow hair, contrasting with the surrounding parts; hair of mesothorax black.....	<i>flavomaculatus</i> , Ckll., ♂*.
Not so	2.
2. Abdomen distinctly metallic, with blue, green, or purple (very obscurely so in <i>P. obscuripennis</i>); size small or medium.....	3.
Abdomen not (or hardly) metallic (slightly so in <i>P. obscuripennis</i>)	9.
3. Thorax green or blue	4.
Thorax black; colours of abdomen never brilliant	6.
4. Abdomen crimson-purple and brassy; flagellum ferruginous beneath except at base; stigma rather large, amber-colour	<i>cupreus semipurpureus</i> ,
Abdomen very dark purple; thorax dark green; flagellum all dark	[Ckll., ♀.
Abdomen blue, with green tints; narrow and very strongly punctate	<i>plumosellus</i> , Ckll., ♂.
Abdomen olive-green	5.
5. Second recurrent nervure joins third submarginal cell before end; area of metathorax with no sharp transverse keel	<i>cæruleotinctus</i> , Ckll., ♂.
Second recurrent nervure joins third submarginal cell at end; area of metathorax with a sharp transverse keel ..	5.
6. Abdomen black, with the broadly depressed hind margins of the segments olive-green; much black hair on vertex, mesothorax, and apex of abdomen; antennæ entirely black	<i>amabilis</i> (Sm.), var., ♀.
Hind margins of abdominal segments not green	7.
7. Wings strongly dusky, with purple tints; abdomen hardly metallic	<i>carinatus</i> , Ckll., ♂.
Wings clear	8.
	<i>viridicinctus</i> , Ckll., ♀.
	7.
	<i>obscuripennis</i> , Ckll., ♀.
	8.

* When describing *P. flavomaculatus* I omitted to call attention to its close resemblance to *P. cristatus* (Smith), which is known only in the female. The two may be sexes of one, but the type of *flavomaculatus* belonged to Smith, and he did not label it *cristatus*. I have not seen the type of *cristatus*; it is not at the British Museum, but probably at Oxford. I visited the Oxford University Museum, but was not able to ascertain the whereabouts of the type bees presumed to be there.

8. Larger; hind margins of abdominal segments not reddish *sputulatus*, Ckll.
 Smaller; hind margins of abdominal segments reddish *providellus*, Ckll.
9. Antennæ hooked at end; scape red; abdomen with golden pile *moretonianus*, Ckll.
 Antennæ normal at end; scape not red.. 10.
10. Flagellum bright ferruginous beneath; face covered with yellow hair; first recurrent nervure joining second submarginal cell near its beginning *colletellus*, Ckll.
 Flagellum not so 11.
11. Stigma and nervures amber-colour; sides of face with black hair; legs dull reddish *semilautus*, Ckll.
 Stigma and nervures darker 12.
12. Sides of face with black hair 13.
 Sides of face without black hair..... 15.
13. Face densely covered with light yellow hair, except at sides above..... *obscuripennis*, Ckll.
 Face without such yellow hair 14.
14. Larger, about $12\frac{1}{2}$ mm. long; tegulæ black..... *hobartensis*, Ckll.
 Smaller; tegulæ dark brown (Greymouth, New Zealand, *Koebele*; ♂ ♀ in U.S. National Museum) *vestitus* (Smith).
15. First r. n. joining second s.m. near its beginning; abdomen with hair-bands. *perfasciatus*, Ckll., ♀.
 First r. n. joining second s.m. near its middle or before middle, but not very near beginning..... 16.
16. Area of metathorax dull 17.
 Area of metathorax shining 18.
17. Scutellum shining *Worsfoldi*, Ckll.
 Scutellum dull and roughened *rudis*, Ckll.
18. Large, about 13 mm. long; *Colletes*-like; abdomen hairy..... *subfuscus*, Ckll.
 Small; stigma sepia-colour; abdomen strongly punctate..... *thornleighensis*, Ckll.

IV.—Notes on some Genera of the Crustacean Family Hippolytidæ. By W. T. CALMAN, D.Sc., British Museum (Natural History).

IN attempting recently to refer to its appropriate genus a species of Hippolytidæ obtained by the 'Discovery,' I found it necessary to re-examine the characters of the existing genera of the family so far as these are represented in the Museum collections. Some of the results seem to be of sufficient importance to warrant the publication of the

following notes. A proper revision of the genera would demand the study of much more material than is at my disposal, and for this reason I have confined my examination to characters which have already been employed for systematic purposes by previous authors.

The limits of the family cannot be said to be satisfactorily defined at present. On the one hand, the recognition of the fact that the legs of the first pair in many Pandalidæ are not "simple," but microscopically chelate, renders it hard to define that family so as to exclude the Hippolytid genus *Cryptocheles*, in which the chelæ of these limbs are stated to be "minute." On the other hand, the boundary between the Hippolytidæ and Alpheidæ is so vaguely marked that even Coutière, in his elaborate monograph of the latter family, is unable to decide as to the proper position of certain genera, such as *Ogyris*. Ortmann (Bronn's Thier-Reich, Crust. ii. p. 1130) has separated a group of genera to form the family Latreutidæ, characterized by the absence of the incisor-process* of the mandible. It is impossible, however, to retain this arrangement, since the genus *Nauticaris*, which Ortmann refers to the Latreutidæ, is certainly closely allied to *Saron*, as, indeed, Thallwitz pointed out in establishing the latter genus. The genus *Lysmata* is referred by several recent writers to the Processidæ (Nikidæ), but it seems to be undoubtedly connected with the Latreutid group through Stimpson's *Hippolysmata*. The settlement of such questions, however, must wait for a future reconsideration of the whole classification of the Caridea.

The following is a partial and provisional synopsis of the genera usually referred to the family. The names of those genera of which I have seen no specimens are enclosed within square brackets :—

- A. Arthrobranchiæ are present at the bases of the first four pairs of peræopods. Mandible with palp. More than seven segments in carpus of second peræopods.
- a. Movable spine at base of uropods.
- α. Mandible with incisor-process *Saron*, Thallwitz.
- β. Mandible without incisor-process .. *Nauticaris*, Spence Bate.
- b. No movable spine at base of uropods.
- α. Mandible with incisor-process *Merhippolyte*, Sp. Bate.
- β. Mandible without incisor-process .. *Parhippolyte*, Borradaile.

* I have employed the term "incisor-process" for the distal division of the mandible. It is naturally suggested by "molar-process" and is a little more definite than "cutting-edge," while requiring less explanation than "psalistoma."

B. No arthrobranchiæ on peræopods.

a. Mandible with incisor-process.

a. Mandible with palp.

a. Two segments in carpus of second peræopods

Caridion, Goës.

b. Four segments in carpus

[*Pterocaris*, Heller.]

Leontocaris, Stebbing.

c. Seven segments in carpus.

a. Mandibular palp of two segments.

Spirontocaris, Spence Bate (including *Hetairus*, Spence Bate, *Euales*, Thallwitz, *Helia*, Thallwitz, *Hetairocaris*, de Man, *Heptacarpus*, Holmes, *Birulia*, Brażnikov.)

b. Mandibular palp of three segments

Alope, White.

d. More than seven segments in carpus.

Chorismus, Spence Bate.

β. Mandible without palp

Hippolyte, Leach.

[*Thor*, Kingsley.]

[*Cryptocheles*, Sars.]

b. Mandible without incisor-process or palp.

(= Latreutidæ, *Ortm.*, *pro parte.*)

a. Two segments in carpus

Trachycaris, g. n.

[*Concordia*, Kingsley.]

β. Three segments in carpus

Latreutes, Stimpson

(= *Platybema*, Sp. Bate).

Angasia, Sp. Bate (= *Tozeuma*, Stimpson).

γ. More than three segments in carpus . .

Bythocaris, Sars.

Hippolysmata, Stimpson.

[*Mimocaris*, Nobili.]

Lysmata, Risso.

Genus NAUTICARIS.

Nauticaris, Spence Bate, Chall. Rep., Macrura, p. 602.

No type is specified, but *N. marionis*, which stands first among the species described, may be taken as the type. In Spence Bate's summary of the generic characters on p. 577 of the 'Challenger' Report the carpus of the second legs is said to be 7-articulate, whereas in the definition of the genus on p. 603 it is stated to be "multiarticulate"; as a matter of fact, I find 15-16 segments in the carpus of co-typical specimens. This inaccuracy appears to have misled Mr. Stebbing in his summary of Spence Bate's classification (Hist. Crustacea, p. 234), and, through him, Mr. Hodgson, who has described, under the name *Merhippolyte australis* (Rep. 'Southern Cross,' p. 233), a form which I find on comparison of the type specimens to be identical with *Nauticaris marionis* of the 'Challenger' Report. Mr. Hodgson was mistaken in supposing that the mandible of his specimens possessed an incisor-process.

Hippolyte magellanicus of A. Milne-Edwards (Miss. Cap

Horn, Crust. p. F 46) belongs to the same genus. I have examined two of the type specimens kindly sent me by Prof. E. L. Bouvier. It differs from the other species of the genus in possessing exopods on the third maxillipeds.

Genus MERHIPPOLYTE.

Merhippolyte, Spence Bate, Chall. Rep., Macrura, p. 618. (Type, *M. agulhasensis*, Sp. Bate.)

The carpus of the second peræopod in the type species has 14 or 15 segments and the merus is also more or less distinctly annulated. Of the three segments of the mandibular palp the first is subequal to the second. The other characters are as given by Spence Bate. On *Merhippolyte australis*, Hodgson, see under *Nauticaris* above. Spence Bate suggested that *Hippolyte spinifrons*, Milne-Edwards, might belong to this genus, and Mr. G. M. Thomson has accepted the suggestion (Trans. Linn. Soc. (2) Zool. viii. p. 444, 1903). The species, however, appears to me to be much more closely allied to the genus *Alope*, and, indeed, a specimen in the Museum collection labelled *Hippolyte spinifrons* is specifically identical with *Alope palpalis*, White.

Genus SPIRONTOCARIS, Spence Bate.

Spirontocaris, Spence Bate, Chall. Rep., Macrura, p. 595. (Type, *S. spinus*, Sowerby.)

Hetairus, Spence Bate, *t. c.* p. 610. (Type, *H. polaris*, Sabine.)

Euales (or *Eualus*), Thallwitz, Abh. Mus. Dresden, 1890-91, no. 3, p. 23. (Type, *E. obesus*, Thallw.)

Helia, Thallwitz, *t. c.* p. 24. (Type, *H. Fabricii*, Kröyer.)

Hetairocaris, de Man, Notes Leyden Mus. xii. p. 120 (1890). (Type, *H. orientalis*, de Man.)

Heptacarpus, Holmes, Occas. Pap. Calif. Acad. Sci. vii. p. 195 (1900). (Type, *H. palpator*, Owen.)

Birulia, Bražnikov, Annuaire Mus. St. Pétersb. viii. Nouvelles, p. xlv (1903). (Type, *B. sachalinensis*, Bražnikov.)

All the above genera agree in possessing a mandible with a reduced incisor-process and a palp of two segments, seven segments in the carpus of the second peræopods, and no arthrobranchiæ on the peræopods. They have been separated mainly on the ground of differences in the armature of the carapace and in the number of epipods. It is possible that some of them may deserve to be kept distinct, but the material at my disposal is not sufficient to enable me to estimate the value of the characters upon which they have been based.

I have assumed that Thallwitz is in error in stating that the mandible is without an incisor-process in his genus *Helia*.

He gives as the type species *H. Fabricii*, which has a typical *Spirontocaris* mandible.

The type of Spence Bate's *Hetairus* is a species which he describes under the name *H. Gaimardii* (M.-E.), but which Miss Rathbun (Harriman Alaska Exped. x. p. 73, 1904) identifies, no doubt correctly, as *H. polaris* (Sabine).

So far as I can gather from the description of *Birulia*, which Mr. W. F. Kirby has kindly translated from the Russian for me, the genus differs from *Spirontocaris* only in the characters of the carapace and rostrum.

Genus LATREUTES, Stimpson.

Latreutes, Stimpson, Proc. Acad. Philadelphia, 1860, p. 27; Spence Bate, Chall. Rep., Macrura, p. 531. (Type, *L. ensiferus*, M.-Edw.)

Platybema, Spence Bate, Chall. Rep., Macrura, p. 578. (= *Cyclorhynchus*, de Haan, *Rhynchocycclus*, Stimpson. Type, *P. planirostris*, de Haan.)

As Ortmann has pointed out (Zool. Jahrb., Abth. f. Syst. v. p. 505, 1891), there seems to be no valid reason for regarding the two species mentioned above as belonging to distinct genera. They agree in having the carpus of the second legs composed of three segments and in such details as the rounded lobe of the first segment of the antennules, the acute antennal scale, and the serrated antero-lateral margin of the carapace. Stebbing (Hist. Crust. p. 235) relies for their separation on the statements of Spence Bate that the second maxillipeds of *Platybema* are six-jointed and those of *Latreutes* seven-jointed. This, however, is certainly not the case in the two type species, both of which have the second maxillipeds identical in structure and composed of six segments. Apart from the difference in general form, which seems to have been Stimpson's chief reason for separating the genera, the only distinction which I can find is that, while in *Platybema* the series of epipods extends to the penultimate pair of legs, in *Latreutes* (contrary to Stimpson's statement) it ceases at the third pair. Since Spence Bate names *Cyclorhynchus planirostris* as the type of *Platybema*, it is not legitimate to use that generic name, as Ortmann has done, after transferring its type species to *Latreutes*.

Genus TRACHYCARIS, gen. nov.

Type, *Platybema rugosus*, Spence Bate, Chall. Rep., Macrura, p. 579.

There can be no doubt that Spence Bate's *P. rugosus* is generically distinct from de Haan's *Cyclorhynchus planirostris*, the type of the genus *Platybema*. The following

may serve as a definition for the new genus in which I propose to place it:—

“Carapace with a supraorbital, an antennal, and a single antero-lateral (pterygostomial) spine. External process on first segment of antennules spiniform. Antennal scale broad, rounded at the tip. Mandibles (according to Spence Bate) without incisor-process or palp. Third maxilliped with exopod. Carpus of second peræopods composed of two segments. Neither arthrobranchiæ nor epipods on the peræopods. Endopods of the second to the fifth pairs of pleopods very broad.”

The genus *Concordia* (Kingsley, Proc. Acad. Nat. Sci. Philadelphia, 1879, p. 413), of which I have seen no specimens, is stated to have the rostrum very short, the antennal scale very small, and the telson acute, and it appears to have no supraorbital spines.

Genus ANGASIA, Spence Bate.

Toxeuma, Stimpson, Proc. Acad. Philadelphia, 1860, p. 26 (preoccupied as *Toxeuma*, Walker). (Type, *T. lanceolatum*, Stimps.)

Angasia, Spence Bate, Proc. Zool. Soc. London, 1863, p. 493. (Type, *A. pavonina*, Sp. Bate.)

This genus is very closely allied to *Latreutes*, with which it might, perhaps, be united. It differs, however, in having the process on the first segment of the antennules long and spiniform, a single antero-lateral (pterygostomial) tooth on the carapace, and no epipods on the legs.

Genus AMPHIPLECTUS.

Amphiplectus, Spence Bate, Chall. Rep., Macrura, p. 622.

The genus *Amphiplectus* of Spence Bate must, I think, be excluded from the Hippolytidæ altogether. In examining the unique specimen of the only species of the genus—*A. depressus*—I fail to see the slightest trace of segmentation in the carpus of the second peræopods. Spence Bate's reference to this is not very intelligible, but he seems to have had difficulty in perceiving the segmentation. The shape of the mandible, which has the incisor-process not separated from the molar, is very unlike that found in any of the other genera of the family. It is possible that Spence Bate's remark on the resemblance of the legs to those of *Nematocarcinus* may point the way to the true position of the genus; but the consideration of this question may be postponed till we are in possession of more satisfactory material than is afforded by the unique and now much mutilated type specimen.

V.—On the Bats of the *Hipposiderus armiger* and *Commersoni* Types. By KNUD ANDERSEN.

I.—THE *HIPPOSIDERUS ARMIGER* TYPE.

Nasals not inflated, the naso-frontal region of the skull forming an almost completely flattened pentagonal area. This is the chief peculiarity of the skull as compared with the *diadema* type. A facial foramen (for the nerve-supply of the nose-leaves), situated at about the middle of the naso-frontal region, leading into two fine canals, the one extending backwards, the other forwards, into the bone; rarely (in 3 out of 37 skulls) the canals open by two separate foramina, the one in front of the other*. The infraorbital foramina slightly wider (not longer) than in *H. diadema*.

Dentition essentially as in *H. diadema*, but a trifle more advanced:— p_2 and p_4 always in contact, and the cingula almost always overlapping each other. p^2 very small, external to the tooth-row; the canine and p^4 as a rule but very slightly separated or completely in contact †. The chief progress, as compared with *diadema* ‡, is the more strongly pronounced reduction, or very often complete disappearance, of the interspace between c and p^4 (the former place of p^2).

The wing-structure differs in some details from that of *diadema* and its closest allies §:—whereas the fifth metacarpal has retained precisely the same length (in proportion to the forearm) as in *diadema*, the fourth is somewhat, the third considerably, shortened, making as a total result the third and fourth equal in length and but slightly longer than the fifth (individually, of course, the fourth metacarpal is found sometimes a little shorter, sometimes, especially in *H. turpis*, a trifle longer, than the third). The proportionate length of the phalanges is almost as in *diadema*.

Posterior leaf narrower than the horseshoe, trilobate; three vertical ridges on the front face of the leaf. No notch in the front border of the horseshoe ||. In one species

* A similar foramen is found in the bats of the *H. diadema* type.

† The details, from an examination of thirty-seven skulls, are these:—in three c and p^4 are distinctly, but rather narrowly, separated; in sixteen slightly or very slightly separated; in eighteen in contact, and in three of these the cingula overlap each other.

‡ Ann. & Mag. Nat. Hist. (7) xvi. p. 504 (Nov. 1905).

§ Compare the wing-indices below, on p. 43.

|| A notch in the front border of the horseshoe is found in *H. Pratti*, a species which bears some external resemblance to *H. armiger*. But the skull of *H. Pratti* is very peculiar (sagittal crest raising abruptly far

(*H. turpis*) three supplementary leaflets external to the horseshoe, in another (*H. armiger*) four, the fourth very small (or, in very rare instances, completely wanting). Wart-like elevations, forming a backward extending direct continuation of the third supplementary leaflet, greatly developed in adult males, smaller in females. Frontal sac in adult males very large, opening transversal; in females small or represented by a depression only.

Males of the *armiger* type average somewhat larger than females, but practically there is no fixed difference in size between the sexes, small males being often inferior in size to large females.

Colour.—Upperside, from shoulder-region to tail (“horseshoe-patch”), almost “Vandyke brown,” this colour confined to the narrow tips of the hairs; broad base of hairs “wood-brown”; upperside of head, neck, and front of back, owing to a considerable reduction or complete absence of the dark hair-tips, “wood-brown,” contrasting with the rest of the back; line of demarcation between these light- and dark-coloured regions of the upperside strongly marked, crescent-shaped, concavity forwards. The whole of the underside a very dark shade of “wood-brown.”—Individual variation small: the “horseshoe-patch” can be darker, approaching “seal-brown,” and at the same time the “wood-brown” lighter; this is the case especially in young adults. The sexes are alike in colour, nor is there any appreciable colour-difference between the species or subspecies.

Range.—Throughout the Himalayas, eastwards to the Loo-choo Islands, southwards to the Malay Peninsula.

1. *Hipposiderus armiger*, Hodgs.

Diagnosis.—Forearm about 87.5–97 mm.

Four supplementary leaflets, the fourth very small and occasionally (in 1 out of 26 specimens examined) completely wanting. [Skins of this species, in which the nose-leaves are damaged or made unrecognizable by shrinkage, are puzzlingly like *H. diadema* or *H. lankadiva*; the very different naso-frontal region of the skull will make them easily distinguishable; in case also the skull is unavailable for examination, *H. armiger* can always be discriminated by the longer

beyond the level of the very broad facial region of the skull, almost to the same degree as in *Rhinonycteris*!), showing it to have no very close relationship with the *armiger* type. I believe it to be a relative of *H. leptophylla*, the skull of which is as yet unknown.

lower leg: in *diadema* 30–37 mm., in *lankadiva* 35·5–37·5, in *armiger*, although the bat is practically of the same size as the latter species, 38–43. There is, as pointed out above, also some difference in the wing-structure.—From *H. Pratti*, under alike unfavourable conditions, *H. armiger* can be discriminated by the much smaller hind foot: in *armiger* (measured with claws) 15·8–19 mm., in *Pratti*, although this species averages slightly smaller, 21–22·5, as well as by the markedly longer lower leg, *Pratti* agreeing in this point with *diadema*.]

Range.—From Masuri eastwards to Fokien, southwards to the Malay Peninsula.

1 a. *H. armiger debilis*, subsp. n.

“*Hipposiderus Diadema*, Gray?,” Cantor (non Geoffr.), J. A. S. B. xv. no. 171, p. 181 (1846).

*Diagnosis**.—Anteorbital width 9–10 mm. Mandibular tooth-row, exclusive of incisors, 13–14.

Type.—♂ ad. (skin). Prov. Wellesley, Malay Peninsula. Dr. Th. Cantor’s Collection. Brit. Mus. no. 79. 11. 21. 80.

Range.—Malay Peninsula, northwards to Assam (Khasia Hills).

1 b. *H. armiger*, Hodgs., *typicus*.

Rhinolphus (sic) *armiger*, Hodgson, J. A. S. B. iv. no. 48, p. 699 (Dec. 1835).

Phyllorhina Swinhoei, Peters, P. Z. S. 1870, p. 616.

Diagnosis†.—Anteorbital width 9·7–10·7 mm. Mandibular tooth-row, exclusive of incisors, 13·7–14·5.

Range.—From Masuri eastwards through Upper Burmah, to Szechuen and Fokien.

Technical name.—The type locality is “the central region of Nepal.” The typical specimens of Hodgson’s *Rh. armiger* (♂ ad., ♀ ad., in alcohol) are in the British Museum.

Ph. Swinhoei.—Type locality: Amoy, Fokien. Three co-types (skins; Amoy, 1867; R. Swinhoe ded.; Peters det.) are in the British Museum. These and other examples from Fokien are indistinguishable from Nepal individuals. Peters’s

* 10 specimens examined:—9 (skins), various places in the Malay Peninsula; 1 (in alc.), Khasia Hills, Assam. Skulls of all the specimens.

† 16 specimens examined:—2 (alc.), Masuri; 5 (alc. and skins), Nepal; 1 (alc.), Kakhyen Hills, Upper Burmah; 1 (alc.), Kia-ting-fu, W. Szechuen; 6 (skins), various places in the province of Fokien, S. China; 1 (skin), stated to be from N. China. 14 skulls, representing all the localities enumerated.

remarks on *H. Swinhoei* make me suppose that he regarded it as an unrecorded species, because he compared it not with *H. armiger*, but with *H. diadema*.

Remarks.—There is only an *average* difference between the southern and northern race of *H. armiger*. In the latter the skull, more especially the facial region, is generally a little heavier built, the tooth-rows a trifle longer. The external difference is still less pronounced. The two races, perhaps, meet somewhere in Burmah or Assam.

2. *Hipposiderus turpis*, Bangs.

Hipposiderus turpis, Outram Bangs, Amer. Naturalist, xxxv. no. 415, p. 561 (July 1901).

Diagnosis *.—Forearm about 67·2–71·7 mm.

The skull is an exact miniature copy of an *armiger* skull. So far as I can make out from dried specimens (by softening the nose-leaves), there are three leaflets only, without any trace of a fourth. The fourth metacarpal is, more often than in *armiger*, a trifle longer than the third. These are, I believe, the only external differences as compared with *armiger*, apart from the much smaller size.

Range.—As yet recorded only from Ishigaki, S. Loo-choo Islands.

II.—THE *HIPPOSIDERUS COMMERSONI* TYPE.

The general shape of the skull much as in the *diadema* type. Nasal swellings distinctly inflated, as in *diadema* (not flattened, as in *armiger*). Naso-frontal region broader, especially posteriorly, and more pronouncedly pentagonal in shape, both of these peculiarities chiefly due to the somewhat more projecting postorbital processes (in *diadema* and its allies the postorbital processes are smaller and more rounded off). A small facial foramen, situated in the middle line between the posterior nasal swellings. Sagittal crest more strongly, sometimes (viz. in *H. gigas*) enormously, developed, crescent-shaped, gradually descending in front towards, and merging into, the supraorbital ridges. Lambdoid crest stronger than in *diadema*. The rami of the mandible higher. There is scarcely any other essential and constant difference between the skulls of the *diadema* and *Commersoni* types.

* 13 skins, with skulls, examined.—For the loan of 9 of these specimens I am indebted to the Authorities of the Museum of Comparative Zoology, Cambridge, Massachusetts.

Dentition much as in *diadema*, but slightly more advanced:—the cingula of p_2 and p_4 generally overlapping each other, often very strongly so, rarely in simple contact without overlapping; in none of the twelve skulls examined, representing all the forms known, is there any interspace between p_2 and p_4 . p^2 always external to the tooth-row, often unusually small; the upper canine and p^4 in contact, sometimes slightly overlapping each other at base, rarely separated. *A small, but always very distinct, cusp-like projection on the hinder cutting-edge of the upper canines*, a little above the middle of the tooth (no trace of a similar “cusp” in *diadema* nor in *armiger*); front face of upper canines more or less distinctly furrowed, in *H. gigas* very deeply so (practically smooth in *diadema* and *armiger*).

Wing-structure* on a considerably higher level of development than in *diadema* and its allies:—third and fourth metacarpals slightly shortened, *fifth lengthened*, making as a final result the third metacarpal a little longer than the fourth, but the fourth and fifth practically equal in length (individually the fifth metacarpal can be even a trifle longer than the fourth); broadly speaking, these three metacarpals might be called *approximately* equal in length (in *diadema* the fifth decidedly much shorter than the fourth and third). *Distal phalanx of the third finger much lengthened* (much longer than the proximal phalanx; in *diadema* only about equal to, or shorter than, the proximal phalanx). These modifications combined make a broader and, especially, more pointed wing, *i. e.* an increased power of flight.

The nose-leaves are, in their more essential characters, of the *diadema* type. Four supplementary leaflets on either side, external to the horseshoe, the fourth always the smallest, but very rarely (*H. gigas gambiensis*) completely wanting; I never found *more* than four leaflets †. The

* Compare the wing-indices below, on p. 48.

† The statements in literature about the number of supplementary leaflets in these bats are very confusing:—two (Temminck, in his “*Ph. vittata*”); three (Wagner and others); “three, sometimes with the rudiment of a fourth”; four; “four, often with the rudiment of a fifth.” Supposed differences in this respect have been used as a means to discriminate subspecies or species. The facts, from the material examined by me, are these:—*H. Commersoni typicus*: four leaflets, the fourth quite small (one alcohol specimen; one skin unsuitable for this purpose); *H. C. marungensis*: four leaflets, the fourth small, but distinctly larger than in the Madagascar form (two in alc., one skin); *H. thomensis*: quite as *marungensis* (one skin; two other skins unsuitable); *H. gigas typicus*: quite as *marungensis* (four in alc., three skins, a fourth skin unsuitable); *H. g. gambiensis*: three leaflets, without any trace of a fourth (one, in alc.).—The divergent statements in literature are, I

posterior leaf of practically the same breadth as the horse-shoe, its upper border evenly convex, on the front face three vertical ridges, the lateral ridges often more or less obsolete. Thus, there are only two noteworthy points of difference between the nose-leaves of a *H. diadema* and those of a *H. Commersoni*, viz. the somewhat stronger development of the lateral leaflets in the latter type of bat (three with, almost invariably, a small fourth, instead of three with rare individual traces of a fourth in *diadema*) and the proportionately slightly smaller posterior leaf; but the shape of the posterior leaf, as well as of all the other nose-leaves, is extremely similar in both types.—A frontal sac, opening by a longitudinal fissure, is found in both sexes.

The ears are considerably modified (as compared with *diadema*): narrowed and pointed. The tail much shortened: always shorter than the lower leg (in *diadema* always much longer than the lower leg). The plagiopatagium inserted on, or a short distance above, the ankle, quite as in *diadema**.

They are all bats of very large size, the forearm varying from 79 to 116 mm. Males seem to *average* larger than females, but practically there is no constant difference in size between the sexes †. The frontal sac is markedly shallower in females.

Their range is confined to the Ethiopian Region, on the eastern side from Madagascar and the Mozambique coast to British East Africa, on the western from Angola to Gambia. I discriminate three species (five forms).

believe, not difficult to explain. When the number is given too low (two, three) it may be due to an examination of *skins*, in which the true number of leaflets is often very difficult to ascertain, owing to shrinkage; when the number is given too high (four, with the rudiment of a fifth), the reason may be this: external to the fourth leaflet is almost invariably situated a small rounded gland, which by a hasty examination can easily be taken for the trace of a fifth leaflet; but similar glands are found in many other places of the upper lip.

* Some details about the insertion of the plagiopatagium on the hind leg (from alcohol specimens only):—*H. Commersoni*, in two (♀ ad.) on the ankle, in one (♂ young ad.) 2 mm. above the ankle; *H. gigas*, in one (♀ ad.) on the ankle, in one (♂ ad.) 2.5 mm., in two (♂ ad.) 5 mm., in one (♂ young ad.) 6 mm. above the ankle.—It has been suggested that the membranes in younger individuals reach the ankle, but “sich allmählig so zurückziehen, dass sie bei alten Exemplaren einen Theil des Schienbeins frei lassen” (Peters, MB. Ak. Berlin, 1871, p. 318). The above details are not in favour of that explanation.

† A few particulars in support of this statement (forearm of full-grown individuals):—*H. C. marungensis*, one male 94 mm., one female 96.5 mm.; *H. gigas*, three males 108, 110, and 115 mm., one female 108 mm.

1. *Hipposiderus Commersoni*, Geoffroy.

Diagnosis.—Skull (as compared with *H. gigas*) small: anteorbital width 9–10 mm.; upper tooth-row 11.2–12.3. Size moderate: forearm about 90–100; third metacarpal about 60–68.

Range.—Madagascar and the opposite part of the continent, northwards to British East Africa*.

1 a. *H. Commersoni*, Geoffroy, *typicus*.

Diagnosis †.—On an average smaller: forearm about 90 mm.; third metacarpal about 60–61.

The fourth leaflet is slightly smaller than in any other form. In one skull the upper canine and p^4 are distinctly separated, the only instance of this more primitive condition in all the skulls of the *Commersoni* type examined; in a second skull of the present form these teeth are perfectly in contact. The front face of the upper canines not very deeply furrowed.

Range.—Madagascar.

1 b. *H. Commersoni marungensis*, Noack.

Diagnosis ‡.—On an average larger: forearm about 94–100 mm.; third metacarpal about 66–68.

The fourth leaflet is slightly more developed than in the Madagascar form. Front face of upper canines not deeply furrowed.

Range.—From Tanganyika and the Mozambique coast northwards to British East Africa.

2. *Hipposiderus thomensis*, Bocage.

Diagnosis §.—Skull and teeth almost quite as in *H. Commersoni*. Size very small: forearm about 79–82 mm.; third metacarpal about 55–58.

* There can scarcely be any doubt that *H. Commersoni* also occurs on the western side of the Continent. Of seven examples of *Ph. Commersoni* from Angola, in the collection of the Lisbon Museum and recorded by Sr. A. F. de Seabra in *Jorn. Sci. Math. &c. Lisboa*, (2) vol. v. no. xx. p. 254 (Dec. 1898), four (*b, c, d, e*) are unquestionably *H. gigas*, whereas the others (*f, g, h*) no doubt are referable to *H. Commersoni* as defined in the present paper.

† 2 specimens, with skulls, examined: ♂ (skin), ♀ (in alc.).

‡ 3 specimens examined: 2 (in alc.), Zanzibar; 1 (skin), Tana River, British East Africa. 2 skulls (Zanzibar and Tana River).

§ 3 skins, with skulls, examined, from various places in S. Thomé.

There is scarcely any other peculiarity with this species, as compared with *H. Commersoni*, than its remarkably small size (on the coloration, see below).

Range.—San Thomé, Gulf of Guinea.

3. *Hipposiderus gigas*, Wagner.

Diagnosis.—Skull very large and heavily built: ante-orbital width about 11 mm.; upper tooth-row 13.3–14.5. Size very large: forearm about 108–116; third metacarpal about 75–81.

Front face of upper canines deeply furrowed.

Range.—From Angola to Gambia; on the eastern side of the Continent as yet known from the Querimba Islands only*.

3 a. *H. gigas*, Wagner, *typicus*.

Diagnosis †.—Nose-leaves not enlarged: width of horse-shoe and of posterior leaf about 11–12 mm.

Range.—Angola; Rio Muni (Benito River).

3 b. *H. gigas gambiensis*, subsp. n.

Diagnosis ‡.—Nose-leaves larger: width of horseshoe and posterior leaf about 13 mm.

In the specimen examined there are three supplementary leaflets only, no trace of a fourth.

Type.—♀ ad. (in alcohol). Gambia. Presented by the Earl of Derby. Brit. Mus. no. 42. 9. 27. 36 §.

Colour.

In the *style* of colour all bats of the *Commersoni* type are very similar to *H. diadema* || :—a dark brown “horseshoe” (Y-shaped) patch on the back; a more or less distinct white patch on either flank, at the insertion of the propatagium; a

* From this latter locality (the Querimba Islands) I have seen no specimens. But one of the two bats called by Prof. Peters *Phyllorhina vittata* (the male, not the female) and obtained by him in Ibo Island is undoubtedly a *H. gigas* ('Reise nach Mossambique,' Säugeth. p. 35).

† 8 specimens examined:—3 (1 alc., 2 skins), from various places in Angola; 2 (1 alc., 1 skin), Benito River; 3 (2 alc., 1 skin), without exact locality. 5 skulls: 3 Angola; 1 Benito River; 1 without details.

‡ 1 specimen, with skull, the type, examined.

§ Temminck's *Phyllorhina vittata*, from the Gold Coast ('Esquisses Zoologiques,' pp. 72–74, 1853), may belong to this form.

|| Ann. & Mag. Nat. Hist. (7) xvi. p. 503 (Nov. 1905).

more or less distinct light longitudinal stripe bordering either side of the hinder back, along the plagiopatagium.

H. gigas.—Y-patch very pronounced, of a colour perhaps best defined as an extremely dark shade of "hair-brown"; below the tips the hairs are considerably lighter (greyish "drab"), at the extreme base very dark. The whole of the upperside in front of the Y-patch light grey; this colour confined to the tips of the hairs; below the tips the hairs are dark "drab," further down lighter, at the extreme base again dark-coloured. Longitudinal stripe on either side of hinder back well marked, of the same light grey colour as the anterior part of the upperside. A well-marked white patch at the insertion of the propatagium. Underside very light, almost whitish, or washed with greyish or yellowish; base of hairs very dark "drab" or "drab-grey."—The three skins here described are all of *young adults*, the epiphyses of the metacarpals not quite ankylosed, the teeth unworn; the whole of the coloration is strongly like that of a young *H. diadema typicus* from Java. I have but very little doubt that aged individuals will prove to be darker (as is the case in *H. diadema*).

A fourth skin (adult, unsexed; teeth slightly worn, epiphyses ankylosed) is of the russet phase. The style the same, but the whole of the pelage strongly washed with "russet"; the flank-patches (at the propatagium) indistinct.

H. Commersoni marungensis.—Practically quite like the non-russet phase of *H. gigas*. The skin is of a young adult, epiphyses ankylosed, but teeth unworn.

H. thomensis.—On the whole, both above and below, somewhat darker than *H. gigas*; flank-patches quite distinct; lateral stripes bordering hinder back somewhat obliterated.—The three skins are of individuals with slightly worn teeth and the epiphyses ankylosed, thus a little older than the light-coloured series of *H. gigas*.

H. Commersoni typicus.—Practically indistinguishable from *H. thomensis*. One skin, epiphyses ankylosed, teeth almost unworn.

As a general conclusion:—The style of colour is the same in all of the species. There is probably no essential difference in the details of the coloration between the species, provided, of course, that individuals of approximately the same age are compared. Young and young adults are lighter coloured, with the markings and stripes more strongly marked. A russet phase occurs.

Nomenclature.

Rhinolophus Commersoni; 1813*.—Described from Commerson's drawings and hand-written notes; type locality: Fort Dauphin, Madagascar; description very incomplete, drawing bad: no lateral leaflets, no frontal sac; but there can be no doubt as to the identification.

Rhinolophus gigas; 1815 †.—The brief preliminary diagnosis (1845) must be compared with the detailed description three years later (1848). Type locality: Benguela. This, combined with the size of the skull (37 mm.), the length of the forearm (107 mm.; Wagner probably measured the radius), the shape of the ears ("hoch, schmal, länglichoval, zugespitzt"), the furrows on the canines, and the colour, settles the matter. The number of "Backenzähne" is stated to be $\frac{4}{5}$ (the small p^2 overlooked), the number of lateral leaflets 3 (probably from a skin). The frontal sac, so conspicuous in all bats of the *Commersoni* type, is not mentioned; that this is an accidental omission is proved by reference to Wagner's article on *gigas* in Schreber's 'Säugethiere' (Suppl. v. p. 651, 1855).—This is the earliest name of the largest species of the *Commersoni* type.

Phyllorhina vittata; 1852 ‡.—Peters had two distinct species of the *Commersoni* type before him when describing *Ph. vittata*. The first question therefore is which of these two species is the true type of *vittata*. The whole of the detailed description, the size as indicated in the brief "diagnosis" (p. 32), the whole series of measurements of the *first* of the two specimens (the male, pp. 35–36 §), and

* Geoffroy Saint-Hilaire, "Sur un genre de Chauve-souris, sous le nom de *Rhinolophes*," Ann. Mus. d'Hist. nat. xx. p. 263, pl. v. (head in front view).

† Joh. Andr. Wagner, "Diagnosen einiger neuen Arten von Nagern und Handflüglern," Arch. f. Naturg. xi. 1, p. 148; id. "Beschreibung einiger kleinen Säugethiere aus Syrien und Afrika," *op. cit.* xiv. 1, pp. 180–182 (1848).

‡ W. Peters, 'Naturwissenschaftliche Reise nach Mossambique,' Säugeth. pp. 32–36, pl. vi. (whole figure, head in front view, ear), pl. xiii. figs. 7–13 (skull, osteology of lower leg and foot).—(Peters refers to an earlier "Mittheilung" about *Ph. vittata* in the 'Gesellschaft naturforschender Freunde,' Aug. 21, 1849; to my knowledge no Proceedings of that Society were issued between 1839 and 1860, but reports on the meetings are said to have appeared in the 'Berliner Vossische Zeitung.')

§ Peters measures the forearm (probably the radius) of this specimen 105 mm.; taken on the life-size figure (pl. vi.) the forearm is, according to my method, very nearly 110 mm., thus precisely as in *gigas*. The tibia is stated to be 40 mm., a measurement evidently taken on the skeleton, inasmuch as it agrees exactly with the length of the tibia in the osteological figure, pl. xiii. fig. 13; on the figure pl. vi. the lower leg is at

all the figures clearly apply to a *H. gigas*. This specimen, the male, stated to have been obtained in Ibo Island, Cap Delgado group, therefore is to be regarded as the type of *vittata*, which consequently becomes a synonym of Wagner's *gigas*. The other specimen referred to by Peters (a female, measured on pp. 35-36) is a *H. C. marungensis*.—Peters's reasons for regarding his *vittata* distinct from Wagner's *gigas* are given by himself as follows (p. 36):—(1) the latter is "russbraun," *vittata* "rehbraun"; a more or less russet suffusion is, however, an individual, not a specific difference: (2) *gigas* has, according to Wagner, "nur drei Falten zu jeder Seite des Hufeisens," whereas Peters found four in his *vittata*; but specimens of *gigas* from the type locality (Benguela) examined by me have four leaflets, and Wagner's statement to the contrary is, as already mentioned, in all probability wrong, or, if correct, based on an individual aberration: (3) *gigas* was by Peters believed to differ "durch den Mangel (oder die Kleinheit?) der Stirnöffnung"; it is true that Wagner neither in 1845 nor in 1848 mentions the frontal sac in the type of *gigas*; but in 1855 (Schreber's 'Säugethiere'), three years later than Peters's 'Reise nach Mossambique,' he corrects this omission: (4) *gigas* differs "durch die nicht bis zur Ferse herabreichenden Flughäute," whereas in *vittata* "die Flughäute gehen bis auf die Fusswurzel herab"; this is a purely individual variation (*cf. antea*, p. 40, footnote *)—Thus, none of the distinguishing characters of *vittata* emphasized by Peters holds good. Another thing is that by actual comparison of the type of *vittata* (obtained in Ibo Island) with specimens of *gigas* from Benguela some slight difference on *other* points might be found; but Peters's description of the former is so detailed, and the figures, both of the external aspect and of the skull and dentition, so completely like *H. gigas*, that the difference, if any there be, must be exceedingly small indeed.

Phyllorhina Commersoni, var. *marungensis*; May 7th, 1887*.
—Type locality: Qua Mpala, Marungu, W. Tanganyika. Prof.

least 44 mm., quite as in *gigas*. These are the only discrepancies worth mentioning between Peters's measurements of the type of *vittata* and my own of *gigas*, and they are, it will be observed, apparent only, not real.—The measurements of the skull and teeth, as taken on Peters's figures of *vittata* (pl. xiii. figs. 7-9) are like those of *gigas*.

* Th. Noack, "Beiträge zur Kenntniss der Säugethier-Fauna von Ost- und Central-Afrika," Zool. Jahrb. ii. pp. 272-275, pl. x. figs. 31-33 (head in front view; skull in lateral and upper view; all figures stated to be natural size).

Noack emphasizes only one distinctive mark : the horseshoe is "bei *Commersemi* unten gerade, bei allen 5 Ex. von var. *marungensis* unten genau wie bei *Phyll. cyclops* rundlich lanzettförmig ausgebogen." This is a very suspicious character ; it is quite true that in "*Commersemi*" (*i. e.* both in the true *Commersemi* and in *gigas*) the front margin of the horseshoe is approximately "gerade" ; that is to say, when we examine alcohol specimens ; but in *skins* it will, almost always, be found more or less "rundlich lanzettförmig ausgebogen" (the meaning of these words is illustrated in Noack's fig. 31) ; there can be small doubt, therefore, that Noack was misled by the shrunk shape of the horseshoe in *dried* specimens. That this explanation is correct seems proved, almost beyond doubt, by a closer examination of Noack's description and figures :—(1) the whole set of nose-leaves (fig. 31, and measurements on p. 273) are so extraordinarily small if compared with the nose-leaves of alcohol specimens of *Commersemi* (*e. g.* width of horseshoe 8.5 mm., as against 11.7 in *Commersemi*) that, if such were really their natural aspect, *marungensis* would be a very different species ; but their size is quite as in *dried skins* : (2) the number of leaflets is stated to be three (p. 272) ; the small fourth is most often difficult to observe in *skins* : (3) the exceedingly narrow and pointed ears (fig. 31) cannot have been drawn from, nor can the drawing have been controlled by comparison with, well-preserved alcohol specimens : (4) "die Flughaut reicht bis zu $\frac{2}{3}$ der Tibia" (p. 274) ; no bat of the *Commersemi* type known to me has, by far, $\frac{1}{3}$ of the tibia free of the plagioptagium, but it often looks so in *skins*, owing to shrinkage of the narrow distal part of the membrane. Eliminating all the statements just reviewed, which, so far as I can see, must be erroneous, there remains the description and figures of the ordinary East-African representative of the *Commersemi* type, and the name *marungensis* is the earliest available for this form.

Phyllorhina Commersemi, var. *thomensis* ; Sept. 1891*.—
Type locality : S. Thomé. According to Bocage, this species has three leaflets only ; I find the usual small fourth in one of the *skins* at my disposal (two other *skins* unsuitable for this purpose).

Hipposiderus Commersemi mostellum ; May 1st, 1904†.—
Type locality : Tana River, British East Africa. This form

* J. V. Barboza du Bocage, "Sur une variété de '*Phyllorhina Commersemi*' de l'île St. Thomé," Journ. Sci. Math. &c. Lisboa, (2) ii. no. vi. p. 88 (see also (2) vii. no. xxvi. (1904) p. 67, where a misprint in the measurement of the ear of the female is corrected).

† Oldfield Thomas, "Three new Bats, African and Asiatic," Ann. & Mag. Nat. Hist. (7) xiii. pp. 385-386.

was separated under the supposition that Noack's *marungensis* was identical with Wagner's *gigas*. As pointed out above, there can scarcely be any doubt that *marungensis* is the ordinary East-African form, and *mostellum* thus becomes a synonym of *marungensis*.

General Remarks.

One primitive character, lost in *diadema*, has been preserved in *Commersoni* and its allies, viz. the posterior "cusp" on the upper canines. That this is a truly primitive character is shown by the fact that it is found in the overwhelming majority of *Hipposideri*, down to the most primitive species known (compare certain Insectivora).

But the bats of the *Commersoni* type are on a higher level of development than *diadema* and its allies, at least in the following points:—in the, almost invariably, complete disappearance of the interspace between the upper canine and p^4 ; in the much more pronounced furrows on the front face of the upper canines; in the very strong sagittal and lambdoid crests; in the wing-structure; in the almost constant presence of an additional (fourth) leaflet; in the presence of a frontal sac; in the large size. It is very probable that most of these peculiarities are closely correlated to (dependent on) each other: large size, powerful flight, more advanced wing-structure; large size, very strong teeth, more advanced stage of the dentition, more highly differentiated upper canines, much stronger cranial crests.

To sum up the probable phylogeny and interrelations of these bats:—the Ethiopian *Commersoni* and Oriental *diadema* types have had a common origin; their unknown progenitor had, as most *Hipposideri*, a posterior cusp on the upper canines; this cusp is lost in the recent modifications of the *diadema* type, but preserved in *Commersoni* and its allies; the *Commersoni* type is, apart from this particular point, on a markedly higher level of development than *diadema*.

As pointed out in the foregoing pages, three closely allied species of the *Commersoni* type can be discriminated:—one, *H. Commersoni*, essentially eastern (Madagascar; Mozambique to British East Africa), but occurring also in Angola; a second, *H. gigas*, essentially western (Angola to Gambia), but extending its range also to some part of East Africa; a third, *H. thomensis*, confined to San Thomé.

The presence of a comparatively well-differentiated species in the small island of San Thomé is in conformance with the general character of the fauna (terrestrial Mollusca, Batrachians, Reptiles, Mammals, Birds) of that island, which implies very long isolation from the continent.

Table of Measurements.

	<i>H. armiger.</i>		<i>H. turpis.</i>		<i>H. Commersoni.</i>		<i>H. thomensis.</i>		<i>H. gigas.</i>			
	<i>debilis.</i>		<i>f. typica.</i>		<i>f. typica.</i>		<i>marungensis.</i>		<i>f. typica.</i>		<i>gambiensis.</i>	
	10 spems., 10 skulls.	16 spems., 13 skulls.	13 spems., 13 skulls.	Min. mm. Max. mm.	Min. mm. Max. mm.	Min. mm. Max. mm.	3 spems., 3 skulls.	Min. mm. Max. mm.	6 spems., 2 skulls.	Min. mm. Max. mm.	♀ ad. Type.	♀ ad. Type.
Ears, length	28.5	29.2	31.8	28	28	28	28	28.7	30.8	31	31	31
" greatest breadth	24.5	26	27.7	19.3	18	18	18	18.8	19	19.7	19.7	19.7
Horseshoe, greatest breadth	8.5	8.8	10	11.7	11.5	11.5	11.5	11	11.8	13.2	13.2	13.2
Posterior leaf, breadth	7.2	7	8.8	11	11	11	11	11	11.8	13	13	13
Forearm	87.5	87.7	97	71.7	90	94	100	79	82	108	108	108
3rd metacarpal	58.7	64.8	60	46.5	49	60.8	68	55.5	57.5	76	76	76
4th metacarpal	58.2	63.5	66	46.8	49.6	58.8	65.8	54.5	55.5	74	74	74
5th metacarpal	54.5	61.5	56.8	44.8	47.1	58	65.4	52.8	56	72.8	72.8	72.8
Tail	50.5	50	61	34.7	35.5	35.5	35.5	31	39	36	36	36
Lower leg	38.2	38	43	29	32	36.5	40	32.7	33.2	43.5	43.5	43.5
Skull, total length	30	32.5	31.8	32.5	33.5	33.5	33.5	31.6	33.2	37	37	37
" mastoid width	14.3	15.2	15	14.2	14.7	15.2	15.2	11.5	12	14.4	14.4	14.4
" width of brain-case	11.7	12.2	12.8	10.5	11	12	12.5	11.5	12	14.2	14.2	14.2
" zygomatic width	16.8	18.7	18	13.9	15	16.5	18	16.8	17	20	20	20
" maxillary width	11.9	12.8	13.2	10	10.5	11.8	12	11.2	11.7	13.8	13.8	13.8
" anteorbital width	9	10	9.7	7.8	8.1	9	9.5	9	9.2	11	11	11
" across cingula of canines	8	8.8	8.8	6.7	7	8.8	9.8	8.7	9	11.6	11.6	11.6
Mandible	21.5	23.2	24	17.8	18.7	22	23.2	21.7	22	27.8	27.8	27.8
Upper teeth	11.6	12.5	13.1	10	10.4	11.2	11.5	11	11.2	13.8	13.8	13.8
Lower teeth	13	14	14.5	11	11.5	12.9	13	12.5	12.8	16	16	16.3

Wing-indices.

	Forearm.		III. ¹ .	III. ² .	4th metac.	IV. ¹ .	IV. ² .	5th metac.	V. ¹ .	V. ² .
	<i>H. diadema</i> type	1000	716	329	327	696	237	173	640	247	191
<i>H. armiger</i> type	1000	677	339	333	677	250	164	642	247	191
<i>H. Commersoni</i> type	1000	700	329	400	678	250	152	672	262	165

VI.—*A Revision of the South-American Cichlid Genera Retroculus, Geophagus, Heterogramma, and Biotocetus.*
By C. TATE REGAN, B.A.

THE genera here dealt with are distinguished from other Cichlidæ by the following combination of characters:—Dorsal fin without notch between spinous and soft portions; gill-rakers, if present, short or of moderate length, in small or moderate number; anal fin with 3 spines; teeth conical; præoperculum entire; a compressed lobe on the upper part of the anterior branchial arch.

Their relations to each other may be shown by means of the following synopsis:—

- I. First branchial arch with the upper gill-rakers of the outer series running at the base of the lobe; upper lateral line well separated from the spinous dorsal *Retroculus*.
- II. First branchial arch with the gill-rakers of the outer series, when developed, continued on to the free edge of the lobe.
- D. XII-XIX 9-14; upper lateral line well separated from the spinous dorsal *Geophagus*.
- D. XV-XVI 5-7; upper lateral line, if complete, separated from the dorsal fin, for most of its length, by only $\frac{1}{2}$ a series of scales *Heterogramma*.
- D. VII-VIII 14-15; lateral line more or less rudimentary *Biotocetus*.

I take this opportunity of gratefully acknowledging my indebtedness to Dr. F. Steindachner, who has given me information as to the number of gill-rakers in *Geophagus pappaterra*, Prof. B. G. Wilder, who has sent me notes on the type of *Retroculus Boulengeri* and has also permitted me to examine the excised first branchial arch of the same specimen, and Dr. R. Gestro, who has lent the type of *Geophagus Balzani*.

RETROCULUS.

Retroculus, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 614;
Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 181 (1904).

Body moderately elongate, compressed; scales rather large, ctenoid. Two lateral lines, the upper well separated from the spinous dorsal. Mouth moderate; jaws equal anteriorly; maxillary completely sheathed by the deep præorbital; teeth conical, in bands; no canines; cheeks scaly; præoperculum entire. Gill-rakers short, in moderate number;

upper part of the anterior branchial arch bearing a compressed lobe, with the gill-rakers at its base. A single dorsal fin, with XVI 11 rays. Anal with III 6-7 rays. Pectoral asymmetrical. Caudal rounded or truncate.

A single species from the Araguay.

Retroculus lapidifer.

Chromys lapidifera, Casteln. Anim. Am. Sud, Poiss. p. 16, pl. xii. fig. 1 (1855); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 122.

Retroculus Boulengeri, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 614; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 181 (1904).

Geophagus lapidifera, Pellegr. t. c. p. 199.

Depth of body 3 in the length, length of head $2\frac{3}{4}$ -3. Snout long, the eye situated in the posterior half of the head. Diameter of eye 4-5 in the length of head, depth of præorbital about $2\frac{1}{2}$. Maxillary extending to below the nostril; cheek with 4-6 series of scales. First branchial arch with 29 gill-rakers in the outer series, 15 at the base of the lobe and 14 on the lower part of the arch; gill-rakers of the inner series 21, 5 at the base of the lobe, 16 on the lower part of the arch. Scales 38-39 $\frac{6\frac{1}{2}-7}{13}$. Dorsal XVI 11, the soft fin scaly at the base. Anal III 6-7. Pectoral shorter than the head. Caudal truncate or rounded, covered with little scales. Caudal peduncle as long as deep. Yellowish, with darker cross-bars; a blackish spot at the base of the anterior rays of the soft dorsal.

R. Araguay.

The type measures 190 mm. in total length.

GEOPHAGUS.

Geophagus, Heck. Ann. Mus. Wien, ii. 1840, p. 383; Günth. Cat. Fish. iv. p. 315 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 107; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 621; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 188 (1904).

Mesops (part.), Günth. t. c. p. 311; Eigenm. & Bray, t. c.

Satanoperca, Günth. t. c. p. 313.

Biotodoma (part.), Eigenm. & Kennedy, Proc. Ac. Philad. 1903, p. 533.

Body deep or moderately elongate, compressed; scales ctenoid, large. Two lateral lines, the upper well separated from the spinous dorsal. Mouth moderate; jaws equal anteriorly; maxillary completely sheathed by the præorbital; teeth conical, in bands; no canines; upper surface of head to between the orbits, and opercular bones scaly; cheeks usually scaly; præoperculum entire. Gill-rakers short, in small or moderate number (6 to 21 on the lower part of the anterior arch); upper part of anterior branchial arch bearing

a compressed lobe, with the gill-rakers at its free margin. A single dorsal fin, with XII-XIX 9-14 rays. Anal with III 6-9 rays. Pectoral asymmetrical, with 13-17 rays; ventrals below or a little behind the base of the pectoral. Caudal rounded, truncate or emarginate, usually scaly at the base and near the upper and lower margins.

Twelve species from S. America, including Panama.

Skeleton.

In *Geophagus jurupari* the supraoccipital crest is elevated and extends forward to the anterior margin of the frontals, which are hollowed out to form the posterior border of the depression in which the præmaxillary processes lie. The parietal crests are nearly horizontal and merge into the orbital margin. The præmaxillary processes are long, but the snout being much produced they do not reach the frontals. There are 28 vertebræ (15 + 13); parapophyses are developed on the præcaudal vertebræ from the third; the ribs are inserted near the ends of the parapophyses. The third vertebra bears a long inferior apophysis. The lower pharyngeals are united by a straight suture.

Steindachner pointed out that *Geophagus badiipinnis*, Cope, is a synonym of *Chætobranchus flavescens*. This was not accepted by Cope, who stated that the fish was a true *Geophagus*, and Pellegrin includes it in this genus. After carefully comparing Cope's description and figure of *Geophagus badiipinnis* with specimens of *Chætobranchus flavescens*, I feel absolutely certain of their specific identity. There had evidently been some confusion of specimens in Prof. Cope's collections.

Synopsis of the Species.

I. 6-17 gill-rakers on the lower part of the anterior arch.

A. Pectoral extending distinctly beyond the origin of anal.

1. Dorsal with 12 to 16 spines.

a. Pectoral extending nearly to the end of the base of anal.

D. XII-XIV 12-14 1. *Balzani*.

b. Pectoral not or scarcely extending beyond the middle of anal.

D. XIII-XV 9-11. Scales $30 \frac{3\frac{1}{2}-4}{8-10}$. Pectoral extending nearly to above middle of anal; caudal peduncle at least as long as deep

2. *gymnogenys*.

D. XIV-XVI 8-10. Scales $27-28 \frac{4-5}{9}$. Pectoral extending to above middle of anal; caudal peduncle deeper than long

3. *brachyurus*.

4*

- D. XV 9-10. Scales 29-31 $\frac{6}{12-14}$. Pectoral extending to above the anal spines; caudal peduncle longer than deep 4. *cupido*.
- D. XV-XVI 11-12. Scales 30-31 $\frac{5}{10-11}$. Pectoral extending to above the anal spines; caudal peduncle longer than deep 5. *camopiensis*.
2. Dorsal with 17 to 19 spines 6. *surinamensis*.
- B. Pectoral not or scarcely extending beyond the origin of anal.
1. Pectoral extending about to above the origin of anal; last dorsal spine from $\frac{2}{5}$ to $\frac{1}{2}$ the length of head.
- D. XIV-XVI 9-10. A. III 6-7 7. *jurupari*.
- D. XIV-XVI 10-13. A. III 8-9 8. *brasiliensis*.
2. Pectoral not extending to above the origin of anal; last dorsal spine $\frac{1}{3}$ the length of head. D. XVI 10-11. A. III 7-8. 9. *crassilabris*.
- II. 19-21 gill-rakers on the lower part of the anterior arch.
- A. D. XV 10. A. III 7; dorsal spines subequal from the third, which is $\frac{1}{2}$ the length of head; pectoral extending to above the origin of anal 10. *pappaterra*.
- B. D. XII-XIV 11-14. A. III 7-8.
- Last dorsal spine $\frac{1}{2}$ the length of head; pectoral extending to above the vent 11. *dæmon*.
- Last dorsal spine $\frac{2}{3}$ the length of head; pectoral extending to above the anal spines 12. *acuticeps*.

1. *Geophagus Balzani*.

Geophagus Balzani, Perugia, Ann. Mus. Genov. (2) x. 1891, p. 623; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 191 (1904).

Geophagus duodecimspinosus, Bouleng. Proc. Zool. Soc. 1895, p. 524, and Trans. Zool. Soc. xiv. 1896, pl. iv. fig. 1; Eigenm. & Kennedy, Proc. Ac. Philad. 1903, p. 535; Pellegr. *l. c.*

Depth of body $1\frac{4}{5}$ to nearly 2 in the length, length of head nearly 3. Snout $2\frac{2}{5}$ - $2\frac{1}{2}$ in the length of head, diameter of eye $3\frac{1}{3}$ - $3\frac{1}{2}$, interorbital width $2\frac{3}{5}$ - $2\frac{2}{3}$, depth of præorbital $2\frac{2}{5}$ - $2\frac{1}{2}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 7 series of scales; 10 or 11 gill-rakers on the lower part of anterior arch. Scales 28-29 $\frac{5-6}{10-11}$, 3 between lateral line and anterior rays of soft dorsal, those of the thoracic region small. Dorsal XII (XIII-XIV 12) 13-14, the spines subequal or only slightly increasing from the fourth, the last from more than $\frac{1}{2}$ to nearly $\frac{3}{5}$ the length of head. Anal III (7) 8-9. Pectoral much longer than the head, extending to the end of the base of anal. Caudal truncate or slightly emarginate. Caudal peduncle $\frac{2}{3}$ - $\frac{3}{4}$ as long as deep. Olivaceous; a dark stripe below the eye; body with

about 9 pairs of dark vertical stripes on each side; a large dark spot on the middle of the side; fins greyish, more or less distinct light spots on the soft dorsal and caudal.

Paraguay.

1. (88 mm.) type of *G. duodecimspinosus*. Paraguay. Dr. Ternetz.

Dr. R. Gestro, of the Genoa Museum, has very kindly lent the type of the species, which measures 10½ mm. in total length and is included in the above description. Perugia's description is in some respects inaccurate.

Heros centralis, Holmberg (Rev. Arg. i. 1891, p. 183), from Argentina, is a species of doubtful position placed by Pellegrin in *Acara*, but it may prove to be a *Geophagus* allied to *G. Balzani*. D. XIV 11. A. III 8-9. Sc. 24 $\frac{4}{9}$. Check with 5 series of scales. Depth of body $\frac{1}{2}$ the total length (with caudal).

2. *Geophagus gymnogenys*.

Geophagus gymnogenys, Hensel, Arch. f. Nat. 1870, p. 61; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 194 (1904).

Acara minuta, Hensel, t. c. p. 71; Pellegr. t. c. p. 178.

Geophagus camurus, Cope, Proc. Am. Phil. Soc. xxxiii. 1894, p. 103, pl. ix. fig. 17.

Geophagus brasiliensis (non Quoy & Gaim.), Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 623.

Depth of body $2\frac{1}{4}$ - $2\frac{2}{3}$ in the length, length of head 3. Snout 3 in the length of head, diameter of eye $3\frac{1}{2}$, inter-orbital width $3\frac{1}{2}$, depth of præorbital 3. Maxillary extending nearly to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek naked except for 2 or 3 scales below the eye; 6-8 gill-rakers on the lower part of anterior arch. Scales $30\frac{3\frac{1}{2}-4}{8-10}$, $1\frac{1}{2}$ or 2 between lateral line and anterior rays of soft dorsal, those of the thoracic region small. Dorsal XIII-XIV (XV 9) 10-11, the spines only slightly increasing from the fourth, the last nearly $\frac{1}{2}$ the length of head. Anal III (8) 9. Dorsal and anal fins scaleless. Pectoral longer than the head, extending nearly to above middle of anal. Caudal slightly emarginate. Caudal peduncle $1-1\frac{1}{3}$ as long as deep. Brownish, with a large pearly spot on each scale and series of similar spots on the vertical fins; a dark vertical bar below the origin of the dorsal, a dark blotch on the middle of the side.

Rio Grande do Sul; Montevideo.

- 1-2. (126 and 129 mm.) Rio Grande do Sul. Dr. H. von Ihering.

Acara minuta, Hensel, appears to me to be founded on very young examples of this species.

3. *Geophagus brachyurus*.

Geophagus brachyurus, Cope, Proc. Am. Phil. Soc. xxxiii. 1894, p. 105, pl. ix. fig. 18; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 195 (1904).

Depth of body $2-2\frac{1}{3}$ in the length, length of head $2\frac{3}{4}-3$. Snout $2\frac{2}{3}-3$ in the length of head, diameter of eye $3-4\frac{1}{4}$, interorbital width $3-3\frac{2}{5}$, depth of præorbital $3-3\frac{1}{2}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous or subcontinuous; cheek with 4 to 6 series of scales, the lower 2 or 3 series sometimes deciduous; 8 to 10 gill-rakers on the lower part of the anterior arch. Scales $27-28\frac{4-5}{9}$, 1 or 2 between lateral line and anterior rays of soft dorsal, those of the thoracic region small. Dorsal XIV-XVI 8-10, the spines subequal from the fourth, the last $\frac{1}{2}$ the length of head. Anal III 8-9. Dorsal and anal fins scaleless. Pectoral longer than the head, extending to above the middle of anal. Caudal truncate or slightly emarginate. Caudal peduncle $\frac{3}{4}-\frac{7}{8}$ as long as deep. Olivaceous, with obscure darker cross-bars and with pearly longitudinal stripes along the series of scales of the posterior part of the body; a dark blotch on the middle of the side; a dark vertical stripe through the eye in the young, but not in the adult; vertical fins usually with oblique stripes, the dorsal sometimes with a dark edge; outer half of the ventral fin blackish.

Rio Grande do Sul; Uruguay.

1-2. (89 and 99 mm.)	Rio Grande do Sul.	Dr. H. von Ihering.
3-4. (52 and 69 mm.)	Mercedes, Uruguay.	O. V. Aplin, Esq.

4. *Geophagus cupido*.

Geophagus cupido, Heck. Ann. Mus. Wien, ii. 1840, p. 399; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 189 (1904).

Mesops cupido, Günth. Cat. Fish. iv. p. 311 (1862).

Geophagus (Mesops) cupido, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 107.

Depth of body $2\frac{1}{3}-2\frac{2}{5}$ in the length, length of head $3\frac{1}{5}-3\frac{1}{3}$. Snout $3\frac{1}{5}$ in the length of head, diameter of eye $2\frac{2}{3}$, interorbital width $3\frac{1}{4}$, depth of præorbital $3\frac{1}{2}-3\frac{4}{5}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 6 series of scales; 6 to 8 gill-rakers on the lower part of anterior arch. Scales $29-31\frac{6}{12-14}$, 3 between lateral line and anterior rays of soft

dorsal, those of the thoracic region very small. Dorsal XV (9) 10, commencing above the opercular cleft, the spines subequal or slightly decreasing from the fifth or sixth, the last $\frac{1}{2}$ the length of head. Anal III 9. Dorsal and anal fins scaleless. Pectoral longer than the head, extending to above the anal spines. Caudal slightly emarginate. Caudal peduncle longer than deep. Brownish; a blackish stripe from the occiput through the posterior part of eye to the angle of the præoperculum; a blackish spot, usually ocellated, on the lateral line below the soft dorsal; fins immaculate.

R. Amazon; Guiana.

1. (75 mm.)
2. (87 mm.)

R. Essequibo.
Tonantins.

Mr. Ehrhardt.
Paris Museum.

5. *Geophagus camopiensis*.

Geophagus camopiensis, Pellegr. Bull. Mus. Paris, 1903, p. 123, and Mém. Soc. Zool. France, xvi. 1903, p. 196, pl. iv. fig. 1 (1904).

Depth of body $2\frac{1}{3}$ – $2\frac{1}{2}$ in the length, length of head $2\frac{1}{2}$ – $2\frac{3}{4}$. Snout about $2\frac{1}{4}$ in the length of head, diameter of eye $3\frac{1}{2}$, depth of præorbital about $2\frac{2}{3}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous; cheek with 5 series of scales; 12 gill-rakers on the lower part of anterior arch. Scales 30–31 $\frac{5}{10-11}$. Dorsal XV–XVI 11–12, the spines subequal from the fifth or sixth, the last nearly $\frac{1}{2}$ the length of head; soft dorsal not scaly at the base. Anal III 7. Pectoral nearly as long as the head, extending to above the anal spines. Caudal truncate or slightly emarginate. Caudal peduncle longer than deep. Olivaceous, with a blackish blotch on the middle of the side; vertical fins with dark stripes or series of spots.

The types, from the R. Camopi, French Guiana, measure from 60 to 110 mm. in total length.

6. *Geophagus surinamensis*.

Sparus surinamensis, Bloch, Ausl. Fische, v. p. 112, pl. cclxxvii. fig. 2 (1791).

Geophagus altifrons, Heck. Ann. Mus. Wien, ii. 1840, p. 385.

Geophagus megasema, Heck. t. c. p. 388.

Geophagus surinamensis, Müll. & Trosch. in Schomb. Reise in

Guiana, iii. p. 625; Günth. Cat. Fish. iv. p. 315 (1862); Steind.

Sitzb. Ak. Wien, lxxi. pt. 1, 1875, p. 122; Pellegr. Mém. Soc.

Zool. France, xvi. 1903, p. 198 (1904).

Chromys proxima, Casteln. Anim. Am. Sud, Poiss. p. 14, pl. vii. fig. 1 (1855).

Satanoperca proxima, Günth. t. c. p. 314.

Depth of body 2– $2\frac{1}{2}$ in the length, length of head 3– $3\frac{2}{3}$.

Snout 2-3 in the length of head, diameter of eye $3-4\frac{1}{2}$, interorbital width $3\frac{1}{4}-3\frac{3}{4}$, depth of præorbital $2\frac{1}{5}-3\frac{1}{3}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip not continuous or subcontinuous; cheek with 4-9 series of scales; 11-14 gill-rakers on the lower part of anterior arch. Scales 33-36 $\frac{6-8}{12-14}$, 2 or 3 between lateral line and anterior rays of soft dorsal, those of the thoracic region very small. Dorsal XVII*-XIX 11-12 (13), commencing above the opercular cleft, the spines subequal from the fifth or sixth, the last $\frac{1}{2}-\frac{3}{5}$ the length of head; dorsal fin naked in the young, in the adult with the basal parts of the interradiial membranes covered with small scales. Anal III 7-9. Pectoral $1\frac{1}{3}-1\frac{1}{2}$ the length of head, extending to beyond origin and sometimes nearly to posterior end of anal. Caudal truncate, with the uppermost ray often slightly produced. Caudal peduncle $1\frac{1}{4}-1\frac{1}{2}$ as long as deep. Olivaceous, sometimes with obscure cross-bars, and with a blackish spot on the middle of the side; vertical fins with series of dark spots.

R. Amazon; Guiana.

1. (174 mm.)	—	Sir R. Schomburgk.
2-6. (126-183 mm.)	Surinam.	Mr. Kappler.
7. (150 mm.)	Guiana.	
8-10. (111-233 mm.)	R. Capin, Para.	
11. (88 mm.)	—?	Zool. Society.
12. (99 mm.)	Obidos.	Mus. Comp. Zool.
13. (244 mm.)	Cameta.	Prof. A. Agassiz.
14. (220 mm.)	Manaos.	Mr. J. C. Antony.
15-24. (82-207 mm.)	Teffé.	Dr. J. Bach.

7. *Geophagus jurupari*.

Geophagus jurupari, Heck. Ann. Mus. Wien, ii. 1840, p. 392; Cope, Proc. Ac. Philad. xxiii. 1872, p. 251; Steind. Denkschr. Ak. Wien, xlvi. 1883, p. 2; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 195 (1904).

Geophagus leucostictus, Müll. & Trosch. in Schomb. Reis. in Brit. Guiana, iii. p. 625 (1848).

Satanoperca jurupari, Günth. Cat. Fish. iv. p. 313 (1862).

Satanoperca leucosticta, Günth. t. c. p. 314.

Satanoperca macrolepis, Günth. l. c.

Geophagus (Satanoperca) jurupari, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 120.

Depth of body $2\frac{2}{5}-2\frac{2}{3}$ in the length, length of head $2\frac{3}{4}-3$. Snout $2-2\frac{3}{5}$ in the length of head, diameter of eye $3-4\frac{1}{4}$, interorbital width $3-3\frac{1}{4}$, depth of præorbital $2\frac{1}{2}-3$. Maxillary not extending to below the eye; jaws equal anteriorly; fold

* 19 spines in one specimen only.

of the lower lip not continuous; cheek with 4-7 series of scales; 16 gill-rakers on the lower part of anterior arch. Scales 29-31 $\frac{3\frac{1}{2}-4}{9-10}$, $1\frac{1}{2}$ or 2 between lateral line and anterior rays of soft dorsal, those of the thoracic region small. Dorsal (XIV) XV-XVI 9-10, the spines subequal from the fourth or fifth, the last $\frac{1}{2}$ the length of head. Anal III 6-7. Soft dorsal and anal not scaly at the base; more or less produced. Pectoral as long as or longer than the head, extending to above the origin of anal. Caudal truncate. Caudal peduncle nearly as long as deep. Olivaceous; sides of the head with light blue spots; soft dorsal with alternate light and dark spots; sometimes a dark spot on the upper part of the base of caudal.

R. Amazon; Guiana.

1. (127 mm.) type of <i>S. macrolepis</i> .	Guiana.	Sir R. Schomburgk.
2. (73 mm.)	Lago de Maximo.	Mus. Comp. Zool.
3. (130 mm.)	Coary.	Mus. Comp. Zool.
4. (200 mm.)	Teffé.	Dr. Bach.
5. (220 mm.)	Coary.	Prof. A. Agassiz.
6. Skeleton.	Coary.	Prof. A. Agassiz.

8. *Geophagus brasiliensis*.

Chromis brasiliensis, Quoy & Gaim. Voy. Uran., Poiss. p. 286 (1824).
Chromis unipunctata, Casteln. Anim. Am. Sud, Poiss. p. 13, pl. viii.
fig. 2 (1855).

Chromis unimaculata, Casteln. l. c. pl. vii. fig. 2.

Chromis obscura, Casteln. t. c. p. 14, pl. vi. fig. 3.

Acara brasiliensis, Günth. Cat. Fish. iv. p. 278 (1862).

Acara gymnopoma, Günth. l. c.

Acara obscura, Günth. t. c. p. 281.

Acara unipunctata, Günth. t. c. p. 283.

Geophagus brasiliensis, Kner, Novara Fische, p. 226, pl. x. fig. 3 (1869);

Hens. Arch. f. Nat. 1870, p. 59; Steind. Sitzb. Ak. Wien, lxx. 1874,

p. 511, pls. ii. & iii.; Cope, Proc. Am. Phil. Soc. xxxiii. 1894, p. 106;

Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 192 (1904).

Geophagus rhabdotus, Hens. t. c. p. 60.

Geophagus bucephalus, Hens. t. c. p. 63.

Geophagus labiatus, Hens. t. c. p. 64.

Geophagus scymnophilus, Hens. t. c. p. 65.

Geophagus pygmaeus, Hens. t. c. p. 68.

Geophagus obscura, Pellegr. t. c. p. 193.

Depth of body $1\frac{5}{6}$ - $2\frac{2}{5}$ in the length, length of head about 3. Snout $2-3\frac{2}{3}$ in the length of head, diameter of eye $2\frac{3}{4}-5\frac{1}{2}$, interorbital width $2\frac{2}{3}-3\frac{1}{2}$, depth of præorbital $2\frac{2}{5}-4\frac{1}{2}$. Maxillary extending to below anterior margin of eye in the young, not in the adult; jaws equal anteriorly; fold of the lower lip often continuous in the young, not in the adult; cheek with 4-7 series of scales; 9-12 gill-rakers on the

lower part of anterior arch. Scales 27-30 $\frac{3-4\frac{1}{2}}{9-10}$, $1\frac{1}{2}$ or 2 between lateral line and anterior rays of soft dorsal, those of the thoracic region smaller than on the sides of the body. Dorsal XIV-XVI 10-13, the spines increasing in length to the last, which is $\frac{2}{3}-\frac{1}{2}$ the length of head; soft fin usually with a few scales at the base in the adult. Anal III 8-9. Pectoral as long as the head, extending to above the origin of anal. Caudal rounded. Caudal peduncle nearly as long as deep. Olivaceous, often with light blue spots on the sides of the head and body; a blackish blotch on the middle of the side; in the young a blackish stripe from occiput through eye to angle of præoperculum; spinous dorsal brownish, with or without light longitudinal stripes; soft dorsal and anal with oblique light and dark stripes or series of spots, at least posteriorly; caudal with vertical light and dark stripes. Eastern Brazil.

1. (130 mm.) type of <i>A. gymnopoma</i> .		
2-9. (70-220 mm.)	Bahia.	Dr. Wucherer.
10-15. (110-227 mm.)	Bahia.	Dr. Wucherer.
16-17. (157 and 171 mm.)	Brazil.	Lord Stuart.
18-19. (178 and 199 mm.)	Santos.	Mr. Salmin.
20-22. (95-113 mm.)	R. Parahyba.	Mus. Comp. Zool.
23-27. (93-136 mm.)	Rio Grande do Sul.	Dr. H. von Ihering.
28-32. (93-178 mm.)	Porto Real, Rio Janeiro.	M. Hardy du Dréneuf.
33-34. (157-244 mm.)	Rio Janeiro.	Prof. A. Agassiz.
35. (203 mm.)	Rio Janeiro.	Capt. Milner.

9. *Geophagus crassilabris*.

Geophagus (Satanoperca) crassilabris, Steind. Sitzb. Ak. Wien, lxxiv. 1877, p. 65, pl. vii.

Geophagus jurupari (non Heck.), Vaill. Bull. Mus. Paris, 1897, p. 221.

Satanoperca crassilabris, Jord. & Everm. Bull. U.S. Nat. Mus. xlvii. 1898, p. 1542.

Geophagus crassilabris, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 196 (1904).

Depth of body $2\frac{2}{3}$ in the length, length of head $2\frac{2}{3}$. Snout $1\frac{4}{5}$ in the length of head, diameter of eye 5, interorbital width $3\frac{2}{3}$, depth of præorbital $2\frac{3}{5}$. Maxillary not extending to below the eye; jaws equal anteriorly; lips thick, the fold of the lower not continuous; cheek with 5 or 6 series of scales; 14 or 15 gill-rakers on the lower part of anterior arch. Scales 30-31 $\frac{4\frac{1}{2}}{9-11}$, $2\frac{1}{2}$ between lateral line and anterior rays of soft dorsal. Dorsal XVI 10-11, the spines subequal or only slightly increasing from the fifth, the last $\frac{1}{3}$ the length of head. Anal III 7-8. Dorsal and anal fins scaleless. Pectoral $\frac{2}{3}-\frac{3}{4}$ the length of head, extending to

above the vent. Caudal truncate. Caudal peduncle about as long as deep. Brownish above, yellowish below; traces of 4 or 5 darker cross-bars; fins immaculate.

Panama.

The typical example measures about 190 mm. in total length.

10. *Geophagus pappaterra*.

Geophagus pappaterra, Heck. Ann. Mus. Wien, ii. 1840, p. 396; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 192 (1904).

Satanoperca pappaterra, Günth. Cat. Fish. iv. p. 313 (1862).

Geophagus (Satanoperca) pappaterra, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 120.

Depth of body $1\frac{1}{4}$ the length of head, which is $3\frac{1}{2}$ in the total length (with caudal). Snout convex; eye situated in the upper and posterior part of the head, its diameter 4 in the length of head and $1\frac{1}{4}$ in the interorbital width. Depth of præorbital $1\frac{1}{2}$ the diameter of eye; maxillary not extending to below the eye; fold of the lower lip continuous; cheek with 6 series of scales; 19 gill-rakers on the lower part of the anterior arch; 14 rows of scales between dorsal and ventral fins, of which the middle row comprises 32 scales. Dorsal XV 10, the spines subequal from the third, which is $\frac{1}{2}$ the length of head; soft fin not scaly. Anal III 7. Pectoral as long as the head, extending to above origin of anal. Yellowish, with 7 obscure cross-bars; a broad dark longitudinal band from operculum to base of caudal; fins unspotted.

R. Guapori.

The typical example measures about 200 mm. in total length.

11. *Geophagus daemon*.

Geophagus daemon, Heck. Ann. Mus. Wien, ii. 1840, p. 389; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 197 (1904).

Satanoperca daemon, Günth. Cat. Fish. iv. p. 313 (1862).

Geophagus (Satanoperca) daemon, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 118.

Depth of body $2\frac{3}{5}$ -3 in the length, length of head nearly 3. Snout about 2 in the length of head, diameter of eye 4, interorbital width about 3, depth of præorbital about $2\frac{1}{5}$. Maxillary not extending to below the eye; fold of the lower lip not continuous; cheek with 6-10 series of scales; 19 gill-rakers on the lower part of anterior arch. Scales 32-33 $\frac{4\frac{1}{2}-5}{9-11}$. Dorsal XIII-XIV 11-14, the spines increasing in length to the last, which is $\frac{1}{2}$ the length of head.

Anal III 8. Dorsal and anal fins scaleless. Pectoral as long as the head, extending to above the vent. Caudal peduncle a little longer than deep. Olivaceous; a dark spot on the middle of the side; an ocellus on the upper part of the base of caudal; dorsal with alternate light and dark stripes.

R. Amazon.

The typical example measures 290 mm. in total length.

12. *Geophagus acuticeps*.

Geophagus acuticeps, Heck. Ann. Mus. Wien, ii. 1840, p. 394; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 191 (1904).

Satanoperca acuticeps, Günth. Cat. Fish. iv. p. 312 (1862).

Geophagus (Satanoperca) acuticeps, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 117.

Depth of body $2\frac{2}{5}$ – $2\frac{2}{3}$ in the length, length of head 3 – $3\frac{1}{4}$. Snout $2\frac{1}{3}$ – $2\frac{2}{3}$ in the length of head, diameter of eye $3\frac{1}{4}$ – $3\frac{3}{4}$, interorbital width 3 – $3\frac{1}{4}$, depth of præorbital 3 – $3\frac{2}{3}$. Maxillary not extending to below the eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 5–7 series of scales; 19–21 gill-rakers on the lower part of anterior arch. Scales 30–31 $\frac{4-5}{9-10}$, 2 or $2\frac{1}{2}$ between lateral line and anterior rays of soft dorsal, those of the thoracic region small. Dorsal XIII (XII–XIV) 11–12, the spines subequal or only slightly increasing from the fourth or fifth, the last $\frac{2}{3}$ the length of head. Anal III 7–8. Soft dorsal and anal not scaly at the base, considerably produced. Pectoral longer than the head, extending to above the anal spines. Caudal truncate. Caudal peduncle about as long as deep. Olivaceous; a dark spot on the upper part of the base of caudal; soft dorsal sometimes spotted.

R. Amazon.

1. (140 mm.)	R. Cupai.	
2–4. (80–119 mm.)	Teffé.	Mus. Comp. Zool.
5. (170 mm.)	Teffé.	Prof. A. Agassiz.
6. (220 mm.)	Teffé.	Paris Museum.

HETEROGRAMMA, gen. nov.

Mesops (part.), Günth. Cat. Fish. iv. p. 311 (1862).

Geophagus (part.), Cope, Proc. Ac. Philad. 1872, p. 250; Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 107; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 621.

*Biotodoma** (non Eigenm. & Kennedy), Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 186 (1904).

* Eigenmann and Bray proposed *Mesops cupido* as the type of *Mesops*. Subsequently the name *Biotodoma* was given by Eigenmann and Kennedy

Body moderately elongate, compressed; scales large, ctenoid. Two lateral lines, the upper running obliquely upwards to the spinous dorsal, from which, if complete, it is separated by not more than 1 series of scales for most of its course; posterior part of upper lateral line and the lower line sometimes wanting. Mouth small; maxillary exposed or not; a band of small conical teeth in each jaw; upper surface of head scaly to between the orbits; cheeks and opercular bones scaly; præoperculum entire. A lobe on the upper part of the anterior branchial arch; gill-rakers very few and small, sometimes entirely wanting. A single dorsal fin, with XV-XVI 5-7 rays. Anal with III 6-7. Dorsal and anal fins scaleless. Pectoral asymmetrical, with 11-12 rays. Caudal rounded or pointed. Five or six species from S. America.

Synopsis of the Species.

- I. Lateral lines complete.
 Snout much shorter than eye; last dorsal spine more than $\frac{2}{3}$ the length of head 1. *taniatum*.
 Snout nearly as long as eye; last dorsal spine $\frac{1}{2}$ - $\frac{2}{3}$ the length of head 2. *Agassizii*.
- II. Upper lateral line fully developed on 3-10 scales only; lower lateral line rudimentary or wanting.
 A. Dorsal spines subequal from the seventh; caudal peduncle $\frac{3}{5}$ as long as deep 3. *Borellii*.
 B. Dorsal spines subequal from the fourth; caudal peduncle from $\frac{3}{4}$ to as long as deep.
 Length of head $\frac{1}{3}$ the length of the fish and $3\frac{1}{4}$ times the interorbital width (in a specimen of 38 mm.). A dark stripe from eye to base of caudal; a dark stripe along each series of scales on the lower part of the body 4. *combræ*.
 Length of head $\frac{1}{3}$ the length of the fish and $3\frac{1}{4}$ times the interorbital width (in a specimen of 30 mm.). A dark stripe from eye to base of caudal; an oblique dark stripe from base of pectoral to origin of anal 5. *trifasciatum*.

1. *Heterogramma taniatum*.

Mesops taniatus, Günth. Cat. Fish. iv. p. 312 (1862).
Geophagus (Mesops) taniatus, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 115.

as a substitute for *Mesops*, which is preoccupied. I am quite in agreement with Pellegrin in regarding *M. cupido* as a *Geophagus* and *M. taniatus* and its allies as generically distinct; but the name *Biotodoma* cannot be applied to the latter.

Biotodoma tæniatum, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 187 (1904).

Depth of body $2\frac{3}{4}$ in the length, length of head 3. Snout much shorter than eye, the diameter of which is $2\frac{3}{4}$ in the length of head, interorbital width $3\frac{1}{5}$. Depth of præorbital $\frac{2}{5}$ the diameter of eye. Maxillary extending to below anterior $\frac{1}{3}$ of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 3 series of scales; no scales on the præoperculum; 3 or 4 very small gill-rakers on the lower part of anterior arch. Scales $23\frac{2}{7}$; upper lateral line extending to below posterior part of spinous dorsal, from which it is separated by only 1 or $\frac{1}{2}$ a scale for most of its course. Dorsal XV (XVI) 6 (7), the spines increasing in length to the last, which is more than $\frac{2}{3}$ the length of head. Anal III 6, the third spine slightly more than $\frac{1}{2}$ the length of head. Pectoral a little longer than the head. Caudal rounded. Caudal peduncle $\frac{4}{5}$ as long as deep. A blackish longitudinal band from eye to base of caudal; an oblique blackish stripe from eye to interoperculum; a dark stripe from eye to mouth; membrane between the first 3 dorsal spines blackish; a blackish spot at the base of caudal; soft vertical fins more or less distinctly spotted.

R. Amazon; Guiana.

1. (60 mm.) type of the species. R. Cupai. H. W. Bates, Esq.

2. *Heterogramma Agassizii*.

Geophagus (Mesops) Agassizii, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 111, pl. viii. fig. 2.

Biotodoma Agassizii, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 187 (1904).

Depth of body $2\frac{2}{3}$ –3 in the length, length of head $2\frac{4}{5}$ –3. Snout a little shorter than the eye, the diameter of which is 3 in the length of head and equal to the interorbital width. Depth of præorbital a little more than $\frac{1}{2}$ the diameter of eye. Maxillary extending a little beyond the vertical from anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 3 series of scales; no scales on the præoperculum; 4 very small gill-rakers on the lower part of anterior arch. Scales $23\frac{2-2\frac{1}{2}}{6-8}$; upper lateral line extending to below posterior part of spinous dorsal, from which it is separated by only $\frac{1}{2}$ a series of scales for most of its course. Dorsal XV–XVI 7, the spines only slightly increasing in length after the fifth, the last $\frac{1}{2}$ – $\frac{2}{3}$ the length of head. Anal III 6, the third spine as long as the last of the dorsal.

Pectoral as long as the head. Caudal rounded or pointed. A dark longitudinal stripe from eye to extremity of caudal; an oblique dark stripe from eye to interoperculum, another from eye to mouth; caudal with dark posterior edge; soft vertical fins more or less distinctly spotted.

R. Amazon.

The types described by Steindachner measure up to 55 mm. in length.

In this species, as in *B. Borellii* and probably throughout the genus, the soft vertical and ventral fins are produced in the male.

Geophagus amœnus, Cope, Proc. Ac. Philad. 1872, p. 250, has been placed in the synonymy of *H. tæniatum* by Steindachner and by Pellegrin. However, it has the longer snout and shorter dorsal spines of *H. Agassizii*, which it closely resembles in most other respects, apparently differing in the coloration, the lateral stripe ending in a spot at the base of the caudal.

3. *Heterogramma Borellii*, sp. n.

Mesops tæniatus (part.), Bouleng. Boll. Mus. Torin. x. 1895, no. 196, p. 33.

Depth of body $2\frac{2}{5}$ – $2\frac{3}{5}$ in the length, length of head about 3. Snout shorter than eye, the diameter of which is about 3 in the length of head, interorbital width $2\frac{3}{4}$ – $3\frac{1}{5}$. Depth of præorbital nearly $\frac{1}{2}$ the diameter of eye or less. Maxillary extending to below anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 2 or 3 series of scales; no scales on the præoperculum; no distinct gill-rakers on the lower part of anterior arch. Scales 22–24 $\frac{2\frac{1}{2}}{8}$; upper lateral line fully developed on 2–8 scales only; lower lateral line rudimentary or completely wanting. Dorsal XVI 5–6, the spines subequal from the seventh, the last $\frac{1}{2}$ – $\frac{3}{5}$ the length of head. Anal III 6–7. Pectoral as long as the head. Caudal rounded or pointed. Caudal peduncle $\frac{3}{5}$ as long as deep. Brownish, with darker cross-bars, bearing a series of blackish blotches along the middle of the side; a curved blackish stripe from temporal region through posterior part of eye to interoperculum; an oblique dark stripe from eye to mouth; sides of head with some light blue spots and lines; dorsal and anal with a narrow blackish edge; soft dorsal and anal with a few alternate light and dark spots posteriorly.

In this species the males are characterized by longer and

more slender dorsal spines (the last $\frac{3}{5}$ the length of head) and produced soft fins (except the pectoral), the soft dorsal and anal extending to the posterior part of caudal, the ventral to posterior part of anal, and the middle caudal rays being from more than $\frac{2}{5}$ to nearly $\frac{1}{2}$ the length of the fish (without caudal); in the females the last dorsal spine is $\frac{1}{2}$ the length of head, the soft fin does not extend beyond the middle of caudal, the ventral reaches the anal spines, and the middle caudal rays are $\frac{1}{3}$ to less than $\frac{2}{5}$ the length of the fish.

Upper course of the Paraguay.

1-4. (25-55 mm.) types of the species.	Carandasiñho, Matto Grosso.	Dr. A. Borelli.
5-7. (35-44 mm.).	Colonia Risso.	Dr. A. Borelli.

4. *Heterogramma commbræ* *.

Mesops tæniatus (part.), Bouleng. Boll. Mus. Torin. x. 1895, no. 196, p. 33.

Biotodoma commbræ, Eigenm., M.S.

Depth of body $2\frac{1}{2}$ - $2\frac{3}{4}$ in the length, length of head $2\frac{3}{4}$ -3. Snout shorter than eye, the diameter of which is $2\frac{3}{5}$ - $2\frac{4}{5}$ in the length of head, interorbital width $3\frac{1}{4}$ - $3\frac{2}{5}$. Depth of præorbital $\frac{1}{3}$ the diameter of eye. Maxillary extending to below anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 3 series of scales; no scales on the præoperculum; no distinct gill-rakers on the lower part of anterior arch. Scales 23-24 $\frac{2\frac{1}{2}-3}{8}$; upper lateral line fully developed on 5 to 10 scales only; lower lateral line rudimentary or absent. Dorsal XVI 5-6, the spines subequal from the fourth, the last $\frac{1}{2}$ the length of head. Anal III 6-7 (in one specimen IV 5). Pectoral a little shorter than the head. Caudal rounded. Caudal peduncle $\frac{3}{4}$ - $\frac{4}{5}$ as long as deep. Brownish, with darker cross-bars forming a series of blotches below the dorsal fin; a continuous dark stripe from eye to base of caudal, forming a large blotch on the caudal peduncle; each series of scales of the lower part of the body with a more or less distinct dark

* In reply to a query asking whether the number of spines in the dorsal fin of *Biotodoma trifasciatum* had been correctly stated, Prof. Eigenman kindly wrote to me that the type has 16 dorsal spines. He also sent me photographs of the three Paraguayan species of this genus, viz. *H. Borellii* (named by him *B. tæniatum*), *H. trifasciatum*, and the present species, named *B. commbræ*, which I had intended describing under another name. I have kept back this paper in the hope that his memoir containing the descriptions of these species might be published; but this not having occurred, I have taken his name for this species, which should be called *H. commbræ*, Eigenm.

longitudinal stripe; a dark stripe from eye to mouth and another from eye to interoperculum; dorsal with a blackish edge; posterior part of soft dorsal and anal and middle of caudal sometimes spotted.

Upper course of the Paraguay.

- | | | |
|------------------|----------------------------|-----------------|
| 1. (38 mm.) | Carandasiño, Matto Grosso. | Dr. A. Borelli. |
| 2-5. (24-36 mm.) | Colonia Risso. | Dr. A. Borelli. |

5. *Heterogramma trifasciatum*.

Mesops taniatus (part.), Bouleng. Boll. Mus. Torin. x. 1895, no. 193, p. 33.

Biotodoma trifasciatum, Eigenm. & Kennedy, Proc. Ac. Philad. 1903, p. 536; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 188 (1904).

Depth of body $2\frac{1}{2}$ - $2\frac{3}{4}$ in the length, length of head 3. Snout shorter than eye, the diameter of which is $2\frac{3}{4}$ in the length of head, interorbital width $3\frac{1}{4}$. Depth of præorbital $\frac{1}{3}$ the diameter of eye. Maxillary extending to below anterior margin of eye; jaws equal anteriorly; fold of the lower lip continuous; cheek with 3 series of scales; no scales on the præoperculum; no distinct gill-rakers on the lower part of anterior arch. Scales $24\frac{2\frac{1}{2}}{8}$; upper lateral line fully developed on 7-9 scales only; lower lateral line rudimentary. Dorsal XV-XVI 6, the spines subequal from the fourth, the last $\frac{1}{2}$ the length of the head. Anal III 5-6. Caudal peduncle scarcely deeper than long. Brownish; a dark longitudinal stripe from eye to base of caudal, continued anteriorly from eye to mouth; an oblique dark stripe from eye to interoperculum, another from base of pectoral to origin of anal.

Upper course of the Paraguay.

- | | | |
|-------------|----------------|-----------------|
| 1. (30 mm.) | Colonia Risso. | Dr. A. Borelli. |
|-------------|----------------|-----------------|

The specimen described above appears to have a somewhat smaller head and broader interorbital space than one of *H. commbræ* of the same size. The very different coloration leaves no doubt as to the distinctness of this species.

BIOTOECUS.

Saraca (non Walk.), Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 125.

Biotococcus, Eigenm. & Kennedy, Proc. Ac. Philad. 1903, p. 533; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 199 (1904).

Differs from *Geophagus* and *Heterogramma* in the structure of the dorsal fin, which has VII-VIII 13-14 rays. Lateral line usually rudimentary; caudal slightly emarginate.

A single species from the Amazon.

Biotoecus opercularis.

Saraca opercularis, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 125.

Biotoecus opercularis, Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 199 (1904).

Depth of body $3\frac{2}{3}$ –4 in the length, length of head 3. Snout as long as eye, the diameter of which is $3\frac{1}{3}$ in the length of head and $1\frac{1}{2}$ times the interorbital width. Præmaxillaries protractile, the length of their processes 2 – $2\frac{2}{3}$ in that of the head; maxillary completely sheathed by the præorbital, extending to below anterior margin of eye; lower jaw slightly projecting; depth of præorbital $\frac{1}{2}$ the diameter of eye; cheek with 4 series of scales. Scales 29–30 $\frac{2}{7}$. Dorsal VII–VIII 13–14. Anal III 7. Caudal slightly emarginate, scaly at the base, the upper ray often elongate. Caudal peduncle longer than deep, its length $\frac{1}{4}$ of the length of the fish (without caudal). A dark spot on the operculum, another at the base of caudal; a series of dark blotches on the upper part of the body; anterior and upper edge of spinous dorsal blackish; caudal with alternate clear and dark spots.

Total length about 50 mm.

Lake Saraca, R. Amazon.

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

[Plates II. & III.]

1. On a very young Stage of *Phycis blennoides*, Bl.
2. On the Female Heteronereid of *Nereis pelagica*, L.
3. On Bifid Nemerteans (*Cerebratulus angulatus*, O. F. M., = *marginatus*, Renier?) from Aberdeen Bay and Naples.
4. On *Amphiporus hastatus*, M'Intosh.

1. *On a very young Stage of Phycis blennoides, Bl.*

The example was kindly brought under notice by Dr. J. H. Ashworth, of Edinburgh University, who procured it from the Mediterranean. It was captured by a skilful collector of marine organisms off Messina in April 1905, and it appears that no such specimen has been seen, at any rate, for 25 years.

The little fish (Pl. II. figs. 1 & 2) has a total length of 35 mm., and the vertical diameter of the body at the vent is 3 mm., whilst the long pelvic fins reached a length of 13 mm. No silvery sheen is present in the preparation. The pigment has been removed to a considerable extent by the spirit, but five distinct and broad bars occur along the sides, and traces of a sixth appear at the narrow region in front of the caudal. Moreover, several of these are faintly continued at the ventral surface. The first lies behind the pectoral. The dorsum of the head also shows blackish pigment, and a band of the same pigment extends within the margin of the second dorsal about a third of its length posteriorly, a similar band characterising the border of the anal fin. In both fins the posterior end of the band is broadest. A deep furrow (the lateral line) runs from the caudal to the pectoral along the middle of the body, but anteriorly the mucus-glands leave the furrow about the long diameter of the pectorals behind them, gently slope upward, and then pass straight forward to the head. The same arrangement is met with in the adolescent and in the adult, and also in the young ling.

The pectorals, which are directed obliquely upward, appear to have fewer rays than in the adult, for only thirteen are distinct, a few, however, appear to be fused at the lower border. The first dorsal has 9 rays, and none is specially lengthened; whereas in the adolescent the long whip-like tip of this fin is conspicuous, especially as it has black pigment. This elongation is likewise a feature in the adult, though the fin is proportionally shorter than in the adolescent. The second dorsal has about 78 rays—considerably more than in the type; and the anal has 74, also more than in the adult. In all probability, therefore, fusion of some of these occurs at the anterior or posterior end—if the diagnosis be correct. The caudal presents a series of short rays along the upper and lower edges anteriorly, but these subsequently appear to be so fused as to be indistinguishable. Thus 49 rays can be counted from the one edge to the other, whereas in the adult there are 15–18 rays. The type of tail in the adult, moreover, thus diverges from that of the example from Messina.

The jugular ventral fins have a powerful origin in front of the pectorals, and show 3 rays. They appear to be of nearly uniform diameter for a considerable distance, then about the commencement of the terminal third expand into a fusiform blade with the inner ray projecting as a terminal process. The outer ray is shorter than the rest, and thus a

gradation occurs*. The black pigment is most developed on the posterior surface of the fin, and is especially conspicuous in the expanded portion. The fins are also pigmented ventrally, so that both surfaces are dark. In the adolescent and adult the tips of these rays are long and filiform, and in the former traces of the expansion forming the blade and the pigment are still visible, and to a less extent in some adults, though the fin has altered its type, being stouter at the base and filiform at the tip. In the one case the fin is a balancing organ, whilst in the other it is probably a tactile one. In the young these fins are as long as in the curious Gadoid *Bregmaceros*.

Stout, sharp, recurved teeth occur in the premaxillæ, maxillæ, and mandible. The premaxillæ and maxillæ have an upward slope, and the mandible projects beyond. The eye is proportionally large, and has once and a half the distance behind it that it has anteriorly. A small barbel (much less than in *Motella*) lies in the anterior pit of the mandible.

The young stages of *Phycis* seem to be rare. Mr. Boulenger informs me that the smallest specimen in the British Museum is about 10 centimetres (nearly 4 inches). Risso regarded certain young specimens as a distinct species (*Phycis Gmelini*), and thought they led a solitary life in the shallow water of the littoral zone, whereas the shoals of the adults frequented deeper water with a soft bottom. Lütken † alludes to what he considers the young of *Phycis blennoides*, 28 mm. long, and with ventrals measuring 12 mm., from the neighbourhood of Messina. He is of opinion that *Hypsiptera argentea*, Günther ‡, 24 lines long, which the latter author placed in the Scombridæ, after *Echeneis*, is the larval form of *Phycis mediterranea* from the open sea, and in this Emery agreed with him. Mr. Boulenger, however, states that while it is allied to *Phycis* it is quite a different form. It has a greyish-green back, and the fins are transparent, no mention being made of the coloration of the ventrals, which have 3 or 4 rays, it may be because the pigment had disappeared in the preparation. The ventrals, however, are considerably shorter than in the ling or *Phycis*, so that though allied and a Gadoid, it may not be *Phycis*, and with

* In the 'Scandinavian Fishes' the third ray of these fins in *P. blennoides* is stated to be the longest, the colour of the fin reddish with a dash of yellow, while the free tips are white.

† Videnskab. Medel. Naturhist. Foren. Kjöbenhavn, 1881, p. 252.

‡ Cat. Fishes Brit. Mus. ii. p. 386 (1860).

this view Mr. Boulenger coincides. It agrees with *Phycis* in the condition of the dorsal and anal fins, in the snout, in the elevation of the pectorals, and in the long ventrals being jugular and having 3-4 thread-like rays. It differs from the present form in being silvery with a greyish-green back, in the upper jaw overhanging the lower, in having only six rays to the first dorsal, and in having at this early stage a subtruncated caudal.

It is noteworthy that Couch * was fortunate in securing a young example of *Phycis blennoides* measuring 4 inches in length, which was drawn up in the shell of a living *Pinna* from 40 fathoms, and the outline of this specimen affords an interesting contrast with that from the surface at Messina. In Couch's example of 4 inches the first dorsal has long anterior rays with black pigment, and the proportions of the second dorsal and anal agree with those of the younger form, but the dark pigment of both fins is marginal, whereas it is within the margin in the preparation of the younger. The pectoral is represented as passing to the fifth ray of the second dorsal, and therefore considerably longer than in the younger. The ventrals only reach the anterior rays of the anal and are bifid. The caudal is rounded posteriorly, the tail in the figure being almost lozenge-shaped, a form perhaps partly due to preservation. It would appear, however, to be the slightly modified tail of the younger fish from Messina, and thus differs from the truncated tail of the adolescent and adult at St. Andrews †, though Day in this connexion says "caudal rounded or square." The size of the barbel is considerable, and the upper jaw now projects beyond the mandible. From the diminished proportional size of the eye and other changes the distance in front of the eye is greater in proportion to that in rear of it than in the younger. The maxilla also reaches to a vertical behind the eye. The body is more massive, the depth at the pectorals especially being marked. The lateral line is not indicated. In coloration the specimen was "light grey, anterior portion and end of the first dorsal black, its posterior border bright white, border of the second dorsal and tail black." In the woodcut a black border is also present on the anal, and Day describes the anal as "edged with black with a narrow white outer edge."

Luigi Facciola ‡, in November 1882, described a young

* Brit. Fishes, iii. p. 128, and woodcut, p. 129 (1864).

† *Vide* also Couch, Brit. Fishes, ii. p. 303 (plate).

‡ 'Il Naturalista Siciliano,' Anno ii. no. 2, p. 25.

form of *Phycis belenoides* which he had procured on the 18th February from the same region as the present example, viz. off Messina. If his figure is reliable this has a proportionally deep body, and the first dorsal is separated from the second by a greater interval than occurs in the present example or in the young ling*. The caudal has a straight posterior border, whereas both in the young ling and in the young *Phycis* dealt with here the caudal is rounded, a condition not uncommon in very young postlarval forms, which subsequently may have a straight or nearly straight posterior border to the caudal. The Italian author gives the caudal about 22 rays. The first dorsal apparently has its third and fourth rays longer than the others, and there are 8 in all. The second dorsal has 50 rays; the ventral has 3 rays and extends beyond the vent, an interradiial membrane with black pigment separating the rays, so that in the figure the proportions are those met with in a rockling—the outline forming an elongated triangle. Facciola describes the pectoral as attenuate at the tip, which reaches a vertical from the vent and has 17 rays, the length being thus much greater than in the present form, and the shape is equally divergent. The scales had 4 or 5 concentric lines. The lateral line was indistinct. The general aspect of the fish was silvery with specks of black pigment here and there, and a dark ventral band posteriorly. The swim-bladder had two anterior horns, and there were 30 vertebræ. A barbel of moderate length occurred on the chin. He concludes from the outline of the pyloric appendages (15), the shape of the swim-bladder, the scales, and other particulars that his example was a young *Phycis blenoides*. Further remarks on this example follow.

The account given by the authors of the 'Scandinavian Fishes' of the fry of *Phycis* and the figure just alluded to from the 'Sicilian Naturalist' differ from the present form, for they state that "young specimens of 30–35 mm. are of a silvery mackerel-like colour, resembling the fry of the rocklings. The four or three rays of the long ventral fins are united by a black pigmented membrane as in the fry of the ling." Now the present example is only 35 mm. in length, yet it diverges much from the young *Motella* of the same length, and it would not be possible to spread out its ventral fins as shown in the figure cited, which resembles *Motella* except in the first dorsal. Either the specimen

* M'Intosh & Prince, Trans. R. S. E. vol. xxxv. pl. xviii. figs. 3 & 4.

figured is a much earlier stage than the present example from Messina, or the latter is not a *Phycis*. The present specimen resembles the young ling figured in the "Researches"* in general aspect, in the rounded condition of the first dorsal, and the distance which a vertical from the vent is behind the commencement of the second dorsal. For both of these, as well as the present, the position of the vent places the commencement of the ventral further back than in the adult ling, so that it might be supposed the young fork-beard was dealt with rather than the young ling—especially as the rays in the long ventrals are so few (3-4). These fins, however, in the young ling never attain the tenuity of those in the fork-beard, and the outline of the body of the ling is less slender, and the barbel in the ling of the same length or even less is longer. Additional specimens, however, are required to clear up all the features. In a young ling of 3 inches the first dorsal has 14-15 rays, and the second dorsal 63-66. The ventrals have considerably more rays than in *Phycis*. Moreover, the localization of the expanded region to the commencement of the terminal third in the latter (*Phycis*) is diagnostic. The present young example from Messina differs from the adult, again, in the absence of elongated rays in the first dorsal, in which it agrees with *Phycis mediterranea*, from which, however, it differs in having longer ventrals. It differs from the adult in the projection of the mandible beyond the premaxillæ, but a similar difference might with equal reason be urged in the case of the young haddock, in which the mandible in the very young projects beyond the upper jaw, the reverse obtaining in the adult, which has an underhung lower jaw. The longer rays of the first dorsal probably become conspicuous at a later stage—just as the form of the tail alters from the rounded to the truncated condition. While agreeing with *Phycis mediterranea*, as already stated, in the first dorsal, it differs from it in the much longer ventrals, since they extend far beyond the origin of the anal, in the greater number of rays in the second dorsal and anal fins, in the shorter barbel, and in the colour of the ventrals, which is stated by Dr. Günther to be "brownish immaculate." In the 'Scandinavian Fishes' it is stated that a large round spot of dark brown occurs about the middle of the dorsal fin in young specimens. This has not been observed in the very young or adolescent.

It would appear that some adult examples are of a more

* M'Intosh & Prince, Trans. R. S. E. vol. xxxv. pl. xviii. figs. 3 & 4.

elongated outline than others, and one of these is figured by Couch* as the "Blennoid Fork-beard." In this instance the ventral fins scarcely reach the vent.

2. *On the Female Heteronereid of Nereis pelagica, L.*

In a former note on the British Nereids † it was stated that, though Ehlers had recorded a heteronereid female of *Nereis pelagica*, only male heteronereids had hitherto come under examination at St. Andrews. This uncertainty has now been removed by the occurrence from September to February of the earlier stages formerly mentioned, and about this period and somewhat later of the fully developed heteronereid female. Indeed, it is possible that in some localities the change may occur earlier, since two examples of a female heteronereid, apparently of this species, were procured by Mr. Gray in October 1904 in the stomach of a salmon at Berwick-on-Tweed.

Before the heteronereid condition is developed, the female *Nereis pelagica* is distinguished by the lustrous deep brownish or bronzed colour formerly mentioned, and the size is frequently larger than that of the male. As the ova develop and distend the posterior region the latter assumes a somewhat pale hue and by-and-by also the body generally becomes somewhat shorter and broader from contraction. The change of colour does not at first much affect the general aspect, and no sign of alteration in the structure of the feet is visible externally, but they are highly vascular—the dorsal edge of each being connected with the body by a reticulated bar of blood-vessels. The eggs at this stage are dull reddish and minutely granular, and have none of the large globules of a subsequent stage; moreover, in the lustrous brown condition of the adult they are more minute. The eyes as yet show no perceptible change.

The next stage is characterized by the lustrous pale greenish condition of the body from the 20th foot backward, whilst the brownish-olive hue remains in front. The head has a pale trifold mark between the eyes, the median spur going forward. The eyes do not show marked alteration, but the anterior dorsal cirri have a slight enlargement at the base.

* *Op. cit.* pl. cliv.

† *Ann. & Mag. Nat. Hist.* ser. 7, vol. x, p. 256 (Sept. 1902).

The pale region is loaded with greenish-white ova measuring $\frac{17}{100}$ mm. The vascularity of the feet is pronounced.

Then the deep brownish or olive colour anteriorly gives way to a paler greenish brown, the posterior region becoming still more pale as the eyes enlarge. Various isolated and fixed black specks appear, but whether in the gut or body-wall is not clear. The pallor makes the blood-vessels of the feet and the dorsum conspicuous. The head and anterior region retain in some the brownish hue mingled with green for some time, but the tentacles and tentacular cirri are pale greenish.

At a further stage (24th February) the anterior region of 19 segments is olive-green, and the palpi, tentacles, and tentacular cirri pale green, the head itself being olive with the white trifid mark posteriorly. The pelagic posterior region is developing and its colour is pale, while the feet are vascular. The ova are pale greenish with numerous large globules amongst the smaller.

The epitokous females hitherto observed are about the size of the males, though one or two are larger, and all possess the triradiate band between the eyes and a pale peacock-green colour anteriorly. The first five dorsal cirri are enlarged at the base, and the ventral cirri of the same feet are slightly swollen. In the altered posterior region the dorsal cirri are also somewhat dilated towards the base (ceratophore), and have inferiorly on the enlarged region low papillæ or warts—to which groups of stalked infusoria and also slender filaments of algæ adhere. Thus, although the prominent row of papillæ which projects from the lower edge of the cirrus in the male is absent, there is a tendency to such growths. The ventral cirri present even a more marked tendency to these growths, about four prominent cones being found on the ventral edge, and they also have infusoria and algæ. The swimming-bristles in the posterior region are very large.

Ventrally the same marked distinction between the anterior and posterior regions of the body occurs as in the male, the anterior region being pale—a slightly greenish shade only being visible in the head-region, whereas the posterior is of a deep pinkish purple. This hue is apparently not due to the muscles, as during the movements of the animal the intensity varies, as if from vascular changes.

3. *On Bifid Nemerteans* (*Cerebratulus angulatus*, O. F. M., =marginatus, Renier?) *from Aberdeen and Naples.*

The occurrence of a bifid Nemertean is by no means common; indeed, during the examination of many hundreds in various groups such a condition was unknown. It was, therefore, with much interest that an example of *Cerebratulus angulatus* (Pl. III. fig. 1) with a bifid tail was received early in 1904 from Dr. Charles H. Williamson, M.A., of the scientific staff of the Fishery Board for Scotland. The specimen was obtained by a liner attached to a hook in Aberdeen Bay in November 1903, and it is noteworthy that all those captured in St. Andrews Bay had been hooked when feeding on the mussels used as bait. One exception only need be alluded to, viz. the case of a very large example which, in a contracted state at the surface, on a warm and calm morning, resembled a sole. The fisherman stretched out his hand-net to capture it, and instantly, to his astonishment, it shot out more than a yard in length. When brought to the Laboratory it, like its predecessors, swam swiftly and gracefully through the water, with an undulatory motion—from above downwards—just as an eel does laterally. This pelagic habit has also been noticed in foreign representatives of the genus. Thus the late talented young zoologist Mr. F. P. Bedford, whose early death was a great loss to science, caught various examples of *Cerebratulus natans*, R. C. Punnett*, swimming in shallow water at night, and observed them near the bottom by day. The bifid tail in the present case would certainly, at any rate, not interfere with this natatory habit, for the “flukes” are both broad and short and might even increase the powers of the animal in this respect. It thus differs from an interesting example Mr. Punnett procured at Naples in January (Pl. III. fig. 2), in which the bifid region was considerably longer than the normal anterior part. Mr. Punnett kindly sent me his notes and figures of this specimen, and these will be alluded to shortly.

The length of the example from Aberdeen is 30·7 centimetres. In its contracted condition (Pl. III. fig. 1) the anterior third is massive, pointed at the snout, and diminishing posteriorly to a flattened body with its thin margin. It tapers gently to the bifurcation, where its transverse diameter is 18 mm. The left limb of the fork, which comes off at right angles to the main axis, is the larger and longer,

* Q. J. Mic. Sc. vol. xlv. N. S. p. 122.

measuring 30 mm. from the edge of the main trunk, and about 27 mm. in breadth at the base (*i. e.* next the main axis), the tip being slightly tapered and rounded. The process is marked dorsally by three transverse constrictions, which divide it into four pseudo-segments.

The right limb of the fork is more oblique, its right border measures 30 mm. from the main stem, but its left is only about 25 mm. Two transverse wrinkles make three pseudo-segments.

The under surface of each of the limbs of the fork is marked by a median ridge prolonged to the ventral surface of the main trunk.

Mr. Punnett's specimen was fresh when examined, and thus was preserved in fairly good condition. He observes:—

“When it reached me it was unfortunately already moribund and did not allow of any observations being made upon its method of locomotion. After narcotisation with a 1 per cent. solution of choral hydrate in sea-water a sketch was made and measurements taken:—

“Length of unpaired anterior part	7	cm.
„ right posterior part	9·3	„
„ left posterior part	11	„

“The right posterior portion was, however, broken off, and probably when entire was slightly longer than the left, since its cross section near the point of bifurcation is rather greater. The worm was then fixed in a saturated solution of corrosive sublimate and sections were cut across the forked part. These were reconstructed into the diagrammatic figure given [Pl. II. fig. 3].

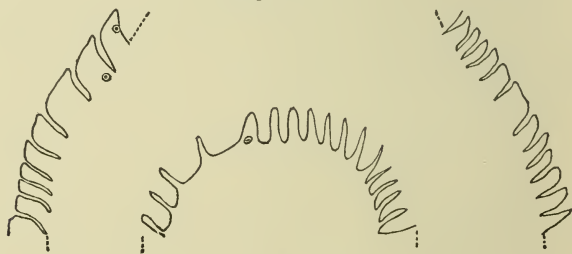
“From this it will be seen that the median organs, *i. e.* the gut, the dorsal blood-vessel, and the rhynchocoelom, bifurcate, whilst the lateral nerve-cords and blood-vessels of the anterior end are continued down on the outer sides of each of the two posterior portions. It is worthy of note that the neurochords, characteristic of this group of Nemertines, were found along the outer nerve-cords of the two posterior ends, but were lacking in the inner cords.

“A subsequent dissection of the anterior end showed that the proboscis was present and more or less coiled up. Its length even in the state of contraction following preservation was 10·5 cm., *i. e.* considerably greater than the length of the rhynchocoelom before its bifurcation. It showed, however, no trace of division.

“The animal in question was a female and a few ova were observed scattered irregularly in the mesodermal tissue both dorsal and ventral to the gut. They were not regularly arranged between the pockets of the gut, but possibly this may have been due to the fact that sexual maturity does not occur in this species until several months after the date of the capture of the abnormal specimen in January.

“A slight irregularity may be noticed with regard to the arrangement of the gut-pouches. In the normal *Cerebratulus* these correspond on each side and are directed somewhat anteriorly. Such was found to be the case in the anterior portion. Below the point of bifurcation, however, they became irregular in arrangement, and whilst those of the outer sides of the two posterior parts were still directed anteriorly, those of the inner sides were directed in the opposite direction (fig. 1).

Fig. 1.



R. C. P.

Gut-pouches at fork.

“Such being a brief description of the internal arrangements, two points seem to call for special attention:—

“Firstly, the fact that there are no neurochords in the third nerve-cord does not agree with the only other case in which their behaviour in such an abnormality has been observed. In a specimen of *Lumbriculus variegatus* noted by Cori, each of the three neurochords divided into two, one part going to each posterior division. But whereas *Lumbriculus* is a Chaetopod with the nerve-cords closely apposed, in the Nemertine they are widely separated.

“The second point concerns the rhynchocœlom. As is well known, this arises from a cleft appearing in the mesoderm, which has grown round the unpaired ectodermal invagination, which is destined to give rise to the epithelium of the protruded proboscis. It seems a little remarkable that, whilst that part which grows on to the unpaired ectodermal invagination should remain single, the portion of

the mesoderm forming the outer wall of the rhynchoœlom should bifurcate.

“As to the cause of such an abnormality, several alternatives have been suggested by Williamson* in discussing a similar case which occurred in a specimen of *Lumbricus*. The alternative suggestions are :

- “ (1) Embryonic formation.
- (2) Median division.
- (3) A lateral wound.

“Except the doubtful case of a *Polygordius*-larva cited by Ritter, there is little evidence to support the first view, though the experimental production of spina bifida in frog-embryos may be mentioned here (Morgan).

“The second view may be rejected, owing to the extreme improbability of an injury ever passing exactly through the median line.

“Williamson himself leans to the third view, which supposes that the gut is damaged, forming a new and shorter passage for faecal matter. Irritation is set up at the injury, resulting in cell-proliferation and a downward growth of the various organs into the bud. Such a view would explain the arrangement of the nerve-cords and neurochords; but it is difficult to understand why a medially-situated organ, such as the rhynchoœlom or dorsal vessel, should grow down. Moreover, such an explanation will not account for many cases in other groups, such as a bifid tail in *Lacerta*, where the gut ends before the point of injury.

“The supposition that it is due to an ordinary transverse breakage, under certain unknown conditions, seems as feasible as any other explanation. It must be assumed that this occurred behind the proboscis, but in front of the posterior end of the rhynchoœlom, in order to account for the bifid condition of the latter †.

“Such a view receives a certain amount of support from some recent experiments of T. H. Morgan, who investigated the regeneration of the earthworm after transverse section. In three cases the worm produced a bifid tail (with two vents) on regeneration; but nothing is said about the arrangement of the internal organs.

* Ann. & Mag. Nat. Hist. ser. 6, vol. xiii. p. 217.

† “This view, of course, leads one to regard the inner nerve-cord of each of the two ‘tails’ as a structure which has arisen *de novo*, and not in continuity with the original nerve-cords. The absence of neurochords in them is not opposed to such a view, though perhaps the ‘excrescence’ idea is more in keeping with the little that is actually known.”—R. C. P.

“Such experiments, however, refer to segmented animals; whilst one of the most interesting points about this specimen is that it is a case of bifidism occurring in an animal which does not exhibit the phenomenon of metameric segmentation. Possibly the experimental study of regeneration among the Nemertines might throw some light on an instance such as this.”

In the example from Aberdeen the bifid tip is beyond the region of the proboscidian sheath. The alimentary canal is thus the sole chamber which becomes bifid, and much of it has fallen out from imperfect preservation, so that only the body-wall and the gut-pouches appear in sections*. It is evident, however, that the inner nerves appear, as Mr. Punnett describes, within the arch of the fork, and pass to each limb, whilst the original nerves continue their course externally. A brief examination of the structure of the inner nerves (that is, those placed on the inner border of each fork) revealed no very evident distinction from the outer trunks, the nervous structure of the sheath apparently having similar elements in both. The tissues, however, may have been altered by the imperfect preservation, and yet, in a specimen so large, even a slight difference in the neurochords would have been noted.

The Mediterranean *Cerebratulus marginatus*, Renier (1804), which Burger identifies with the *Cerebratulus angulatus*, O. F. Müller, of the ‘British Nemerteans,’ presents marked differences in coloration from the British form, and is also much smaller, but such may be due to variation. Burger does not allude to O. F. Müller’s form in this connexion.

4. *On Amphiporus hastatus*, M'Intosh.

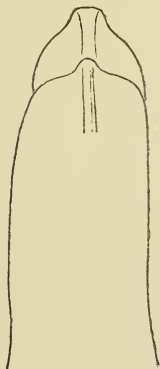
The occurrence of a very fine example of *Amphiporus hastatus*, M'I., affords an opportunity for a few additional remarks on its aspect and structure. It was found by the experienced attendant at the Laboratory (A. W. Brown) whilst digging for littoral forms near low-water mark, in sand near the Burn-stools (rocks), and in the same line of beach in which rare Nemerteans and Annelids have so often been obtained. It was in a tube of mucus and sand, sufficiently

* For these sections I am indebted to Dr. J. R. Tosh and Mr. R. M. Craig, who carried out the somewhat difficult task of following the structure of the separate tails.

consistent to withstand the vicissitudes of capture. The example is considerably larger than that obtained in Shetland, measuring between 3 and 4 inches, and at first sight resembled a very large *Amphiporus lactiflorens*, Johnston. The general colour was that of the human skin, or pale yellowish pink, with a reddish hue at the ganglia and a faint reddish line on each side in the line of the nerves. The mid-dorsal region was flaccid, from the subjacent fluid in the proboscidian chamber, whilst on the ventral surface of the posterior third a series of pale and closely arranged frills or pinnæ indicate the glandular cæca of the gut. The skin had the usual soft creases and folds, and secreted transparent mucus in abundance.

The large size of the specimen enables the minute structure of the head to be more fully described. As formerly indicated, the snout is separated by a curved line (fig. 2) from the succeeding region, and has a whitish prominent ridge in the

Fig. 2.



W. C. M.

median line anteriorly with a longitudinal groove marked by dark pigment, the tip especially being blackish, with a continuation on each side along the ventral edge. The median ridge at the tip often gives the impression of a bicornuate snout, but such is merely due to the mobility of the parts. A portion behind the cephalic furrow, as well as that in front of it, is distinguished by its pallor from the rest of the body. Though interrupted by the furrow at the boundary, the median dark streak is continued a short distance backward on the dorsum. The furrow has a peak directed forward in the centre, and a backward and a forward (or O G) curve on each side, and then passes to the ventral surface, where it curves to the sides of the mouth and ceases. A median

dark band indicates the mouth and is continued a short distance behind it.

Since the original description in 1873 *, an account of the species under the name *Cosmocephala cordiceps*, M. Sars, has been published by Jensen † from the MS. of the elder Sars, who found an example at low water in March 1837, and who left excellent sketches of the animal and of the dorsal and ventral surfaces of the snout ; so that there can be no doubt that this indefatigable and experienced naturalist had the same form before him, though his example was less massive than the present. These figures of the external characters are in contrast with Burger's, which only indicate the general reddish stone-colour and a pointed snout without differentiation. His description of the cephalic grooves and furrows coincides in most respects with the foregoing account, though the somewhat cruciform arrangement of the pale streaks in front of the ventral aspect of the snout and the pale marginal line ‡ were not marked in the British forms. From the description of Girard § it would seem that the genus *Cosmocephala*, Stimpson, would include the present form, which, however, may be left under the genus *Amphiporus*. Representatives occur on the coast of the United States and at Behring's Strait, as well as in Europe, if the American authors are correct in their diagnosis. Sars's example appears to have been more deeply pigmented on the dorsum than either of the British or than the reddish type found by Joubin. Hubrecht, again, found it at Naples, while Girard met with it on the N. American shores (his *Hallezia hastata*) and Joubin in 35 metres off Roscoff. Burger || observes that it is not uncommon at Naples.

The anterior region of the proboscis is slightly pinkish, and the stylet-region, as in the Zetlandic example, had four stylet-sacs in a horizontal plane, each having two stylets, one with a finished "head," the other about as long but with an incomplete "head."

In sections ¶ towards the tip of the snout, two and sometimes three large vascular chambers occur in the centre, apparently over the mouth. The fibres surrounding these pass off or radiate into the tissues, which are highly con-

* Brit. Annel. : Part I. Nemerteans, Ray Soc. p. 162.

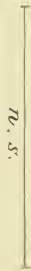
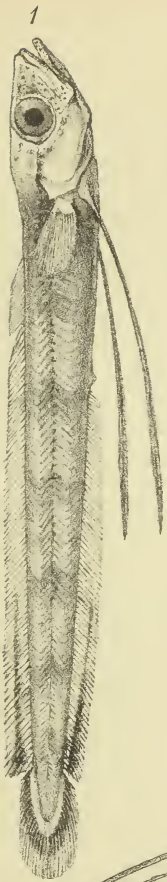
† Turbell. ad lit. Norvegiæ, Bergen, 1878, p. 82, tab. viii. figs. 13-16.

‡ Jensen, pl. viii. fig. 16.

§ Ann. des Sc. Nat. 7^e sér. tom. xv. p. 248.

|| Die Nemert. Neap. p. 563, Taf. 2. fig. 20 (1895).

¶ Mr. R. M. Craig kindly made sections of this species.



3

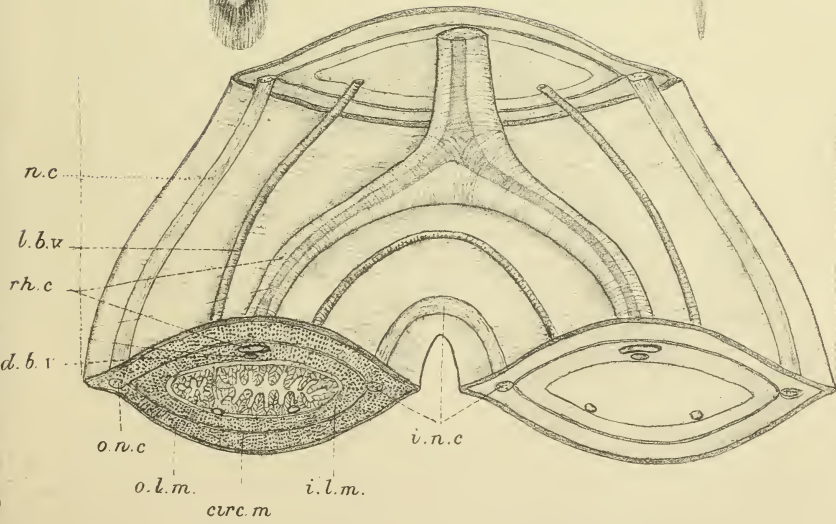
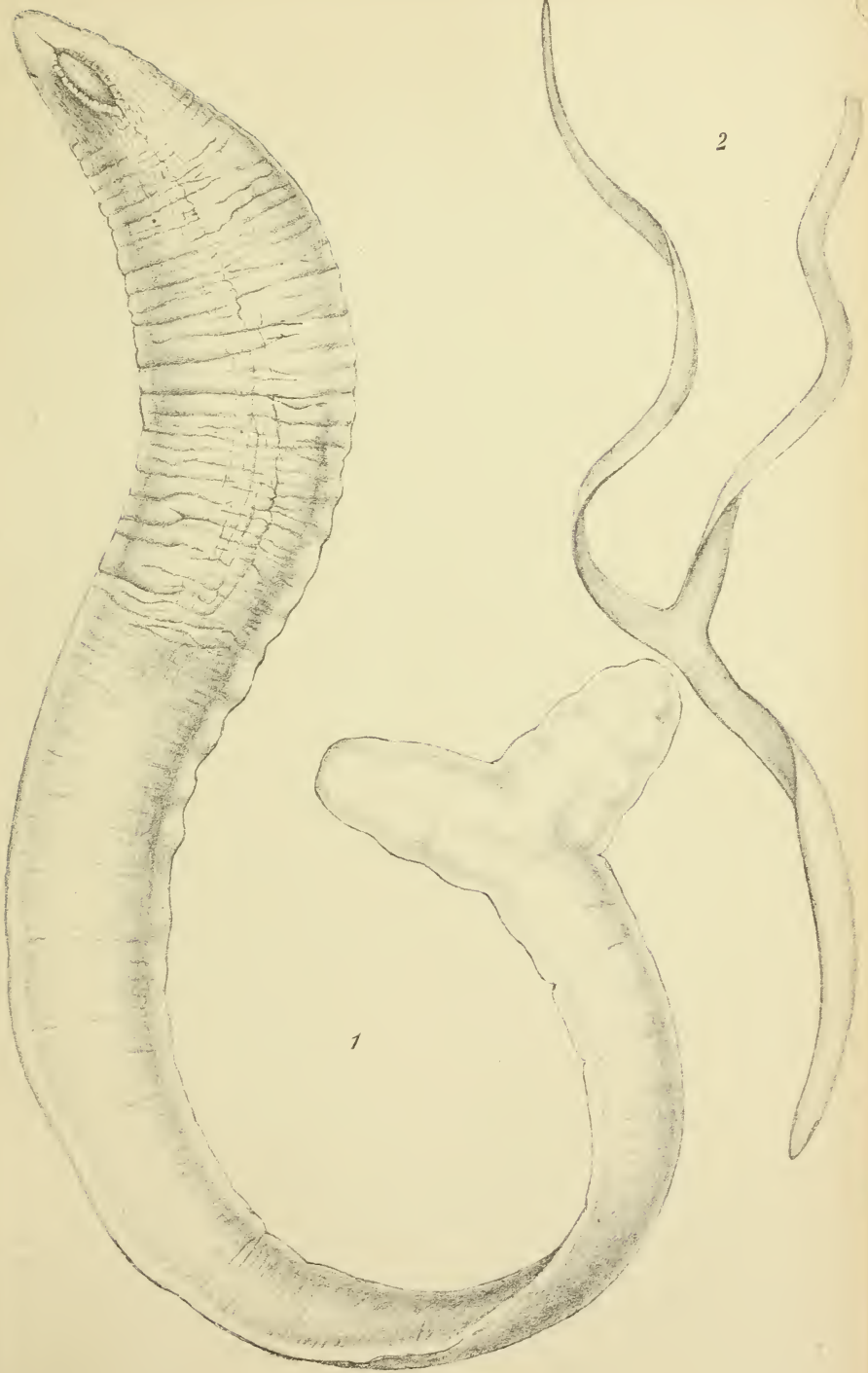


Fig 1 & 2. A.W. del. Fig 3. R.C.P. del.

Highley, lith. & imp.



tractile, so that the movements of the region will affect these channels, especially as the stroma is lax. Towards the commencement of the lateral nerve-cords, the vascular trunks are found at their inner borders, and in some sections more than one trunk occurs on each side at the commencement. The hypoderm and basement-tissue of the snout are largely developed, the basement-tissue especially being massive in the œsophageal region, where it is more bulky than the circular muscular coat within it. So far as can be observed in sections of the anterior region of the proboscis, the nerves (elastic layer, M.I.) are at least 14 in number*. The cerebral organs are in front of the ganglia, and the gut-pouches do not come forward to the brain, the succeeding region, as in *A. lactiflorens*, being occupied by the thick-walled œsophageal section of the alimentary apparatus.

EXPLANATION OF THE PLATES.

PLATE II.

- Fig. 1.* Lateral view of the very young *Phycis blennoides*. Enlarged.
Fig. 2. Ventral view of the foregoing. Similarly enlarged. The expansions of the ventral fins are indicated towards the tip. The straight line indicates the natural size of the example.
Fig. 3. Restoration of the parts at the fork of the *Cerebratulus* from Naples, by Mr. R. C. Punnett, M.A. (Cantab.). $\times 15$ diams.
circ.m., circular muscular fibres; *d.b.v.*, dorsal longitudinal vessel; *i.l.m.*, inner longitudinal muscular fibres; *i.n.c.*, inner nerve-cords; *l.b.v.*, lateral blood-vessel; *n.c.*, outer nerve-cords (ordinary); *o.l.m.*, outer longitudinal muscular layer; *o.n.c.*, outer nerve-cord of bifid region; *rh.c.*, proboscis-sheath.

PLATE III.

- Fig. 1.* Bifid *Cerebratulus angulatus*, sent by Dr. C. H. Williamson from Aberdeen Bay. The left side shows the ventral aspect with the mouth in front, whilst the bifid tail is viewed from the dorsum. About natural size.
Fig. 2. Bifid *Cerebratulus "marginatus"* from Naples. The figure (which is inverted) is copied from a water-colour by Mr. R. C. Punnett.

VIII.—On the Generic Arrangement of the Australian Rats hitherto referred to *Conilurus*, with Remarks on the Structure and Evolution of their Molar Cusps. By OLDFIELD THOMAS.

IN connection with the working out of some Australian Muridæ recently received by the British Museum through the generosity of Sir William Ingram and the Hon. John

* These were best seen in sections of the proboscis by Dr. Tosh.

Forrest, I have had occasion to examine the generic position of the little rat I described in 1889 * as "*Mus*" *argurus*, and, for comparison with that, of all the species hitherto referred to the group of the Jerboa Rats—*Conilurus*.

Without much inquiry into their dental structure, all the Australian long-eared rats were placed by earlier writers in the genus "*Hapalotis*," which was founded by Lichtenstein on the species *H. albipes*. The name, however, being pre-occupied, was rightly superseded by J. D. Ogilby, in 1892 †, in favour of that of *Conilurus*, W. Ogilby, founded on the same well-known species.

In 1898 Mr. Waite, of the Sydney Museum, observing the striking peculiarity of the feet of *Conilurus longicaudatus* and other allied species, separated off the jerboa-footed forms under the name of *Podanomalus*, while he gave to another jerboa-footed form, *C. cervinus*, the generic name of *Thylacomys*, which, being preoccupied, he afterwards altered to *Ascopharynx*.

But in doing so Mr. Waite did not notice that Lesson had already given the name of *Notomys* to the "*Dipus Mitchelli*" of Ogilby, one of the jerboa-footed species, and therefore *Podanomalus* becomes a synonym of *Notomys*. Moreover, as *cervinus* agrees both in dental and pedal structure with *Mitchelli* and *longicaudatus*, I am not at present prepared to consider its possession of a gular pouch as a character of generic importance, and should therefore also place *Ascopharynx* as a synonym of *Notomys*.

But it has not been hitherto noticed that, besides the difference in foot-structure that separates *Notomys* from all the other jerboa rats, there are found in the group two quite different types of molar teeth, the differences being similar to those which separate *Micromys* from *Mus*, but even more distinct and sharply defined.

For while, as shown in Mr. Waite's figures, the species of *Notomys* and both *Conilurus apicalis* and *murinus* have the same number of molar cusps as *Mus*, *C. albipes*, *penicillatus*, *hirsutus*, and certain other species have those described in my "*Mus*" *argurus*, i. e. three inner cusps to both m^1 and m^2 , a postero-internal cusp being present which is absent in *Mus*. This type of tooth was figured in my paper on *Mus argurus*, and proves to be so constant throughout a number of species that it should clearly be considered as of generic importance. The resemblance of the teeth of *Mus argurus* to those of

* Ann. & Mag. Nat. Hist. (6) iii. p. 433 (1889).

† Cat. Austr. Mamm. p. 113 (1892).

Conilurus hirsutus was noted when I described the former, but I did not then carry the investigations as far as I should have done.

By this character, then, *Conilurus apicalis* and *murinus* are at once separable from all the other rat-footed members of the group, and are brought into the neighbourhood of true *Mus*, to which, through *M. lineolatus*, they are very closely allied.

Indeed it might be thought that they should actually be referred to *Mus*; but as it is an advantage to separate from that protean genus as many species as possible, I would consider the long ears of these two species as indicating generic distinction (as has always hitherto been done), and would propose for them the special name of *Leporillus*.

Then among the species with three internal cusps to the molars I find two types of skull-structure. In one group, consisting of *Conilurus albipes* and *penicillatus*, the skull is highly modified in shape, as has been described by previous writers, while in the other, to which the species *hirsutus*, *macrurus*, *pedunculatus*, and *argurus* belong, it is very much as in ordinary rats. For this latter group I would suggest the name of *Ammomys*.

These conclusions may be tabulated as follows:—

I. NOTOMYS.

Type.

<i>Notomys</i> , Less. N. Tabl. R. A., Mamm. p. 129 (1842)	<i>N. Mitchelli</i> , Ogilb.
<i>Pedanomulus</i> , Waite, Proc. Roy. Soc. Victoria, x. p. 117 (1898)	<i>N. longicaudatus</i> , Gould.
<i>Thylacomys</i> , Waite, t. c. p. 121 (1898) (nec Blyth, 1841)	<i>N. cervinus</i> , Gould.
<i>Ascopharynx</i> , Waite, Ann. & Mag. Nat. Hist. (7) v. p. 223 (1900)	<i>N. cervinus</i> , Gould.

Teeth practically as in *Mus*; no postero-internal cusp on the molars, along the inner edge of whose series there are therefore only 6-7 cusps. Skull considerably modified; anterior edge of zygoma-root deeply concave. Hind feet lengthened, their pads reduced in number to three or four, usually three.

Species: *N. Mitchelli*, *cervinus*, *longicaudatus*, and *Richardsoni*.

II. LEPORILLUS.

Genus novum Type: *C. apicalis*, Gould.

Molars, as in *Conilurus*, without postero-internal cusps.

Skull very much as in *Mus lineolatus*. Hind feet normal, with the usual six pads.

Species: *C. apicalis* and *murinus*.

The gradation of this genus, from *C. apicalis*, through *C. murinus*, *Mus lineolatus*, and *Mus Higginsi*, into true *Mus*, affords an interesting study in evolution. Whether the *Mus lineolatus* group should not also be subgenerically separated from the ordinary species of *Mus* is a question which may have to be considered later.

III. AMMOMYS.

Genus novum Type: *A. hirsutus*, Gould.

Teeth as figured in *Mus argurus*; a distinct and well-defined postero-internal cusp on each molar, so that along the inner edge of the full molar series there are 8-9 cusps. Skull rat-like in general form, a well-developed coronoid process on the mandible. Hind feet normal, with six pads. Mammæ, so far as known, 0-2=4.

Species: *A. hirsutus*, *macrurus*, *pedunculatus*, and *argurus*.

IV. CONILURUS.

Type.

Hapalotis, Licht. Darst. Säug. text to pl. xxix.

(1829) (nec Hübner, 1816) *C. albipes*, Licht.

Conilurus, Ogilb. Tr. Linn. Soc. xviii. p. 124 (1838). *C. albipes*, Licht.

Teeth and foot-structure as in *Ammomys*. Skull highly modified, broad, flattened, the interorbital region concave, the palatal foramina enlarged, and the mandibular coronoid process and incisive capsule reduced or absent.

Species: *C. albipes* and *penicillatus*.

Of the other species described as members of this group, *arboricola*, Krefft, is a *Mus rattus*; *personatus*, Krefft, also probably belongs to *Mus*; and *caudimaculata*, Krefft, and *papuanus*, Ramsay, to *Uromys*.

With regard to the development and evolution of the additional postero-internal cusp on the molars, Dr. Winge, our greatest authority on the subject, when treating* of its presence in *Micromys*, has considered that it is a new development, the two original internal cusps (numbered by him on his general scheme "6" and "7") having been pushed forward

* "Græske Pattedyr," Vid. Medd. For. Copenhagen, 1881, p. 17 (under "*Mus mystacinus*'"), and 1882, pl. iii. fig. 10.

to form the present antero-internal and median internal cusps. However this latter point may be—and even after having had the advantage of discussion with Mr. Knud Andersen over Dr. Winge's theories I still find it difficult to believe—I certainly think the postero-internal cusp cannot be explained as he supposes. He would call it 5 *c*, on the ground that it represents an off-splitting of the inner corner of the main central posterior cusp "5" of the tooth as found in typical *Mus*, and is therefore of very recent origin. But if we consider the distribution of the forms which possess it, scattered as they are about the Old World—*Micromys* in the Palæarctic region, "*Mus*" *arborarius* and *rutilans* in Africa, *Crateromys* and *Lenomys* in the Philippines and Celebes, *Pogonomys* and *Hyomys* in New Guinea,—it seems impossible to believe that these forms have all in widely separated localities independently developed exactly the same structure from a type, as I suppose, so advanced and certainly so dominant as *Mus*. It would rather appear natural to suppose that (even if a later growth as compared with the very primitive Cricetine series of Muridæ) it is an early development within the true Murinæ, occurring here and there in the group, and has then been reduced in some forms and lost in others, among which latter would be the dominant and highly developed genus *Mus*.

Dr. Winge has shown himself such a genius in disentangling the complicated homologies of molar cusps that it is with much diffidence that I put forward this modification of his views about this postero-internal cusp, which, for purposes of discussion and not to prejudge the question, might be called the *x* cusp. I would only recall that nearly all the forms in which it occurs have been either discovered or had their tooth-structure described since he wrote his work on the subject, and that he therefore had *Micromys* alone to examine, and was without the opportunity of considering the very important argument from distribution and occurrence in otherwise widely separated forms which I have now ventured to bring forward.

That many of the small additional cusps found in such multicuspid Muridæ as *Leggada*, *Chiruromys*, and others are recent supplementary additions, as Dr. Winge supposes, I would freely admit; but I do not think this to be the case with the interesting *x* cusp, which is in Australia the diagnostic mark of *Ammomys* and *Conilurus*.

IX.—*A new Aquatic Genus of Muridæ discovered by Consul L. Soderström in Ecuador.* By OLDFIELD THOMAS.

AMONG a further consignment of small mammals which the British Museum owes to the generosity of Consul L. Soderström, of Quito, there occurs a most interesting new form, the type of the following description:—

ANOTOMYS, gen. nov.

External characters as in *Ichthyomys*, but ear-conch quite rudimentary and the ear-opening itself a mere minute slit. Fur exceedingly rich and velvety, almost wholly composed of wool-hairs. Feet strongly fimbriated.

Skull with the brain-case smooth, round, and inflated, like that of a young non-aquatic Murine, not flattened as in *Ichthyomys*. Muzzle set on in a peculiar manner, appearing to be bent upwards owing to the strong angle at which its upper profile meets the marked rise of the frontal, and to this profile continuing perfectly straight anteriorly without any descent towards the tip of the nasals. Nasal opening not slanting backwards in lateral view, but practically vertical, the tip of the nasals projecting in front of the main part of the premaxillæ, but in turn just surpassed by the unusually projecting gnathic point between the incisors; in front view the opening is high and narrow, approaching "guttate" of Ridgway, while in *Ichthyomys* it is nearly "deltoid" (the point, of course, downwards in each case). Anteorbital foramina essentially as in *Ichthyomys*, or even more open; the anterior zygoma-root, both above and below, very slender and delicate. Malars absent on both sides in the type, possibly never ossified. Palatal foramina much broader behind than in front, instead of being approximately parallel-sided. Posterior palate less extended behind the molars.

Incisors narrower and less specialized than in *Ichthyomys*, the lower ones particularly narrow, with long slender points; a marked laterally projecting incisive capsule over the root of each upper incisor, in front of the anteorbital foramen. Molars apparently as in *Ichthyomys*, but much worn in the only specimen.

Type, *A. leander*.

This genus is evidently closely allied to *Ichthyomys*, but is less specialized for an aquatic piscivorous life in some directions (shape of brain-case, structure of incisors), and more so

in others (loss of ear-conch, character of fur, peculiar build of muzzle). It forms, therefore, a second instance of this interesting type of rodent, developed at an even higher altitude than in the case of *Ichthyomys Soderströmi* (Quito, 8000 feet), a species also discovered by our generous correspondent Consul L. Soderström.

The entire suppression of the external ear-conches is an almost unique character in Muridæ, the only forms in which it is found being the mole-rats *Ellobius* and *Myospalax* (*Siphneus*). Of aquatic animals this specialization is only known in the seals and cetaceans, not in any of the Insectivora nor in the otters. Of course there is a possibility that in the present specimen the conches have been aborted pathologically, but their reduction in *Ichthyomys* and *Hydromys* suggests the further development now described, while in the specimen itself the identity of the two sides and the natural appearance of the aural slits tell against any suggestion of accidental loss.

Anotomys leander, sp. n.

Size about as in the species of *Ichthyomys*. Fur excessively thick, soft and velvety, consisting almost wholly of wool-hairs, with a thin sprinkling of longer hairs intermixed; the wool-hairs 9, the longer hairs 14-15 mm. in length on the back. General colour above uniform dark slaty (near "slate-black"), the bases of the hairs rather lighter than their tips; sides slightly paler than the back. Some of the longer hairs tipped with whitish. Under surface from snout to anus and inner sides of limbs whitish grey (grey no. 9), well defined from the dark colour of the sides; bases of hairs dark slaty. Lower whiskers white, upper dark. A distinct white patch over each ear-hole, thus imitating the effect of having white-tipped ears, as though this coloration were of value even when the ears themselves were absent. Metacarpals brown; fingers and whole of hind feet silvery white. Tail well-haired, dull brown above, rather, but not abruptly, lighter below.

Skull and teeth as described above.

Dimensions of the type (measured in skin):—

Head and body 128 mm.; tail 125; hind foot (wet) 32.

Skull: greatest length 27.5; basilar length 21.2; zygomatic breadth 14.8; nasal opening 4.2 × 2.4; nasals 9 × 3.2; interorbital breadth 3.9; breadth of brain-case 13.8; height of muzzle behind incisors 5.4; zygoma-root 1.0; palatilar

length 11·2; diastema 6·7; palatal foramina $4\ 9 \times 2\ 3$; length of upper molar series (crowns much worn) 4·6.

Hab. Mount Pichincha, Ecuador: mountain-streams at 11,500 feet.

Type. Old male. B.M. no. 5. 11. 7. 1. Collected and presented by Consul L. Soderström.

X.—*On a Second Species of Lenothrix from the Liu Kiu Islands.* By OLDFIELD THOMAS.

In a collection of Liu Kiu mammals recently obtained by the British Museum from Mr. Alan Owston there occurs a peculiar long-haired rat, which proves on examination to belong to the genus *Lenothrix*, founded by Mr. Gerrit S. Miller for *L. cana*, a species obtained in Sumatra by Mr. W. L. Abbott. The occurrence of this Sumatran form in the Liu Kiu Islands is of much interest. The species is naturally quite different, and may be called

Lenothrix legata, sp. n.

Size, as judged by foot and tooth-row, decidedly larger than in *L. cana*, though the skull seems to be little longer. Fur very long and thick, the ordinary hairs about 29 mm. in length on the back, the numerous long bristle-hairs attaining 50–60 mm., and the spines (which are slender and flattened, about $\frac{1}{2}$ mm. broad) 25 mm. in length. General colour above approaching “clay-colour,” but more greyish, and made up of such a mixture of other colours that the general tone is not easily determined. The dorsal hairs are slaty grey for nine-tenths of their length, their ends buffy, lighter on the anterior back, darker across the loins. The long bristles black, with a buffy tip. The spines whitish, with a black tip. Under surface dirty greyish, hardly lighter than the greyish bases to the dorsal hairs, the tips of the hairs dull buffy. Ears short, thinly haired, a patch behind their posterior bases buffy. Upper surface of hands and feet uniform dark brown. Tail evenly well haired throughout, the hairs about 3–4 mm. in length, not or scarcely lengthened terminally (though there is a little doubt if the tip of the tail is quite perfect); colour of tail uniformly dark brown on basal three fifths, white beyond.

Skull chiefly differing from that of *L. cana* by being immensely broader across the crested region of the crown, so

that the distance across the postorbital processes is 20·3 mm., as against 13·3 mm. in Mr. Miller's figure. Anterior zygomatic root rather more projected forward. Palatal foramina longer. A small intermediate ridge present on the side of the brain-case between the main parietal ridge and that running back from the hinder edge of the squamosal.

Teeth agreeing very closely in structure with those of *L. cana*, but the minute anterior median cusp on m_1 is not present, while there is a minute supplementary cusp at the outer end of the second as well as of the first interlamina space in the same tooth. But these small supplementary cusps are very variable in other groups, and are evidently of only specific importance.

Approximate dimensions of the type (taken on a remade native-prepared skin):—

Head and body 230 mm.; tail 246 (perhaps imperfect at tip); hind foot (moistened) (s. u.) 49; ear (moistened) 23.

Skull: back of interparietal to front of nasals 51; greatest breadth 25; nasals $18 \times 5\cdot7$; interorbital breadth 9·8; breadth across postorbital processes 20·3; breadth across parietal ridges at centre 19·7; zygoma-root 5·4; diastema 15; palatal foramina $9\ 8 \times 3\cdot7$; length of upper molar series (crowns) 10.

Hab. Oshima, northern group of Liu Kiu Islands.

Type. Adult male. B.M. no. 5. 11. 3. 41. Obtained 15th September, 1904, by Cho, a native collector employed by Mr. Alan Owston.

The genus *Lenothrix* is an interesting one, as connecting *Lenomys* with *Mus*. It possesses the cranial characters and many of the molar foldings of the former, while, like the latter, it has lost the important postero-internal cusp α of the upper molars*.

The British Museum now possesses a good series of all the mammals known to inhabit the Liu Kiu Islands. To Mr. Bonhote's list † there should be added the present striking and peculiar species and a *Cervus* of the *C. sika* group. The "*Rhinolophus minor*" of the list has since been described by Mr. Knud Andersen as *R. cornutus pumilus* ‡, and a *Mus norvegicus* is contained in Mr. Owston's collection, thus confirming its occurrence in the islands, on which doubt was thrown by Mr. Bonhote.

* *Cf. supra*, p. 85.

† *Nov. Zool.* ix. p. 628 (1902).

‡ *P. Z. S.* 1905, i. p. 127.

XI.—*Greenlandic Polyzoa*. By Canon A. M. NORMAN,
M.A., D.C.L., F.R.S., &c.

ON the occasion of the last British Arctic Expedition of 1875 H.M.S. 'Valorous' accompanied the 'Alert' and 'Discovery' as far as Disco Island with additional stores, which were there transferred to the exploring ships. The Admiralty, in response to an application from the Royal Society, directed that the 'Valorous' should subsequently do a little dredging in Davis Strait and on the return voyage across the Atlantic; and my old friend Dr. Gwyn Jeffreys accompanied the 'Valorous' in order to act as naturalist and superintend the dredging. After the return of the expedition a short report of the biological results was made to the Royal Society, in which Dr. Jeffreys reported on the Mollusca, Dr. McIntosh on the Annelida, and myself on the other classes of the Invertebrata (Proc. Royal Soc. vol. xxv. no. 173, 1876, pp. 176-237).

At p. 205 of the Report just referred to I stated that sixty-six species of Polyzoa had been determined as having been brought home by the expedition, and certain of the more interesting species were mentioned under the head of the several dredgings. No full list was, however, given, and, moreover, there were other forms at that time undetermined. I have long purposed to give a complete catalogue of the species procured, but have regarded the existing nomenclature as so unsatisfactory that I disliked using it. As some continental zoologists, however, are now working at the Arctic Polyzoa, I feel that it may be useful to publish the 'Valorous' species.

In my "Notes on the Natural History of East Finmark," in dealing with the Polyzoa (Ann. & Mag. Nat. Hist. ser. 7, vol. xi. 1903, pp. 567-598, and vol. xii. pp. 87-128), after an attempt to rearrange some earlier genera of the Cheilostomata, I wrote (p. 108):—"As I feel that I cannot use as though they were my own many associations of generic and specific names which have been employed, I shall signify my doubts as to the allocation of the species by putting the generic name within inverted commas." The same course I here pursue.

Polyzoa of Davis Strait procured by the 'Valorous.'

Crisia producta, Smitt.

Idmonea atlantica, E. Forbes.

— *liliacca*, Pallas.

- Hornera lichenoides*, Fabricius.
Stomatopora major, Johnston.
— *diastoporides*, Norman.
Diastopora obelia, Johnston.
Lichenopora verrucaria, Fabricius.
— *crassiuscula*, Smitt.
Gemellaria loricata, Linné.
Menipea ternata, Ellis and Solander.
— *gracilis*, J. van Beneden.
— *Smitti*, Norman.
— *arctica*, Busk.
Scrupocellaria scabra, J. van Beneden, var. *elongata*, Smitt.
Cuberea Ellisii, Fleming.
Bugula Murrayana, Johnston.
— —, var. *fruticosa*, Packard.
Carbasea membranaceo-truncata, Smitt.
Cellularia articulata, Fabricius.
Electra catenularia, Jameson.
Callopora craticula, Alder.
— *Whiteavesii*, Norman.
— *Sophice*, Busk.
— *unicornis*, Fleming, var. *armifera*, Hincks.
— *arctica*, d'Orbigny.
Amphiblestrum trifolium, Busk.
Cribrilina annulata, Fabricius, var. *spitsbergensis*, Norman.
Gephyrotes nitidopunctata, Smitt.
Microporella arctica, Norman.
Doryporella spatulifera, Smitt.
Cylindroporella tubulosa, Norman.
Anarthropoda monodon, Busk.
Hippothoa hyalina, Linné.
— *divaricata*, Lamouroux.
— *expansa*, Dawson.
Schizoporella ansata, Johnston.
— *biaperta*, Michelin.
— *auriculata*, Hassall.
“*Schizoporella*” *sinuosa*, Busk.
“*Schizoporella*” *cruenta*, Norman.
Leieschara coarctata, M. Sars.
— *subgracile*, d'Orbigny.
— *plana*, Dawson.

Porella compressa, Sowerby.

— *plana*, Hincks.

— *elegantula*, d'Orbigny.

— *bella*, Busk.

— —, var. *grænländica*, Norman.

— *concinna*, Busk.

— —, var. *Belli*, Dawson.

— *aperta*, Boeck.

— *struma*, Norman.

— *princeps*, Norman.

— *propinqua*, Smitt.

“*Porella*” *acutirostris*, Smitt.

Monoporella spinulifera, Hincks.

Hemicyclopora polita, Norman.

Escharella immersa, Fleming, = *Peachii*, Hassall.

— *laqueata*, Norman.

— *ventricosa*, Hassall.

“*Mucronella*” *sincera*, Smitt.

“*Mucronella*” *labiata*, Boeck.

“*Mucronella*” *pavonella*, Alder.

Palmicellaria Skenei, Ellis & Sol., var. *tridens*, Busk.

Smittina arctica, Norman.

— *Jeffreysi*, Norman.

— *porifera*, Smitt (*typica*).

“*Smittia*” *lineata*, Nordgaard.

Eschura hippopus, Smitt.

“*Lepralia*” *reticulato-punctata*, Hincks.

Escharopsis lobata, Lamouroux.

— *rosacea*, Busk.

Rhamphostomella scabra, Fabricius.

— *costata*, Lorenz.

— *plicata*, Smitt.

— *ovata*, Smitt.

— *contigua*, Smitt, = *Cellepora Whiteavesii*, Norman, MS., in
‘Valorous’ Report.

Cellepora incrassata (Lamarck?), Smitt.

Acyonidium gelatinosum, Linné.

Rhabdopleura Normani, Allman.

The foregoing list includes seventy-eight species. In the ‘Manual and Instructions for the Arctic Expedition, 1875,’ at p. 139 will be found a list of the Polyzoa of Greenland which was drawn up by my late friend Dr. Lütken, of Copenhagen.

It shows that at that time sixty-three species were known in the Greenland sea. Among the species then known were the following twenty-six forms* which were not procured by the 'Valorous,' and these, when added to my own list, raise the number of Greenlandic Polyzoa to one hundred and four forms, now regarded as distinct species. A few of the names, however, may be regarded with some doubt.

The list of Dr. Lütken is taken chiefly, though not entirely, from Smitt, "Bryozoa marina in regionibus arcticis et borealibus viventia" (Erfvers. Kong. Vet.-Akad. Förhand. (1867) 1868, pp. 443-487). A comparison with this paper of Smitt enables me to add explanatory notes after the names of some of the species. Species given by Lütken which are not in the following list are contained, although perhaps under a different name, in the preceding catalogue of 'Valorous' Polyzoa.

Crisia eburnea, Linné (including as Greenlandic formæ *C. eburnea*, *C. cornuta*, and *C. denticulata*).

Mesentipora meandrina, Wood.

Tubulipora flabellaris, Fabricius.

— *incrassata*, d'Orbigny.

— *fungia*, Couch.

— *penicillata*, Fabricius. (Only on that writer's authority.)

Discoporella hispida, Fleming.

Defrancia lucernaria, M. Sars.

Alcyonidium hirsutum, Fleming (including *A. mamillatum*, Alder).

— *hispidum*, Fabricius. (Only on that writer's authority.)

Flustra papyracea, Pallas (= *Carbasa Solanderi*, Norman).

[— *foliacea*, Linné. On what authority?]

Membranipora lineata, Linné.

— *spinifera*, Johnston (? = *cymbæformis*, Hincks).

— *pilosa*, Linné.

Porina Malusii, Audouin.

Escharella palmata, M. Sars.

— *porifera*, Smitt (forma *contorta*, Kirchenpauer).

Discopora appensa, Hassall.

Cellepora ramulosa, Linné (forma *avicularis*, Hincks).

Retepora cellulosa, Linné (formæ *Beaniana*, King, *cellulosa*, Busk, and *elongata*, Smitt).

Loxosoma sp.

* This number includes the species given by Lütken, together with the "formæ" indicated by Smitt and added in the following list within brackets.

XII.—Notes on some Loricariid Fishes, with Descriptions of Two new Species. By C. TATE REGAN, B.A.

IN my monograph of the Loricariidæ I followed Steindachner in placing *Plecostomus horridus*, Kner, in the synonymy of *P. emarginatus*, Cuv. & Val., and Eigenmann in uniting *P. tenuicauda*, Steind., to the same species. Although I have never seen specimens of the first-named, I am now of the opinion that it is probably distinct from *P. emarginatus*, whilst I am quite sure that *P. tenuicauda* should be recognized as a valid species. *P. horridus* does not seem to have the deeply emarginate caudal fin with produced lobes which is so characteristic of the other two species, whilst *P. tenuicauda* may at once be separated from *P. emarginatus* by the greater length of the base of the dorsal fin. The following description is based on three specimens, from 200 to 380 mm. in total length, from Baranquilla, Colombia.

Plecostomus tenuicauda.

Plecostomus tenuicauda, Steind. Denkschr. Ak. Wien, xxxix. 1878, p. 40, pl. vi., and xlii. 1880, p. 63.

Plecostomus emarginatus (part.), Eigenm. & Eigenm. Occ. Pap. Cal. Ac. i. 1890, p. 400; Regan, Trans. Zool. Soc. xvii. 1904, p. 210.

Depth of body 5–6 in the length, length of head $3\frac{1}{2}$ – $3\frac{3}{4}$. Depth of head $1\frac{2}{3}$ – $1\frac{2}{3}$ in its length, breadth of head $1\frac{1}{8}$ – $1\frac{1}{6}$, length of snout $1\frac{4}{5}$ –2, diameter of eye 6– $8\frac{1}{2}$, interorbital width $2\frac{1}{5}$ – $2\frac{1}{3}$. Length of mandibular ramus 3– $3\frac{1}{2}$ in the interorbital width; rami of both jaws subequal, with 24–32 teeth on each side. Barbel $1\frac{1}{3}$ – $1\frac{2}{3}$ the diameter of eye. Snout narrowed anteriorly; supraorbital edges not or scarcely raised; opercular bones without marginal bristles; temporal plate not distinctly carinate; supraoccipital with strong median ridge extending posteriorly on to the well-developed pointed occipital process, which is bordered on each side by a lateral scute or pair of scutes and at the apex by a median scute. Scutes spinulose, the posterior ones usually weakly carinate, 28–29 in a longitudinal series, 8 between dorsal and adipose fin, 14–15 between anal and caudal. Lower surface of head and abdomen almost completely covered with small granular scales. Dorsal I 7, the first ray as long as the head, when laid back extending to the third or fourth scute behind the last ray, which is $\frac{1}{2}$ – $\frac{2}{3}$ as long. Length of base of dorsal equal to or a little greater than its distance from the adipose fin, which is well developed. Anal I 4.

Pectoral spine extending to anterior $\frac{1}{3}$ of ventral. Caudal deeply emarginate, the median rays not more than $\frac{1}{2}$ as long as the outermost, which are $\frac{2}{5}$ – $\frac{1}{2}$ the length of the fish. Caudal peduncle 4–4 $\frac{1}{2}$ as long as deep, anteriorly with the scutes of the lowest (fifth) series nearly flat and those of the fourth series strongly angulated. Numerous rather small or oblong purplish spots on head, body, and fins, those on the dorsal in 2 or 3 series on each interradiial membrane.

Magdalena and Cauca Rivers.

Professor Eigenmann ('Science,' xxi. pp. 792–795) takes exception to my name *Plecostomus Garmani* for the species which he erroneously identified with *P. lima*, Lütken. He had given the name *P. lima atropinnis* to a specimen, presumably of this species, with the fins uniformly dark brown, and he says "Regan considers this variety distinct from *lima* and names it *Garmani*. Of course, if the variety *atropinnis* is distinct from the present form it must go by the older name *atropinnis* and not *Garmani*." This is hardly a correct statement of the case. I reserve the name *atropinnis* for a fish which I have never seen, with the fins uniformly dark brown*. This fish will probably prove to be specifically identical with *P. Garmani* (*P. lima* (non Lütken), Eigenm.), and if it be worthy of recognition as a variety, its name will be *P. Garmani*, var. *atropinnis*; if it should prove to be specifically distinct from both *P. Garmani* and *P. lima*, its name would be *P. atropinnis*.

The application of the generic name *Ancistrus* seems to need some explanation. As defined and restricted by Gill this genus includes species with an eight-rayed dorsal fin and with the interoperculum armed with a tuft of rather long and slender spines with hooked apices. This definition appears to me applicable only to *A. brachyurus*, *A. scaphirhynchus*, and *A. medians* of the species described by Kner. *A. cirrhosus*, afterwards selected by Bleeker as the type of the genus, has rather short and stout interopercular spines, curved towards the apices, which can scarcely be called "hooked." Dr. Gill's diagnosis was evidently chiefly based on the specimens from Trinidad which he identified with *A. guacharote*, Cuv. & Val., which Günther named *Chaetostomus trinitatis*, and which have now been lost. In view of

* I consulted more than one authority as to the correctness of this course, as I did not wish to dedicate a species to Dr. Garman which might be considered a synonym.

the last mentioned fact, and of the insufficiency of the specific diagnosis, I left *C. trinitatis* as a doubtful synonym of *A. guacharote*; but it is quite probable that this species may prove to be nearer to *A. megacephalus* or *A. Bachi*, since Dr. Gill does not make any mention of the bristles which are found external to the interopercular spines in *A. guacharote* and its allies.

The British Museum has recently received examples of a new species of this genus, which I propose to call

Ancistrus Bovallii, sp. n.

Allied to *A. Schomburgkii*, Günth. Depth of body about 7 in the length, length of head 3. Head nearly as broad as long and $2\frac{1}{2}$ – $2\frac{2}{3}$ as long as deep. Diameter of eye 6 – $7\frac{1}{2}$ in the length of head, interorbital width about 3, length of snout nearly 2. Snout broad, rounded; supraorbital edges not raised; supraoccipital flat, without median ridge; temporal plates not carinate; interoperculum armed with about 15 slender but rather short spines, with curved tips. Mouth small, with only 5 or 6 teeth on each side in both jaws; length of mandibular ramus considerably less than $\frac{1}{2}$ the interorbital width. Scutes spinulose, not carinate, 24 to 26 in a longitudinal series, 7 to 9 between dorsal and adipose fin, 11 to 13 between anal and caudal. Supraoccipital bordered posteriorly by a pair of scutes. Lower surface of head and abdomen naked (in the young). Dorsal I 7, the first ray about $\frac{3}{5}$ the length of head, the length of the base less than the distance from adipose fin. Anal I 4–5. Pectoral spine extending to the base of ventral. Caudal obliquely emarginate. Caudal peduncle about 3 times as long as deep. Olivaceous, usually with darker transverse bars or irregular marbling; fins usually with dark spots.

Seven specimens, measuring up to 55 mm. in total length, from the Kaat River, tributary to the Treng River, Upper Potaro, British Guiana, collected and presented to the British Museum by Dr. C. Bovallius, who captured them "in a rapid on the under side of stones."

Eigenmann has proposed to restrict the name *Xenocara* to the species without tentacles on the snout, i. e. *X. latifrons* and *X. gymnorhynchus*. He would use the name *Ancistrus* for the species with tentacles; but, as has been shown above, this is inadmissible, and as it seems useful to distinguish these species by a subgeneric name, I propose *Thysanocara* for *Xenocara cirrhosum* and its allies.

Several recently acquired specimens of *X. brevipinnis*, Regan, from Theresopolis are a little smaller than the typical example, from which they differ slightly. They seem to show that the type represents the extreme of variation in respect of two or three characters, so that it appears useful to give a description based on these examples.

Xenocara brevipinnis.

Depth of body nearly 6 in the length, length of head $2\frac{2}{3}$ -3. Head as long as or a little longer than broad and $2-2\frac{1}{4}$ as long as deep. Diameter of eye 6-7 in the length of head, interorbital width $2\frac{3}{5}$ - $2\frac{5}{6}$, length of snout 2. Length of mandibular ramus $1\frac{2}{3}$ - $2\frac{1}{4}$ in the interorbital width. Snout with tentacles. Interoperculum with 12 to 17 spines, the longest $\frac{2}{3}$ the length of head. 23-26 scutes in a longitudinal series, 6 or 7 between dorsal and adipose fin, 11 or 12 between anal and caudal. Dorsal I 7, the first ray $\frac{2}{3}$ - $\frac{3}{4}$ the length of head, the last $\frac{2}{3}$ as long, when laid back not reaching the spine of the adipose fin, which is preceded by a keel formed by a single scute. Length of base of dorsal equal to its distance from the anterior part of the spine of the adipose fin. Anal I 4. Pectoral spine extending to base of ventral or a little beyond. Caudal obliquely truncate, the lowest ray $\frac{3}{4}$ - $\frac{4}{5}$ the length of head. Caudal peduncle $2\frac{1}{2}$ - $2\frac{3}{4}$ as long as deep. Olivaceous, fins dark spotted.

Loricaria Steinbachi, sp. n.

Length of head $3\frac{1}{2}$ - $3\frac{3}{4}$ in the length of the fish. Head as broad as long (σ) or a little longer than broad (ρ) and twice as long as deep. Diameter of eye 8 or 9 in the length of head, interorbital width 3, length of snout nearly 2. Sides of the head in the male armed with well-developed bristles. Snout obtuse; supraorbital edges not or scarcely raised; orbital notch broad; occipital plate flat, without keels; lips papillose, with short marginal fringes; lower lip moderately broad, rounded; barbels very short; teeth well developed, 6-9 on each side in both jaws. 30 scutes in a longitudinal series, 19-21+9-11, not carinate except for the lateral keels, which are obsolete anteriorly and posteriorly are obtuse, but remain separate throughout. Lower surface of head and abdomen naked, except for a series of about 8 plates on each side between pectoral and ventral. First dorsal ray about $\frac{3}{4}$ the length of head; pectoral spine extending to base of ventral or slightly beyond; ventrals rounded, the spine not produced, the first or first and second

branched rays the longest; caudal truncate, the outer rays not produced. Breadth of body at level of first anal ray $2\frac{3}{4}$ –3 in the distance from that point to the caudal. Back with 4 dark cross-bands, the first through the base of the dorsal fin; traces of dark spots on the fins.

Three specimens, up to 100 mm. in total length, from Salta, Argentina, collected by Herr J. Steinbach.

Allied to *L. latirostris*, which it resembles in the notable differentiation of the sexes, the males having a broader head and more obtuse snout than the females, and also the sides of the head armed with bristles and the whole upper surface of the body and of the pectoral fins rough, spinulose.

The preceding notes may be summarized thus:—

Plecostomus horridus, Kner, is probably, and *P. tenuicauda*, Steind., which is redescribed, is certainly distinct from *P. emarginatus*, C. & V.

Plecostomus Garmani, Regan, is not equivalent to *P. lima atropinnis*, Eigenm., but to *P. lima* (non Lütken), Eigenm.

Ancistrus was restricted to *A. medians*, Kner, and its allies by Gill, not by selection of a typical species, but by diagnosis; a new species of this genus (*A. Bovallii*) is described.

Thysanocara is proposed as a new subgeneric name for *Xenocara cirrhosum* and its allies. *X. brevipinnis*, Regan, is redescribed.

A new *Loricaria*, *L. Steinbachi*, is described.

XIII.—Descriptions of Two new Species of *Pterygistes*.

By G. E. H. BARRETT-HAMILTON.

I FIND amongst the bats in the British Museum of Natural History examples of two hitherto undescribed species of *Pterygistes*—the one from Madeira, the other from the North-western Himalayas. In each of these the skull is very distinct from that of any known form, but I do not attribute great importance to the dimensions of the body, those of spirit-specimens being subject to distortion. The two species may be described as follows:—

1. *Pterygistes madeiræ*, sp. n.

This bat is similar to *P. Leisleri*, Kuhl, of Britain, but perhaps smaller and with quite different skull. The colour is

unascertainable in the old spirit-specimens, which alone are available for examination.

The *skull*, as compared with that of *P. Leisleri*, is slightly smaller, less massive, and relatively longer and narrower, characters which, although quite apparent to the eye, do not stand out so clearly when expressed in words. It is not at all like the much smaller *P. azoreum*, Thomas, with its somewhat inflated cranium and depressed nasal region.

The *dimensions* in millimetres of a female (in spirit) are as follows:—

Head and body 55; ear 12; tragus 4; greatest expanse of wing 240; thumb and claw 6; longest digit 74; basal joint of fifth digit 32; basal joint of second digit 40; forearm 43; tibia 16; hind foot (without claws) 7.5.

Skull (of the type): greatest length 15; basipalatal length 11.5; zygomatic breadth 9.5; posterior breadth 9; breadth between orbits 8, at constriction 4.5; length of palate 6.5; breadth between outer borders of m^2 6.75; length from anterior border of canine to posterior border of m^3 5.25.

Hab. Madeira.

This species is evidently the representative of *P. Leisleri* in Madeira, and it is remarkable how different it is from its neighbour *P. azoreum* of the Azores. It is described from specimens in the R. F. Tomes collection procured by Mason. According to the custom of his day, Tomes identified his specimens with *P. Leisleri*, from which species, however, it is clearly differentiated by its characteristic skull.

The *type* is no. 1 of the Tomes collection in the British Museum (a female).

2. *Pterygistes montanus*, sp. n.

As regards general size, coloration, and characters, so far as they can be ascertained from a specimen long in spirit, this bat is very similar to *P. Leisleri*; but the remarkably large and massive skull, the big teeth, and somewhat *noctula*-like dentition mark it as one of the most distinct members of the *Leisleri* group, occupying a position at the head and opposite end of the series to that occupied by *P. azoreum* at the foot.

The *skull* is remarkably strongly built and massive; the lambdoid crests are well developed, the sagittal less so; the teeth are very large, except the small anterior upper premolar, which is relatively inconspicuous and recalls that of *noctula*.

The *dimensions* of the type (a female in spirit) are as follows:—

Head and body 60; ear 12; tragus 6; thumb and claw 6.5;

longest digit 70; basal joint of fifth digit 32; basal joint of second digit 39; forearm 42.5; tibia 18; hind foot (without claws) 8.5.

Skull (of the type): greatest length 16; basipalatal length 12.2; zygomatic breadth (damaged); posterior breadth 10; breadth between orbits 8, at constriction 5; length of palate (damaged) 6; breadth between outer borders of m^2 7.5; length from anterior border of canine to posterior border of m^3 7.

Hab. (see type).

The *type* and only known specimen is a male, no. 79.11.21.164 of the British Museum collection. It was procured by Capt. T. Hutton at Mussooree, North-western Himalayas, at an altitude of 4500 to 5500 feet, and was received from the Indian Museum.

Capt. Hutton (P. Z. S. 1872, p. 707) remarks that this bat is "far from common at Mussooree, and appears to be confined to an elevation ranging from 4500 to 5500 feet, on the northern side of the Tyne range, immediately beyond Mussooree. . . . Colour of the fur dark brown, with a chestnut tinge, beneath paler and somewhat greyish. . . . A male [evidently the type] has the carpus $1\frac{1}{6}$ in.; tibia $\frac{1}{6}$ in.; ear $\frac{1}{2}$ in.; nose to tail $3\frac{1}{8}$ in.; tail $2\frac{1}{8}$ in.; total length $5\frac{1}{4}$ in."

XIV.—*New Species of Lycænidæ from British New Guinea.*
By GEORGE T. BETHUNE-BAKER, F.L.S., F.Z.S.

Parelodina aroa, B.-B.

When I described this species from the Aroa River (see Novit. Zool. vol. xi. p. 368) I stated that there was a blue irroration over the blackish basal area; since writing that I have received the species from Mr. Pratt, who took it at Babooni in August. There is a most delicate pale mauve-blue iridescence over nearly all the white area also.

Candalides owgarra, sp. n.

♂. Both wings creamy white: primaries with a very restricted black basal area; costa black to the cell, expanding towards the apex and descending in a nearly even curve to vein 2, making the termen very broadly and the apex yet more broadly black: secondaries with a black basal dash

along vein 1. Underside spotless white, but with the black of the primaries showing through.

Expanse 36 mm.

The type is in my collection from Owgarrá, a short series being sent home by Mr. Meek.

Candalides Meeki, sp. n.

♂. Both wings snow-white: primaries with apex very broadly black from just beyond the end of the cell, termen very broadly black to below vein 2: secondaries with the under-surface spots showing through; fringes white, finely intersected with brown at the veins. Under surface: both wings white: primaries with the costa broadly grey, a very broad postmedial black band to about vein 2; apex and termen brown suffused with whitish, with a subterminal row of small chestnut-brown spots; cell closed by a fine dark line: secondaries with base slightly suffused with brownish white; two small basal chestnut-brown spots, a subbasal curved row of five such spots, the two on the inner margin being points; cell closed by a fine brown line, above it, slightly outwards, are two spots, the lower one the smaller; a postmedial oblique row of four spots, the upper two large and confluent, the lower two small and detached; below these are two more spots, one larger, lunular, shifted outwards between veins 1 and 2, the other shifted well inwards on the inner margin; a subterminal row of small chestnut-brown spots; termen narrowly chestnut-brown.

Expanse 36 mm.

This type is in my collection from Owgarrá, where it must have been fairly abundant, as Mr. Meek has sent home a good series.

Candalides sublutea, sp. n.

♂. Both wings dark brown: primaries with the basal half suffused with brilliant metallic greenish blue or purplish blue according to the light they are in: secondaries with a trace of the same metallic colour along the lower margin of the cell, and with a terminal row of similar small spots. Underside: both wings uniform spotless chrome-yellow, with a terminal row of minute silvery dots.

Expanse 30 mm.

The type is in my collection from Owgarrá, where it is apparently a rare species.

Candalides grandis, sp. n.

♂. Both wings mauvish blue with termen finely black: secondaries with terminal small black spots between the lower radial veins. Under surface: primaries greyish white with clay-coloured marks; a narrow line closing the cell, a broad serrate, irregular, somewhat curved (as to its lower portion) band tapering gradually towards the tornus, a subterminal row of crenulate marks: secondaries whitish, more or less suffused with clay-coloured irrorations up to the postmedial line, all the marks clay-coloured; a series of five small basal dots; a median series of larger spots, the third shifted outwards and bisected by vein 3; cell closed by an irregular dash, with a narrow waved dash above it shifted inwards, an irregular strongly serrate posterior stripe curved outwards from vein 6 to 2; a fine subterminal serrate line following the same course as the postmedial stripe, a small twin dot near the tornus; termen finely brownish.

Expanse 46 mm.

The type is in my collection from Owingarra, a short series being sent home.

Cyaniris Drucei, sp. n.

♂. Both wings lustrous purplish blue with termen narrowly black; in the secondaries the termen is narrower than in the primaries, and there is a trace of a terminal row of black dots which become plainer at the tornus. Under surface: both wings whitish with chestnut-brown marks: primaries with a fine line closing the cell; a postmedial row of six waved marks not quite confluent, the first one being isolated basewards, a subterminal row of dots; termen finely brown; fringes white with brown tips: secondaries with a small basal spot above the cell; a series of three small subbasal spots, the middle one angled; cell closed by a fine line, above which outwards are two small isolated spots, the upper one being furthest out; a posterior row of more or less confluent marks, the upper ones forming a double angle, below which are two small isolated spots, followed by an angled one shifted outwards, and another on the inner margin shifted right inwards; a subterminal row of small spots; termen finely brown; fringes white intersected with brown at the veins.

Expanse 32 mm.

The type is in my collection from Owingarra, where it is apparently not very abundant.

Cyaniris acesina, sp. n.

♂. Both wings pale sublustrous violet-blue: primaries with a broad black apex and termen, which narrows very rapidly to the tornus: secondaries with a smallish black patch at the apex and a narrow black termen, with a small black spot between veins 2 and 3; fringes white interrupted with black. Under surface: both wings pale greyish mauve, with similar-coloured spots encircled with white: primaries with the inner marginal two thirds whitish, a spot closing the cell; postmedial band composed of six confluent spots, the first on the costa small, third to fifth shifted outwards, sixth well inwards, with a seventh below it scarcely more than a dash; terminal area whitish from this band, a terminal row of six small spots preceded internally by a scalloped line: secondaries with a series of three basal spots followed by a series of three median spots, the middle one of which has a minute one just below it; cell closed by a largish spot; postmedial row consisting of seven spots, viz., a pair below the costa, three shifted right outwards (the middle one being the furthest out), sixth spot inwards, seventh outwards; a terminal row of small dark spots preceded by a strongly scalloped line, area between this line and the postmedial row whitish.

Expanse 34 mm.

The type from Owgarrá is in my collection. This species has a most extraordinary likeness below to the section of the genus *Arhopala* that was named by Moore *Acesina*; the resemblance, however, is but superficial.

PARADUBA, gen. nov.

♂. Palpi porrect, fringed with long hair; third segment smooth, slightly deflexed. Eyes hairy. Neuration similar to that obtaining in the genus *Nacaduba*, except that in the primaries veins 6 and 7 arise from the same point at the upper extremity of the cell, whilst 7 terminates in front of the apex, and vein 11 anastomoses with 12 almost from its origin, separating near the costa. In the secondaries a short tail arises at the end of vein 2. In shape the costa is nearly straight, the apex of the primaries is somewhat acute, and the termen is produced between veins 5 and 2. The secondaries are small and somewhat truncated.

Type, *Paraduba owgarrá*, B.-B.

Paraduba owgarra, sp. n.

♂. Both wings dull violet-blue: primaries with apex and termen broadly brown, the latter tapering somewhat to the tornus: secondaries with the apex and termen much less broad. Underside: both wings pinkish brown with slightly darker spots edged with white: primaries with a band consisting of three confluent spots across the wing at the middle of the cell, an irregular spot closing the cell; post-medial band of six spots, very irregular in shape, 3 and 4 being shifted outwards, 5 inwards, 6 small; a terminal row of spots preceded by a broadish scalloped line; area above the tornus whitish: secondaries with a small basal spot at vein 8, a series of three largish subconfluent subbasal spots, a large irregular spot closing the cell; postmedial band consisting of eight more or less confluent irregular spots, 3 and 4 shifted well out, 5 to 8 each more inwards than its predecessor; termen with a row of small dots preceded by a narrow scalloped dark line; a small black spot with an internal red edging in the space between veins 2 and 3, and a minute trace of another at the tornus.

Expanse 28 mm.

The type is in my collection from Owgarra, where it appears to be a rare species.

XV.—*Descriptions of some new African Butterflies.*

By GEORGE T. BETHUNE-BAKER, F.L.S., F.Z.S.

I HAVE recently received a small collection of Lepidoptera from Patigo, in the Acholi country, in which there are a few new species that I here describe. Patigo is the old Fatiko of Sir Samuel Baker's days and formed his chief station. The people and country are interesting; the latter abounds with game, large and small, but the people, who are very keen hunters, so scour the land with fires, that the entomological prospects are not good so long as this custom prevails. The Acholi are practically unclothed, nothing but a short apron being ever worn, and this only, as a rule, by the men, though both sexes, as frequently is the case, are heavily laden with ornaments. I am informed that the common method of salutation is the high handshake, of recent fashion in our own country, a curious illustration of the old adage "Extremes meet." I am also describing a few new species

sent over by Mr. F. J. Jackson in his last collection. My measurements are taken by doubling the distance from the centre of the thorax to the apex of the wing.

Pentila ntebi, sp. n.

♂. Both wings subdiaphanous white: primaries with the costa broadly dark, expanding towards the end of the cell and in an even curve descending towards the tornus, so that the apex and termen are very broadly dark, tapering gradually to the tornus; the dark termen of the secondary is comparatively narrow from the apex to the tornus.

Expanse 32 mm.

The type was taken by Mr. Jackson at N'tebi (Uganda): it occurs from March to May.

The species will follow after *P. sylpha*, Kirby, but it has no trace of a cell-spot in either wing.

Epitola mengoensis, sp. n.

♂. Primary blackish, with a slight purplish patch to beyond the cell, but so dark as to appear little more than a greasy area: secondaries black, with the area between veins 7 and 1 bluish, of a rough appearance, the veins intersecting the blue, and with a black dash at the end of the cell; termen broadly dark. Underside: primaries dark greyish brown, with a pale spot beyond the cell and a pale inner margin: secondaries pinkish brown, with the basal area dark to beyond the cell; a posterior and submarginal lunulated line close together, somewhat darker than the ground-colour.

The apex of the primaries is almost falcate, being acute and excavated directly below it, whilst the termen from veins 5 to 3 is strongly produced outwards, giving the contour an unusual shape for this genus; the neuriation is quite typical.

Expanse 36 mm.

The type was taken by Mr. Jackson in March at Mengo.

Lachnocnema busoga, sp. n.

♀. Both wings blackish brown, with large white central areas: primaries with the white area from nearly the base, expanding very rapidly for three quarters of the wing, and extending from near the upper margin of the cell to vein 1: secondaries with a very large white patch from the abdominal fold to vein 6 and from half of the cell to near the termen. Underside: primaries white, with costa and termen broadly

brown; a smallish spot before the apex, followed by a large oblique one below, with scattered silvery scales in the dark costa and apex: secondaries white, with a very broad, sharply defined, subquadrangular costal patch from near the base to three quarters, in the middle of which is a white oblique streak; one or two basal white spots ringed with silvery brown, followed by a median row of four similar spots; a trace of a postmedial row of four or five like spots; termen broadly brown, with probably some anal dark and silvery spots, but the tornus is damaged.

Expanse 46 mm.

The type was taken by Mr. Jackson in Busoga in October. It will come next to *L. magna*, Auriv.

Myrina Sharpei, sp. n.

♂. Both wings blackish: the primaries with the lower part of the cell, a limited area below the cell and between veins 1 and 2, and also a dash between veins 2 and 3 lustrous dark blue: secondaries with the area between veins 2 and 8 dark lustrous blue, the blue extending nearly into the termen at vein 2. Underside: both wings pinkish brown: primaries spotless: secondaries with a small black spot in the cell and a postmedial row of small black spots, this row being sharply and deeply curved between veins 8 and 3; from the latter it becomes almost a line to the inner margin; lobe-spot bright red, with a dash of grey scaling above it margined laterally with blackish; tail white, black-edged.

Expanse 30 mm.

This species was taken from March to May at N'tebi by Mr. Jackson. It will come next to *M. dermatoptera*, Willgr., to which it is a close ally.

Hypolyccena Jacksoni, sp. n.

♂. Upperside: both wings dull orange-red, with a slight purple gloss in certain lights: primaries with a very broad dark brown termen, with a purple gloss: secondaries with a broadish dark termen, tapering rapidly to the tornus, which is bluish white, the lobe having a yellowish edging; tail long, second tail of moderate length. Underside: both wings pure white up to the termen: primaries with a short oblique orange-red stripe from the costa to near the origin of vein 2; a postmedial, orange-red, oblique, subcrenulate stripe ending on vein 1*b*; a fine, slightly curved, dark line between this and the termen. Secondaries: a short orange-red basal dash between vein 8 and the cell; an oblique, orange-red, slightly

irregular line to vein 2 ; below vein 2 at the angle the line is continued as a fine blackish line ; between this and the termen a fine dark subcrenulate line to the inner margin, where it is angled, and continued shortly up the inner margin ; a black spot above the second tail, edged internally with yellowish ; lobe-spot black, edged with a small yellowish patch internally, and a very pale metallic-blue patch nearer the termen, with an indefinite greyish metallic-blue scaling beyond it ; termen finely black.

Expanse 41 mm.

Hab. Toro.

This fine and unusual-looking species is like none with which I am acquainted ; it belongs to the section having no sex-mark ; it was taken by Mr. Jackson in February.

Catochrysops kabrosæ, sp. n.

♂. Both wings palish brown : primaries with a dark mark closing the cell and a trace of a terminal row of spots in a very slightly paler ground, those in the tornus and between veins 2 and 3 slightly edged with orange internally : secondaries with a very large orange patch occupying the tornal area and tapering rapidly as it nears the apex ; a well-defined black terminal spot between veins 2 and 3 ; fringes whitish. Underside : both wings clear whitish grey : primaries with a black lunulate mark encircled with white closing the cell, followed by a postmedial curved row of five black spots encircled with white ; directly beyond is a subterminal row of six dark sublunular marks, edged with white, followed by a terminal row of pale brown spots in a whitish area ; termen finely dark brown : secondaries with three small black sub-basal spots encircled with white, the uppermost one followed by a similar spot midway between it and the apex ; the rest of the marks are scarcely darker than the ground-colour and are all encircled with white ; a lunulate spot closing the cell ; a postmedial row of six spots, the upper three in an acute curve ; the middle spot of the lower three shifted inwards ; touching these spots outside is a row of white spear-shaped marks ; a terminal row of spots in a white ground, the spot between veins 2 and 3 black, edged externally with metallic blue and internally more broadly with orange ; termen finely dark.

Expanse 30 mm.

The type was taken by Mr. Jackson at Kabros in November.

Catochrysops acholi, sp. n.

♂. Both wings uniform very dark brown, with the cell closed by a darker dash; secondaries with a terminal black spot between veins 2 and 3, margined internally with orange. Underside: both wings pale greyish brown: primaries with spots but little darker than the ground-colour, edged with whitish; a spot closing the cell; a posterior row of six spots, the upper three slightly curved; a subterminal row of broad marks, slightly <-shaped: secondaries with all the spots edged with whitish; three subbasal black spots—one below the costa, in the cell, and on the inner margin; an irregular spot closing the cell, with a black spot above and below it; a very irregular posterior row of six spots, the uppermost one isolated and the lowest two shifted well inwards; a subterminal row of five <-shaped marks, below which is a black spot, edged externally with metallic blue and internally by a large orange spot, with a small orange spot at the tornus.

♀. Both wings pale whitish lustrous mauve-blue: primaries with a large dark spot closing the cell; a broad dark brown costa and a very broad dark brown termen: secondaries with a broad brown costa to the cell and along vein 7; termen broadly brown, with a row of <-shaped bluish-white marks in it; a black spot between veins 2 and 3, edged internally broadly with orange, and a smaller orange spot at the tornus; a posterior row of four or five spots, the fourth shifted inwards; these spots in the type specimen are quite small, but in a second specimen they are large. Underside like the male, but paler and the white encirclings of the spots broader.

Expanse, ♂ 49, ♀ 48 mm.

The types are in my collection from the Acholi country, a district 200 miles north of the Victoria Nyanza.

The species will come near *C. parsimon*.

Catochrysops nandiana, sp. n.

♂. Both wings bright mauve-blue, with termen rather narrowly black: primaries with a trace of the coppery irrorations that make *C. mahallakoæna*, Wlgr., so conspicuous an insect; but with this species there is only a faint trace of this coppery colour, and in flown specimens it quite disappears: secondaries with a black terminal spot between veins 1*a* and 2, edged internally with a small pinkish spot. Underside similar to that of *mahallakoæna*, Wlgr., but the

colour is very pale and the spots somewhat larger and more broadly edged with white.

Expanse 26 mm.

The type was taken by Mr. Jackson at Nandi in the month of April.

Zizera Drucei, sp. n

♂. Both wings sooty brown, strongly suffused all over with blue: primaries with a moderately narrow dark termen, on the internal edge of which is a trace of a row of blackish spots: secondaries just like the primaries. Underside: both wings dark coffee-brown, with black spots edged with white: primaries with two cell-spots, the second large; beyond this below the costa a minute spot; a postmedial curved row of four spots, the lowest very small; an indefinite subterminal row of dark spots adjoining the white edging of the subterminal row: secondaries with a basal row of four minute but distinct spots, followed by a similar subbasal row of larger spots; a spot closing the cell; a strongly curved postmedial row of seven spots; a fine white streak extends from the spot closing the cell to the third and fourth spots of this row; terminal and subterminal row as in the primaries.

Expanse 20 mm.

The type (from Madagascar) is in my collection. The species is nearest to *Z. knysna*, Trim., but the spots of the secondaries are quite diverse.

Sarangesa ganyi, sp. n.

♂. Both wings dark grey: primaries with the basal two thirds darker; a double hyaline spot at the origin of vein 11, and another double spot at the angle of vein 3; three small spots not in a straight line below the costa nearer the apex; beyond these is a trace of a postmedial spotted row, the spots scarcely darker than the ground-colour: secondaries with traces of a subbasal and postmedial spotted band scarcely darker than the ground-colour. Under surface as above, but the pattern is more distinct.

♀. Like the male, but the hyaline spot below vein 3 much larger, whilst the darker bands are also more distinct.

Expanse, ♂ 35, ♂ 36 mm.

The types from Patigo, in the Ganyi or Acholi country, are in my collection. The species will come next *S. lugens*, Rogenh.

Cyclopides ogwanyi, sp. n.

♂. Head black; palpi yellow, with a few interspersed black hairs; thorax with dark orange-red patagiæ. Primary black, with a short, irregular, postmedial band of four very pale canary-yellow spots from vein 10 to vein 3, the two middle spots being longish and projected well outwards; a small chrome-yellow spot near the tornus; fringes black: secondaries very dark brown, with a submarginal row of small chrome-yellow spots; fringes chrome-yellow. Underside with the canary-coloured spots darker, and a series of canary-coloured interneural terminal spots, those at the apex being dashes: secondaries silvery white, with black veins; a chrome-yellow subbasal spot below vein 8; cell closed by a similar spot, with two more below it; two posterior similarly coloured spots, viz. one near the apex between veins 6 and 7 and one above it shifted basewards; a row of three such spots between veins 1 *a* and 4.

Expanse 35 mm.

The type (from Patigo) is in my collection. The species should be placed between *C. formosus*, Btl., and *Carsoni*, Btl., but the upperside and the marked break in the posterior row of yellow spots on the underside of the secondaries should easily separate it.

XVI.—*On some Fishes from the Kwango River (Congo System) in Angola, collected by Dr. W. J. Ansorge.* By G. A. BOULENGER, F.R.S.

AT the end of 1903 Dr. Ansorge collected some fishes at Fort Don Carlos, in the province of Loanda, at the junction of the Cambo and Kwango (or Cuango) Rivers. Owing to the great difficulties of transport over land some of the specimens unfortunately arrived decayed, whilst a few, in a rather poor state of preservation, could be preserved for the British Museum. However, the interest which attaches to a knowledge of the fishes of the southern tributaries of the Congo induces me to shortly describe without further delay two remarkable new species represented in that collection. The other determinable species are:—*Hydrocyon lineatus*, Blkr., *Labeo macrostoma*, Blgr., *L. lineatus*, Blgr., and *Clarias Dumerilii*, Stdr.

Varicorhinus Ansorgii, sp. n.

Body strongly compressed, its depth twice and $\frac{2}{3}$ in total length; length of head 5 times in total length. Snout rounded, broader than long, $\frac{1}{3}$ length of head; eye supero-lateral, its diameter $5\frac{1}{2}$ times in length of head, twice in inter-orbital width; no conical tubercles on the head; mouth wide, curved, its width $\frac{2}{5}$ length of head; two barbels on each side, anterior $\frac{2}{3}$ diameter of eye, posterior as long as eye. Dorsal IV 9, last simple ray strong, bony, not serrated, shorter than head; border of fin convex; longest soft rays as long as head. Anal III 5, reaching root of caudal. Pectoral pointed, as long as head, not reaching ventral, which is situated below anterior rays of dorsal. Caudal peduncle as long as deep. Scales $29\frac{4\frac{1}{2}}{4\frac{1}{2}}$, 2 between lateral line and root of ventral, 12 round caudal peduncle.

Dr. Ansorge describes the coloration when fresh as pale mauve above, scales edged with bluish grey, greyish white beneath; fins all pale mauve, with dark mauve striæ; iris greyish mauve, with a narrow orange-golden circle round the pupil.

A single specimen, measuring 300 mm. Native name: *Kimnewu*.

The Cyprinid genus *Varicorhinus*, Rüppell, 1837 (= *Dil-
lonia*, Heckel, 1846), which should embrace *Pterocapoëta* of Günther and the typical *Capoëta* of the same author, may be regarded as nearly intermediate between *Labeo* and *Barbus*, being distinguished from the first by the absence of both upper and lower lips, from the second by the absence of upper lip. Some species of *Barbus*, however, including the typical *Scaphiodon* of Heckel, approach *Varicorhinus* very closely. As here defined, the genus contains only four African species, which may be contrasted as follows:—

1. *V. Ansorgii*, Blgr.—Two pairs of barbels; last simple ray of dorsal strong and ossified. Sq. $29\frac{4\frac{1}{2}}{4\frac{1}{2}}$.
2. *V. beso*, Rüpp.—One pair of barbels; last simple ray of dorsal strong and ossified. Sq. $30-35\frac{4\frac{1}{2}-5\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$.
3. *V. tanzanicæ*, Blgr.—One pair of barbels; last simple ray of dorsal strong and ossified. Sq. $68-70\frac{13\frac{1}{2}-14\frac{1}{2}}{14\frac{1}{2}-15\frac{1}{2}}$.
4. *V. maroccanus*, Gthr.—One pair of barbels; last simple ray of dorsal feeble and flexible. Sq. $45-46\frac{8\frac{1}{2}}{8\frac{1}{2}}$.

Atopochilus macrocephalus, sp. n.

Depth of body $\frac{2}{3}$ its greatest width, 5 times in total length. Head much depressed, once and $\frac{1}{3}$ as long as broad, its length twice and $\frac{3}{4}$ in total length, its upper surface slightly rugose; snout broadly rounded, its length twice and $\frac{1}{3}$ postocular part of head; nostrils nearer end of snout than eye, the diameter of which is $6\frac{1}{2}$ times in length of head and twice and $\frac{1}{2}$ in interorbital width; buccal cleft $\frac{3}{5}$ length of head; band of præmaxillary teeth interrupted in the middle, as broad as the lower lip; lateral barbel $\frac{1}{4}$ length of head, more than twice as long as posterior barbel. Occipito-nuchal shield broader than long. A striated, acutely pointed humeral process. Dorsal I 6; spine striated, $\frac{2}{5}$ length of head. Adipose fin 3 times as long as deep, $\frac{2}{3}$ its distance from rayed dorsal. Anal 9 (3 rays rudimentary). Pectoral spine striated, with 8 retrorse teeth on its inner border, its length $\frac{3}{5}$ that of the head. Ventral reaching origin of anal. Caudal peduncle slightly longer than deep.

Slate-grey when fresh, with three yellowish bars on the body, the first above the pectoral fin, the second in front of the adipose fin, the third on the caudal peduncle; head greenish grey above, greenish yellow beneath; fins greenish yellow, ventrals, anal, and caudal with a dark brown bar; iris greenish grey, with a golden streak on upper part.

Total length 75 mm.

A single specimen. Native name: *Kibanda*.

Only one species was hitherto known of the remarkable Silurid genus *Atopochilus*, Sauvage—*A. Savognani*, Sauv., from the Upper Ogowe, in which the head is contained $3\frac{3}{5}$ times in the total length and the eye $4\frac{1}{2}$ times in the length of the head and not more than twice in the interorbital width; the dorsal and pectoral spines are longer, and there are 11 anal rays instead of 9.

XVII.—On new Thyrididæ and Pyralidæ.

By Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S., &c.

THE numbers refer to papers on the classification of the Thyrididæ (P. Z. S. 1897, pp. 603–633), the Chrysauginæ (pp. 633–692); the Epipaschianæ, Endotrichinæ, and Pyralinæ (Trans. Ent. Soc. 1896, pp. 451–550).

Thyrididæ.

(5 a.) *Dysodia rufiflava*, sp. n.

♂. Head red-brown; thorax and abdomen fiery red; pectus and legs pale brownish red; abdomen with the basal half white, then deep red. Fore wing with the basal and costal areas and veins fiery red, the medial area below cell and the terminal area yellow; an elliptical hyaline spot in end of cell; two ill-defined, slightly waved and curved, antemedial brown lines; two very indistinct red medial lines on the yellow medial band with dark striæ on them in and just below cell; a broad red-brown postmedial band, its outer edge angled outwards at veins 5, 4, then incurved; an oblique brown line from costa before apex to middle of termen; a series of brown points from the angle of postmedial band to tornus. Hind wing with the basal and costal areas fiery red-brown, the terminal half of wing yellow reticulated with red; two or three ill-defined interrupted dark brown lines on the basal dark area; a quadrate hyaline spot in end of cell; an ill-defined, irregular, dark brown postmedial line from costa to vein 2; a slightly curved red-brown line from costa beyond middle to middle of termen, diffused towards apex; a dark red-brown line from vein 2 to tornus.

Hab. SINGAPORE (*Ridley*), 1 ♂ type. *Exp.* 24 mm.

(8.) *Dysodia pennitarsis*, sp. n.

Mid legs of male with large fringe of scales and hair on terminal joint of tarsi.

Fiery orange-red; palpi and tegulæ brown, the former with fine pale line on second joint at sides; mid tarsi with the fringe of scales black; hind tarsi with the extremity blackish; abdomen with fine blackish subbasal lines. Fore wing with dark striæ forming somewhat reticulate lines; a curved antemedial line; a medial line excurved in cell; a prominent oblique straight black postmedial line, slightly angled below costa, and confluent with a small diffused blackish mark from below costa beyond middle; a very slightly curved oblique line from costa just beyond the postmedial line to middle of termen; cilia dark brown with some pale patches above tornus. Hind wing with dark striæ forming somewhat reticulate markings; a rather reniform hyaline patch in end of cell edged with dark brown; a prominent oblique line from middle of costa to tornus, above which it forks; a slight oblique line from costa beyond

middle to near termen at vein 4, where it is acutely angled, then parallel to termen; cilia dark brown, whitish at tips in the emarginations below middle. Underside of fore wing with irregularly elliptical deep chocolate patch edged with black beyond and below lower angle of cell, traversed by the reddish veins.

Hab. SUMATRA (*de Nicéville*), 1 ♀; BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 40 mm.

(3.) *Mathoris lenistrialis*, sp. n.

♀. Fiery red; wings uniformly and rather thickly marked with inconspicuous deeper red striæ; the underside rather paler, with the striæ slightly more prominent, some of them forming an ill-defined somewhat darker oblique postmedial band on fore wing not reaching costa, and an indistinct oblique postmedial line on hind wing.

Hab. GOLD COAST (*W. H. Johnson*), 1 ♀ type. *Exp.* 26 mm.

(4.) *Mathoris multiguttata*, sp. n.

♂. Wings rather long and narrow. Head and collar dark grey and rufous; thorax and abdomen chalky white, the latter with the medial segments dorsally suffused and the terminal segments banded with dark grey. Fore wing dark grey, the costal area suffused with rufous; five rather ill-defined bands of annulate white marks, the first three almost coalescing below the cell; a prominent black-centred white spot on an apical rufous patch. Hind wing dark grey striated with black; a postmedial band of annulate white spots expanding into a large triangular patch at tornus. Underside of fore wing with a large rufous black-speckled patch on disk, the veins towards and beyond end of cell streaked with metallic scales.

Hab. BOLIVIA, Tanampajo. *Exp.* 26 mm. Type in Coll. Staudinger.

(4 a.) *Striglina pallidirufa*, sp. n.

♀. Rather pale rufous. Fore wing with rather sparse pale fuscous striæ forming obscure reticulations; faint traces of an oblique line from beyond the cell to middle of inner margin; terminal half of costal edge whitish, with medial, postmedial, and subterminal short black streaks. Hind wing with rather sparse pale fuscous striæ forming obscure reticulations; an indistinct oblique medial line with some slightly deeper rufous suffusion beyond it. Underside

with the striæ rather more prominent; fore wing with slight black discoidal bar, rather concave towards base.

Hab. SOLOMONS, Gizo I. (*Meek*), 1 ♀. *Exp.* 36 mm.

(4 b.) *Striglina flammans*, sp. n.

♀. Fiery red; palpi, tegulæ, tips of patagia, and medial part of abdomen tinged with brown; pectus, legs, and ventral surface of abdomen pale brown. Fore wing with numerous brown reticulate lines formed of striæ; a rather triangular brown patch beyond the cell with an oblique line from it, expanding below vein 2 and forking above inner margin; a brown line obliquely excurved from costa beyond middle to vein 5, slightly incurved at vein 4, retracted below vein 3, and ending at tornus; terminal half of costal edge alternately streaked with black and whitish; cilia dark brown, whitish at tips above tornus. Hind wing with numerous reticulate lines formed of brown striæ; a brown mark below middle of costa with line from it to inner margin; cilia dark brown, with whitish tips in two slight emarginations towards tornus. Underside with the ground-colour pale brown.

Hab. PERU, Perené (*Simons*), 1 ♀ type. *Exp.* 36 mm.

(6.) *Striglina guttistigma*, sp. n.

Fore wing with the termen excised toward tornus.

♀. Head, thorax, and abdomen pale dull red-brown; pectus, legs, and ventral surface of abdomen pale rufous, the front of pectus deep rufous. Fore wing pale dull red-brown with numerous indistinct dark striæ; indistinct oblique dark antemedial and medial lines, the area beyond the latter tinged with fuscous and glossed with silvery grey to near termen; a reddish-ochreous postmedial patch between veins 7 and 1, with two small round white spots on its upper extremity, expanding at middle, and with three similar small white spots on inner and outer sides; terminal area reddish ochreous. Hind wing ochreous tinged with red-brown, the basal area greyish; numerous reticulate brown lines formed of striæ; an irregular red-brown medial band expanding somewhat at middle and narrowing to a point at inner margin. Underside more ochreous with rufous reticulations, some blackish suffusion round the postmedial patch on fore wing.

Hab. NIGERIA, Sapele (*Sampson*), 1 ♀ type. *Exp.* 36 mm.

(2.) *Camadena emarginalis*, sp. n.

Hind wing with the termen acutely angled at veins 7

and 2, then with two slight excisions towards tornus; fore wing with the termen excised towards tornus.

♀. Head, thorax, and abdomen rufous; pectus, legs, and ventral surface of abdomen whitish. Fore wing rufous, with yellowish-white patches reticulated with fine rufous markings; a small elliptical antemedial spot in cell and somewhat quadrate patch on inner area; a somewhat quadrate medial patch from below costa to just below cell and a rather oblique elliptical spot on inner area; an elliptical postmedial patch from costa to vein 5, a patch beyond angle of cell between veins 4 and 2, and a patch from vein 3 to inner margin near tornus; two minute spots on costa towards apex. Hind wing with the basal area yellowish white, closely reticulated with rufous markings, the terminal half rufous with a rounded rufous-reticulated yellowish patch below costa beyond middle confluent with a large patch extending from vein 5 to submedian fold, the inner edge of which is confluent with the basal area, an interrupted medial narrow band, the apical and tornal areas being left rufous. Underside of fore wing with dark brown antemedial striæ on costa and in cell, and irregular postmedial patches on costal and inner areas; hind wing with small dark brown spots on and below middle of costa.

Hab. DUTCH N. GUINEA, Kapaur (*Doherty*), 1 ♀ type. *Exp.* 24 mm.

Genus *ENDOLOPHIA*, nov.

Palpi upturned, the second joint reaching vertex of head, the third long; antennæ of male simple; tibiæ with the spurs short; abdomen long, the claspers very long and with long genital tufts. Fore wing with all the veins from the cell, vein 8 absent. Hind wing with vein 5 from above lower angle of cell; 6 from below upper angle, the inner area largely tufted with long hair on underside.

Endolophia hypohæmia, sp. n.

♂. Head, thorax, and abdomen red-brown mixed with grey; the genital tufts ochreous. Wings bright red-brown, variegated with grey and ochreous, and striated with darker red; a dark discoidal point to fore wing; a curved greyish-ochreous postmedial band and similar narrower subterminal band on both wings. Underside strongly suffused with crimson; the tufts of hair ochreous and fuscous.

Hab. BR. GUIANA, Berg-en-Daal (*Ellacombe*), 1 ♂ type in Coll. Rothschild. *Exp.* 18 mm.

(2 a.) *Rhodoneura pexa*, sp. n.

Antennæ bipectinate with moderate branches to apex in both sexes.

Head rufous; thorax and abdomen grey-white; legs rufous, except tarsi, the hind tibiæ black at extremities. Fore wing ochreous tinged with rufous, the costa suffused with white, reticulate with indistinct rufous markings (except on marginal areas, which have only a few faint striæ); traces of oblique greyish ante- and postmedial bands; cilia white at tips. Hind wing ochreous tinged with rufous and reticulate with rufous markings, very faint on terminal area; a greyish medial band defined by rufous striæ, the reticulations before and on its middle filled in with yellow. Underside with the reticulations on basal half of fore wing and medial band of hind wing deep rufous filled in with yellow.

Hab. MASHONALAND, Umtali (*Marshall*), 1 ♀; CAPE COLONY, 1 ♂ type. *Exp.*, ♂ 26, ♀ 36 mm.

(2 b.) *Rhodoneura sparsireta*, sp. n.

♂. Antennæ bipectinate. Yellowish white; head and thorax partly suffused with red-brown; abdomen slightly ringed with brown; wings striated with rufous. Fore wing with curved antemedial line; a line from costa near the first line to lower angle of cell, where it joins the oblique medial line which forks at costa; a postmedial line angled outwards below costa, where it anastomoses with a curved line from costa before apex to middle of termen, angled inwards at middle, and outwards above vein 2, where it gives off a spur to termen. Hind wing with oblique medial line connected by spurs at middle and above inner margin with the sinuous subterminal line, which gives off two spurs to termen above middle and one below.

Hab. CUBA. *Exp.* 20 mm. Type in Coll. Staudinger.

(14 a.) *Rhodoneura acygoniata*, sp. n.

Fore wing with the termen slightly angled at middle; hind wing with it acutely angled.

♂. Pale rufous; wings reticulated with darker rufous. Fore wing with some rufous markings at base; an antemedial band angled below costa, then oblique; a postmedial band acutely angled below costa, then oblique and forking towards inner margin, some dark marks beyond it at middle; an oblique band across apical area curving round and reaching termen above middle; a submarginal band

from inner margin to vein 5, where it is bent inwards. Hind wing with dark rufous subbasal band; a medial band constricted at middle and inner margin; a large apical patch and a short submarginal band below the angle of termen.

Hab. COLOMBIA. *Exp.* 40 mm. Type in Coll. Staudinger.

(14 b.) *Rhodoneura eugrapha*, sp. n.

Pale rufous; palpi, antennæ, and a bar between their bases deep rufous; patagia and metathorax with deep rufous patches; abdomen with more or less complete deep rufous dorsal stripe, the terminal segments blackish. Fore wing thickly reticulated with deep rufous; a rufous fascia on base of costa, then just below costa to apex; an antemedial rufous line slightly angled outwards below costa, then oblique; an almost medial line forked towards costa and slightly incurved below the cell; a somewhat oblique postmedial line forked towards costa and inner margin; a line across apical area from costa to termen at vein 4; a rather triangular patch on termen from below vein 3 to tornus. Hind wing thickly reticulate with deep rufous; oblique antemedial and medial rufous lines; a line across apical area from costa to termen at vein 4; a rather annulate mark on termen at vein 2; cilia deep rufous.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♂, 1 ♀ type. *Exp.* 38 mm.

(14 c.) *Rhodoneura leucosticta*, sp. n.

Hind wing with the termen strongly excised from apex to vein 4, then excurved, and the cilia crenulate.

♂. Head and base of tegulæ pale rufous; palpi, frons, and antennæ dark brown; thorax dark brown, the tips of patagia, pectus, and legs with some ochreous; abdomen dark brown with some ochreous on ventral surface. Fore wing rufous, the marginal areas suffused with dark brown and glossed with silver; numerous dark striæ forming four indistinct narrow bands across the cell; some short black streaks in interspaces beyond the cell; the inner area with oblique dark medial band from cell to inner margin, with small quadrate white spots, each formed of two striæ on each side of it in submedian interspace; an oblique dark postmedial band from vein 6 to inner margin; an indistinct curved subterminal line; two black subapical points. Hind wing pale rufous thickly striated with darker rufous, forming obscure reticulations; the extreme base black; a small discoidal black spot and spot on middle of inner margin; an

oblique medial narrow band with waved edges, ending at tornus; apical area deeper rufous, with curved inner edge. Underside similar; fore wing with black subapical point on a whitish spot with black annulus.

Hab. BR. GUIANA (*Roberts*), 1 ♂ type. *Exp.* 32 mm.

(17 a.) *Rhodoneura nephelopera*, sp. n.

Head, thorax, and abdomen deep rufous; front of thorax and dorsum of abdomen with a purplish-silvery gloss; pectus, legs, and ventral surface of abdomen rather paler; wings rufous with a golden gloss, thickly and nearly evenly reticulate with pale and deep rufous lines. Fore wing with the base, costal area, and area beyond the cell to apex and down to vein 3 deep rufous suffused with purple; cilia with two white patches at tips below apex and two above tornus. Hind wing with the extreme base deep rufous; cilia with the tips chequered white and rufous. Underside of fore wing with the subcostal nervure and base of veins beyond upper angle of cell finely streaked with black and white, the terminal area between veins 8 and 2 suffused with purple, with a curved white streak below extremity of vein 8.

Hab. ASSAM, Khâsis, 2 ♂, 1 ♀ type. *Exp.* 24 mm.

(18 a.) *Rhodoneura euprepes*, sp. n.

♀. Head, thorax, and abdomen pale ferruginous, the last dorsally tinged with brown except at base and anal tuft; wings uniform pale silky ferruginous, with numerous evenly disposed indistinct rufous striæ; hind wing with oblique red subbasal line; the underside redder, with numerous prominent dark striæ and ill-defined rufous lines.

Hab. BR. GUIANA, Bartica (*Kaye*), 1 ♀ type. *Exp.* 24 mm.

(20 a.) *Rhodoneura gemmata*, sp. n.

♂. Bright rufous. Fore wing with dark rufous striæ forming obscure reticulations; two slight antemedial lines somewhat retracted to costa; two slight postmedial lines approximated below costa, the outer one oblique to below vein 4, then incurved and ending at tornus; an oblique line across apical area. Hind wing with dark rufous striæ forming obscure reticulations; a slightly darker rufous subbasal band; a similar medial band from vein 5 to inner margin, towards which it narrows. Underside paler, with the reticulations more distinct; fore wing with the basal part of cell irrorated

with black and metallic-blue scales; some yellow hair above and below this part of cell and at upper angle.

Hab. NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 26 mm.

(30 a.) *Rhodoneura bullita*, sp. n.

♂. Head, thorax, and abdomen deep rufous, the metathorax, pectus, and legs rather paler. Fore wing deep rufous, with numerous small white rounded spots reticulated with rufous forming very ill-defined antemedial, medial, and postmedial bands with other spots between them, the medial band expanding at end of cell, the postmedial with series of four spots beyond it between veins 6 and 2; a triangular patch on termen below apex, its apex above vein 5; some spots just before middle of termen. Hind wing deep rufous, mostly covered with rather small, rounded, whitish spots reticulated with rufous forming very ill-defined bands, the area below base of cell and beyond the cell between veins 5 and 2 marked with minute rather X-shaped black spots.

Hab. N. PERU, Hauncabamba, 2 ♂ type. *Exp.* 52-56 mm.

(33 a.) *Rhodoneura miosticta*, sp. n.

♂. Pale rufous; palpi dark brown; tegulæ bright rufous; abdomen with dorsal series of dark brown spots. Fore wing thickly but rather faintly reticulate with dark brown; the costa dark towards base; traces of a small discoidal lunule; a dark point in middle of submedian fold; a prominent subterminal spot above vein 5 with two slight marks above it. Hind wing thickly but rather faintly reticulate with dark brown; a slight subterminal point above vein 5.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♂ type. *Exp.* 26 mm.

(50 b.) *Rhodoneura lateritiata*, sp. n.

♂. Pale chestnut-red; abdomen suffused with pale pink; wings with numerous dark striæ; fore wing with pinkish tinge in and below cell; hind wing with the inner area pinkish. Underside of fore wing with the costal and inner areas and an oblique patch below middle of terminal area pink; a black point on a pink spot at apex. Hind wing pinkish white, with dark striæ and irregular series of pink spots.

Hab. BORNEO. *Exp.* 28 mm. Type in Coll. Staudinger.

(64 a.) *Rhodoneura palealides*, sp. n.

♂. Head and pectus orange; palpi pale yellow, the second

joint with black lateral line, the third joint black; antennæ black, the basal joint pale yellow; thorax pale yellow; fore legs black in front, the spurs and tarsi black, the latter with pale rings; abdomen yellowish white. Fore wing pale yellow; the costal edge black, the median nervure and veins 1 to 7 fuscous; a fine fuscous terminal line. Hind wing yellowish white; a fine fuscous terminal line.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♂ type. *Exp.* 42 mm.

(65 a.) *Rhodoneura ferruginosa*, sp. n.

♂. Bright ferruginous red. Fore wing with numerous indistinct deep rufous striæ; a rufous postmedial line ex-curved from costa to vein 4, then incurved, with some deeper rufous suffusion before it; the striæ on terminal area forming an ill-defined sinuous subterminal line. Hind wing with numerous deep rufous striæ forming ill-defined lines. Underside with a slight silvery gloss, the striæ rather more prominent.

Hab. SIKHIM (*Dudgeon*), 1 ♂ type. *Exp.* 30 mm.

(65 b.) *Rhodoneura flavicilia*, sp. n.

♀. Bright ferruginous; tarsi ringed with white; wings with a slight silvery gloss and numerous deeper rufous striæ. Fore wing with antemedial and medial lines; an oblique postmedial line with another from just beyond it on costa to tornus; an oblique line across apical area. Hind wing with slight antemedial and medial lines; a line from costa beyond middle to tornus with traces of another line beyond it and a curved line across apical area; both wings with fine dark terminal line, the base of cilia rufous with dark irroration and yellow tips. Underside with slight silvery irroration, the lines more prominent.

Hab. RHODESIA, Bulawayo (*Eyles*), 1 ♀ type. *Exp.* 22 mm.

(80 d.) *Rhodoneura nubila*, sp. n.

♂. Head dark reddish brown; thorax and abdomen greyish fuscous; legs and ventral surface of abdomen pale. Fore wing dull rufous clouded with purplish fuscous on basal, inner, and terminal areas beyond end of cell, the suffusion being formed by obscure dark reticulations. Hind wing dull rufous with obscure purplish-fuscous reticulations, especially at base, beyond end of cell, and at apex. Underside with the reticulations rather more prominent.

Hab. BR. GUIANA, Bartica (*Kaye*), 1 ♂ type. *Exp.* 28 mm.

(80 e.) *Rhodoneura aurifera*, sp. n.

♂. Head and thorax rufous; pectus and hind legs whitish; abdomen whitish dorsally suffused with black. Fore wing rufous, the inner area tinged with grey, the termen purplish grey, numerous fine blackish striæ forming reticulations; a triangular golden-yellow patch from middle of costa to lower angle of cell, and a similar but less prominent patch tinged with rufous from apical part of costa to vein 5, the former slightly reticulate, the latter prominently, the grey suffusion extending from termen between the two patches; cilia white. Hind wing pale rufous with prominent dark striæ forming reticulations; an indistinct dark subbasal line; termen purple-grey; cilia white.

Hab. PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 24 mm.

(6.) *Plagiosella pectinifera*, sp. n.

♂. Head, thorax, and abdomen rufous; wings pale rufous thickly striated with ferruginous. Fore wing with fine ante-medial rufous line excurved below costa, then incurved; a medial line almost straight on left wing, sinuous on right; a postmedial line forking above vein 5, one branch reaching inner margin beyond middle, the other sinuous and ending at tornus; a line across apical area. Hind wing with medial line forking at vein 5, one branch ending on inner margin above tornus, the other on termen below middle; a sinuous line from costa before apex to termen at vein 2.

Hab. SIERRA LEONE (*C'ements*), 1 ♂ type. *Exp.* 40 mm.

Pyralidæ.

EPIPASCHIANÆ.

Genus MICROPASCHIA, nov.

Palpi upturned, slender, reaching vertex of head, the third joint short; maxillary palpi filiform; antennæ of male with long cilia, a slender process from basal joint fringed on both sides with long hairs and reaching to metathorax; tibiæ smoothly scaled. Fore wing very narrow, the termen obliquely curved; vein 2 from near angle of cell; 3, 4, 5 stalked; 6 from upper angle; 7, 8, 9, 10 stalked, 7, 8 bent downwards, and 7 given off long beyond 9 towards termen; 11 from cell. Hind wing with vein 2 from before angle of cell; 3, 4, 5 stalked; 6, 7 stalked, and 8 anastomosing with them to near apex.

Micropaschia orthogrammalis, sp. n.

♂. Head, thorax, and abdomen grey-brown; pectus, legs, and ventral surface of abdomen grey irrorated with brown, the tarsi brownish ringed with white. Fore wing grey irrorated and suffused with brown; a diffused red-brown spot below middle of cell; a strong straight blackish line from middle of costa to inner margin beyond middle; a slight discoidal lunule; a punctiform postmedial line oblique from costa to vein 6, then inwardly oblique; termen slightly more suffused with brown and with obscure series of dark points. Hind wing greyish, uniformly suffused with brown.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type. *Exp.* 16 mm.

(4a.) *Arnatula constantialis*, sp. n.

♂. Antennæ with short thickly scaled process on basal joint; fore wing with no glandular swelling on costa, which is somewhat concave, the apex produced upwards and the termen oblique; vein 3 well separated from 4, 5.

Head and collar pale rufous; thorax and abdomen creamy white with rufous tuft on metathorax; abdomen fuscous towards extremity, the anal tuft fulvous. Fore wing with the basal area clothed with black and cream-coloured scales bounded by an erect black line defined by white on outer side; the medial area cream-coloured, extending along costa almost to the submarginal line; the outer area fuscous; a sinuous white subterminal line excurved at middle and much incurved in submedian fold. Hind wing whitish tinged with fuscous towards termen; an ill-defined sinuous white subterminal line, obsolete towards tornus.

Hab. EGYPT, Suez Canal. *Exp.* 28 mm. Type in Coll. Rothschild.

(2.) *Tioga melazonalis*, sp. n.

Tioga atrifascialis, Hmps. n. A. M. N. H. (7) xiv. p. 182 (nec Hulst).

Head, thorax, and abdomen white slightly irrorated with brown; palpi with black patches on first and second joints at sides; tegulæ with black patches at base; fore and mid legs with the extremity of femora and base of tibiæ black. Fore wing slightly tinged and irrorated in parts with brown; short black streaks at base on costa and below cell; an antemedial rufous band mostly suffused with black and becoming deep black at costa, its inner edge slightly angled

inwards below cell, its outer edge slightly sinuous and with a faint oblique medial line just beyond it; a faint postmedial line slightly excurved beyond lower angle of cell and with raised black scales towards inner margin; a double sub-terminal line with slight black streaks before it on the veins, and some fuscous suffusion beyond it at apex and slight rufous suffusion before and beyond it at inner margin; a terminal series of black striæ. Hind wing white, slightly tinged with brown on terminal half; a fine dark terminal line.

Hab. BAHAMAS, Nassau (*Sir G. Carter*), 2 ♂ type; JAMAICA, Runaway Bay (*Walsingham*), 1 ♂, Constant Springs, 1 ♂. *Exp.* 18 mm.

(3.) *Tioga fovealis*, sp. n.

Fore wing of male with small triangular fovea in end of cell.

♂. Head and thorax white mixed with some black; palpi with the third joint black; antennæ black except at base; tegulæ with black patches; tarsi black ringed with white; abdomen whitish suffused with fuscous. Fore wing white; a black patch at base of costa; a broad rather oblique black band just before middle, expanding on inner half; a broad, rather diffused, incurved, black band from apex to inner margin before tornus, the area beyond it tinged with fuscous; a terminal series of black points; cilia with a fuscous line through them. Hind wing white slightly tinged with brown, especially towards termen; a dark terminal line; a pale fuscous line near base of cilia.

Hab. FR. GUIANA, Cayenne (*Schaus*), 1 ♂ type, St. Jean Maroni. *Exp.* 14 mm.

(2 a.) *Pococera nigribasalis*, sp. n.

Pococera robustella, Druce, Biol. Centr.-Am., Het. ii. p. 199 (part.) (nec Zell.).

♀. Head and thorax grey mixed with fuscous; tarsi black ringed with grey; abdomen grey banded with fuscous. Fore wing with the basal area suffused with black, deepening towards its outer edge, which is slightly sinuous; a broad medial grey band slightly irrorated with fuscous, more thickly towards costa, and with a small tuft of black scales on discocellulars; terminal area suffused with reddish brown and slightly irrorated with fuscous; an indistinct grey post-medial line excurved from below costa to vein 4, then incurved and with a small patch of black suffusion before it on vein 2; some blackish suffusion on costal area before

apex ; a terminal series of black points. Hind wing yellowish white, the costal area and termen tinged with brown ; cilia white, brownish towards apex.

Hab. GUATEMALA, S. GERONIMO (*Champion*), 1 ♀ type. *Exp.* 24 mm.

(2 b.) *Pococera hemimelas*, sp. n.

♀. Head, thorax, and abdomen whitish tinged with rufous ; palpi with the third joint black ; tegulæ at middle, patagia near tips, and metathorax with a pair of small black patches ; tibiæ and tarsi blackish, the latter ringed with white ; abdomen dorsally tinged with fuscous. Fore wing with the basal area black, its outer edge slightly curved ; a medial whitish band with nearly straight medial brown line on it ; terminal area suffused with rufous and slightly irrorated with black ; postmedial line rather diffused, black defined by white on outer side, oblique from costa to vein 5, then incurved and excurved to inner margin ; a broad curved black band from costa before apex to termen below apex, some whitish on termen, and a prominent series of small terminal black spots ; cilia pale rufous, with some fuscous points at base and a fine pale line at middle. Hind wing pale rufous, the base whitish, the termen darker ; cilia whitish with a dark line near base.

Hab. PANAMA, La Chorera (*Dolby-Tyler*), 1 ♀ type ; COLOMBIA, 2 ♀. *Exp.* 20 mm.

(3 a.) *Pococera rufitinctalis*, sp. n.

♀. Head, thorax, and abdomen pale rufous, the last slightly irrorated with fuscous. Fore wing pale rufous slightly irrorated with fuscous ; a subbasal black point below the cell ; a slight black streak below median nervure before the medial line, which is oblique, especially from costa to median nervure, and very slightly angled inwards on vein 1, some greyish suffusion beyond it ; a black discoidal bar ; postmedial line indistinct, dentate, excurved from below costa to vein 3, incurved in submedian interspace and excurved to inner margin, defined by greyish on outer side, forming slight streaks on the veins ; a terminal series of black points. Hind wing ochreous white, the terminal area suffused with brown except towards tornus ; cilia yellowish white with slight brown points towards apex.

Hab. PARAGUAY, Sapucay (*Foster*), 2 ♀ type. *Exp.* 24 mm.

(5 a.) *Pococera polialis*, sp. n.

♀. Head and thorax grey-white slightly mixed with fuscous; tibiæ and tarsi banded with black; abdomen grey-white irrorated with fuscous and dorsally banded with black. Fore wing grey-white thickly irrorated with fuscous; sub-basal black points below costa and cell; a double oblique black antemedial line filled in with white and with curved black line before it from cell to inner margin, the area beyond it whiter, except towards costa, to the black discoidal point and ridge of raised black scales from below angle of cell to inner margin; postmedial line black defined by white on outer side, excurved between veins 6 and 3, and produced to minute streaks on veins 4 to 1; a slight diffused subterminal line, excurved at middle and the veins beyond it with short black streaks from costa to vein 5; a terminal series of black striæ; cilia white with fuscous lines at middle and tips and blackish points at middle. Hind wing semi-hyaline white, the terminal area suffused with fuscous, broadly at costa, narrowing to tornus; cilia white with a fuscous line through them, the underside with traces of curved postmedial line.

Hab. JAMAICA, Runaway Bay (*Walsingham*), 2 ♀ type.
Exp. 28 mm.

(6 a.) *Pococera albiceps*, sp. n.

♂. Head and thorax grey mixed with fuscous, vertex of head white; fore tibiæ and tarsi blackish ringed with white; abdomen grey slightly tinged with fuscous. Fore wing grey tinged with brown and slightly irrorated with fuscous; a fuscous mark on costa before middle with patch of raised black scales below it in cell, another patch below cell rather nearer base with a few scales forming a slight oblique line from it to inner margin; some fuscous suffusion on middle of costa, with diffused band of black scales from it to inner margin, incurved below cell, then oblique; a slight double oblique medial line filled in with white; postmedial line indistinct, diffused, defined by whitish on outer side and produced to slight dark streaks on the veins, oblique from costa to vein 4, then incurved; traces of a subterminal line slightly excurved from below costa to vein 3; a terminal series of black striæ. Hind wing whitish tinged with brown, especially on apical area.

Hab. ARGENTINA, Santa Fé, Ocampo (*Wagner*), 2 ♂ type.
Exp. 22 mm.

(8 a.) *Pococera stenipteralis*, sp. n.

Palpi of male with the second joint angled in front, the third very long and extending to end of tegulæ; maxillary palpi brush-like in fold of labial palpi; antennæ without process on basal joint; hind tibiæ with fringes of long hair on inner side; fore wing narrow, veins 4, 5 from cell.

Head and thorax golden olive-green; pectus, legs, and abdomen greyish, the last dorsally tinged with rufous and fuscous. Fore wing golden olive-green, the costal and inner areas slightly irrorated with black; a slight oblique black striga below vein 1; a rufous streak above middle of vein 1 with an oblique indistinct black striga from beyond its extremity to vein 1; an indistinct pale waved medial line defined on each side by olive; a slight oblique black discoidal lunule, with an oblique diffused black bar beyond it between veins 6 and 3 emitting slight streaks on the veins; a pale postmedial line defined on inner side by olive, incurved from costa to vein 5, excurved to vein 2, angled inwards in submedian fold and bent outwards to tornus; apical area suffused with rufous and black; a terminal series of prominent black points; cilia with a rufous line through them. Hind wing semihyaline whitish, the costal and apical areas suffused with brown; a brown terminal line and slight brown line through apical part of cilia. Underside of fore wing and costal and apical areas of hind wing suffused with purplish red.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type.
Exp. 24 mm.

(14.) *Pococera albimedialis*, sp. n.

Pococera melanoleuca, Druce, Biol. Centr.-Am., Het. ii. p. 548 (nec Hmps.).

♀. Head and thorax white; palpi with some black at middle of first and second joints, the third joint black with white tip; tegulæ with small black spots at base and tips of dorsum; thorax with black patches; legs banded with black; abdomen white irrorated with black, leaving white segmental rings. Fore wing white; black points at base of costa and cell; a diffused subbasal band formed of spots on costa and in cell, and an oblique streak above inner margin; a diffused antemedial fuscous band ending at vein 1, its inner edge angled outwards below cell, with two small black spots beyond it below cell and a bar from vein 1 to inner margin; a round discoidal tuft of black scales; three striæ

from medial part of costa; postmedial line strong, black, angled outwards at median nervules, then rather oblique; terminal area suffused with olive, leaving some white beyond postmedial line; a terminal series of black striæ; cilia white with series of fuscous points. Hind wing white, the apical area suffused with olive; two blackish spots on vein 2 near extremity; a terminal black line; the underside with faint discoidal spot and curved postmedial line from costa to vein 2.

Hab. MEXICO, Guerrero, Amula (*H. H. Smith*), 1 ♀ type. *Exp.* 24 mm.

(15.) *Pococera subviolascens*, sp. n.

♀. Fore wing with veins 10, 11 stalked.

Head black and white; palpi banded black and white; antennæ with the basal joint white, the shaft black; thorax white; tegulæ with black band at base and points at tips; legs banded black and white; abdomen white suffused with fuscous and with slight black segmental lines. Fore wing white, the inner and terminal areas suffused with purplish fuscous; a subbasal black striga from costa; an antemedial triangular black patch from costa to vein 1, followed by a small wedge-shaped spot from costa; a slightly curved strong postmedial black line bounding on inner side the purplish terminal area, with small wedge-shaped white spot beyond it from costa; a terminal series of black striæ; cilia with a fine white line at base. Hind wing pale purplish fuscous. Underside purplish fuscous, with white spot on costa of fore wing towards apex.

Hab. ARGENTINA, Gran Chaco, Florenzia (*Wagner*), 1 ♀ type. *Exp.* 20 mm.

(16.) *Pococera africalis*, sp. n.

♀. Head and thorax brownish grey largely mixed with black; tarsi black ringed with grey; abdomen grey tinged with red-brown and irrorated with black, the terminal segments with black segmental lines. Fore wing brownish grey irrorated with black; subbasal and antemedial black spots on costa; a medial black spot on costa conjoined to a discoidal spot, a rather diffused black line from cell to inner margin; postmedial line black, diffused on inner side and defined by whitish on outer, oblique from costa to vein 5, then incurved; the apical area suffused with black; a diffused black patch on termen above tornus; a terminal series of black striæ; cilia fuscous with greyish tips. Hind

wing fuscous brown, with slightly darker patch at extremity of vein 2; cilia grey with a fuscous line through them; the underside with indistinct, diffused, curved, whitish postmedial line from costa to submedian fold.

Hab. BR. E. AFRICA, Tana R. (*Crawshay*), 1 ♀ type. *Exp.* 14 mm.

(1 a.) *Lepidogma flagellalis*, sp. n.

Antennæ of both sexes bipectinate, the basal joint in male with a long process thickly fringed with hair below and reaching beyond metathorax.

Reddish brown irrorated with black; the antennal process fringed with black hair; abdomen obscurely banded with black. Fore wing with the tufts of scales in cell black; the basal area suffused with black bounded by an obscure pale antemedial line; a postmedial dark line, oblique from costa to vein 5 and slightly angled inwards in submedian fold; the terminal area suffused with black; a series of black points on termen. Hind wing fuscous, the inner area paler.

Hab. BORNEO, Kuching, 1 ♀ type. *Exp.* 24 mm. Type ♂ in Coll. Rothschild.

(1 b.) *Lepidogma melaleucalis*, sp. n.

Antennæ of male with long process from basal joint fringed with hair and extending to beyond metathorax.

♂. Head and thorax black slightly mixed with grey; pectus and legs whitish, the tarsi banded with black; abdomen ochreous white, blackish at base and towards extremity. Fore wing with the basal area black; the medial area whitish slightly tinged with brown; a black spot at upper angle of cell connected with a black fascia on medial part of costa; postmedial line black slightly defined by whitish on outer side, somewhat incurved below vein 5; terminal area black-brown; cilia black with a fine whitish line at base. Hind wing with the basal half brownish white, the inner area suffused with fuscous; the terminal half black-brown; a slight postmedial oblique line between veins 5 and 2 defined by whitish on outer side; cilia blackish with a fine white line at base.

Hab. ASHANTI, Kumassi (*Whiteside*), 2 ♂ type. *Exp.* 16 mm.

(1 c.) *Lepidogma melanobasis*, sp. n.

♂. Head and thorax black mixed with brown and grey; pectus, legs, and abdomen grey, the last with slight dorsal

fuscous segmental lines. Fore wing with the basal area blackish with sinuous outer edge, the rest of wing whitish slightly tinged with brown and irrorated with fuscous; a small tuft of black scales in middle of cell on edge of basal area and discoidal tuft; postmedial line whitish with some fuscous suffusion before it, the area beyond it suffused with fuscous, excurved from vein 5 to 2, then incurved in submedian fold. Hind wing whitish tinged with brown, especially on apical area.

Hab. JAPAN, Yokohama (*Pryer*), 1 ♂ type. *Exp.* 20 mm.

(1 d.) *Lepidogma dentilinealis*, sp. n.

♂. Head and thorax whitish tinged in parts with rufous, the patagia with some black scales; palpi fuscous at sides; tarsi fuscous ringed with white; abdomen whitish, tinged in parts with rufous and with ill-defined subdorsal black bands, complete dorsally on third and fourth segments, the ventral surface white with some black towards extremity. Fore wing whitish suffused with rufous and irrorated with black, leaving white patches beyond the antemedial line and in and beyond end of cell; an ill-defined black streak below the cell before the nearly straight antemedial line; the fans of scales at middle and end of cell blackish; a diffused, rather dentate, oblique line from lower angle of cell to inner margin; postmedial line very oblique from just below costa to vein 4 near termen, then incurved and dentate on veins 3, 2; traces of a diffused subterminal line excurved from costa to vein 4, then incurved; the apical area suffused with black. Hind wing white, the apex suffused with fuscous; two dark marks on terminal part of vein 2.

Hab. BR. E. AFRICA, Maungu-Inkuhwa (*Betton*), 1 ♂ type. *Exp.* 22 mm.

(2 a.) *Lepidogma melanopolis*, sp. n.

♀. Head, thorax, and abdomen pale reddish brown mixed with some fuscous; tarsi fuscous with pale rings. Fore wing pale reddish brown; the basal area suffused with black, its outer edge nearly straight and somewhat oblique; a large fan of black scales at upper angle of cell; postmedial line diffused on inner side, oblique from costa to vein 5, then erect; terminal area slightly tinged with fuscous; a terminal series of blackish points. Hind wing pale rufous, the base whitish, the terminal area tinged with fuscous; an oblique postmedial line hardly traceable towards costa and ending in a prominent mark at submedian fold with some brighter rufous before it; a fine pale line at base of cilia.

Hab. BORNEO, Sandakan (*W. B. Pryer*), 2 ♀ type. *Exp.* 16 mm.

(2 b.) *Lepidogma rubricalis*, sp. n.

♀. Head, thorax, and abdomen clothed with red-brown and black scales. Fore wing red-brown with a glistening greyish gloss; some fuscous suffusion on basal inner area and a tuft of scales below the cell; traces of a curved yellowish antemedial line; a discoidal tuft of black scales; the postmedial line yellowish defined by a black line on its inner side and excurved between veins 5 and 2, some purplish-grey suffusion on its inner side and some patches of black scales between vein 5 and inner margin; the terminal area yellow-brown with some dark striæ on termen. Hind wing fuscous brown with faint traces of a postmedial line bent outwards and defined by ochreous between veins 5 and 2; the cilia ochreous with a dark line through them.

♂. Hind wing with the ground-colour ochreous white.

Hab. MASHONALAND, Salisbury (*Marshall*), 2 ♂, 3 ♀ type. *Exp.* 24 mm.

(1 a.) *Jocara trilinealis*, sp. n.

♀. Head, thorax, and abdomen white slightly tinged with brown; palpi brown except at base; fore tibiæ and fore and mid tarsi fuscous; abdomen with fine dorsal black lines on first two segments and small subdorsal spots on three penultimate segments. Fore wing white; the base suffused with reddish brown bounded by an oblique subbasal black line excurved in cell and strongly below cell, giving off a slight black streak below costa; small antemedial tufts of black scales in and below cell; some brownish suffusion before an oblique slightly sinuous medial black line; terminal area suffused with brown; a postmedial black line excurved below costa, then incurved, veins 7, 6 beyond it streaked with black; a white patch on middle of terminal area, a terminal series of small black spots; cilia white. Hind wing white, the apical area suffused with brown; a terminal series of black striæ.

Hab. BAHAMAS, Nassau (*Sir G. Carter*), 1 ♀ type. *Exp.* 22 mm.

(2 a.) *Jocara lophotalis*, sp. n.

Head, thorax, and abdomen grey-white; palpi fuscous in front; antennæ blackish, the process from basal joint in male tipped with black; patagia with fine black streak on

outer edge; metathorax edged with black; legs tinged with fuscous, the tarsi blackish ringed with white. Fore wing grey tinged with brown, especially on costal area; an antemedial ridge of black scales from cell to inner margin and another from lower angle of cell; an indistinct double waved medial line filled in with grey; black points in middle of cell and on discocellulars; the veins beyond the cell streaked with black to the white postmedial line slightly defined on each side by fuscous and excurved from below costa to vein 3, some black before and beyond it on costa and some brown suffusion before it down to vein 3; a terminal series of prominent black points; cilia whitish with a brown line near base. Hind wing white slightly tinged with fuscous, especially on terminal area.

Hab. JAMAICA, Runaway Bay (*Walsingham*), 4 ♂, 3 ♀ type. *Exp.* 22 mm.

(2 b.) *Jocara pictalis*, sp. n.

♀. Head, thorax, and abdomen white and olive-yellow. Fore wing silvery white, with olive-yellow marks at base of costa and inner margin; a black point at base and subbasal points below costa and median nervure; an antemedial broad olive-yellow band with a tuft of black scales in cell, a large fan of white and black scales below the cell and a waved white line near its outer edge; a tuft of black scales at end of cell; some postmedial patches of black scales forming a broken waved line; the postmedial line white and minutely dentate, defined by an olive and fuscous line on each side, with a patch of black and blue-grey beyond it on apical area and a white patch at middle; a terminal series of black spots; cilia pale brownish. Hind wing pale fuscous with darker terminal line, the cilia white.

Hab. BRAZIL, São Paulo (*Jones*). *Exp.* 28 mm. Types in Coll. Rothschild and B.M.

(4 a.) *Jocara ferrifusalis*, sp. n.

♀. Head, thorax, and abdomen grey suffused with ferruginous, the last with obscure fuscous dorsal bands. Fore wing greenish grey, more or less strongly suffused with ferruginous and irrorated with black; a small antemedial tuft of black scales below the cell; an indistinctly double black medial line filled in with whitish on costal area and from cell to inner margin, excurved in submedian interspace and above inner margin and angled inwards on vein 1; a small discoidal tuft of raised scales; postmedial line rather

indistinct, defined by grey on outer side, dentate, excurved from costa to vein 4, then oblique, more or less black suffusion before and beyond it on costal half; a terminal series of black striæ. Hind wing grey suffused with ferruginous brown; a fine dark terminal line. Underside of fore wing fuscous, the costal and terminal areas ferruginous; hind wing whitish suffused with ferruginous, deeper on costal and terminal areas, a black point at upper angle of cell.

Hab. JAMAICA, Montpelier (*Walsingham*), 2 ♀ type; PARAGUAY, Sapucay (*Foster*), 1 ♀. *Exp.* 28 mm.

(5.) *Jocara discalis*, sp. n.

Head, thorax, and abdomen clothed with ochreous, red, and black scales; tarsi whitish banded with rufous; anal tuft ochreous white. Fore wing ochreous white suffused with rufous and irrorated with black, the postmedial area rather darker, the apical area blackish; a medial blackish line defined by ochreous on inner side, excurved below costa and bent inwards to inner margin; a slight black discoidal lunule with large rounded purplish-white patch beyond it with some blackish suffusion round it and some purplish below it; postmedial line ochreous white, obliquely excurved from costa to vein 3, then incurved and slightly sinuous, defined by black on inner side and with short black streaks before it on the veins, the one on vein 5 somewhat indenting the grey patch; the apical black patch with some white suffusion at apex, a whitish patch at tornus; a terminal series of slight dark lunules with more prominent black striga above tornus; cilia rufous with fine ochreous line at base. Hind wing whitish tinged with brown, the apex suffused with brown; a brown terminal line; cilia with brown line through them; in female nearly uniformly suffused with brown; the underside with the costal area suffused with red, a black discoidal point and postmedial points on veins 7, 8; female with the terminal area suffused with red, a diffused curved postmedial line from costa to vein 2.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type, type ♀ in Coll. Schaus. *Exp.* 24 mm.

(6.) *Jocara ædiperalis*, sp. n.

♂. Antennæ with the process very long and thickly scaled; fore wing with the apical part of costa dilated into a large rounded lobe with large fringe of scales recurved from it over upper surface and some rough scales below the fringe.

Head and thorax ochreous tinged with rufous; tips of

antennal process, tegulae and patagia, and metathorax tinged with fuscous; abdomen ochreous, dorsally tinged with fuscous. Fore wing ochreous tinged with rufous and irrorated with fuscous except on costal and terminal areas; a large rounded whitish patch on inner area beyond middle; the fringe of scales from apical part of costa fuscous; traces of an antemedial line from cell to inner margin; a tuft of dark scales below middle of cell; traces of a double medial line, oblique from lower angle of cell to submedian fold, then filled in with whitish; an indistinct postmedial line defined by whitish on outer side, excurved and somewhat dentate from vein 5 to 2, where it is angled inwards, then slightly excurved again; series of slight fuscous points on termen and at tips of cilia. Hind wing ochreous white, the costal area and termen suffused with brown; the underside with the costal area suffused with rufous, a slight dark lunule at upper angle of cell.

Hab. PANAMA, La Chorera (*Dolby-Tyler*), 1 ♂ type. *Exp.* 26 mm.

Genus ARÆOPASCHIA, nov.

Palpi upturned, slender, reaching vertex of head, the third joint short; maxillary palpi filiform; antennæ of male ciliated, without process on basal joint; tibiæ smoothly scaled. Fore wing rather narrow; vein 2 from near angle of cell; 3 from angle; 4, 5 stalked; 6 from upper angle, somewhat down-curved at base and with slight groove above it; 7, 8, 9 stalked; 10, 11 from cell; a slight glandular swelling on costa just beyond middle. Hind wing with vein 3 from near angle of cell; 4, 5 stalked; 6, 7 from upper angle; 8 free.

Aræopaschia rufescentalis, sp. n.

♂. Head and thorax pale rufous; pectus, legs, and abdomen whitish irrorated with brown; tarsi fuscous with pale rings. Fore wing pale rufous irrorated with dark rufous; small dark subbasal, antemedial, and medial spots on costa; traces of an oblique antemedial line; a dark point at upper angle of cell; postmedial line indistinct, very oblique from costa to vein 6, incurved below vein 4; a terminal series of indistinct dark points; a fine pale line at base of cilia. Hind wing white, the costal and terminal areas tinged with brown; cilia with a fine brown line near base; the underside with traces of curved postmedial line.

Hab. W. AUSTRALIA, Geraldton (*Saunders*), 3 ♂ type. *Exp.* 20 mm.

(2.) *Spectrotrota normalis*, sp. n.

Male without secondary sexual characters; fore wing in both sexes with veins 4, 5 stalked, 3 from cell.

Head and thorax rufous; pectus, legs, and abdomen whitish thickly irrorated with rufous; tarsi ringed with white. Fore wing pale rufous thickly irrorated with dark rufous; a rather diffused sinuous dark antemedial line bent inwards to costa; a diffused sinuous postmedial line, excurved and dentate between veins 5 and 2 and angled outwards on vein 1; a terminal series of obscure dark points. Hind wing whitish slightly tinged with rufous, the terminal area slightly irrorated with rufous; a dark terminal line; the underside with the costal half thickly irrorated with rufous, traces of a curved postmedial line.

Hab. W. AUSTRALIA, Sherlock R. (*Clements*), 2 ♂, 1 ♀ type. *Exp.* 22 mm.

(12 a.) *Macalla mixtirosalis*, sp. n.

♂. Head and thorax clothed with grey-brown and pink scales; abdomen grey-brown. Fore wing pale irrorated with pale brown and pink scales; four dark spots on costa; an indistinct antemedial line angled below the cell; a black spot at end of cell; a dentate fuscous postmedial line oblique from costa to vein 5, excurved to vein 2, where it is strongly angled inwards, then bent outwards again; a terminal series of fuscous spots; cilia pinkish with series of fuscous spots. Hind wing pale fuscous; cilia pale pinkish with fuscous spots.

Hab. QUEENSLAND, Dawson district (*Barnard*). *Exp.* 28 mm. Types in Coll. Rothschild and B.M.

(12 b.) *Macalla elæa*, sp. n.

♂. Head and thorax olive-green and brown; abdomen rufous, with black segmental line on second segment. Fore wing olive-green irrorated with rufous and fuscous; some subbasal brown marks; the minutely waved green ante- and postmedial lines defined by diffused brown bands on each side; a dark discoidal tuft of scales; the postmedial line slightly bent outwards between veins 7 and 3, and with diffused black scales on each side it on inner area. Hind wing fuscous; cilia of both wings pale rufous, with waved dark line through them.

Hab. NEW GUINEA, Fergusson Is. (*Meek*), 1 ♂ type. *Exp.* 26 mm.

(12 c.) *Macalla galeata*, sp. n.

Antennal process of male extending as far as tegulae, expanding into a hollow at tips, filled with black hair and fringed with long hair and scales above, held forward over palpi; tufts of hair behind antennae; fore wing without costal gland.

♂. Head, thorax, and abdomen ochreous tinged with rufous. Fore wing ochreous tinged with rufous and slightly irrorated with fuscous, the area below and beyond end of cell whitish; tufts of blackish scales in and below middle of cell, with some blackish suffusion below them; a tuft of blackish scales on discocellulars, with black point above it on costa; an indistinct minutely dentate postmedial line, oblique from costa to vein 4, then inwardly oblique; traces of a curved subterminal shade; a terminal series of slight dark points; cilia ochreous intersected with rufous. Hind wing white, the termen tinged with rufous, narrowing to tornus; traces of a postmedial line from costa to vein 2; a slight dark terminal line; cilia pale, with a rufous line through them.

Hab. W. AUSTRALIA, Sherlock R. (*Clements*), 1 ♂ type. *Exp.* 32 mm.

(12 d.) *Macalla enochoa*, sp. n.

Antennae of male with the process from basal joint triangular, flattened, smoothly scaled, and hollowed out, meeting above corneous cup-like depression on vertex of head; fore wing without glandular swelling on costa.

Golden green fading to yellow. Fore wing irrorated with darker scales; an olive antemedial band narrowing to a point on inner margin and followed by an oblique medial line; a postmedial olive band bordered by lines of black scales interrupted at the veins; a postmedial line oblique from costa to vein 3, where it is angled; a subterminal olive band parallel to the postmedial line from costa to vein 4, where it is interrupted, conjoined to the line below vein 3; cilia green intersected with black. Hind wing pale at base, then fuscous with a reddish tinge; cilia reddish.

Hab. BRIT. N. GUINEA, Moroka (*Anthony*), 2 ♂. *Exp.* 24 mm. Types in Coll. Rothschild and B.M.

(13 a.) *Macalla melapastalis*, sp. n.

♂. Head, thorax, and abdomen grey mixed with black and slightly tinged with brown; abdomen with the basal segment whitish; pectus, base of legs, and ventral surface

of abdomen whitish; tarsi black ringed with white. Fore wing grey tinged with fuscous and rufous and sparsely irrorated with large black scales; the base darker; a fan of fuscous scales in middle of cell and discoidal tuft of black scales; postmedial line forming short black streaks on the veins, oblique from costa to vein 4, then inwardly oblique to submedian fold and bent outwards to inner margin; a diffused subterminal shade, oblique across apical area; a terminal series of slight dark points; cilia grey intersected with fuscous. Hind wing semihyaline whitish, the apical area slightly tinged with fuscous; cilia with a fine dark line through them.

♀. Fore wing much darker; hind wing with the terminal area suffused with black, broadly at apex, narrowing to a point at tornus and with two slight dark spots on extremity of vein 2.

Ab. Fore wing with oblique deep black shade from middle of costa, where it is broad, to inner margin before postmedial line.—Br. E. Africa.

Hab. BR. E. AFRICA, Kui (*Betton*), 1 ♀; MASHONALAND, Salisbury (*Marshall*), 1 ♂ type; N'Gamiland (*Lugard*), 1 ♀. *Exp.* 24–28 mm.

(13 b.) *Macalla minoralis*, sp. n.

♂. Head and thorax grey mixed with black and tinged with rufous; tarsi black ringed with white; abdomen grey, with subdorsal and lateral series of blackish spots. Fore wing grey tinged with fuscous and rufous and sparsely irrorated with black scales; an indistinct, slightly waved, oblique subbasal line; two tufts of black scales in middle of cell with some black irroration or rufous suffusion below the cell; postmedial line oblique from costa to vein 5, then incurved; terminal area suffused with fuscous; a terminal series of slight dark points. Hind wing semihyaline whitish; the inner area tinged with fuscous; the apical area broadly suffused with fuscous to vein 2, the termen then narrowly fuscous; a fine pale line at base of cilia.

Hab. SINGAPORE (*Ridley*), 1 ♂ type. *Exp.* 20 mm.

(14 a.) *Macalla fasciculata*, sp. n.

♂. Antennæ with no process from basal joint, the shaft serrate and fasciculate. Dull olive-green irrorated with black; tarsi and abdomen banded with black. Fore wing with black mark at base of costa; an oblique line from median nervure near base to middle of inner margin; the tufts in cell black; the postmedial line minutely dentate,

angled outwards below costa and strongly beyond lower angle of cell, then incurved; a subapical black patch. Hind wing suffused with fuscous; a small subterminal black spot on vein 2; both wings with terminal black line, the cilia intersected with black.

Hab. NATAL (*Spiller*). *Exp.* 24 mm. Type in Coll. Rothschild.

(14 b.) *Macalla attenualis*, sp. n.

Antennæ of male without process from basal joint; palpi with the second joint very long. Pale brown; abdomen slightly irrorated with black on dorsum near base. Fore wing long and narrow; two obscure, waved, olive-brown antemedial lines interrupted at nervures; a diffused oblique fuscous line from beyond discocellulars to middle of inner margin, the area beyond it below vein 3 whitish; a prominent whitish subterminal line oblique from costa to vein 5, then curved and at vein 3 incurved; the disk irrorated with fuscous, the veins traversing it and some points on termen towards apex fuscous. Hind wing whitish, the costa and termen brownish.

Hab. BR. GUIANA, Rockstone (*Kaye*), 1 ♀; BRAZIL, Bahia, 1 ♂ type. *Exp.* 24 mm.

(16 a.) *Macalla fulvitinctalis*, sp. n.

♀. Head, thorax, and abdomen ochreous tinged with rufous and mixed with some black; tarsi black with pale rings; abdomen with slight black segmental bands on dorsum. Fore wing ochreous tinged with rufous and suffused in parts with fuscous, the area below the cell irrorated with a few large black scales; diffused oblique antemedial and medial black lines; fans of black scales in middle of cell and on discocellulars; a fan of black scales on inner margin below middle; two black spots on costa beyond middle, the faint, slightly waved, postmedial diffused line arising from the outer spot, oblique from costa to vein 5, then becoming subterminal; the apex suffused with fuscous and some fuscous suffusion on inner side of postmedial line below vein 5; a terminal series of black striæ. Hind wing ochreous tinged with rufous; a curved fuscous postmedial line; terminal area suffused with fuscous, broadly at apex, narrowing to a point above tornus; a terminal series of black points; the underside with black discoidal spot.

Hab. BR. E. AFRICA, Taru (*Betton*), 1 ♀ type. *Exp.* 20 mm.

(18 a.) *Macalla ochrotalis*, sp. n.

Antennæ of male with the process slender and fringed with long hair below. Head, thorax, and abdomen ochreous; tegulæ and patagia rufous at base; tibiæ with some rufous; tarsi rufous ringed with ochreous; abdomen with slight rufous dorsal bands. Fore wing ochreous slightly irrorated with rufous and black, the terminal area rufous suffused with black; antemedial line ill-defined, blackish, angled outwards below costa, strongly incurved to submedian fold and bent outwards to inner margin; a prominent black discoidal spot; postmedial line diffused, black, defining the inner edge of rufous area, excurved between veins 5 and 3; a terminal series of black points; cilia pale with black line near base. Hind wing semihyaline white; a terminal black band narrowing from apex to a point at vein 1; cilia with a blackish line near base.

Hab. FR. GUIANA, Cayenne (*Schaus*), 1 ♀ type, type ♂ in Coll. Schaus. *Exp.* 22 mm.

(18 b.) *Macalla niveorufa*, sp. n.

♀. Head, thorax, and abdomen white, the head slightly tinged with ochreous; palpi with black spot on inner side of second joint at extremity, the third joint black; tibiæ banded with black, the tarsi black ringed with white; abdomen with black dorsal segmental lines and lateral black irroration. Fore wing nearly pure white, the basal area slightly tinged with fuscous, the terminal area silky rufous with some black suffusion; an indistinct antemedial line with darker spot on costa, incurved in submedian interspace; two black discoidal points; postmedial line strong, black with slight streaks on the veins, slightly bent outwards between veins 5 and 3, then somewhat retracted, the whole area beyond it rufous; a terminal series of black spots. Hind wing ochreous white, the apical area broadly suffused with fuscous and tinged with rufous to just below vein 2, the termen then narrowly dark; the underside with black discoidal point and indistinct punctiform curved postmedial line from costa to vein 2.

Hab. PANAMA, Cana Mines (*Tylecote*), 1 ♀ type. *Exp.* 28 mm.

(20 a.) *Macalla melanobasis*, sp. n.

♂. Head and thorax black, mixed with some rufous and ochreous; hind legs and abdomen ochreous, with dorsal patches of black scales on first two and fourth and fifth segments.

Fore wing with the basal area black with curved outer edge; the rest of wing creamy ochreous, with pale rufous suffusion on costal and postmedial areas; a fan of pale rufous scales in end of cell; a rather triangular black apical patch; two terminal black striæ towards apex and one above tornus. Hind wing creamy white with ill-defined dark rufous spot on vein 2 near termen, with black striga on termen beyond it.

Hab. MASHONALAND (*Dobbie*), 1 ♂ type. *Exp.* 30 mm.

(20 b.) *Macalla grisealis*, sp. n.

♂. Antennæ with the process long or moderate; hind wing with veins 4, 5 stalked; fore wing with vein 6 stalked with 7, 8, 9.

Head and thorax grey-white mixed with fuscous; legs whitish irrorated with fuscous; abdomen whitish, dorsally suffused with brown, ventrally irrorated with fuscous. Fore wing grey-white irrorated with fuscous and with large black scales; a slight black streak below the cell before the indistinct antemedial line, which is angled outwards just below cell; a black discoidal spot; two obliquely placed spots above middle of inner margin; a postmedial series of prominent black rather elongate spots on the veins, excurved between veins 6 and 3; a terminal series of small black spots. Hind wing semihyaline white, the veins and termen tinged with brown.

Hab. BR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type, Maroni R. *Exp.* 24-30 mm.

(23 a.) *Macalla ignezonalis*, sp. n.

♂. Head and thorax yellowish white tinged with brown; abdomen purplish red; wings whitish, tinged with brown and irrorated with fuscous. Fore wing with whitish medial line, very oblique from costa to median nervure, then curved and with large purplish-red patch on its inner side; a black discoidal tuft; a whitish postmedial line, oblique from costa to vein 5, then minutely dentate; a terminal series of black points. Hind wing with broad fiery-red medial band edged by whitish lines, the inner very oblique from costa to median nervure, the outer slightly excurved and minutely dentate between veins 5 and 2; a terminal series of black points.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type. *Exp.* 24 mm.

(34.) *Macalla glaucochrysalis*, sp. n.

♀. Head, thorax, and abdomen ochreous white, tinged with rufous. Fore wing ochreous suffused with rufous and

irrorated with fuscous, the medial and tornal areas suffused with grey-blue; an antemedial tuft of rufous scales below the cell, with traces of an excurved line from it to inner margin; traces of a pale postmedial line, oblique below vein 4; a terminal series of slight brown points. Hind wing golden yellow, the apex slightly tinged with brown.

Hab. BORNEO, Sandakan (*Pryer*), 1 ♀ type. *Exp.* 26 mm.

(35) *Macalla metachryseis*, sp. n.

♀. Head orange tinged with green; thorax olive-yellow-green; abdomen yellow, dorsally tinged with olive. Fore wing golden olive-green; a slight dark shade below base of cell; an irregular triangular white patch from middle of costa to submedian fold, with small green spot near its outer edge in cell and small tuft of blackish scales on its outer edge below base of vein 2 and line from it to inner margin angled outwards on vein 1, the costa beyond it with series of white points; a white line from costa towards apex, strongest towards costa, dentate inwards above veins 6, 5, then excurved, minutely dentate and incurved in submedian interspace; a series of dark points just before termen. Hind wing golden yellow.

Hab. BR. E. AFRICA, Eb Urru (*Betton*), 1 ♀ type. *Exp.* 44 mm.

GENUS CHLOROPASCHIA, nov.

Palpi upturned, the second joint reaching vertex of head, the third acuminate; maxillary palpi filiform; antennæ of male ciliated, without process from basal joint; tibiæ smoothly scaled. Fore wing with vein 3 from before angle of cell; 4, 5 radiating from angle; 6 from upper angle; 7, 8, 9, 10 stalked; 11 from cell. Hind wing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle; 8 free.

Chloropaschia thermalis, sp. n.

Head and tegulæ rufous, with some dark scales; thorax olive-green mixed with fuscous; pectus and hind legs pale; fore and mid legs rufous and fuscous, the tarsi fuscous with pale rings; abdomen pale, dorsally suffused with rufous and obscurely banded with fuscous. Fore wing olive-green, largely suffused with rufous and irrorated with fuscous; antemedial tufts of raised black scales in and below cell, with a rufous band beyond them in female from cell to inner margin; a slight tuft of black scales in end of cell and

discoïdal bar ; a medial black line obliquely excurved from costa to vein 4, then strongly incurved to below end of cell ; some rufous suffusion with points of black scales at middle before the postmedial line, which is black defined by greyish on outer side, very minutely dentate, somewhat oblique from costa to vein 2, then slightly incurved ; terminal area suffused with rufous, becoming greyish towards termen ; a terminal series of prominent black points ; cilia pale rufous, with series of fuscous points. Hind wing pale tinged with reddish brown, especially on apical area ; cilia pale, with fuscous line near base.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type, type ♀ in Coll. *Schaus*. *Exp.* 26 mm.

(10 a.) *Stericta glaucinalis*, sp. n.

♂. Head and tegulæ ferruginous ; thorax greenish grey ; legs and abdomen pale red-brown irrorated with fuscous. Fore wing greenish grey irrorated with brown ; the basal half of costa, the discoïdal tuft, and three spots on terminal half of costa red-brown ; conjoined dark and pale brown patches on termen from vein 5 to inner margin, with a grey patch in submedian interspace. Hind wing semihyaline greyish, the apical area suffused with fuscous ; a dark line through the cilia.

Hab. SURINAM, Berg-en-Daal (*C. W. Ellacombe*). *Exp.* 24 mm. Type in Coll. *Rothschild*.

(18 a.) *Stericta leucozonalis*, sp. n.

♀. Head, thorax, and abdomen pale ochreous, with a greenish tinge. Fore wing dark olive-green, shading into ochreous in places ; a narrow, oblique, white, slightly waved, and irregular subbasal band ; a slightly curved white medial line, followed by a narrow olive-green band, then a broad white band emitting a short spur inwards in cell to near the medial line, its outer edge angled outwards at middle ; a diffused whitish postmedial line, with olive-green band before it, strongly angled outwards at middle ; termen narrowly greyish, with prominent series of dark points ; cilia pale rufous, with some dark points. Hind wing pale brown, the terminal area rather darker ; cilia pale rufous, with some faint dark points ; the underside paler, except terminal area ; a curved postmedial line.

Hab. SINGAPORE (*Ridley*), 2 ♀ type. *Exp.* 24 mm.

(20 a.) *Stericta chionophoralis*, sp. n.

Antennæ of male with the process reaching to metathorax; maxillary palpi triangularly scaled and flattened against frons; fore wing on upperside with fringes of large scales below the cell and from upper angle to near apex, the neuration rather distorted.

♂. Head, thorax, and abdomen pale brownish ochreous, slightly irrorated with fuscous, patagia and dorsum of thorax with some white, metathorax with some black scales; tarsi blackish, ringed with white. Fore wing pale brownish ochreous irrorated and suffused with fuscous; a white patch from costa before middle to below cell; an indistinct double, minutely waved medial line, oblique from costa to below cell; a black point at upper angle of cell; postmedial line double filled in with whitish, very minutely waved, oblique from costa to vein 5, then subterminal; the apical part of the fringe of scales beyond cell white; some white suffusion at apex; a terminal series of black points; cilia ochreous, intersected with fuscous and with black points at base. Hind wing semihyaline whitish; the apical area suffused with fuscous; an indistinct curved postmedial line from costa to vein 2, where it ends in a small black spot; cilia with series of small blackish spots at base; the underside with the costal area irrorated with brown and white.

♀. Fore wing with the white areas much reduced, the medial line more distinct and erect.

Hab. BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♀; PARAGUAY, Sapucay (*Foster*), 3 ♂ type. *Exp.* 32 mm.

(20 b.) *Stericta leucoplagialis*, sp. n.

♂. Maxillary palpi triangular and flattened against frons; fore wing with fringe of large scales below the cell.

Head, thorax, and abdomen clothed with red-brown and fuscous scales. Fore wing red-brown irrorated with fuscous and black; a short subbasal black streak below costa; a large white patch extending from middle of costa to vein 1 with a few black scales on it, a short black streak in cell, a sinuous line near its outer edge and a large flap of white and black scales on its lower edge; a discoidal tuft of scales; a curved, blackish, minutely dentate subterminal line, with some white points on it; some black points on termen and cilia. Hind wing semihyaline yellowish white with some fuscous at apex, slight streaks on the veins near termen, a terminal line, and a line through cilia towards apex.

Hab. BRITISH GUIANA, 1 ♂, Mapiri (*Stewart*); BOLIVIA, Yungas-la-Paz, 1 ♂ type. *Exp.* 36 mm.

(20 c.) *Stericta lophocephalis*, sp. n.

♂. Maxillary palpi small, triangularly dilated with scales; antennæ with small triangular dilation of basal joint, with very large tuft of hair between them from frons and vertex of head; mid tibiæ above and hind tibiæ at base with tufts of hair; fore wing with vein 4 curved upwards near base, veins 5, 6 meeting at a triangular point, anastomosing for some distance, then forking again.

Head, thorax, and abdomen ochreous, tinged with rufous and irrorated slightly with brown; tarsi banded with black. Fore wing ochreous, irrorated and in part suffused with dark brown; a brown spot on inner margin near base; an ante-medial series of four irregularly placed dark spots with another beyond them in cell and three below the cell; a postmedial minutely dentate dark line with minutely dentate ochreous band on its outer side, strongly excurved from below costa to vein 2, angled inwards in submedian fold, then excurved again, some dark suffusion before it from below end of cell to inner margin; a subterminal diffused fuscous band; a terminal series of small black spots, larger towards apex; cilia with blackish line near base, obsolescent towards tornus. Hind wing fuscous brown, rather darker towards termen; cilia with fine pale line at base; the underside pale, an indistinct curved postmedial line, the terminal area suffused with fuscous.

Hab. BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 30 mm.

(20 d.) *Stericta congenitalis*, sp. n.

Antennæ of male without process from basal joint, a large tuft of hair between them from frons and vertex of head; maxillary palpi brush-like in a hollow of labial palpi; claspers normal; fore wing with vein 4 slightly curved upwards near base, the discocellulars slightly produced below upper angle of cell, and veins 5, 6 shortly stalked.

♂. Head, thorax, and abdomen ochreous suffused in parts with rufous. Fore wing pale ochreous slightly tinged with rufous; rufous subbasal spots on costa and below cell; a spot on inner margin before middle; two diffused, slightly waved, medial, rufous lines, oblique from costa to median nervure, then angled inwards in submedian fold; postmedial line minutely dentate, oblique from costa to vein 3, where it is met by an oblique mark from lower angle of cell, then incurved and stronger; apical area suffused with rufous and with a slightly incurved maculate line from it to tornus; a terminal series of small rufous spots. Hind wing pale

suffused with brown, darker on terminal area; cilia pale; the underside pale with indistinct curved postmedial line, the terminal area brown.

Hab. BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 28 mm.

(21 a.) *Stericta obliqualis*, sp. n.

Head, thorax, and abdomen grey suffused and irrorated with pale rufous; tarsi banded with black. Fore wing grey irrorated with rufous and suffused with rufous on medial area; a subbasal blackish spot on costa and prominent spot below the cell; a black point in middle of cell; a prominent oblique slightly sinuous black line from middle of costa to inner margin towards tornus, with another oblique black line beyond it from costa to vein 5; some slight streaks on the veins beyond the cell and an incurved line from vein 2 to inner margin; postmedial line emitting short black streaks on the veins, rather oblique from costa to vein 5, excurved between veins 5 and 2 and oblique to inner margin; traces of a curved waved subterminal line; a terminal series of prominent black points. Hind wing whitish; the termen suffused with brown, broadly on apical and tornal areas; an indistinct curved postmedial line ending in a small black spot on vein 2; the underside with discoidal point, the apical area suffused with fuscous.

Hab. BOLIVIA, Yungas-la-Paz, 1 ♂ type. *Exp.* 30 mm.

(3 a.) *Orthaga ferrealis*, sp. n.

Antennæ of male with process extending to collar; palpi hollowed out to receive the brush-like maxillary palpi; fore wing on underside with the terminal half of cell clothed with large down-turned scales.

♂. Head, thorax, and abdomen bright ferruginous irrorated with white; tarsi ringed with white. Fore wing bright ferruginous irrorated with white and a few black scales; a very ill-defined oblique whitish antemedial band with blackish streak beyond it below the cell; a broad, ill-defined, whitish postmedial band with the indistinct, minutely waved postmedial line on it, angled outwards at vein 4, the outer edge of white band also waved, angled at vein 4 and emitting a streak to termen, with blackish streaks beyond it below veins 7 and 6 nearly reaching termen and shorter streaks above and below vein 2 and above vein 1; a subterminal series of indistinct whitish spots; cilia chequered white and rufous with darker spots at base. Hind wing

pale suffused with reddish brown, especially on terminal area, the hair on inner margin reddish; cilia chequered white and pale rufous with darker spots at base; the underside whitish, the costal area irrorated with white and rufous, the apical area suffused with brown.

Hab. QUEENSLAND, Townsville (*Dodd*), 1 ♂ type. *Exp.* 30 mm.

(10 a.) *Orthaga rubridiscalis*, sp. n.

♂. Head grey tinged with rufous, antennal tuft grey, rufous, and black; collar rufous; thorax grey; abdomen brownish. Fore wing grey thickly irrorated with black, brown, and rufous scales; a large subbasal blackish and rufous quadrate patch on costa; a sinuous fuscous medial line incurved in cell, excurved on inner area; the tufts of scales below cell and on discocellulars grey; discal area bright ferruginous extending to inner margin inside the postmedial line, which is minutely dentate, excurved beyond cell with series of white points on it and black spot at costa; apical area blackish; some rufous at tornus; cilia chequered pale brown and blackish. Hind wing fuscous; cilia grey at tips.

Another form is darker with dark purplish-fuscous replacing the ferruginous tones.

Hab. LOUISIADDES, St. Aignan (*Meek*), 1 ♀; QUEENSLAND (*Waller*), 1 ♂ type, Cooktown, Cedar Bay (*Meek*), 1 ♂. *Exp.* 28 mm.

(20 a.) *Orthaga melanoperalis*, sp. n.

Maxillary palpi triangularly scaled, flattened against frons; fore wing of male with the glandular swelling very large, without laminate plates in cell.

♂. Head, thorax, and abdomen ochreous slightly tinged with rufous; tarsi fuscous ringed with white. Fore wing ochreous tinged and irrorated with rufous, the apical area deep rufous suffused with black; blackish subbasal points on costa and below cell; traces of two diffused antemedial lines with dark patch on costa and black point below cell; traces of two diffused minutely waved postmedial lines oblique from costa to vein 4; traces of a diffused subterminal line; a terminal series of prominent small black spots; cilia pale with rufous line and series of fuscous points. Hind wing pale tinged with brown, the terminal area fuscous; cilia with fuscous line near base.

♀. Fore wing with prominent discoidal tuft of black scales.

Hab. BORNEO, Baram (*Everett*), 1 ♂, Pulo Iaut (*Doherty*), 1 ♂ type; SAMBAWA (*Doherty*), 1 ♀. *Exp.* 18-22 mm.

(23.) *Orthaga chionalis*, sp. n.

♂. Antennæ without process from basal joint; palpi with the third joint normal; fore wing without glandular swelling or fan of scales.

Head, thorax, and abdomen white, the last slightly irrorated with black on dorsum and with fans of black and white scales from behind origin of hind wings. Fore wing white, the terminal area from middle of costa and inner margin beyond middle rufous; the costal area tinged with rufous; a diffused pale rufous subbasal band; a small antemedial tuft of black scales below the cell; an indistinct, oblique, slightly waved medial line; a black discoidal point; a diffused black postmedial line, oblique from costa to vein 4, then incurved, double below vein 3; a diffused, curved, fuscous, subterminal band with rather blacker patch above middle; a terminal series of prominent, small, rather quadrate, black spots; cilia white with slight brown line through them. Hind wing pale fuscous, rather darker on terminal area; cilia chequered with fuscous on apical half; the underside with traces of diffused medial line.

Hab. SINGAPORE (*Ridley*), 1 ♂ type. *Exp.* 24 mm.

(24.) *Orthaga bipartalis*, sp. n.

♀. Head, thorax, and abdomen greyish ochreous irrorated in parts with fiery red, the last with some black scales on terminal segment; tarsi fuscous with pale rings. Fore wing greyish ochreous irrorated with fiery red and some black scales to middle of costa and inner margin beyond middle, the terminal area suffused with olive-green and irrorated with fuscous; a diffused red streak below cell before middle; a black point in middle of cell and black discoidal spot with oblique striga from costa to it; postmedial line defined by ochreous on outer side, minutely dentate, oblique from costa to vein 4, angled inwards in submedian fold, and emitting a black tooth upwards towards the discoidal spot, angled outwards on vein 1; a terminal series of small black spots. Hind wing fuscous brown; the underside with slight discoidal spot and diffused postmedial and subterminal lines oblique on costal half.

Hab. SINGAPORE (*Ridley*), 1 ♀ type. *Exp.* 24 mm.

XVIII.—*Note on Bulimulus (Drymæus) citrinellus, Pfr., and scitulus, Reeve.* By HUGH C. FULTON.

B. CITRINELLUS was first published by Pfeiffer in his *Monog. Helic. Viv.* vol. vi. p. 114 (1868), as a "var.?" of *B. scitulus*, Rve., with the following description:—"Anfractibus paulo convexioribus, strigis spadiceis nullis." The latter part of this is translated in Tryon's 'Manual,' vol. xi. p. 271, as having "no scarlet streaks"; this should have been "no brown streaks." As a matter of fact, specimens which I believe are properly referred to Pfeiffer's *citrinellus* have very pale orange or scarlet stripes, but no brown ones as seen in *scitulus*.

I have before me a large number of both *scitulus* and *citrinellus* collected in 1894 by Mr. Baron, the former at Cajamarca, Peru, and the latter at Cajabamba, Peru. Among the specimens of *citrinellus* are some answering to Pfeiffer's description, whilst others are ornamented with orange and dark brown streaks, so that Pfeiffer's description does not suffice for the material now under consideration. *Citrinellus* is easily separated from *scitulus*; the latter in the adult state is a smaller shell, with much narrower and more numerous streaks, generally narrower in form, with its peristome more contracted at its anterior or basal area, and its whorls increase more rapidly than in *scitulus*, consequently the body-whorl is obviously larger.

Pfeiffer's description of the whorls of *citrinellus* as "paulo convexioribus" is scarcely borne out by the majority of the specimens before me; if there is any difference worth mentioning, I should say the body-whorl of *scitulus* is the more convex of the two, but the specimens vary in this respect.

The darker form of *B. citrinellus* is well illustrated in Tryon's 'Manual,' vol. xi. pl. xlvii. fig. 17; the figure 16 on the same plate is a *not very faithful copy* of the excellent figure of Reeve's *scitulus* as given in the *Conch. Icon.* pl. xcvi. fig. 513.

XIX.—*Notes on Trematode Parasites of the Cockle (Cardium edule) and Mussel (Mytilus edulis).* By WILLIAM NICOLL, M.A., B.Sc., Gatty Marine Laboratory, St. Andrews.

[Plate IV.]

IN April 1903, at the suggestion of Professor McIntosh, I commenced the examination of the edible cockle (*C. edule*)

for parasitic Trematodes, in the hope of being able to fill up some of the gaps in the life-history of the pearl-forming Distomid of the mussel. The life-history of this parasite (*Leucithodendrium somateriæ*) has been almost completely worked out by Dr. H. Lyster Jameson*. At Piel he found the sporocyst stage in the mantle of the cockle close to the anterior border of the anterior adductor muscle. At Billiers, however, he found the same stage occurring in *Tapes decussatus*. From this we may conclude that the host harbouring the sporocyst stage is not constant, but varies according to locality.

Mr. A. J. H. Russell, M.A.†, at St. Andrews in 1902 (April–July) examined a considerable number of both large and small mussels from the beds at the mouth of the Eden. He found pearls in 45 per cent. of the large, and 21 per cent. of the small mussels. These numbers fall short of those obtained by Dr. Jameson, who found almost every specimen infected. This is probably due to the comparative unsuitability of the locality. Mr. Russell apparently did not determine whether the parasite causing the pearl-formation in the Eden mussels was the same as that described by Jameson, but, assuming this, I sought for the sporocyst stage in the cockle. During three months (May–July) several hundred cockles were examined and in no case were sporocysts present in the positions indicated by Jameson, nor, indeed, in any part of the mantle-edge.

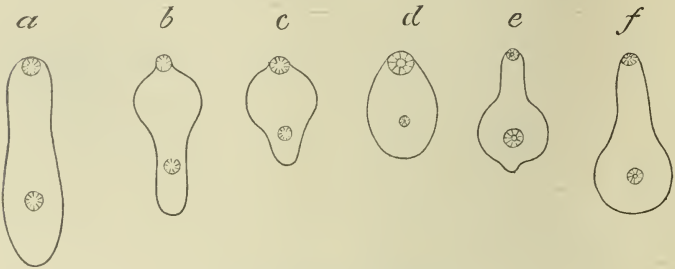
Later, however, in examining the other organs of the cockle, I met with sporocysts containing cercariæ closely resembling those discovered by Jameson in *Tapes*. They occurred in one well-defined, somewhat oval-shaped mass (Pl. IV. fig. 1), situated in the middle line dorsally just over the posterior border of the liver, but separated from that organ by a short distance (1–2 mm.). They could be best seen by removing the cockle entirely from the shell and looking down on it from above. The mass then appeared whitish, semiopaque, and of a somewhat soft consistency. Within it the individual sporocysts appeared as yellow spots of various sizes. The dimensions of the mass were in some cases as large as 4 mm. × 3 mm. The occurrence of the sporocysts in this case is thus different from that observed by Jameson in *Cardium* and more nearly resembles the condition in *Tapes*, for while in the latter large groups were found, "there were only single, triple, or quadruple cysts" in the former.

* Proc. Zool. Soc. 1902, i. p. 140.

† Ann. & Mag. Nat. Hist. 1903, xi. p. 550.

On microscopic examination of a pressure preparation (Pl. IV. fig. 2), the sporocysts contained cercariæ varying in number from two to as many as fifty, while the total number of cercariæ sometimes exceeded 250. Inside the sporocyst they appear of different shapes and sizes, but on being pressed out they assume an oval outline, changing, however, with the movements of the animal.

These movements are interesting. Fully extended (text-fig. *a*), the cercaria is spindle-shaped, and fixing itself in



Movements of cercaria.

this position by its oral sucker it begins to draw the remainder of the body up to the sucker. The anterior part expands (*b*), the rest remaining narrow and elongated, but this is gradually drawn forward until the whole body has the shape of a prolate spheroid (*d*). The ventral sucker then comes into action, the oral is released and the anterior part of the body begins to elongate until finally the spindle-shape is reassumed.

The cercariæ (Pl. IV. fig. 3) vary in size, the average length being about $\cdot 22$ mm. At the period of greatest contraction the length may be $\cdot 11$ mm., while at full extension it reaches $\cdot 28$ mm. The greatest breadth is about $\cdot 1$ mm.

The whole surface of the cuticle, except on the suckers, is set with small spines arranged in transverse rows, the members of each row alternating with those in the next. Of the two suckers the oral (Pl. IV. fig. 3, *a.s.*) is the larger; it is subterminal and eup-shaped, with a circular aperture. The ventral (fig. 3, *v.s.*) is just in front of the bifurcation of the excretory system. The mouth opens in the oral sucker, and viewed from the side it has a triangular outline. It is continuous with a pharynx (*ph.*), the lumen of which has a small dilatation at both ends. The œsophagus is short and divides into two sac-like diverticula (*div.*). The excretory system (*ex.*) occupies the major part of the body. In most

examples it appears intensely black, but in some, the more active and possibly the older, it is lighter in colour. It consists of two wide pouches, uniting posteriorly, continued by a narrow tube, which opens terminally by an excretory pore.

A pair of eyes (*e.s.*) is present, one on each side of the oral sucker. Each consists of a small crystalline rod with a pigment-spot. Round the aperture of the oral sucker are several minute papillæ.

The genital system can hardly be made out in the living animal, but on death, when the tissues become more opaque, a pair of testes (*ts.*) can be distinctly seen, one on each side of, and somewhat behind, the ventral sucker. They contain a mass of globular cells. From each testis a narrow tube issues and joins its fellow from the other side at the level of the sucker. From this point a single tube leads forwards and opens just in front of the sucker.

In addition, in the living cercaria, a number (from 8 to 12) of globular cells (*k.s.*) can be seen in front of the ventral sucker. These may possibly be the rudiments of the ovary.

With regard to the frequency of occurrence of the sporocysts, in a sample of twenty cockles recently examined I found every specimen infected and invariably the sporocysts were situated in the same position. The cockles were not of full size, measuring on an average only 25 mm.

It is evident that, as the cercaria can only perform creeping movements, it must reach its next host in this manner. Search in the mud, however, of the mussel-beds failed to reveal the migratory stage. I have also kept a number of cockles and mussels together in a tank for a considerable time, until, in fact, the cockles died, but met with no better success on examining the mud at the bottom. It is possible that migration may only take place at a particular period of the year.

Although, in the cockle, the mantle-edge was free from sporocysts, it was, nevertheless, by no means free from parasites. In this case the infection took the form of numerous small globular cysts (Pl. IV. fig. 4), as many as 35 being present in one specimen, although, as a rule, the number did not exceed 10. They occurred usually in the inmost fold of the mantle-edge, sometimes in groups of two or three, but oftener singly, and their distribution seemed to be general. They were situated in the loose connective tissue, just underneath the epidermis, but, as far as observed, their presence gave rise to no pathological condition (except that there was a slight proliferation of the cells in the neighbourhood). There was no tendency to pearl-formation round these cysts,

although Herdmann* notes the occurrence of pearls in a number of cockles examined by him, to as large an extent as 8 in 25.

In the foot the same cysts were found in much greater numbers, embedded beneath the epidermis in the muscular tissue. They were most numerous near the tip and were almost entirely confined to the horizontal part. Occasionally white concretions, 2-3 mm. in diameter, were met with in the glandular part of the foot, but these had no obvious connexion with the occurrence of the cysts.

The cysts vary from .21 mm. to .25 mm. in diameter. They can be quite easily dissected out from the surrounding tissue. The capsule is perfectly transparent and of a slightly brownish colour. It consists of three parts: the outermost is a thin membrane and is separated from the rest by a space; the middle layer is thicker than the internal, and the whole thickness of the capsule is about .013 mm. It contains the encysted stage of a Trematode larva. By the use of moderate pressure the capsule can be ruptured and the Distomid (Pl. IV. fig. 5) set free. The anterior part is broader than the rest of the body, somewhat spade-shaped in general outline and with a ridge (fig. 5, *r.s.*), in the form of a horseshoe, bearing spines. The whole length of the animal is .75-.8 mm. (minimum .6 mm.). The greatest breadth of the anterior part is .19 mm., while the rest of the body varies from .14 mm. in front to .08 mm. The body is flattened dorso-ventrally.

There are two cup-shaped suckers, raised somewhat above the surface of the body. The oral sucker, situated within the ridge of spines, is smaller than the ventral, having a diameter of .065 mm. The ventral lies in the middle of the body, but nearer the posterior end, and measures .095 mm. in diameter. Both suckers have a circular aperture.

The ridge on the anterior end carries 29 spines arranged in a single row. They are about .025 mm. long, but three at each end are shorter than the others. The ridge has rounded ends and the two terminal spines on each side seem to lie behind and below the adjacent ones.

In addition, part of the body, from what may be called the neck down almost to the level of the ventral sucker, is studded with small hooks (fig. 5, *c.s.*) or spinelets. There are 30 or 40 transverse rows, and the hooks in one row alternate with those in the next, so that diagonal rows are also formed.

The mouth opens in the oral sucker and leads into a

* Lancashire Sea-Fisheries Lab. Rep. for 1903, p. 93.

muscular pharynx (*ph.*) measuring $\cdot 05 \times \cdot 03$ mm. This is continued by a narrow straight oesophagus, which remains undivided until near the ventral sucker, where it bifurcates into two diverticula (Pl. IV. fig. 5, *dig.*).

The excretory system (fig. 5, *ex.*) is well-marked. It is loaded with bead-like globules, which disappear on treatment with acid. There are two main tubes of varying width running almost the whole length of the body and uniting posteriorly in a vesicle which opens terminally by an excretory pore. Anteriorly the main tubes receive numerous short, simple branches.

On more minute examination an extremely narrow tubule (Pl. IV. fig. 5, *f.t.*) can be discerned to the outer side of each main excretory tube. They are provided with flame-flagella and have apparently some connexion with the excretory system, although their exact relation could not be observed.

Genital organs are not yet present, but sperm-cells are apparently developed. They occur diffusely. On rupture of the animal by pressure these cells issue in great numbers. They are evidently spermatozoa, for they possess a head and vibratile tail, and execute the typical spermatozoid movements.

The adult stage (Pl. IV. fig. 6) of this parasite is to be found in the oyster-catcher (*Hæmatopus ostralegus*). I had an opportunity* of examining many of the birds that frequent the shores of the Eden estuary, but in most of them only cestode parasites were to be found. In the oyster-catcher, besides the usual collection of tapeworms, several Trematodes were found in the intestine. The stomach is generally full of the remains of cockles and mussels, and the gut contains numerous cysts similar to those found in the cockle. Towards the lower end of the intestine the desired parasites were obtained. They are not at all of frequent occurrence, but being translucent and of no great size they may easily escape notice.

The adult resembles the encysted larva to a marked degree, the main external point of difference being the elongation of the posterior part of the body. The distance between the two suckers remains practically the same, as does the average breadth of the animal, the whole length being increased to about 1.25 mm.

This parasite has several features in common with the members of the Trematode subgenus *Echinostomum* (cf.

* For this I am indebted to my friends Messrs. R. M. Craig and Arthur Mills and to Mr. A. W. Brown, of the Gatty Marine Laboratory.

E. baculus *, *E. spinulosum* †, *E. echinatum* ‡); for instance, the anterior ridge with its spines, which differ only in number and arrangement, and the positions and relative sizes of the suckers. It may be classed under this subgenus and is probably a new species §.

On further examination and dissection of the organs and tissues of the cockle, a number of ciliated sporocysts || (Pl. IV. fig. 7) were found, chiefly in the liver, but sometimes in connexion with the intestine—occasionally in both places in the same individual. Rarely were there more than half a dozen in one cockle, and only in about 20 per cent. were they entirely absent. They seemed to be free, and being provided with cilia they moved about actively enough. The general outline of the body was oval, tapering anteriorly, but somewhat blunter posteriorly. There was some diversity in size, the largest being about .8 mm. long, with a greatest width of .38 mm. Small examples not exceeding .2 mm. were occasionally observed.

Two crescentic eye-spots (fig. 7, *e.s.*) are present in front, and between and slightly anterior to them a pharynx is situated. Inside the sporocyst a number of globular cysts appear, usually from six to eight. Each cyst contains from two to four daughter-sporocysts (*d.s.*) in various stages of development. The youngest cysts, occurring generally near the body-wall of the sporocyst towards the anterior end, appear entirely undivided and contain small globular bodies. A somewhat older stage shows a division into two hemispheres. Later these take on the character of daughter-sporocysts, two eye-spots and cilia making their appearance. Towards the hinder end of the daughter-sporocyst four or five globules are seen similar to those mentioned above. Inside the cyst the minute sporocysts can be observed moving round and round, and on rupture of the parent they make their escape and swim about with considerable agility.

The relationship of these sporocysts to the other stages of Trematode larvæ found in the cockle is a matter of some difficulty. The occurrence of the sporocysts, containing cercariæ, in close proximity to the liver is somewhat suggestive of a connexion between these two stages at least.

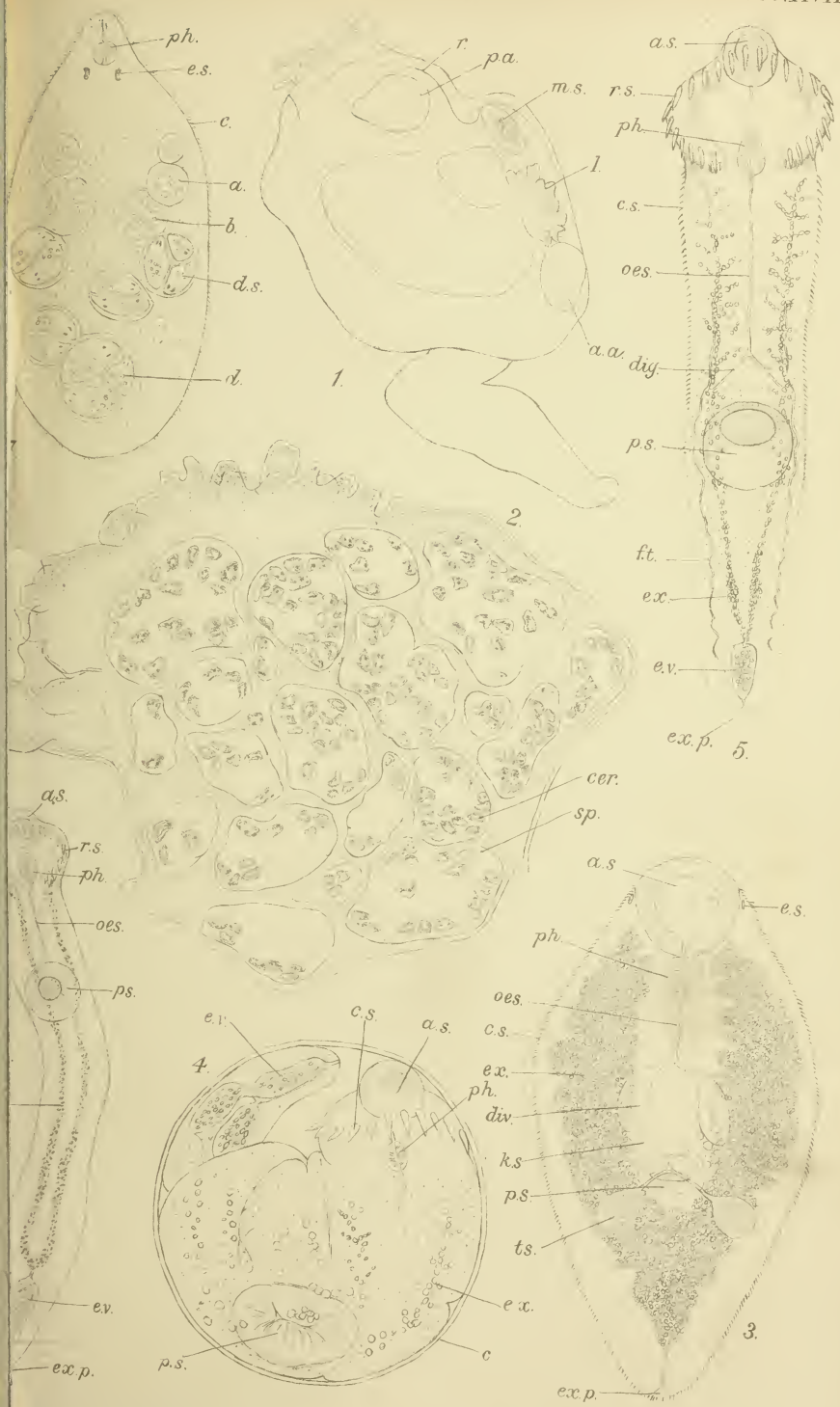
* v. Linstow, Arch. f. Naturg. xliii. 1877, p. 183, pl. xiii. fig. 15.

† *Ibid.* fig. 14.

‡ Wedl, Wiener Sitzungsber. xxvi. 1857, pl. i. fig. 5.

§ Cf. Northumberland Sea-Fisheries Report, 1904, p. 82, where, in a note by Miss M. V. Lebour, B.Sc., what appears to be the same parasite is described, but in an imperfect manner.

|| The sporocysts are also described in the same note.



del fig 7 WN del.

Higley, lith. & imp.

No redia or other intermediate stage has as yet come under my observation.

Again, on examination of several other Lamellibranchiate mollusks from the neighbourhood of the Eden, I found in the mussel (*Mytilus edulis*) and *Mactra stultorum* the same encysted parasites in the foot. They were as numerous in the mussel as in the cockle, and occurred in almost every example; even in specimens measuring only 8 mm. as many as half a dozen cysts could be counted in the foot. In *Mactra* they were rarer. But in *Mytilus* and *Mactra* sporocysts did not occur in the mantle, in the mid-dorsal line, or in the liver. This would appear to be a proof that the sporocysts in the liver, and those containing cercariæ in the mid-dorsal line, are stages of the same parasite, or, at any rate, that they have no relation to the cysts in the foot.

The antecedent stages of both these parasites are as yet unknown. Examination of the mantle-cavity of the cockle and mussel displayed numerous Infusor-like animals of different kinds, some of which may prove to be the *Miracidium* larva*.

EXPLANATION OF PLATE IV.†

- Fig. 1.* Diagram of cockle (removed from valves), showing situation of sporocyst mass (*m.s.*). *l.*, liver; *a.a.*, anterior adductor; *p.a.*, posterior adductor; *r.*, rectum.
- Fig. 2.* Pressure preparation of sporocyst mass. *sp.*, the individual sporocysts; *cer.*, cercaria.
- Fig. 3.* The cercaria. *a.s.*, anterior sucker; *e.s.*, eyes; *ph.*, pharynx; *oes.*, œsophagus; *c.s.*, cuticular spines; *ex.*, excretory system; *div.*, intestinal diverticula; *k.s.*, globular cells; *p.s.*, posterior sucker; *ts.*, testis; *ex.p.*, excretory pore. Cuticular spines omitted.
- Fig. 4.* Cyst from foot of cockle, showing parasite coiled up inside. *a.s.*, anterior sucker; *c.s.*, ridge of spines; *ph.*, pharynx; *ex.*, excretory system; *p.s.*, posterior sucker; *e.v.*, excretory vesicle; *c.*, capsule.
- Fig. 5.* Cercaria from foot of cockle. *a.s.*, anterior sucker; *r.s.*, ridge with spines; *ph.*, pharynx; *c.s.*, cuticular spines; *oes.*, œsophagus; *dig.*, intestinal diverticula; *p.s.*, posterior sucker; *f.t.*, tubule with flame-flagella; *ex.*, excretory system; *e.v.*, excretory vesicle; *ex.p.*, excretory pore. Cuticular spines omitted.
- Fig. 6.* Adult from intestine of oyster-catcher. Lettering same as in *fig. 5.*
- Fig. 7.* Sporocyst from liver of cockle. *ph.*, pharynx; *e.s.*, eye-spots; *c.*, cilia; *a.*, undivided cyst; *b.*, cyst, later stage; *d.*, cyst containing daughter-sporocysts; *d.s.*, daughter-sporocyst.

* I should like to note here that in the mantle-cavity of the cockle swarms of a species of Infusor of the genus *Trichodina* occurred. They were found both swimming about free and adhering to the mantle and foot.

† I have to thank my friend Mr. D. D. Craig, M.A., for preparing the drawings which accompany this paper.

XX.—*A few undescribed Species of Cicadidæ.*

By W. L. DISTANT.

Subfam. *CICADINÆ.*Division *CICADARIA.**Rihana operculissima*, sp. n.

♂. Head and pronotum brownish ochraceous; mesonotum castaneous; head with lateral striæ to front, a broad transverse fascia between eyes which reaches basal margin at the area of the ocelli, pronotum with a broad central fascia widened anteriorly and posteriorly, on each side of which is a longitudinal discal spot, the fissures and a spot on lateral margin, mesonotum with four obconical spots, of which the two central are shorter and better defined, a central line widening into a large subtriangular spot in front of cruciform elevation, and a spot on anterior angles of same, black; margins of pronotum pale ochraceous; abdomen above black; face with the transverse striations and apical two thirds of central area black, inner margins of eyes and a transverse fascia between them and face, black; coxal streaks, anterior and intermediate tibiæ, and the tarsi more or less piceous; abdomen beneath black, somewhat ochraceous towards lateral margins, opercula pale ochraceous; tegmina and wings hyaline, the venation greenish ochraceous on basal and piceous on apical area; tegmina with the costal membrane greenish ochraceous, the postcostal area piceous brown between black veins.

Opercula very long, reaching base of sixth abdominal segment, the interior angles overlapping at base, where they are margined with black, apices subacute and a little outwardly directed, outer margins posteriorly concavely sinuate; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♂ 34 mm.; exp. tegm. 86 mm.

Hab. Mexico, Territ. de Tepic, Cerro San Juan (*L. Diguët*, Paris Mus.).

Rihana Diguëti, sp. n.

♂. Head above black, somewhat thickly ochraceously pilose, ocelli purplish red; pronotum castaneous, its margins brownish ochraceous, with a central fascia, much widened anteriorly and posteriorly, on each side of which is a longitudinal spot, the fissures, and a spot on lateral margins, black; mesonotum black, with four obconical spots only

defined by their testaceous margins, and of which the central two are shortest, angular margins of the cruciform elevation testaceous; abdomen above black; metanotum and posterior apical abdominal margins cretaceously tomentose; head beneath, sternum, and lateral areas of abdomen beneath cretaceously tomentose; legs brownish ochraceous; opercula ochraceous, with nearly their inner halves black, the whole more or less cretaceously tomentose; tegmina and wings hyaline, the venation somewhat ochraceous or testaceous on basal, piceous on apical areas; tegmina with the costal membrane black, on each side margined with testaceous, veins defining the postcostal area black; opercula subovate, their apices angularly convex and reaching the abdominal basal segment, their posterior margins obliquely convex, their outer margins almost straight, the inner angles overlapping; rostrum about reaching the posterior coxæ.

Long., excl. tegm., ♂ 30 mm.; exp. tegm. 90 mm.

Hab. Lower California (*Diguet*, Paris Mus.).

Division DUNDUBIARIA.

Tanna insignis, sp. n.

♂. Head, pronotum, mesonotum, sternum, and legs greenish ochraceous; antennæ, lateral striæ to front, area of the ocelli, and two small central marginal spots at base of head, two central fasciæ which are united posteriorly and angulated anteriorly, on each side of these a short curved discal fascia, a submarginal lateral fascia, the fissures and extreme edge of posterior margin to pronotum, a central line with a short curved anterior line on each side of it to mesonotum, four spots in front of cruciform elevation, and a spot on each side of same, black; abdomen testaceous, above with the segmental margins and the anal segment distinctly piceous, beneath with a transverse basal spot, the tubercles, and the anal segment piceous black; tegmina and wings hyaline, the venation greenish or fuscous; tegmina with the costal membrane greenish; basal margin of upper ulnar area black, the transverse veins at bases of 1st-5th and 7th apical areas infuscated, and marginal fuscous spots near the apices of the longitudinal veins to apical areas; opercula small, subquadrate, not extending beyond base of abdomen; rostrum reaching the posterior coxæ; a prominent tubercle on each side of the second abdominal segment; face broad, obsoletely centrally sulcate, the transverse striations brownish.

Long., excl. tegm., ♂ 20 mm.; exp. tegm. 60 mm.

Hab. Java (Coll. Dist.).

Tanna pallida, sp. n.

♂. Body and legs very pale tawny brown; pronotum with a central pale ochraceous fascia, on each side of which is a short longitudinal black discal spot, the sublateral fissure black and the anterior fissure brown (these dark markings apparently absent in female); mesonotum with two obsolete obconical spots, which are only defined by their somewhat darker margins, a small black spot on each side of cruciform elevation; abdomen finely palely pilose, somewhat in tufts on lateral margins; tegmina and wings hyaline, the venation and costal membrane of the first pale ochraceous; opercula small, subtriangular, just passing the base of abdomen; rostrum reaching the posterior coxæ; a single tubercle on each side of second abdominal segment; face moderately globose and strongly centrally striate.

Long., excl. tegm., ♂ 19, ♀ 17 mm.; exp. tegm., ♂ 55, ♀ 62 mm.

Hab. North Borneo; Sulu Islands, Jolo.

XXI.—*Flying-fish Flight, and an Unfixed Law of Nature.*

By Lt.-Col. C. D. DURNFORD.

THE controversy amongst naturalists as to whether flying-fish do or do not flap their wings in flight has become so one-sided as almost to represent extinction—as a controversy.

It is desirable, if possible, to revive it a little, by carrying the argument into new ground: first, because the one side which is at present believed in would appear to be the wrong one; and, secondly, because it seems to have escaped the notice of the other that this is capable of proof.

The arguments, if they may be so called, hitherto in use are simple assertion and denial, and may be summed up into:—

“Flying-fish do fly, moving their wings with extreme rapidity. I have carefully and frequently watched them, and there can be no doubt whatever about it.”

And the converse:—

“Flying-fish do not flap their wings, but use them as aeroplanes, like swallows when in skimming or sailing flight. I have carefully and frequently watched them, and there can be no doubt whatever about it.”

Somewhat similar remarks will be heard in any ordinary

group of ship's passengers watching the fish. Some will insist that they see the wings flapping, and some will aver that they are quite still.

But among scientists wing-flapping is undoubtedly very much the under-dog, and the carefully written paper by Captain Barrett-Hamilton (*Ann. & Mag. Nat. Hist.* vol. xi. p. 389, 1903), also a convinced aeroplanist, perhaps expresses current opinion as well as may be; and even Professor Whitman (*'American Naturalist,'* vol. xiv. p. 641, 1880), who insists that he has seen "distinctly the individual flaps of the large pectorals," adds that this flapping "may be continued for the whole or part of the flight, but it is generally discontinued after the first few rods, and the course continued by a pure skimming or sailing movement"—thus showing that he, too, believes in the possibility of the aeroplane flight.

Proof that such flight by any known species of flying-fish is a mechanical impossibility is the new ground which I propose to take up.

In order to make clear what the aeroplane theory is, I quote from the *'Encyclopædia Britannica'* (art. "Flying-fish") the "chief results of the inquiries" (*'Die Bewegungen der Fliegenden Fische durch die Luft,'* Leip. 1878) of one of its chief exponents, Professor K. Möbius. These results, which seem also to have formed the groundwork of many subsequent articles, are—with certain omissions on my part for brevity's sake—summed up as follows:—

"They are more frequently observed in rough weather, and in a disturbed sea than during calms; they dart out of the water and they rise without regard to the direction of the wind or waves. The fins are kept quietly distended without any motion, except an occasional vibration caused by the air, whenever the surface of the wing is parallel with the current of the wind. Their flight is rapid, but gradually decreasing in velocity, greatly exceeding that of a ship going ten miles an hour, and a distance of 500 feet. Generally it is longer when the fishes fly against, than with, or at an angle to, the wind. Any vertical or horizontal deviation from the straight course, when flying with or against the wind, is not caused at the will of the fish, but by currents of air. in a rough sea, when flying against the course of the waves; they then frequently overtop each wave, being carried over it by the pressure of the disturbed air. They fall on board vessels. This never happens from the lee side, but during a breeze only, and from the weather side. During the night they frequently fly against the weather-board, where they are caught by the current of air and carried

upwards to the height of 20 feet above the surface of the water, whilst under ordinary circumstances they keep close to it."

The above is fairly representative of the aeroplane theory. There are, however, several variants to it, the most notable being the addition by later writers of the use of the tail, both as a propeller in air, and also as an explanation of the loud buzzing sound always heard when the fish fly near or over a boat, and which is really made—it seems odd to have to write it—by the rapid whirring of the wings.

Of this whirring or flapping motion Professor Whitman writes, "It is so rapid that it is not easily recognised at any great distance until experience has sharpened the eye." Therein lies, I think, the cause of the birth of the aeroplane theory, though I must add that experience need not necessarily sharpen even good natural sight into being able to see the wing-movement. Knack or chance may come in in such matters. Some time ago, for instance, I was astonished, whilst testing the shooting of a shot-and-ball gun at the butts, to find that in certain lights I could plainly see the ball during its whole flight, whilst the attendant, whose daily business it was to test rifles and guns, and whose sight was far superior to mine, tried over and over again but could not pick it up. So have I seen many watch the whirring wings and declare them to be still.

It is commonly accepted that in matters of observation an affirmative evidence is superior to a negative one. In the special case under consideration, the value of the affirmative true flight evidence is very greatly increased by the fact that the aeroplane contradiction thereof must be in proof of a unique act in nature without a known parallel. Flying lizards and flying squirrels are perhaps the nearest, but in both cases the aeroplane is, I believe, greater by far compared with the weight borne, and—of more importance—the course is certainly far less and falling, not horizontal, or rising, as is that of the flying-fish.

Surely, therefore, it is not too much to ask from the aeroplanists either a reference to some mechanical parallel, or else absolutely overwhelming evidence in favour of the marvellous—a fair expression if no parallel be produced. We do not receive the evidence, for, as before noted, it consists of a series of witnesses very fairly divided as to whether they can or cannot see the wing-movement, although scientific writers on the subject nearly all follow the latter. We do receive reference to certain parallels, and I shall endeavour to examine these with such lights as I can find. The parallels

are, first, the "sailing" or skimming flight of birds (swallows being usually mentioned), and, secondly, parachutes.

For purposes of comparison in this examination, we will take a typical flying-fish. I have the wings of one, which flew on board a steamer on which I was travelling, before me as I write. Its weight was just over a pound, and it had a wing-area of 62 square inches, very liberally computed.

Let us consider the bird-flight first. Concerning this we have certain recognized facts to guide us, for which I refer readers to Professor E. J. Marey's work on 'Animal Mechanism' (International Science Series, vol. xi. pp. 221-225, 1874).

We are specially concerned in his acceptance therein of the division of birds into two main classes, viz., those largely given to "sailing" or still-wing flight (which class is found to be endowed with a large wing-surface), and those which confine themselves more to the "rowing" or wing-flapping flight (which, as a class, has short and narrow wings).

"If," says Professor Marey (*loc. cit.* p. 221), "we compare together two rowing, or two sailing birds . . .," arranging as far as possible "to have no difference between them except that of size, we shall find a tolerably constant ratio between the weights of these birds and the surface of their wings." Tables are added of this ratio in various birds, as found by dividing the square root of their wing-surface in square centimetres by the cube root of their weight in grammes.

I will from these tables give this ratio for three of the sailing-birds and for three of the rowing-birds, including the two lowest ratios of the latter. I will add on my own account the ratio for the flying-fish, which is quite properly comparable with birds in this respect. (See table, p. 162.)

Note the place of the flying-fish. It is quite in its proper position as a very low order of wing-flapper, requiring great wing-speed to sustain it in air. Note also the representative of the swallow tribe, weighing considerably under an ounce, in its proper place in the sailing class. The *Hirundo rustica*, or swallow proper, would doubtless hold a higher place still—our principal parallel, whose featherweight ought to have protected us from the comparison.

The figures should be convincing; I will not, therefore, comment more upon this, but proceed to another test, viz. to find what size of wing a one-pound (453 grammes) fish would require to raise it into the sailing class. No birds are dealt with by Marey of exactly one pound weight; I will therefore take the next above and the next below that weight.

Name.	Weight= p in grammes.	Surface of wings = $2a$ in sq. cm.	Ratio= $\frac{\sqrt{2a}}{\sqrt[3]{p}}$.
<i>Falco palustris</i> ..	208.76	1188	5.810
<i>Falco sublatio</i> (?)*	509.62	1684	5.138
<i>Hirundo urbica</i> (House-martin).	18.00	120	4.180
<i>Columba vinacea</i> .	112.00	292	3.545
<i>Saxicola œnanthe</i> .	56.05	125	2.922
<i>Perdix cinerea</i> ..	280.00	320	2.734
<i>Euroætus</i> (Flying- fish)	453.59	400	2.603

* [*Qu. subluteo*?—EDS.]

The *Falco sublatio* shown has a weight of 509 grammes and a wing-area of 1684 sq. cm., with ratio of 5.138, and the *Corvus cornix* has a weight of 374 grammes and a wing-area of 1156 sq. cm., giving a ratio of 4.717.

Our one-pound flying-fish, to enable it to sail, would thus require a wing-area between three and four times greater than the 400 sq. cm. which it possesses. And, mark this, even then it would only sail as birds sail, in favourable winds and circumstances, falling and rising and using the "rowing" flight frequently, as may be necessary, not as our fishes go, "without regard to the direction of the wind," horizontally, and close to the water, and, according to aeroplanists, with ever still wings! Further, "concave bird-like surfaces afford from three to seven times as much support as planes" (Encyc. Brit., art. Aeronautics—*re* flight). It has been pointed out to me that it is extremely improbable that a flying-fish's wings can assume this concave shape. If this be so, "from nine to twenty-eight" may be substituted for the "between three and four" times above.

Need I go on? I am afraid so—superstitions, especially learned ones, die hard. So to the second parallel offered us, the parachute. The term implies the act of falling through the air, and not the horizontal or the rising motion with which we are dealing. Still, the word has been used in explanation of the fish's supposed deeds, and I will try to

deal with it and at the same time keep clear of the pitfalls which will surround the effort.

Professor Möbius puts the speed of the flying-fish as "greatly exceeding that of a ship going 10 miles an hour." George Bennett (*Wanderings in New South Wales*, vol. i. p. 31, 1834), much quoted, puts its extreme time in air at 30 seconds "by the watch," and its distance at 200 yards; this works out at rather over $13\frac{1}{2}$ miles an hour, extreme rate. It will, perhaps, give a sufficiently large margin to call the fish's average speed 15 miles an hour.

Now if wind and a body, either or both in motion, meet at a rate of 15 miles an hour directly against each other, the body having 1 square foot of surface, the pressure exerted thereon will be 1.107 lbs. That, I think, implies that if a flying-fish weighing a little over a pound and having a wing-surface of 144 square inches (an impossibly large one, of course, for such a fish) were falling through still air, it would descend at the rate of about 15 miles an hour; or, on the other hand, if it were in a wind blowing 15 miles an hour straight upward from the sea (an impossibly favouring wind, of course) it would just be supported. I will leave it entirely to my readers to imagine the effect in the second case upon our fish of reducing its wing-area from the suppositious 144 sq. inches to its actual 62 sq. inches.

If the reader's imagination is not sufficient to drop the fish into the sea at once by the reduction, then let him add the effect of removing as much support as would be taken away by changing the impossible upward-blowing wind into the ordinary horizontal one at the same 15 miles an hour speed, meeting the wings at an acute angle. There are pitfalls here, so I will avoid angles and calculations, and merely point out that, however much scientists may differ as to the amount of the loss of the supporting power involved, none will dispute that there will be a very great loss.

Yet again, if these descents from favouring suppositions to sober facts will not convince, I must advance one more argument. It is, I believe, like the others, new ground, and I will give it a fresh paragraph.

Flying-fish, at the end of their first flight of usually about 10 to 50 yards, have a habit, especially when approaching the crest of a wave, of momentarily checking their wing-movement and slowing down from the blur of great rapidity into a pace in which the flapping of the wing becomes easily visible. This period of visibility is supposed by aeroplanists to be the only portion of the flight during which the wings

move, and they even deny them at this time any supporting power whatever. It is their "period of occasional vibration" or "fluttering," and their explanation thereof will make a mechanician smile or feel sad, according to his temperament. I have already quoted it from Möbius, and it amounts to the wings trailing in the wind like a loosely flapping flag, thus not only depriving the heavy fish of the so-called support of its miniature aeroplanes, but actually converting them into an active drag.

And yet, according to the theorists, at an extreme suggested speed of $13\frac{1}{2}$ miles an hour, the fish still sails!

Such an upsetting of one of the best known of nature's laws as all the foregoing implies would be impossible of final acceptance, even if we could not, as many of us can, see the flying-fish flying.

I studied the "vibration" or flutter periods very carefully this spring when returning from the Gulf of Mexico. Their object and method seemed simple and clear, and to be as follows:—The slowing down from extreme wing-speed into visibility heralds an immediate increased effort of flight, often, if not usually, to enable the fish to surmount a wave. The fish is, in fact, pulling itself together for a spurt. The flutter, as was to be expected, is accompanied by a slight fall of the fish of perhaps 2 or 3 inches; but the spurt, at once put on, regains the lost elevation and lifts the fish well over the obstacle. This sudden rise of the fish (the "frequently overtop each wave" of Möbius) is constantly to be seen, and to many the wings seem still at this time.

The difference in the rates of speed of wing-flapping noticeable on different days is very marked. At times, and often for many successive days, it is noticeable that, although the bodies of the fish as they rise from under the steamer's bows are clearly and sharply defined, their supporting wings have a peculiar hazy and blurred look, with a want of definition of outline which cannot be accounted for, for they seem to be still. Then a day will come when the fish, still fleeing in front of the ship, will move their wings less rapidly and their motion will become plainly visible. There are still many lookers-on who cannot pick it up, but for the rest the aeroplane theory is exploded for ever, and when next the swifter-moving wings are seen with the eye of knowledge the wonder is that there had been any difficulty. The haze and blur are exactly what should have been looked for under the circumstances.

We have all of us watched sea-gulls soaring quietly in a certain direction, but obliged to flap when they turn away,

the vigour of the flapping varying more or less regularly with the direction in which they meet the wind. It is more than probable that the change of wing-speed of the fish varies for similar reasons in degree of rapidity, soaring being, as I have endeavoured to show, quite out of the question. From whatever cause, it certainly does so vary.

A curious thing about the "vibration" periods is that they seem to offer fleeting glimpses of a satisfactory wing; for a moment, now and again, the wings have outlines and edges, and will also occasionally return a sun-glare to the eye from their wet glassy surfaces, such as might be expected from them when not whirring. Such a glare is also now and then momentarily to be seen when a fish ceases flying, and just before it strikes the water, if it be in the proper position with regard to the sun. There would, of course, be many long periods of this glare were the wings really still.

One or two more prominent fallacies are handed on from writer to writer, and often accepted as facts. One is that the fish are helped in their flight by the distention of their air-bladder. If such had any appreciable effect it would be that of impeding the flight, for the contained air being under compression would be denser and therefore heavier than the outside air, and the increased size of the fish would merely check its speed as a hollow bullet is checked.

Steering-power is also denied to the fish by most naturalists. It is, nevertheless, a matter of common seafaring knowledge that they turn with deliberate intention. I have myself watched one fly towards the ship, and, circling back, finish its flight in a direction straight away from the ship. It approached within a yard or so of the side, close under where I was standing. The check of speed on its first taking alarm was marked, and during the turn of half a circle of about 10 or 12 feet radius which it made it could not have been flying at a rate of more than three or four miles an hour.

Again, they rise quite at will, though this power also is denied by aeroplanists. With reference to this, as well as to their power of steering, the late Earl of Pembroke, or Doctor G. H. Kingsley, joint authors of 'South-Sea Bubbles,' says (p. 64, 7th ed., 1895):—"Flying-fish do fly, moving their pectoral fins with extreme rapidity, moreover, they raise and lower themselves over the tops of the waves, and do *not* dip into them, I remember between Panama and Rapa I used to see the cabin's bulls' eyes surrounded by a circle of scales every morning left there by flying-fish." They were making for the light. No ingenuity can fasten this upon "currents of air," which are

credited with so many other impossib'le feats on behalf of these fish. This habit of theirs is quite well known, and is effected by raising themselves and steering, pure and simple.

Their taking a baited hook is also denied. As a matter of fact, a baited hook is the first part of the fishing-process of the Barbados flying-fishing fleet, with which I have been out. We had a blank day; but, according to the animated description of the boatmen, the struggles of the first victim bring round it swarms of sympathisers (as gulls flock round a wounded companion), and these are "raked" into the boat by the hand hoop-net, an enlarged edition of a round shallow shrimp-net without any handle.

I have throughout this paper spoken of flying-fish generally, for the wing-areas of all of the known kinds are to their weights and speeds such that the impossibility of their practical use as aeroplanes differs only in degree.

Flying-fish put on different aspects according to the state of air and sea. One is rather startled at times by the changes in their methods. In oily equatorial calms, I have watched them in numbers flying long distances with their tails in the water and their heads and wings in the air, the body making an angle of perhaps 30° or 40° with the horizon. The wake left in the water by the dragging tail showed, as well as I could judge, no signs of its having been used for purposes of propulsion, even in its own element, and it is, perhaps, simply to relieve the fish of its weight that it is so supported when there is no fear of the wings being caught by ruffled water; nevertheless the peculiar long lower half of these tails specially adapts them for use as auxiliary propellers to a fish which, with their exception, is a "fish out of water"; and it looks so like a case of natural evolution, that I feel inclined to doubt the justice of my personal observation as to their non-use.

It would seem, from this habit, reasonable to suppose that the fish have the power of flapping their wings at various angles, as have birds, as ordinarily their bodies are fairly horizontal as they fly.

The flight of these fish is often described as "graceful," "light," and so on. To him who believes that they soar along easily for 200 yards without further effort than a preliminary leap from the sea, such an opinion may be a natural one.

To him who recognizes that such a leap is mechanically impossible, whether or not assisted by a continuous tail-movement, or to him, who, without thinking particularly about it,

simply sees the heavy labouring of the wings as the fish patiently whirrs along its even, uneventful way, "graceful" and "light" are terms misplaced. Strenuous, persistent, plodding effort is the impression left upon the mind, the least failure in which effort means plunging into the water. One often sees this happen obviously without intention on the fish's part.

In conclusion, it is, I think, made clear:—

1. That flying-fish would require to have a wing-area several (and probably many) times greater, according to their weights, than they actually possess to enable them to accomplish sailing flight in even such a restricted form as that carried out by sailing birds.
2. That we know of no parallel case in nature which would justify the assumption that the possession by these fishes of even such increased wing-area would of necessity enable them to sail long distances—(a) horizontally, or (b) close to an obstruction (the sea), or (c) in defiance of the direction of the wind; much less all three (a), (b), and (c) combined, as they commonly fly.
3. That their common flight is exactly what is to be expected of flyers holding, as they do, a very low wing to weight ratio—flyers capable of, and of necessity employing, extreme wing-speed.

XXII.—*A new Heterotanais and a new Eurydice, Genera of Isopoda.* By Canon A. M. NORMAN, M.A., D.C.L., LL.D., F.R.S., &c.

[Plates V. & VI.]

Genus *HETEROTANAIS*, G. O. Sars.

The genus *Heterotanais* was established by Sars in 1880 ("Revision af Gruppen: Isopoda Chelifera," Arch. f. Math. og Naturv. p. 28), and four species were assigned to it:—*Heterotanais Örstedii* (Kröyer), Scandinavian; *H. anomalus*, sp. n., Mediterranean; *H. limicola* (Harger), N.E. American; and *H. tenuis* (Thomson), New Zealand. More recently M. A. Dollfus ("Campagnes de la 'Melita,' Tanaidæ &c.," Mém. Soc. Zool. de France, vol. xi. 1898, pp. 37-47) has assigned

two more species to the genus—*H. algericus*, from Algeria, and *H. provincialis*, from Golfe de Saint-Tropez. The species now to be described comes nearest to *H. Örstedii*.

Heterotanaïs Gurneyi, sp. n.
(Pl. V. figs. 1-7; Pl. VI. fig. 1.)

Heterotanaïs sp. (?), Robert Gurney, "The Fresh- and Brackish-Water Crustacea of East Norfolk," Trans. Norfolk and Norwich Naturalists' Soc. vol. vii. 1904, p. 650.

Mr. Robert Gurney, in his excellent paper on the fauna of the Broads &c. of Norfolk, indicated as above a Tanaid which he had found in brackish water. He was subsequently so kind as to send me a male specimen and also drawings of the female, with a request that I would describe the species; from that specimen and the drawings the following characters are given.

The length of the female is equal to about five times that of the breadth, and the breadth is nearly equal throughout. The cephalosome is as long as the first three segments of the mesosome and half of the fourth; the fourth and fifth segments of the mesosome are the longest; and the metasome equals the two and a half preceding segments in length. The antennules are three-jointed, the first exceeding in length the two distal joints combined. The cheliped is almost exactly like that of *H. Örstedii*, the thumb having three crenations and as many setæ. The second pair of legs have the characteristic formation usual in the genus.

The male has the cephalosome produced and very compressed, narrowed greatly in front to the region of the eyes. The metasome is fully equal in length to half the mesosome. The antennules consist of five articulations, of which the terminal is the shortest, and the second nearly equals the combined lengths of the last three. The cheliped in general structure resembles that of *H. Örstedii*, but as seen from the outside the carpus is not projected so far forwards, while the thumb-process is of entirely different form, (not narrowed at the base, and thence widening, but) narrow throughout its length and of subequal breadth, until near its termination it is bent forwards, and pointed at the extremity. The uropods have the outer branch minute, two-jointed; the inner four-jointed, the two distal joints being subequal to the second in length.

This species very nearly resembles *H. Örstedii* in most

particulars, but the thumb of the cheliped is of widely different form.

Hab. Procured by Mr. Robert Gurney at Six-mile House, on the Bure, and also at Reedham, on the Yare, Norfolk.

Heterotanais Örstedii (Kröyer).
(Pl. VI. figs. 2, 3.)

1842. *Tanais Örstedii*, Kröyer, Naturhist. Tidssk. vol. iv. p. 183; Voyages en Scand. &c. pl. xxxi. figs. 3 a-l. ♀.
 1842. *Tanais curculio*, Kröyer, l. c. p. 184; Voyages &c. pl. xxx. figs. 4 a-h. ♂.
 1852. *Tanais balticus*, Friedrich Müller, "*Tanais rhynchites* and *balticus* neue Arten aus der Ostsee," Archiv f. Naturg. 18 Jahrg. p. 89. ♀.
 1852. *Tanais rhynchites*, Friedrich Müller, l. c. p. 88. ♂.
 1896. *Tanais Örstedii*, G. O. Sars, Crust. Norway, II. Isopoda, p. 14, pl. vi. ♂ ♀.

In this species the thumb or "posteriorly-pointing lappet" of the cheliped of the male is narrow at the base, and widening thence in clavate form has the extremity truncated, with a little notch near the anterior corner. It is similarly represented in the figures of Kröyer, Müller, and G. O. Sars, and the figures given by Müller are here reproduced (Pl. VI. figs. 2, 3) for comparison with the better-known illustrations of Sars. These drawings will show how much this appendage differs from that of *H. Gurneyi*.

Heterotanais Örstedii is recorded from Öresund (*Kröyer*); Baltic, at Landskrona and Westervic (*Lilljeborg*); Prussia, at Greifswalde (*Müller*); Bohuslän (*Lilljeborg*); Christiansand (*Boeck*); and Iddefjord, at Fredrikshald, Norway (*G. O. Sars*). Specimens in my own collection are from Landskrona (*Lilljeborg*) and Denmark (from Copenhagen Museum).

Genus EURYDICE, Leach.

Eurydice rotundicauda, sp. n.
(Pl. VI. figs. 4-7.)

Antennules a little shorter than the peduncle of the antennæ; flagellum consisting of four articulations, combined length of the three distal slightly less than that of the first, which is wholly devoid of the dense covering of downy setæ

usual in species of the genus ; last joint furnished with a few setæ at the extremity.

Antennæ with the last joint of the peduncle much longer than the penultimate, much constricted at the base.

First feet with the fourth joints very small. There are five spines on the third joint, one on the fourth joint, and four on the hand.

The last legs are wholly devoid of spines on the face of the limb ; the ends of the joints are truncate, the third not at all produced downwards behind.

The telson is broader than long, very widely and evenly rounded at the extremity, and furnished with about sixteen serrulations of equal size, alternating with setæ. Uropods longer than the telson and reaching to some distance beyond its extremity ; both inner and outer branches bear two small distal spines, buried among the fringing setæ.

The broad telson, with its widely rounded and distally serrulated extremity and absence of spines or of lateral serrulations larger than the others, at once distinguishes this species from its allies. The forms nearest to it are *E. pulchra* and *E. inermis* ; but in the former the extremity is not nearly so wide and two pairs of spines are present among the serrulations, while in the latter the extremity is not equally rounded, the outermost serræ are somewhat larger than the others, and the uropods are distinctly shorter than the telson. The specimen is a female.

The type here described was dredged by the 'Porcupine' in 1869, but unfortunately no number of the dredging is with the specimen, and therefore the nearest approach which can be given as the habitat is Eastern North Atlantic.

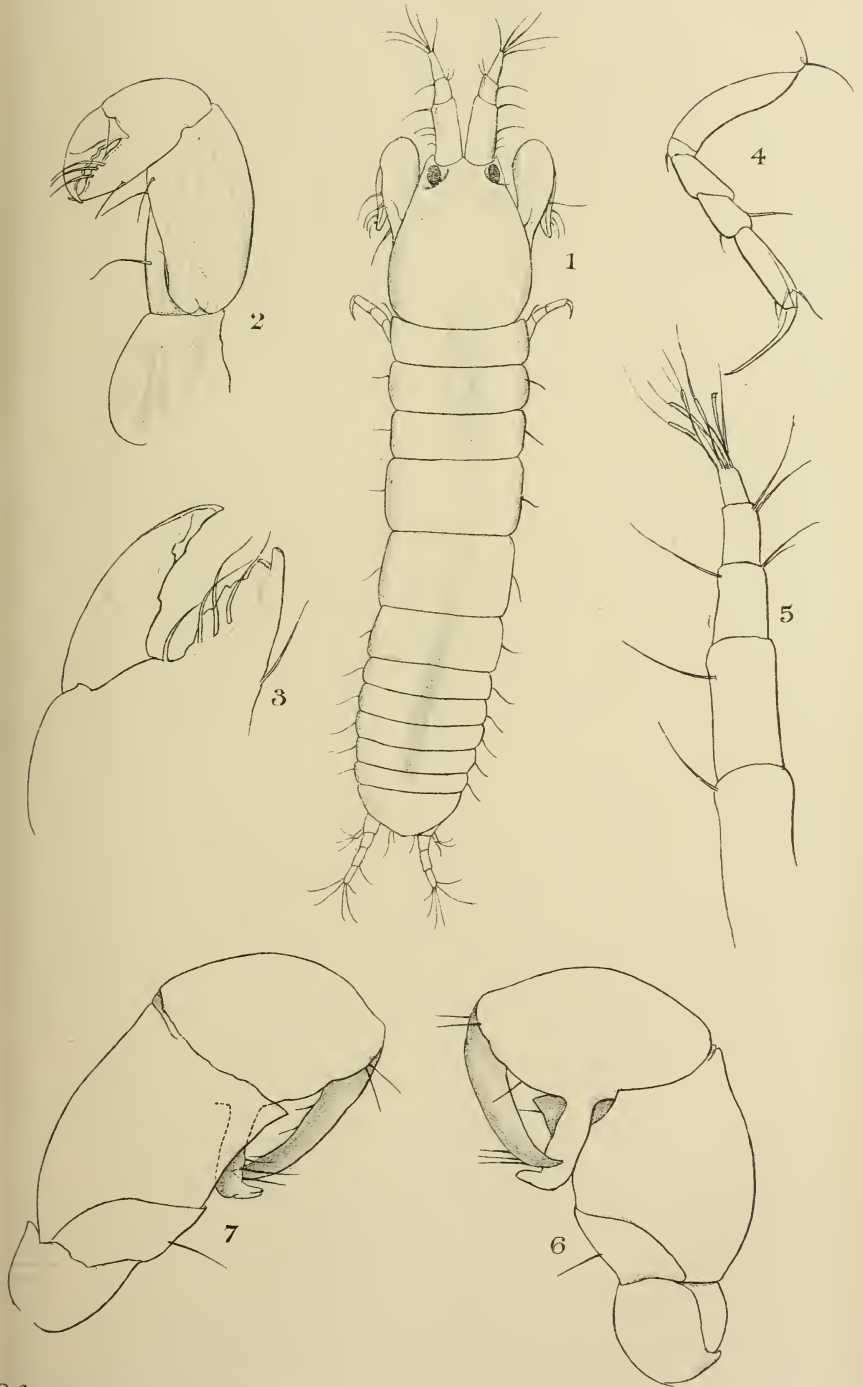
EXPLANATION OF THE PLATES.

PLATE V.

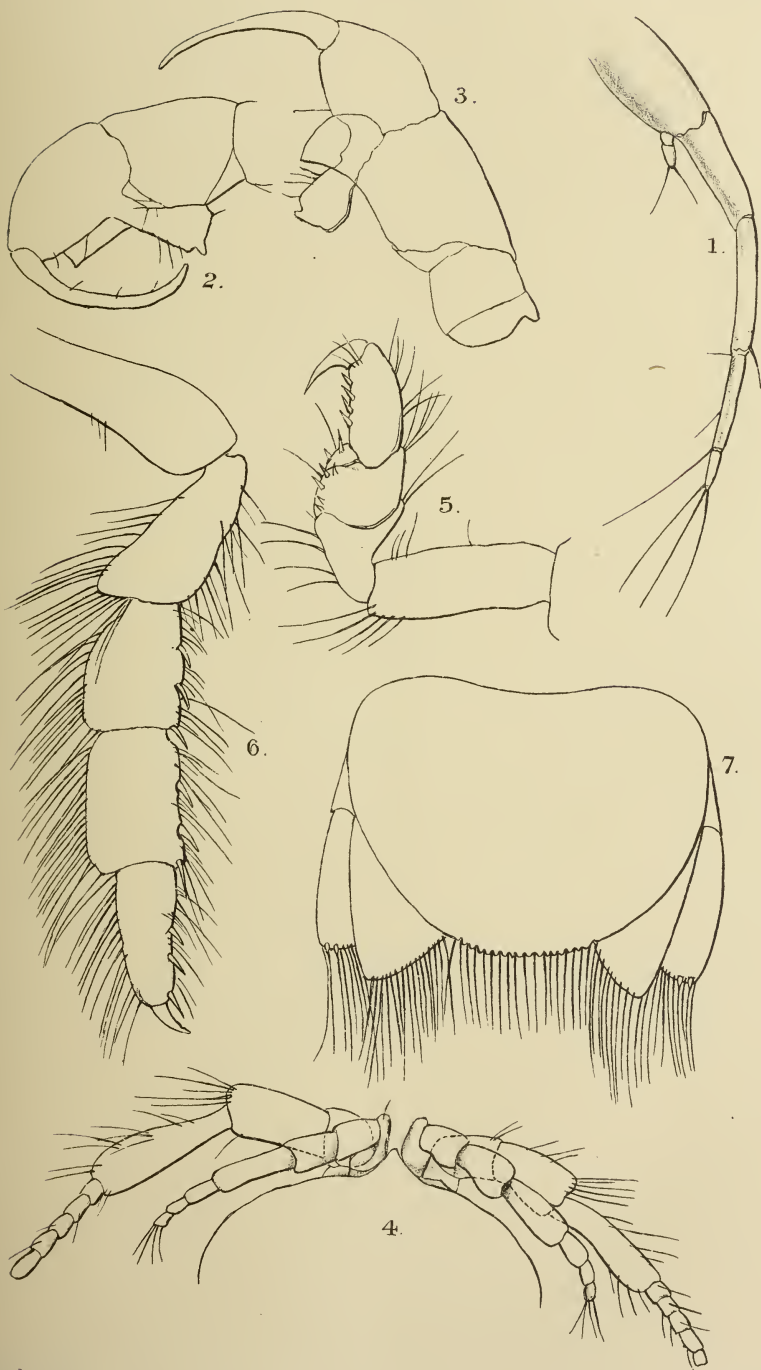
- Fig. 1.* *Heterotanais Gurneyi*, sp. n., ♀, dorsal view.
Fig. 2. " " Cheliped, ♀.
Fig. 3. " " Chela of cheliped, ♀.
Fig. 4. " " Second leg, ♀.
Fig. 5. " " Antennule, ♂.
Fig. 6. " " Cheliped, ♂, inner face.
Fig. 7. " " " " outer face.

PLATE VI.

- Fig. 1.* *Heterotanais Gurneyi*, sp. n. Uropod, ♂.
Fig. 2. *Heterotanais Örstedii*, Kröyer. Cheliped, ♂, inner face. After F. Müller.



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- Fig. 3. *Heterotanis Örstedii*, Kröyer. Cheliped, ♂, outer face. After F. Müller.
- Fig. 4. *Eurydice rotundicauda*, sp. n. Antennules and antennæ.
- Fig. 5. " " First leg.
- Fig. 6. " " Seventh leg.
- Fig. 7. " " Telson and uropods.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

April 5th, 1905.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

‘On the Divisions and Correlation of the Upper Portion of the Coal-Measures, with special reference to their Development in the Midland Counties of England.’ By Robert Kidston, F.R.S. L. & E., F.G.S.

The following classification of the Coal-Measures is proposed by the Author:—

<i>Proposed Names.</i>	<i>Names previously used.</i>
4. Radstockian Series	= Upper Coal-Measures.
3. Staffordian Series	= Transition-Series.
2. Westphalian Series	= Middle Coal-Measures.
1. Lanarkian Series	= Lower Coal-Measures (including the Millstone-Grit).

The Staffordian Series includes the Blackband Group beginning with the Bassey-Mine Ironstone, the Etruria-Marl Group, nearly barren of plant-remains, and the Newcastle-under-Lyme Group. The Radstockian Series includes the Keele Group and various beds in the Midland Coalfields hitherto referred to the Permian System. A classified table is given of all the plants known from the two upper Series in the Potteries Coalfield, and a list of those observed in the Newstead boring, Trentham. The plant-yielding beds in the shaft of the Hamstead Colliery, near Birmingham, between the depths of 243 and 411 yards from the surface, are undoubtedly referable to the Radstockian Series and to the Keele Group of the Potteries Coalfield; and the beds without plants, from 209 yards downward, belong to the same group. A bed at 440 yards is referable to the Newcastle Group. A list of these plants is given. These two Series are recognizable in Denbighshire; and the

Ruabon Marls of the Staffordian Series are as barren in plant-remains as the corresponding Etruria Marls. A list is also given from red and purple shales in Cumberland, which contain Upper Coal-Measure plants. Part of the Ardwick Series of Manchester belongs to the Staffordian Series. A table of all plants known from the two upper Series (3 & 4) is next given, the distribution of species in the four subdivisions is analysed, and the differences between the two Series are discussed. Finally, a list of plants from the Bradford Colliery, Manchester, from shales extending from 8 to 107 yards above the 'Bradford Four-Foot Coal,' is appended, and the beds are placed in the Staffordian Series; while the species from shale immediately below this coal, and from shale 88 yards lower down, are classed with the Westphalian Series.

November 22nd, 1905.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

'On a New Specimen of the Chimæroid Fish, *Myriacanthus paradoxus*, Ag., from the Lower Lias of Lyme Regis (Dorset).' By Arthur Smith Woodward, LL.D., F.R.S., F.L.S., F.G.S.

The Author, having proved that the dorsal fin-spine of the so-called *Ischyodus orthorhinus* is identical with an ichthyodorulite which has been named *Myriacanthus granulatus*, inferred that the larger ichthyodorulite *M. paradoxus* belonged to the same fish as the larger dentition named *Prognathodus Guentheri* by Egerton. This question has been settled by the discovery by Mr. S. Curtis, in the Lower Lias of Black Ven, of a dorsal fin-spine in direct connection with a mass of decayed cartilage, dermal plates, and teeth. On the specimen the following parts are recognized:—the left and left palatine dental plates, right mandibular dental plate, cartilage of the pectoral arch, præsymphyseal tooth, rostral cartilage, frontal spine or tentaculum, and vomerine dental plate, dermal plates, and the dorsal fin-spine. The new fossil warrants the conclusion that *Myriacanthus* is a Chimæroid, closely similar to the Upper Jurassic *Chimæropsis*, with (i) a median chisel-shaped tooth in front of the lower jaw, (ii) a few tuberculated dermal plates on the head, and (iii) a tuberculated dorsal fin-spine. In these respects it differs from all other known Chimæroids—even from the comparatively-primitive types which have been discovered during recent years in the Japanese seas. The Myriacanthidæ, in fact, have still no nearer ally than *Callorhynchus*, with which Egerton originally compared his so-called *Ischyodus orthorhinus*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 98. FEBRUARY 1906.

XXIII.—*New African Mammals of the Genera Cercopithecus, Scotophilus, Miopterus, Crocidura, Georchus, and Heliophobius.* By OLDFIELD THOMAS.

Cercopithecus patas sannio, subsp. n.

General coloration and other characters of typical *C. patas*, but the whole of the upper lip, from the lower edge of the nostrils downward and outward to the corners of the mouth covered with a moustache of white hairs, contrasting markedly with the black of the nose and upper part of the face. Chin and throat also white. Crown bright rufous. Back duller rufous ticked with black, not suffused with yellowish. Frontal black line running outwards to ear without indication of the second line mounting to the crown found in *C. pyrrhonotus*. Upper arms grey. Forearms from elbows and hands wholly white. Hind limbs also wholly white, the red of the body not passing downwards on to the thighs. Tail markedly bicolor, red above, white below, the red becoming as usual paler terminally.

Dimensions of the type (measured in the flesh):—

Head and body 630 mm.; tail 720; hind foot 172.

Skull: greatest length 143; basal length 102; zygomatic breadth 88.5; muzzle to orbit 55; breadth of brain-case 63; combined length of upper cheek-teeth 30.

Hab. Yo, Lake Chad.

Ann. & Mag. N. Hist. Ser. 7. Vol. xvii.

13

Type. Adult male. Original number 61. Collected 3rd December, 1904. Presented by Capt. G. B. Gosling.

"Native name in Kanura 'Dagull.'"

"Iris hazel."—*G. B. G.*

A study of the very imperfect material of the *C. patas* group available in the British Museum and the Zoological Gardens collection* gives evidence that there are in West Africa two forms of the Patas monkey—one, represented by examples from Sierra Leone, with the moustache region black; and the other, from more to the east, with this part white, and thus leading towards *C. pyrrhonotus*, which has the nose also white.

No mention of the colour of the lips was made in the original description of the Patas, but specimens from Senegambia were referred to that species by F. Cuvier and other earlier authors, and that region may therefore be treated as the typical one. The Sierra Leone specimen would thus have the best right of those available to be considered true *C. patas*, and I give a new name to the more eastern form, as represented by the fine example sent home by Capt. Gosling.

Scotophilus nigrata herero, subsp. n.

Hairs of back about 5.5 mm. in length.

General colour above "wood-brown," the hairs rather paler, though not yellowish, towards their bases. Below dull "cream-buff."

Dimensions of the type:—

Forearm 59 mm.

Greatest length of skull 20.1. Front of canine to back of m^3 7.1.

Hab. Northern Damaraland. Type from Elephant's Vley, about 18° S., 17° 30' E. Other specimens from Otjoro.

Type. Female. Original number 260. Collected 8th August, 1859, by Mr. C. J. Andersson, and received in the Tomes Collection. Twenty specimens examined.

This is the bat referred by Mr. Tomes† to *Nycticejus planirostris*, Peters, but it is far paler, both above and below, than either that or any other described race of the widely distributed *S. nigrata*. The variation in colour among the large series collected by Mr. Andersson is much less than one would gather from Mr. Tomes's note. I can find no specimens which are anything like "as dark in colour as the

* For these latter I have to thank Mr. Pocock, the Superintendent.

† P. Z. S. 1861, p. 33.

figure given by Dr. Peters." Nor, in fact, in view of the faunal characteristics of the two regions concerned, would one expect to find any that were so.

Scotophilus damarensis, sp. n.

Quite like *S. nigrita herero*, but markedly smaller. Colour above similarly "wood-brown." Below it is a pale whitish brown, without the buffy tone generally present in *herero*.

Dimensions of the type:—

Forearm 48 mm. (other specimens up to 51).

Skull: greatest length to occipital crest 17·3; zygomatic breadth 12·6; interorbital breadth 7·2; palate length in middle line 6·7; front of upper canine to back of m^3 6·5; greatest breadth of palate between outer corners of m^2 8·1; front of lower canine to back of m_3 7.

Hab. Elephant's Vley, Northern Damaraland.

Type. Male. Original number 276. Collected 10th August, 1859, by C. J. Andersson and received in the Tomes Collection. Four specimens.

Mixed up with the series of *S. nigrita herero* there occur four specimens of this smaller bat, otherwise indistinguishable from its larger ally, to which it would bear the same relationship that in Nigeria *S. nigritellus*, de Wint., does to the true *S. nigrita*. But as it is not quite so small as *nigritellus*, and specimens from the intermediate area are not yet known, I give it a binomial name, though I think it will very probably prove to be a subspecies of that form, from which it may be readily distinguished by its pale brown colour.

Miniopterus Majori, sp. n.

Size large, slightly exceeding that of the largest South-African members of the genus. Fur fairly long, hairs of back about 6 mm. in length. Colour dark glossy black, with a slight brownish suffusion, the head not or scarcely lighter than the back; the hairs black for their basal half, then dull yellowish brown, their terminal fourth glossy black. Under surface little lighter, the ends of the hairs dark brown instead of black. Fur extending slightly on to interfemoral membrane both above and below.

Dimensions (see below).

Hab. Madagascar. Type from Imasindrary, N.E. Betsileo. Other specimens from Vohimar.

Type. Adult female. B.M. no. 97. 9. 1. 38. Original

number 457. Collected 3rd July, 1895, by Dr. C. I. Forsyth Major, after whom the species is named.

This large Malagasy *Miniopterus* differs from *M. dasythrix*, Temm., its South-African ally, by its glossy black colour and the dull yellowish rings on the dorsal hairs, that animal being of a "noir mat," as stated in the original description, confirmed by fresh specimens recently received from Knysna (Rudd Collection).

Miniopterus manavi, sp. n.

Size small, much smaller than in *M. Majori*, which occurs in the same localities. Fur of medium length, hairs of back about 5 mm. Fur of body extending thinly over nearly half the upper surface of the interfemoral membrane and on the proximal fourth below. General colour blackish, not so glossy as in *M. Majori*, the hairs blackish for two thirds their length, with dull brown tips. Under surface similar, but rather paler.

Some specimens are dull reddish throughout, representing a rufous phase of the species.

Skull comparatively small and delicate, with a smooth and narrow brain-case.

Dimensions (see table below).

Hab. Madagascar. Type from Imasindrary, N.E. Betsileo. Other specimens from Vinanitelo.

Type. Male. B.M. no. 97. 9. 1. 37. Original number 453. Collected 3rd July, 1895, by Dr. C. I. Forsyth Major.

This is the bat called by Dobson *Miniopterus scotinus*, Sund., but Sundevall's species has a forearm 44 mm. in length, and differs also by its much paler colour and its African habitat. *M. Majori* again was referred by Dobson to *M. Schreibersi*, from which, to use his own words, it "only differs in colour and in the forearm being constantly longer."

Peters's *M. minor* is presumably nearly related to *M. manavi*, but from its continental habitat (Zanzibar) is no doubt specifically distinct.

Dimensions of the two *Miniopteri* above described:—

	<i>M. Majori.</i>	<i>M. manavi.</i>
	mm.	mm.
Forearm	46.3	39.2
Skull:		
Greatest length	15.5	13.8
Basal length in middle line	12	10.4
Breadth of brain-case	8	6.7
Front of canine to back of m^3	6.4	5.0
Breadth of palate outside m^2	6.6	4.9
Front of lower canine to back of m_3 .	6.7	5.4

The difference in size between these closely allied species affords an instance of the curious tendency of Chiroptera to sort themselves into couples, a larger and a smaller form of so many different groups being often found, as in this case, inhabiting the same locality.

Crocidura goliath, sp. n.

A rough-haired species, the largest of the genus.

Size very large, exceeding considerably that of *Pachyura cærulea* and twice as large as *C. Manni*, the largest known West-African species. Fur coarse, long and loose, sparse and of different lengths, quite different from the close even coat of most shrews; the shorter hairs on the back 12–13 mm. long, the longer ones attaining 17 mm. General colour above sepia-brown, a certain number of whitish hairs intermixed, giving a hoary appearance. Head darker brown. Under surface little lighter than upper, near “broccoli-brown,” suffused on the throat, axillæ, and groins with “raw umber.” Upper surface of hands and feet dark brown, almost blackish on the metatarsals. Tail blackish, the terminal inch white in two specimens out of three, well-clothed both with the usual coat of short hairs and the long bristles on the basal third. Lateral gland large, at centre of flank, its hairs near “hair-brown.”

Skull of the usual proportions, but immensely larger than that of any other known shrew. Sagittal and lambdoid crests highly developed; surfaces covered by the masseteric muscle, both on upper and lower jaws, peculiarly roughened and sculptured, probably less so in younger specimens.

Teeth quite normal, the two posterior unicuspid subequal, about half the size of the anterior.

Dimensions of the type (measured as a spirit-specimen before skinning):—

Head and body 155 mm.; tail 109; hind foot 26; ear 15.

Skull: greatest length 39·3; basal length 36; greatest breadth anteriorly 13·2; breadth posteriorly 15·4; inter-orbital constriction 7·1; palate length 19; front of incisors to back of m^3 18·5, front of p^4 to back of m^3 10·1; length of lower tooth-row from tip of incisors 16·6.

Hab. Efulen, Cameroons.

Type. Old male. B.M. no. 5. 10. 28. 2. Collected by Mr. G. L. Bates. Three specimens examined.

This immense shrew, the largest yet discovered, will be readily recognized by its size and peculiar harsh loose fur.

Georychus Mellandi, sp. n.

A large species allied to *G. Mechowi*.

External characters quite as in *G. Mechowi*, of which the Museum possesses specimens obtained from close to the typical locality, Malanje, N. Angola. The colour is the same, and the only differences are that the fur is a little shorter (hairs of back 5 mm.) and the hind feet are not quite so long.

Skull thick and heavy, more stoutly built throughout than in *G. Mechowi*. Muzzle broad; nasals narrow, parallel-sided, their margins scarcely bowed out laterally. Interorbital region much broader than in *G. Mechowi*, its edges slightly swollen, but not so much so as in *G. Ansoergei*; no post-orbital processes. Anteorbital foramen high and narrow, its outer wall much more slanted backwards, the upper root of the zygoma distinctly behind instead of directly over the lower. Occipital plane more strongly slanted forward, the tip of a 10 cm. rule laid flat against it reaching to a point above the front of the nasals, while in *G. Mechowi* its tip is over the centre of the skull; its surface with two pairs of well-marked ridges, one from the top of the foramen slanting outwards to the middle of the lambdoid crest, the other from the tips of the first pair down to the paroccipital processes, the two pairs together making a well-marked Λ . Posterior palate with the pterygoid ridges nearly parallel, not strongly divergent as in *G. Mechowi*.

Dimensions of the type (measured on the spirit-specimen before skinning):—

Head and body 220 mm.; tail 28; hind foot 34.

Skull: basal length 49; zygomatic breadth 43; nasals 21×5.5 ; interorbital breadth 18.2; intertemporal breadth 11.8; least breadth above meatus 20; greatest posterior breadth 27.5; height of occipital surface from basion 16; palatilar length 32.5; diastema 17; antero-posterior diameter of bullæ 12.2; length of upper tooth-series (alveoli) 10.

Hab. Mpika, N.E. Rhodesia. Alt. 5000 feet.

Type. Old male. B.M. no. 5. 11. 10. 1. Collected and presented by F. A. Melland, Esq.

Mpika, being nearly the most easterly point of the Congo drainage area, will probably prove to be the most distant place from the West Coast at which this type of mole-rat will be found. The occurrence together and striking resemblance to one another of this species and *Heliophobius robustus* are worthy of note.

Heliophobius robustus, sp. n.

Larger than *H. argenteo-cinereus*, with a broad interorbital region.

External appearance quite as in Peters's species. Hairs of back about 12 mm. in length. Ends of hairs drab, darker than Ridgway's "ecru-drab."

Skull markedly larger than any other in the collection, either from Nyasaland (*H. argenteo-cinereus*) or East Africa (*H. albifrons*, *Emini*, &c.). Nasals, instead of being evenly convex on each side and therefore broadest at their centre, continuing to increase in breadth to the tip of the premaxillary processes, so that they are broadest close to their hinder end, their sides being nearly evenly divergent throughout; posteriorly they slightly surpass the fairly broad ends of the premaxillary processes. Interorbital region very broad, the orbital edges distinctly concave, succeeded behind by well-marked postorbital processes. Intertemporal region concave laterally. Bullæ large, their diagonal diameter, on a line from the paroccipital process to the glenoid fossa, 10.5 instead of 8.5 mm.

Dimensions of skull (those of the dried skin not being worth recording):—

Basal length 42 mm.; length from condyle to tip of incisors 50; zygomatic breadth 34; nasals 14×5.5 ; interorbital breadth 11.9; tip to tip of postorbital processes 13.6; intertemporal breadth 10; mastoid breadth 22; palatal length 29.5; diastema 15.6; length of molar series (alveoli) 9.

Hab. Mpika, N.E. Rhodesia. Alt. 5000 feet.

Type. Adult skin, probably male. B.M. no. 5. 11. 10. 2. Collected and presented by F. H. Melland, Esq.

This mole-rat, having been obtained by Mr. Melland on the western side of the escarpment which separates the basin of Bangweolo from the valley of the Loangwa, is the first of the genus received by the Museum from the Congo drainage area.

Noack's *Heliophobius marungensis** has a skull of about the same dimensions as that of *H. argenteo-cinereus*.

* Zool. Jahrb. Syst. ii. p. 223, pl. ix. fig. 25 (1887).

XXIV.—*The Vendaces of Lochmaben and of Derwentwater and Bassenthwaite Lakes, Coregonus vandesius and Coregonus gracilior.* By C. TATE REGAN, B.A.

[Plate VII.]

THE British fishes of the genus *Coregonus* are of considerable interest, as they are the ones whose claim to rank as species peculiar to the British Isles has been least disputed. The *Coregoni* here dealt with are those called "Vendace," this word apparently being derived from the old French word "Vendese" and corresponding to the modern French "Vandoise," the Dace. They are distinguished from other British *Coregoni* by the projecting lower jaw and the larger scales. Some authors unite the Lochmaben Vendace, *Coregonus vandesius*, to *C. albula* of Northern Europe and would even include the Irish "Pollan," *C. pollan*, in the same species. The last-named appears to me to be quite different, and after examination of the specimens preserved in the British Museum I have no hesitation in saying that *C. vandesius* can be separated from its nearest continental allies by several distinctive features; whether these entitle it to rank as a species is, of course, another question.

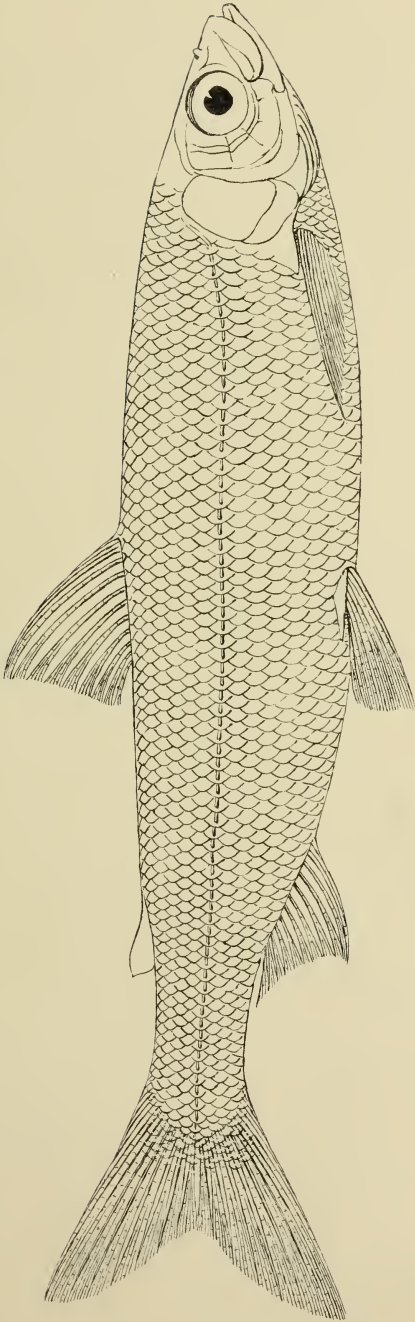
The little-known Vendace of Derwentwater and Bassenthwaite Lake proves to be closely allied to the Lochmaben form, but is by no means identical with it. I have described it below under a new specific name, in order to call attention to its distinctive peculiarities.

Coregonus vandesius, Richardson.

Coregonus vandesius, Günth. Cat. Fish. vi. p. 194 (1866); Day*, Fishes of Britain, ii. p. 128, pl. cxxiii. fig. 1 (1884).

Depth of body $3\frac{2}{3}$ – $4\frac{1}{4}$ in the length, length of head $4\frac{1}{3}$ – $4\frac{2}{3}$. Snout shorter than eye, the diameter of which is $3\frac{1}{5}$ – $3\frac{2}{5}$ in the length of head, interorbital width $3\frac{1}{2}$ –4. Præmaxillaries continuing the line of the upper profile of the snout; maxillary about $\frac{1}{3}$ the length of head, extending to below anterior $\frac{1}{4}$ of eye; lower jaw projecting. 26–30 gill-rakers on the lower part of the anterior arch, the longest $\frac{3}{5}$ – $\frac{3}{4}$ the diameter of eye. Scales 65–72 $\frac{7\frac{1}{2}$ – $9}{9$ – 11 , 6 or 7 between lateral line and root of ventral fin, 20–22 round the caudal peduncle. Dorsal

* Day's figures of this species and of *C. pollan* are by no means good, but that of *C. clupeioides* is more accurate.



COREGONUS GRACILIOR.

J. Green del et lith.

10-12 (III-IV 7-8), its origin nearly equidistant from tip of snout and base of caudal; longest ray from $\frac{3}{4}$ to as long as the head. Anal 13-15 (III-IV 9-12). Pectoral extending $\frac{3}{5}$ - $\frac{3}{4}$ of the distance from its base to the base of ventral; ventrals originating below or a little behind the origin of dorsal, extending $\frac{3}{5}$ - $\frac{3}{4}$ of the distance from their base to the origin of anal. Caudal forked. Least depth of caudal peduncle $\frac{2}{5}$ or a little more than $\frac{2}{5}$ the length of head, nearly equal to or even a little greater than the distance from the base of the last anal ray to the first procurrent caudal ray. Bluish or olivaceous above, silvery on the sides and below; fins yellowish or greyish.

Castle Loch and Mill Loch, Lochmaben, Dumfriesshire.

The description is based on fourteen examples, measuring from 130-195 mm. in total length.

Coregonus gracilior, sp. n. (Pl. VII.)

Depth of body $4\frac{1}{4}$ - $4\frac{3}{4}$ in the length, length of head $4\frac{3}{5}$ - $4\frac{4}{5}$. Snout a little shorter than eye, the diameter of which is $3\frac{1}{2}$ - $3\frac{3}{4}$ in the length of head and equal to the interorbital width. Præmaxillaries continuing the line of the upper profile of the snout; maxillary $\frac{1}{3}$ or slightly more than $\frac{1}{3}$ the length of head, extending to below anterior $\frac{1}{4}$ of eye; lower jaw projecting. 25-28 gill-rakers on the lower part of the anterior arch, the longest nearly equal to the diameter of eye. Scales 67-70 $\frac{7-8}{9-10}$, 6 or 7 between lateral line and root of ventral fin, 18-21 round the caudal peduncle. Dorsal 12-14 (III-IV 8-10), its origin equidistant from tip of snout and base of caudal or a little nearer the former; longest ray $\frac{3}{4}$ the length of head or a little less. Anal 14 (IV 10). Pectoral extending $\frac{1}{2}$ - $\frac{2}{5}$ of the distance from its base to the base of ventral; ventrals originating below or a little behind the origin of dorsal, extending $\frac{3}{5}$ - $\frac{2}{3}$ of the distance from their base to the origin of anal. Caudal forked. Least depth of caudal peduncle $\frac{3}{8}$ - $\frac{2}{5}$ the length of head and less than the distance from the base of the last anal ray to the first procurrent caudal ray. Bluish or olivaceous above, silvery on the sides and below; fins pale yellow.

Derwentwater and Bassenthwaite Lakes, Cumberland.

The description is based on five examples from Derwentwater, measuring from 160-190 mm. in total length.

This species is seen to differ from *C. vandesius*, when specimens of the same size are compared, in the more elongate body and more slender caudal peduncle, smaller head, shorter paired and lower unpaired fins, whilst the dorsal fin

has usually more rays, one specimen having 10 branched rays, three 9, and only one 8.

Dr. D. Embleton (Nat. Hist. Trans. Northumb. and Turham, v. 1877, p. 146) states that in 1872 he obtained several specimens of the Derwentwater Vendace, and presented them to the Newcastle Museum, but on enquiry I find that these have not been preserved. Macpherson, in the 'Fauna of Lakeland,' p. 517 (1892), gives an interesting account of this species, from which I gather that Hutchinson, in the 'History of Cumberland' (*circa* 1794), recorded the Vendace as inhabiting Bassenthwaite Lake and that in 1856 Davy wrote that he had heard of one being taken with the fly and one with a worm, but that in the last eight years a good many had been taken in both lakes by net. They appear to be scarce at the present day and are not netted.

The honorary curator of the Keswick Museum, Mr. H. A. Beadle, very kindly sent me the five specimens described above, with permission to retain one for the British Museum collection. These were found dead, floating on the water, and Mr. Beadle tells me he has never known one to be caught by an angler. It is hoped that more examples of this interesting species may soon be added to the National Collection.

XXV.—*Some undescribed Species of Cicadidæ.*

By W. L. DISTANT.

I PUBLISH the following few descriptions in order that the species may be enumerated in my catalogue of the family, now passing through the press.

Subfam. *CICADINÆ.*

Division DUNDUBIARIA.

Dokuma consobrina, sp. n.

♂. Head, pronotum, and mesonotum dull ochraceous; head with a lateral spot on each side of front, and area of ocelli continued in an oblique broad fascia in front of eyes, black; pronotum with a central fascia amplified anteriorly, and a little roundly amplified posteriorly, followed on each side by a curved discal spot, and the fissures black; mesonotum with four obconical spots, of which the two central are

shortest and almost fused, three elongate spots in front of cruciform elevation (the central one connected with the two middle obconical spots), and an oblique spot on each posterior lateral area, black; tympanal coverings ochraceous, their posterior margins narrowly black; abdomen above testaceous, the segmental margins ochraceous, a series of central discal transverse fasciæ and large lateral spots black; head beneath, sternum, rostrum, legs, and opercula ochraceous, abdomen beneath brownish ochraceous; face with a lunate spot at base and a lanceolate spot at apex, a spot between face and eyes, a central spot to clypeus, spots or streaks to femora, bases and apices of tibiæ, apex of rostrum, and large maculate suffusions to abdomen, black; tegmina and wings hyaline, somewhat talc-like, venation fuscous, in places ochraceous near base; tegmina with the costal membrane ochraceous, transverse veins at bases of first, second, third, and fifth apical areas infuscated, and small fuscous spots at apices of longitudinal veins to apical areas; wings with the outer margin and a basal streak to anal area fuscous; tympanal coverings circular, somewhat wide apart; opercula short, oblique, not passing base of abdomen, their inner angles not inwardly extending beyond the posterior trochanters.

Long., excl tegm., ♂ 16 mm.; exp. tegm. 50 mm.

Hab. Philippines (Coll. Dist.).

Allied to *D. nigristigma*, Walk., from which it may be separated by its smaller size and the following structural characters:—

Tympanal coverings subquadrangular, somewhat close together	<i>D. nigristigma</i> .
Tympanal coverings circular, somewhat wide apart....	<i>D. consobrina</i> .

Oncotympana Mahoni, sp. n.

♂. Head, pronotum, and mesonotum olivaceous green; head with very broad lateral areas to front and area of the ocelli (from which an oblique line proceeds on each side to margins of vertex) black; pronotum with a very broad central angulated fascia, followed by a curved discal spot, an irregular oblique fascia from behind eyes, the fissures, and a transverse spot on lateral margins black; mesonotum with two central obconical spots, followed by a large central lanceolate spot, a broad irregular fascia near each lateral area, two rounded spots in front of cruciform elevation, and a large central spot to same, black; abdomen above olivaceous green, thickly covered with alternately black and ochraceous spots, the anal

segment cretaceous white ; tympanal coverings piceous ; head beneath, sternum, legs, and opercula dull greenish ochraceous ; lateral carinations to face, a spot on each side of clypeus, apex of rostrum, narrow basal and apical suffusions to femora and tibiæ, and the abdomen beneath piceous or black, the latter with the segmental margins and a lateral spot on each side near base olivaceous green ; tegmina and wings hyaline with a bronzy tint, the venation testaceous or fuscous ; tegmina with the costal membrane greenish ochraceous, a round fuscous spot on the transverse veins at bases of second, third, fifth, seventh, and eighth apical areas, and a fuscous spot at apices of longitudinal veins to apical areas ; wings with the outer margin and a basal streak to anal area fuscous ; opercula transverse, their inner margins black but not meeting, their posterior margins broadly rounded ; head (including eyes) narrower than base of mesonotum.

Long., excl. tegm., ♂ ♀ 20 mm. ; exp. tegm., ♂ 77, ♀ 83 mm.

Hab. N.W. India ; Mussooree (*Mahoni*).

Mr. Mackinnon has asked me to name this species after his chief collector Mahoni, who captured the specimens.

Allied to *O. melanoptera*, Dist., from which it may be at once separated, apart from other characters, by its much narrower head.

Subfam *GÆANINÆ*.

Division *CICADATRARIA*.

Cicadatra raja, sp. n.

Head and pronotum castaneous ; the ocelli sometimes margined with piceous ; pronotum with the posterior margin ochraceous or greenish ochraceous, and sometimes with a central longitudinal ochraceous fascia, broadened anteriorly and posteriorly, two small piceous spots at centre of posterior margin ; mesonotum brownish ochraceous, with four obconical piceous or castaneous spots, the two central ones short and somewhat wide apart, two spots of the same colour in front of the cruciform elevation (sometimes absent) ; abdomen above brownish or castaneous, palely pilose, with the segmental margins piceous or darker in hue ; body beneath palely pilose ; tegmina and wings hyaline, the first with the venation fuscous, the costal membrane and some of the basal veins virescent, a distinct small piceous spot at apex of upper apical area ; wings with the venation, inner broad anal margin (enclosing a small pale spot at apex), and the

narrow outer margin of the anal area fuscous; opercula small, obliquely transverse, very thickly palely pilose, not passing base of abdomen nor meeting internally.

Long., excl. tegm., 18-20 mm.; exp. tegm. 44-47 mm.

Hab. N.W. India, Aglar Valley, Masuri (P. W. Mackinnon).

Allied to *C. sankara*, Dist., from the same district.

Division FIDICINARIA.

Majeoroma lutea, sp. n.

♂. Body and legs dark luteous; abdomen above thickly greyishly pilose on each lateral area; tegmina and wings hyaline, both narrowly sanguineous at base, the venation luteous; tegmina with the costal membrane and basal cell luteous; head with the front laterally striate and with a deep linear central longitudinal incision; face strongly narrowly longitudinally sulcate and strongly transversely striate; vertex with a longitudinal impression at the area of the ocelli; mesonotum with two obscure central anterior obconical spots and with a small foveate impression in front of each anterior angle of the cruciform elevation, which is very concave posteriorly; opercula short, transverse; rostrum reaching the posterior coxæ.

Long., excl. tegm., ♂ 37 mm.; exp. tegm. 108 mm.

Hab. Brazil? (Coll. Dist.).

XXVI.—*Natural History Notes from the Royal Indian Marine Survey Ship 'Investigator,' Captain T. H. Heming, R.N. (retired), commanding.*—Series III., No. 11. *On Two new Genera of Deep-sea Nemertines.* By F. F. LAIDLAW, M.A.

[Plate VIII.]

THE two remarkable deep-sea Nemertines briefly described below are unfortunately each represented in the 'Investigator' collection by a single specimen only. As they are Museum specimens and unique I have not thought it proper to make a complete series of sections, but have had in each case a few sections prepared from a small part of the body, removed in such a way as to impair as little as possible the value of the specimen as a whole.

My thanks are due to Major Alcock for permission to examine these interesting specimens, and to Professor Hickson for permission to work in the Beyer Laboratories of the University of Manchester.

METANEMERTINI.

HOLORHYNCHOCELA.

Pelagonemertidæ.

DINONEMERTES, gen. nov.

Mouth and proboscis openings separate and distinct. Median dorsal vessel present. Gut-diverticula very numerous, not branching dendritically. Body broad, flattened, hyaline, sides parallel; bluntly rounded at its anterior and posterior extremities.

This genus is somewhat closely allied to *Planktonemertes*, Woodworth ['99], and resembles it in appearance. It is readily distinguished from Woodworth's genus by the separation of the mouth and proboscis openings.

Dinonemertes investigatoris, sp. n.

(Pl. VIII. fig. 1.)

Station 319, lat. 12° 2' N., long. 73° 46' E., 1154 fath. (Z. E. V. $\frac{1957}{7}$). Indian Marine Survey, 1903-1904, east of Laccadives.

Length 15 cm., breadth 4·8 cm., thickness 4 mm.

There is no note as to colour; in the preserved specimen this is whitish yellow. Bands of longitudinal muscle-fibres can be distinguished without the aid of a lens.

The specimen is a male.

The epidermis has completely disappeared, leaving exposed the basal membrane, which is about 0·2 mm. in thickness and has stained deeply. Immediately below it lies a very thin layer of circular fibres, and within these is the layer of longitudinal fibres, which are grouped in fascicles having a triangular outline in cross-section, the apex of the triangle being directed inwards. These fascicles are embedded in gelatinous parenchyma, which shows no cellular structure and is quite without nuclei, but presents a finely fibrillar structure.

The parenchyma is very similar to that described by Hubrecht for *Pelagonemertes* ['87], and, as in that genus, it is traversed in all directions by nerve-fibres which have a

remarkable zigzag course. I have not found any structures comparable to those which Hubrecht thinks may be of a glandular character, observed by him in *Pelagonemertes*. At the thin margin of the body the muscles are reduced to a single layer of fibres apiece. The epithelium of the gut has the appearance of being in a macerated condition. It presents a finely reticular structure surrounding the gut-cavity, but no cell-characters can be determined in it.

The longitudinal nerve-chords occupy relatively the same position as in *Pelagonemertes*. As in that genus, the parenchyma stains most deeply where it surrounds the organs of the body.

BATHYNEMERTES, gen. nov.

Body somewhat cylindrical, but flattened, especially at its hinder end; with a slightly constricted neck; tapering gradually from the neck backwards, whilst the head is large and pointed anteriorly. The mouth and proboscis open together apically. The parenchyma is similar to that of the preceding genus. The body is pigmented. The gut branches freely.

The position of this genus is somewhat obscure. It certainly differs considerably from other genera referred to the Pelagonemertidæ, all of which are flattened dorsi-ventrally to a much greater extent than is *Bathynemertes*. The constrictions at the "neck" may be, perhaps, supposed to indicate some relationship to *Nectonemertes*, Verrill ['92], but there is no trace of "cirrhi," and the mouth and proboscis openings are united. It is possible that when this form is more fully known it will be found necessary to create a special family for its reception.

Bathynemertes Alcocki, sp. n.

(Pl. VIII. figs. 2, 3.)

Station 310, lat. 13° 29' N., long. 95° 29' E. (Z. E. V. $\frac{1771}{7}$). 1902.

Length 10·5 cm., greatest breadth 2·7 cm.

Resembles externally to some extent a *Euborlasia*. The integument is tough and wrinkled and of a purple-brown colour; the hinder extremity is to a great extent devoid of pigment, whilst there is a narrow colourless band running along either side of the body, commencing at the apex.

The *epidermis* is not in a condition for histological description, but appears to be of the usual type. The basement-membrane is well-developed, about ·06 mm. thick and deeply

pitted externally to receive the bases of epidermal cell (Pl. VIII. fig. 3). It may be described as consisting of two distinct zones. Of these the inner is much the thicker and has a finely fibrillar structure. A few small nuclei are visible in this layer. The outer layer has a stratified appearance, as though it had been secreted by the epidermal cells which lie upon it. The layers of which it is formed lie parallel to its surface. The stratification is marked out as a series of deeply stained bands alternating with thicker layers of a clear hyaline material.

The circular muscle-fibres lie immediately below the basement-membrane, and next to them are the longitudinal fibres. These form a continuous layer, not broken up into fascicles, as is the case in *Pelagonemertes*.

Within the muscular system is the parenchyma, here greatly diminished in bulk by the numerous branches of the gut which lie in it. The parenchyma is traversed by bundles of nerve-fibres.

My sections, which were cut from a part of the body about 3 cm. from the hinder end, give no indication of the sex of the individual.

Bathynemertes Alcocki has the appearance of being a bottom-living species, unlike *Dinonemertes* and the other genera referred to the Pelagonemertidæ, which have all of them the characteristics of pelagic creatures.

Literature.

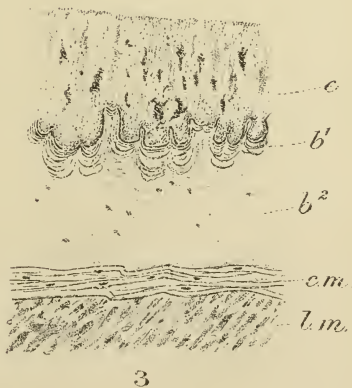
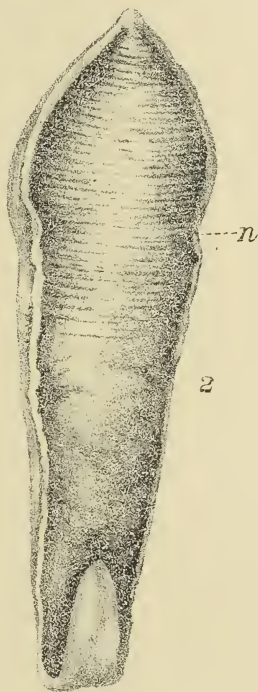
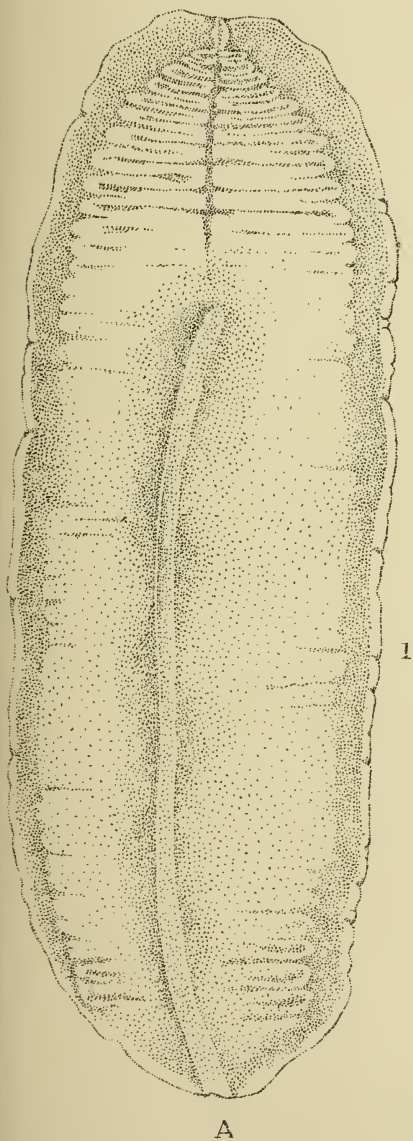
- [87] HUBRECHT, A. W. W.—Report on the Nemertea collected by H.M.S. 'Challenger.' 'Challenger' Report, Zoology, vol. xx. (1887).
- [92] VERRILL.—Trans. Connecticut Acad., New Haven, viii. (1892).
- [99] WOODWORTH, W. McM.—Bull. Mus. Comp. Zool., Cambridge, Mass., xxvii.

EXPLANATION OF PLATE VIII.

- Fig. 1. *Dinonemertes investigatoris*. A., anterior; P., posterior end of body.
- Fig. 2. *Bathynemertes Alcocki*. n, constriction at neck.
- Fig. 3. Part of a transverse section of *Bathynemertes Alcocki*. e, epidermis; b¹, outer zone of basement-membrane; b², inner zone of basement-membrane; c.m., circular muscle-fibres; l.m., longitudinal muscle-fibres.

Figs. 1 and 2 about natural size.

P.



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XXVII.—On new Thyrididæ and Pyralidæ.

By Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S., &c.

[Continued from p. 147.]

Genus POLYLOPHOTA, nov.

Palpi upturned, reaching just above vertex of head, and very thickly tufted with rough hair on inner and outer sides; maxillary palpi dilated with scales; antennæ fasciculate with a short tuft of hair and scales from basal joint; mid tibiæ clothed with rough hair; hind tibiæ fringed on outer side with rough hair and on inner side before the medial spurs. Fore wing short and broad, the apex rectangular; veins 3, 4, 5 well separated at origin; 7, 8, 9, 10 stalked; male with a very large tuft of hair from subcostal nervure near base directed downwards over the cell, with a ridge of large scales from it through the cell almost to outer margin; a glandular swelling on costa beyond middle. Hind wing with vein 3 from before angle of cell; 4, 5 separate at origin; 6, 7 shortly stalked; 8 free; the whole inner area clothed with long hair.

Polylophota barbarossa, sp. n.

♂. Olive-brown with a reddish tinge and irrorated with black scales; abdomen banded with black towards extremity. Fore wing with the tuft in cell olive-brown with some black suffusion above it; medial and postmedial black marks on costa. Hind wing pale with a reddish tinge and suffused with red towards costa; the thick hair on inner area bright red.

Hab. BRIT. N. GUINEA, Moroka. *Exp.* 36 mm. Type in Coll. Rothschild.

Genus STENOPASCHIA, nov.

Type *S. erythralis*.

Proboscis fully developed; palpi porrect, of male short and not reaching beyond frontal tuft, thickly clothed with hair, of female extending to about twice length of head; antennæ of male ciliated; mid tibiæ thickly fringed with hair, the spurs long. Fore wing narrow; vein 3 from angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9, 10 stalked; 11 from cell. Hind wing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle; 8 anastomosing with 7.

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Stenopaschia erythralis, sp. n.

Head and thorax rufous; sides of palpi and frons black; patagia blackish at extremity; tarsi banded with fuscous; abdomen pale rufous. Fore wing rufous, the costal area tinged with fuscous; a fine median line oblique from costa to median nervure, defined by ochreous on inner side with a diffused fuscous band before it from cell to inner margin; the terminal half of wing more ochreous except costal area; an obliquely curved black discoidal bar; a dark postmedial line slightly incurved from below costa to vein 5, where it is angled outwards, then again slightly incurved; a terminal series of black points. Hind wing grey tinged with fuscous.

Hab. BRAZIL, São Paulo, 1 ♂ type; type ♀ in Coll. Schaus. *Exp.*, ♂ 16, ♀ 18 mm.

Genus RHYNCHOPASCHIA, nov.

Proboscis slight; palpi extending about three times length of head, downcurved, beak-like, and rather smoothly scaled; maxillary palpi tufted with hair; antennæ of female nearly simple. Fore wing with vein 3 from well before angle of cell; 4, 5 stalked; 6 from below upper angle; 7, 8, 9 stalked, 7 from beyond 9; 10, 11 from cell; a fan of scales in middle of cell and a tuft of scales on inner margin before middle. Hind wing with vein 3 from well before angle of cell; 4, 5 stalked; 6, 7 from upper angle, 8 anastomosing with 7.

Rhynchopaschia melanolopha, sp. n.

♀. Head, thorax, and abdomen fuscous brown mixed with grey; patagia with tuft of large black and metallic scales at extremity; palpi at sides and abdomen below blackish. Fore wing grey irrorated with brown, the costal area suffused with brown to median nervure; the fan of scales in cell and tuft on inner margin black glossed with metallic colours; a very ill-defined, oblique, diffused, antemedial brown band; post-medial line brown, diffused, excurved from below costa to vein 3, then oblique, with another ill-defined line beyond it on costal half; an ill-defined terminal brown band. Hind wing pale fuscous brown.

Hab. MASHONALAND (*Dobbie*), 1 ♀ type. *Exp.* 24 mm.

Genus OMPHALEPIA, nov.

Palpi porrect, thickly scaled, not reaching beyond the maxillary palpi, which are dilated with scales or the short

sharp frontal tuft; antennæ of female ciliated. Fore wing with very large tufts of raised scales below base and middle of cell, in middle and end of cell, on inner margin before middle, above inner margin beyond middle, and on middle of vein 2; veins 4, 5 separate; 6 from below angle of cell; 7, 8, 9 stalked; 10, 11 from cell. Hind wing with veins 4, 5 from angle; 6, 7 from upper angle; 8 free.

Omphalepia sobria, sp. n.

♀. Head and thorax purplish fuscous mixed with reddish brown; abdomen pale tinged with rufous and irrorated with fuscous. Fore wing purplish fuscous, the inner medial and terminal area except towards apex pale; the tufts of scales mixed with bright rufous; traces of an antemedial line very indistinct from costa to vein 1, where it is angled, then oblique, black, and prominent; a postmedial fuscous line defined by whitish on outer side, angled outwards below costa and inwards at vein 2; a terminal series of dark points. Hind wing fuscous brown with terminal dark line; cilia whitish.

Hab. BR. E. AFRICA, Tanga, 1 ♀ type. *Exp.* 30 mm.

CHRYSAUGINÆ.

(2 a.) *Abæra aurofusalis*, sp. n.

♀. Head and thorax brown irrorated with metallic golden and silvery scales; pectus, legs, and abdomen grey-brown. Fore wing silky reddish brown, the basal half and whole of cell suffused with metallic golden, silvery, and bluish scales; an indistinct dark discoidal spot, a band of silvery-blue scales just before termen, sometimes reduced to spots, and with a faint fine pale line before it. Hind wing silky reddish brown.

Hab. BRAZIL, Castro Paraña, 1 ♀ type. *Exp.* 26-30 mm.

(2.) *Saccopleura erythralis*, sp. n.

♂. Head and thorax pale flesh-red; abdomen ochreous. Fore wing pale flesh-red; a small black discoidal spot; apical area slightly redder from middle of costa to vein 4 towards termen, and thence as a terminal band to inner margin; postmedial line indistinct, pale, slightly defined by reddish on inner side, bent outwards below costa, then oblique. Hind wing golden orange with somewhat diffused reddish terminal band. Underside of both wings yellow with the costal and terminal areas pale red.

Hab. CENTR. BRAZIL, Chapada (Robert), 1 ♂ type. *Exp.* 38 mm.

(1 a.) *Salobrena atropurpurea*, sp. n.

Head and thorax black-brown; pectus and legs tinged with purplish; mid tarsi white, hind tarsi ringed with white; abdomen black with tuft of whitish scales at base of dorsum. Fore wing black-brown with a silky gloss, and with a slight purplish tinge on costal area and beyond the ante- and postmedial lines, which are very indistinct, pale, waved; cilia black tinged with purplish and with yellowish-white patches below apex and above tornus. Hind wing fuscous brown with a silky gloss; cilia whitish at tips below apex; the underside with the costal area suffused with purplish, a small black discoidal spot, curved white postmedial line defined on each side by black, and traces of a diffused black subterminal line on costal half.

Hab. PANAMA, La Chorrera (*Dolby-Tyler*), 2 ♂, 1 ♀ type, Cana Mines (*Tylecote*), 1 ♀; BR. GUIANA, Essequibo, Rockstone; FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♀. *Exp.* 12-16 mm.

(8.) *Salobrena tenebralis*, sp. n.

♀. Uniform dark reddish brown; palpi at base, pectus, base of legs, and ventral surface of abdomen whitish, mid and hind tibiae with white rings at middle and extremity. Fore wing with slight whitish point and traces of excision on costa beyond middle.

Hab. BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♀ type. *Exp.* 18 mm.

(6.) *Idnea ochribasalis*, sp. n.

♀. Fore wing with the costa slightly excised beyond middle, the termen excurved at middle; hind wing with the termen slightly excised from apex to vein 1, where it is lobed. Head and thorax ochreous tinged with rufous; pectus, legs, and abdomen greyish fuscous. Fore wing with the basal area brassy yellow tinged with rufous below costa, the costal edge dark, the rest of wing olive-ochreous tinged with rufous; a curved antemedial line defined by white on outer side, beyond which is some leaden-silvery suffusion; postmedial line double, fuscous filled in with white and with some leaden-silvery suffusion before it on costal area and at middle, slightly bent outwards to costa, excurved to vein 4, then oblique; a fuscous terminal line; cilia whitish at base, fuscous at tips. Hind wing fuscous brown with white subterminal line from vein 3 to 1, oblique and slightly incurved to submedian fold, then angled inwards, and with a yellow

patch on its outer side, a diffused rufous streak before it, and some rufous on termen beyond it; cilia fuscous with greyish tips; the underside yellowish suffused with brown and tinged with rufous, a double slightly sinuous postmedial line filled in with whitish.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♀ type.
Exp. 28 mm.

(6.) *Tosale velutina*, sp. n.

♂. Head and thorax bright rufous, more or less mixed with black; tarsi with the terminal joints whitish; abdomen fuscous brown with some rufous on dorsum. Fore wing deep rufous, more or less suffused with black-brown and with a silky texture, a greyish gloss on outer part of medial area and on terminal area except towards apex; the vesicle at base of costa dark brown; an indistinct, pale, wavy ante-medial line; a pale postmedial line oblique from costa to vein 6, then sinuous and with small blackish spots on its inner side at discal and submedian fold. Hind wing dark brown with the discal patch velvety black. Underside fuscous; fore wing with the discal patch velvety black; hind wing with curved greyish postmedial line.

♀. Fore wing with the medial area paler.

Hab. FR. GUIANA, Cayenne (*Schaus*), 1 ♂ type; type ♀ in Coll. Schaus. *Exp.* 14 mm.

STHENAUGE, nom. nov., for *Sthenobæa*, Rag., nec Champion, Coleoptera (1885).

GENUS HETERAUGE, nov.

♂. Palpi upturned, hardly reaching vertex of head, the second joint fringed with scales in front, the third short; antennæ ciliated; tibiæ and tarsi smoothly scaled. Fore wing with the costa and termen evenly curved; vein 2 from angle of cell; 3, 4 stalked; 5 absent; 6, 7, 8 stalked, 6 from beyond 8; 9, 10, 11 absent; a glandular swelling at middle of costa on upperside and a fold fringed with scales at base of costa on underside. Hind wing with vein 2 from angle of cell; 3, 4, 5 stalked; 6, 7 from upper angle, 7 anastomosing with 8; a fringe of long upturned hair in cell from median nervure on underside.

♀. Palpi downcurved, extending about the length of head and thickly scaled. Fore wing with veins 3, 4, 5 stalked; 6 from angle of cell; 7, 8 stalked; 9, 10, 11 absent.

Heterauge sarcalis, sp. n.

Head and thorax pale flesh-red; pectus, legs, and abdomen pale fuscous brown, tarsi and abdomen ringed with white. Fore wing pale flesh-red with traces of slightly curved medial and postmedial rufous lines. Hind wing pale fuscous. Underside of both wings pale suffused and irrorated with fuscous, the costal areas tinged with red, traces of a curved dark postmedial line.

Hab. BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♂, 2 ♀ type. *Exp.*, ♂ 14, ♀ 18 mm.

(2 a.) *Xantippe tinctalis*, sp. n.

Arta statalis, Druce, Biol. Centr.-Am., Het. ii. p. 546 (part.) (nec Grote).

♀. Fore wing with veins 7, 8 stalked from 9.

Head and thorax olive-yellow, more or less tinged with rufous; palpi white at tips; tarsi white banded with black; mid femora white; abdomen fuscous brown. Fore wing greenish yellow, more or less strongly tinged with rufous; indistinct pale straight oblique medial and postmedial lines; a fine black terminal line rather punctiform towards apex; cilia white, more or less tinged with rufous towards apex. Hind wing fuscous brown with fine dark terminal line; cilia whitish; the underside with pale curved postmedial line slightly defined by fuscous on inner side.

Hab. MEXICO, Tabasco, Teapa (*H. H. Smith*), 2 ♀ type; BRAZIL, Amazons, Paraña (*Austen*), 1 ♀. *Exp.* 14–16 mm.

(4.) *Xantippe biflalis*, sp. n.

Caphys subrosealis, Druce, Biol. Centr.-Am., Het. ii. p. 549 (part.) (nec Wlk.).

♂. Head and thorax ochreous mixed with purplish pink; abdomen pale ochreous. Fore wing pale purplish pink; an oblique pale yellow antemedial line; a pale yellow postmedial line very slightly excurved at middle; the costal edge on medial area dark; cilia with their basal half bright pink, the tips white. Hind wing ochreous white. Underside of fore wing tinged with fuscous to postmedial line; hind wing with the costal area suffused with pink.

Hab. MEXICO, Guerrero, Amula (*H. H. Smith*), 1 ♂ type. *Exp.* 18 mm.

(1 a.) *Parachma thermalis*, sp. n.

♀. Head and thorax yellow mixed with red; tibiae and tarsi with some dark scales, the tarsi with yellow rings;

abdomen yellow, dorsally tinged with red. Fore wing yellow wholly suffused with red, the costal area slightly darker to the postmedial line; the lines yellow; the antemedial line almost from middle of costa, oblique, straight; the postmedial line erect, straight, ending near tornus. Hind wing yellow tinged with red. Underside yellow suffused with red, the costal area of fore wing with dark scaling to the postmedial line, of hind wing irrorated with red and with traces of yellow postmedial line.

Hab. BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♀ type. *Exp.* 16 mm.

(2 a.) *Parachma atripunctalis*, sp. n.

Arta statalis, Druce, Biol. Centr.-Am., Het. ii. p. 546 (part.) (nec Grote).

♀. Head, thorax, and abdomen brownish white; palpi and fore legs tinged with fuscous; hind tibiæ white. Fore wing pale reddish flesh-colour; yellowish, minutely waved medial and postmedial lines defined on each side by series of black points, the former rather oblique, the latter slightly bent outwards at discal fold; a terminal series of black points. Hind wing pale brownish flesh-colour; a fuscous terminal line from apex to vein 2 and fuscous line through the cilia. Underside of fore wing pinker with slight fuscous suffusion on basal half of costal area; hind wing whitish, the costal half suffused with pink, a pale curved subterminal line from costa to vein 2 slightly defined by fuscous on inner side and showing traces through to upperside.

Hab. MEXICO, Vera Cruz, Atoyac (*H. H. Smith*), 1 ♀ type. *Exp.* 16 mm.

(2 b.) *Parachma ignefusalis*, sp. n.

Parachma ochracealis, Hmps. A. M. N. H. (7) xiv. p. 183 (nec Wlk.).

Fore wing with veins 3, 4, 5 stalked; hind wing with the lower angle of cell produced, veins 4, 5 from cell and approximated for some distance.

♀. Head and thorax yellow suffused with red; legs brownish red, the tarsi with pale rings; abdomen yellow, dorsally tinged with red. Fore wing yellow suffused and irrorated with red; the lines indistinct, yellow, erect, slightly excurved at middle. Hind wing yellow slightly tinged with red. Underside yellow tinged with red; fore wing with the costal area deeper red with yellow ante- and postmedial spots; hind wing with the costal area irrorated with deep red and with slight yellow postmedial line.

Hab. BAHAMAS, Andros (*Bonhote*), 1 ♀ type. *Exp.* 20 mm.

(4.) *Parachma rufoflavalis*, sp. n.

♂. Fore wing with vein 5 absent.

Head and thorax bright rufous; pectus and legs yellowish, the tufts of scales rufous; abdomen yellow tinged with rufous. Fore wing bright rufous; a pale yellow medial band expanding at costa and angled outwards on median nervure; a small yellow postmedial spot on costa with an indistinct line from it to inner margin near tornus, slightly excurved to vein 4, then slightly incurved; a yellow point at apex; a slight dark terminal line and a fine yellow line at base of cilia. Hind wing yellow slightly tinged with rufous; a fine dark terminal line and a reddish line through the cilia.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type. *Exp.* 12 mm.

(5.) *Parachma pallidalis*, sp. n.

Parachma meterythra, Druce, Biol. Centr.-Am., Het. ii. p. 547, pl. 100. f. 6 (nec Hmps.).

Head and thorax ochreous white with a slight violaceous tinge; abdomen yellowish. Fore wing ochreous white with a slight violaceous tinge; a very indistinct pale medial line slightly angled outwards on vein 1; a similar postmedial line oblique from costa to vein 5 and slightly incurved at submedian fold; cilia with fine pale line at base, then fuscous with yellowish tips except at tornus. Hind wing yellow with a slight reddish tinge on terminal area and dark terminal line; cilia yellow; the underside with some brown irroration on costal area and traces of a curved postmedial line.

Hab. MEXICO, Orizaba (*Schaus*), 1 ♀ type, Tabasco (*H. H. Smith*), 1 ♂; GUATEMALA, El Tumbador (*Champion*), 2 ♀; PANAMA, Chiriqui (*Champion*), 1 ♂. *Exp.* 20-22 mm.

(2.) *Dasyncnemia agamalis*, sp. n.

♀. Palpi oblique, slender, the second joint reaching vertex of head, the third long; tibiae and tarsi naked; hind wing with vein 3 not approximated to 4, 5.

Head and thorax rufous; pectus, legs, and abdomen pale grey-brown. Fore wing rufous; a pale postmedial line from vein 2 to inner margin angled outwards on vein 1. Hind wing pale grey-brown.

Hab. VENEZUELA, Aroa, 1 ♀ type. *Exp.* 26 mm.

GENUS THERMAUGE, nov.

Proboscis slight; palpi slender, straight, extending about the length of head, frons smooth; antennæ of male almost simple, the basal joint rather long; tibiæ thickened and thickly scaled, the spurs minute, the tarsal joints greatly thickened. Fore wing with the apex rather produced and acute, the termen nearly straight; the lower part of cell open; veins 4, 5 from a point beyond 3; 6 from below upper angle; 7, 8, 9, 10 stalked, 7 from beyond 9; 11 from cell, a fold fringed with hair on base of costa below. Hind wing with the discocellulars retracted to near base; veins 3, 5 stalked, 4 absent; 6, 7 stalked, 8 anastomosing with 7.

Thermauge flaviciliialis, sp. n.

♂. Head and thorax bright chestnut with a silky gloss; hind legs and abdomen ochreous tinged with rufous. Fore wing bright chestnut with a silky gloss; cilia golden yellow except at tornus. Hind wing pale rufous.

Hab. NIGERIA, Old Calabar (*Crompton*), 1 ♂ type. *Exp.* 32 mm.

(2 a.) *Artu solutalis*, sp. n..

Caphys dubia, Druce, Biol. Centr.-Am., Het. ii. p. 549 (part.) (nec Warren).

♀. Head and thorax rufous; palpi at sides and legs red-brown, the mid tarsi whitish, the fore and hind tarsi with pale rings; abdomen grey-brown. Fore wing rufous tinged with yellowish and irrorated with fuscous; the first line medial, fuscous defined by yellowish on inner side, slightly excurved below costa and incurved below cell; postmedial line fuscous slightly defined by yellowish on outer side and somewhat bent outwards at discal fold; a dark terminal line; cilia red with paler tips. Hind wing greyish suffused with brown; a slight dark terminal line; cilia pale; the underside with the costal area suffused with red and irrorated with brown.

Hab. MEXICO, Jalapa (*Trujillo*), 2 ♀ type, S. Barbara, 1 ♀. *Exp.* 18 mm.

(5.) *Artu calidalis*, sp. n.

Caphys dubia, Druce, Biol. Centr.-Am., Het. ii. p. 549 (part.) (nec Warren).

♂. Head and thorax bright fuscous; mid tarsi whitish;

hind tarsi fuscous with pale rings; abdomen ochreous white. Fore wing bright fuscous; an indistinct somewhat diffused, dark, inwardly oblique, sinuous, medial line defined by whitish on each side; a somewhat diffused dark postmedial line, oblique below vein 5 and defined by whitish on outer side; a terminal series of slight black striæ. Hind wing ochreous white, the terminal area slightly tinged with rufous from apex to vein 2; a terminal series of slight fuscous striæ. Underside of fore wing with diffused blackish postmedial band from costa to vein 3; hind wing with diffused blackish postmedial patch on costa.

♀. Hind wing fuscous brown.

Hab. GUATEMALA, Las Mercedes, 3000' (*Champion*), 1 ♀; PARAGUAY, Sapucay (*Foster*), 1 ♂ type. *Exp.* 16 mm.

(6.) *Arta excisalis*, sp. n.

♂. Fore wing with two slight indentations in costa; the mid and hind tibiæ and first joint of tarsi with tufts of scales.

Head and thorax reddish brown, the back of head with tufts of greyish hair; hind tibiæ above and terminal joints of tarsi grey; abdomen grey-brown. Fore wing reddish brown slightly irrorated with fuscous; the antemedial line represented by an oblique grey striga from costa, a point in cell, and line from vein 1 to inner margin; postmedial line represented by a grey striga from costa, then a strongly excurved fuscous line, and a grey line from vein 1 to inner margin; a rather punctiform black terminal line; cilia fuscous with a fine whitish line at base. Hind wing grey suffused with fuscous brown; a rather punctiform black terminal line; cilia pale. Underside of fore wing with the costal area blackish to the postmedial indentation, the indentation whitish; hind wing with pairs of black striæ from costa near base and beyond middle, the apical area tinged with rufous.

Hab. BRAZIL, São Paulo (*D. Jones*), 1 ♂ type. *Exp.* 11 mm.

(2.) *Sarcistis phænicealis*, sp. n.

Arta statalis, Druce, Biol. Centr.-Am., Het. ii. p. 546 (part.) (nec Grote).

♀. Head and thorax pale blood-red; abdomen brownish white tinged with red below. Fore wing pale blood-red faintly irrorated with deeper red; an indistinct diffused red antemedial line excurved from costa to median nervure, then incurved; postmedial line diffused red defined by whitish on

outer side, oblique below discal fold. Hind wing whitish thickly irrorated with brown and faintly tinged with red; cilia white with fuscous line through them from apex to vein 2.

Hab. MEXICO, Teapa, Tabasco (*H. H. Smith*), 1 ♀; GRENADA, Mt. Gay Est (*H. H. Smith*), 1 ♀; ARGENTINA, Goya Corrientes (*Perrrens*), 2 ♀ type. *Exp.* 14 mm.

(2.) *Diloxis ustalis*, sp. n.

♂. Fore wing with fovea in cell and no tuft of hair on median nervure.

Head, thorax, and abdomen grey-brown, the head and thorax with slight reddish tinge. Fore wing fiery red tinged with brown, the tuft of hair on costa browner; a fine dark terminal line; cilia fuscous with fine whitish line at base and whitish tips. Hind wing uniform fuscous brown; the underside greyish irrorated and suffused with brown, a curved postmedial line.

Hab. BRAZIL, Petropolis (*Doer*), 2 ♂ type. *Exp.* 18 mm.

(2.) *Hyperparachma rhodalis*, sp. n.

♂. Head and thorax rufous; pectus and legs grey-brown, the tarsi white; abdomen grey-brown. Fore wing dull crimson; the flap and ridges of scales purplish with an oblique blackish streak below it; cilia yellowish at tips. Hind wing grey-brown, the cilia tinged with dull crimson towards apex; the underside pale, the costal area irrorated with red, the fringe of hair in cell yellowish.

♀. Fore wing uniform dull crimson.

Hab. FR. GUIANA, Cayenne (*Schaus*), 1 ♂, 1 ♀ type. *Exp.* 16 mm.

(3.) *Hyperparachma ænalis*, sp. n.

♂. Hind wing with vein 2 from angle of cell; 3, 4, 5 stalked.

Head and thorax dull purplish red; mid and hind tarsi whitish; abdomen grey-brown tinged with purplish red below. Fore wing pale suffused and irrorated with purplish red, the flap of scales blackish with traces of an antemedial line from it to inner margin; an indistinct pale postmedial line slightly excurved between veins 6 and 2; a black line on apical half of termen. Hind wing greyish fuscous; cilia pale at base and tinged with purplish at apex; the underside

with the costal area irrorated with purplish, the fringe of hair in cell brownish, traces of a curved postmedial line.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type; BRAZIL, Organ Mts., Tijuca (*Wagner*), 2 ♂. *Exp.* 14 mm.

(2.) *Galasa striginervis*, sp. n.

Hind wing with veins 4, 5 shortly stalked.

Head and thorax rufous; pectus and legs fuscous, the tarsal joints whitish with the tufts of scales on mid and hind tarsi black; abdomen greyish fuscous. Fore wing rufous with slightly darker irroration, the veins with fine dark streaks; antemedial blackish streaks on subcostal and median nervures and inner margin, a black streak on terminal part of inner margin; traces of a pale postmedial line, very oblique from costa to vein 4, then inwardly oblique; a fine terminal black line intersected with yellowish points; cilia with a fine pale line through them. Hind wing whitish tinged with fuscous especially on terminal area; in female more uniformly fuscous; cilia whitish with a dark line through them; the underside with the costal area suffused with rufous, traces of a pale highly curved postmedial line.

Hab. MEXICO, Jalapa (*Schaus*), 1 ♀ type; type ♂ in Coll. *Schaus.* *Exp.*, ♂ 20, ♀ 22 mm.

(1 a.) *Blepharocerus ignitalis*, sp. n.

♂. Head and thorax ochreous suffused with fiery red; antennæ white ringed with red; abdomen whitish slightly irrorated with brown, the anal tuft tinged with red, the ventral surface deep red. Fore wing ochreous suffused and thickly irrorated with fiery red; an indistinct diffused red antemedial line with dark point at costa; a dark point on middle of costa with slight diffused red striga from it; postmedial line pale defined by red suffusion on inner side and with dark point at costa, slightly excurved below costa, then incurved to submedian fold and excurved to inner margin; a slight dark terminal line and line through the cilia. Hind wing white irrorated with brown; the terminal area tinged with red from apex to vein 2; a fine dark terminal line from apex to vein 2; the underside with the costal area suffused with red, a dark postmedial line defined by whitish on outer side, below vein 5 retracted to base of inner margin, showing through to upperside.

Hab. CHILI, Mulchen (*Elwes*), 3 ♂ type. *Exp.* 20-22 mm.

(2.) *Uliosoma anæmicalis*, sp. n.

♀. Fore wing with veins 4, 5 from cell.

Head and thorax olive-ochreous; abdomen whitish tinged with fuscous; pectus, legs, and ventral surface of abdomen fuscous brown; fore tarsi tinged with white, mid and hind tarsi whitish. Fore wing pale olive-ochreous, the cilia brown tipped with white. Hind wing white, the costal area and termen slightly tinged with brown. Underside of fore wing strongly irrorated with dark brown, an indistinct pale curved postmedial line slightly defined by brown on inner side; hind wing with the costal area strongly irrorated with dark brown and with very ill-defined maculate subterminal and terminal bands.

Hab. ARGENTINA, Goya Corrientes (*Perrens*), 1 ♀ type. *Exp.* 20 mm.

(3.) *Uliosoma caustalis*, sp. n.

Galasa rubidana, Kaye, Trans. Ent. Soc. 1901, p. 152 (nec Wlk.).

♂. Mid and hind legs with large tufts of scales on tibiæ and first tarsal joints; abdomen without tufts of hair; fore wing with two indentations in costa.

Head and thorax red mixed with dark brown; mid and hind tibiæ and tarsi with some black scales, the mid femora and tarsi grey, the hind tarsi grey except basal joint; abdomen fuscous with the anal tuft greyish. Fore wing deep cupreous red, the inner area suffused with fuscous; some slight grey marks at the indentations of costa; a terminal series of grey points and fine grey line at base of cilia which are fuscous. Hind wing grey tinged with fuscous especially on apical area; a fine grey line at base of cilia; the underside with the costal area suffused with red.

Hab. TRINIDAD (*Kaye*), 1 ♂ type. *Exp.* 16 mm.

(2.) *Acallis trichialis*, sp. n.

♂. Fore wing with the costa dilated near base, then with two slight indentations; hind wing with the inner area clothed with long hair above.

Head and tegulæ reddish; thorax grey-brown; legs with some cupreous red, the mid tarsi and hind femora white; abdomen grey-brown, the anal tuft reddish. Fore wing grey-brown suffused with rufous and with slight whitish striæ from the indentations of costa; cilia brown with fine whitish line at base and whitish tips. Hind wing grey suffused with

brown; the inner area whitish with the hair on inner margin red; the underside with the costal area reddish irrorated with brown and with some white and black scaling near base.

Hab. BRAZIL, Petropolis (*Doer*), 1 ♂ type. *Exp.* 20 mm.

(5 a.) *Caphys microthyralis*, sp. n.

♂. Head and thorax purplish pink; tarsi and abdomen whitish. Fore wing pale purplish pink, the fovea in cell hyaline. Hind wing white.

Hab. BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♂ type. *Exp.* 14 mm.

(7.) *Caphys cuprealis*, sp. n.

♀. Head and thorax red mixed with dark brown, the back of head with tufts of ochreous hair; fore tarsi ringed with grey, mid tarsi grey, hind tarsi with the terminal joints grey. Fore wing deep cupreous red, the inner area and the costal area at middle purplish fuscous; termen dark; cilia fuscous mixed with some greyish. Hind wing greyish suffused with fuscous brown, rather deeper on apical area; cilia greyish with brown line through them on apical half; the underside with the costal area red irrorated with fuscous.

Hab. PARAGUAY, Sapucay (*Foster*), 1 ♀ type. *Exp.* 20 mm.

(8.) *Caphys rufalis*, sp. n.

♀. Head and thorax rufous; fore and mid tibiae and tarsi with some dark scales; hind legs whitish; abdomen grey. Fore wing rufous, the medial area yellowish rufous; the ante- and postmedial lines represented by slight dark striæ from costa, then only defined by the contrasting medial area, the former curved, the latter oblique from costa to vein 5; cilia with fine yellowish line at base, then on apical half with rather punctiform deep rufous line and whitish tips, on inner half brownish. Hind wing pale greyish brown with rather darker terminal line; the cilia with fine pale line at base. Underside of fore wing brown with whitish striæ from costa at the ante- and postmedial lines and some rufous towards apex; hind wing greyish suffused with brown on costal area and with some rufous towards apex, a slight oblique postmedial line from costa to vein 6 defined by whitish on outer side.

Hab. BRAZIL, Petropolis (*Doer*), 1 ♀ type. *Exp.* 16 mm.

(9.) *Caphys ditrogalis*, sp. n.

♂. Head and thorax ochreous mixed with rufous; tarsi fuscous ringed with white; abdomen grey suffused with brown. Fore wing ochreous irrorated and largely suffused with rufous, the veins slightly streaked with rufous; the two slight indentations on costa whitish with the double ante- and postmedial lines filled in with whitish rising from them, the former angled inwards in submedian fold, the latter oblique from costa to middle, then inwardly oblique and with the outer line black and somewhat diffused; some blackish points on termen. Hind wing whitish tinged with brown; a fine dark terminal line, punctiform towards apex; cilia whitish at base, brown at tips; the underside with the costal area irrorated with brown, a blackish mark on costa near base and a double postmedial line filled in with white on costal area.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type. *Exp.* 12-14 mm.

(2.) *Cyclopalpia phæalis*, sp. n.

♀. Fore wing with the costa slightly excised beyond middle; veins 4, 5 from cell. Head and thorax grey-brown; abdomen greyish fuscous, with slight pale segmental lines. Fore wing grey-brown, with slight pale irroration and a silky gloss; a pale oblique antemedial line slightly incurved at middle; a pale postmedial line, oblique from costa to vein 6, then incurved; a fine dark terminal line intersected by pale points; a pale line through the cilia. Hind wing whitish tinged with fuscous, especially on terminal area; an indistinct, pale, curved postmedial line; a fine dark terminal line; cilia whitish, with a dark line through them.

Hab. MEXICO, Jalapa (*Schaus*), 1 ♀; Orizaba (*Schaus*), 1 ♀ type. *Exp.* 16 mm.

(2.) *Pelagis cautichroalis*, sp. n.

♀. Head and thorax bright rufous glossed with silvery grey; palpi at base below and on inner side, pectus, and legs white, the fore and mid tibiæ and first joint of fore tarsi red-brown; abdomen orange-yellow. Fore wing bright glossy rufous, the terminal area tinged with fiery red; an indistinct, oblique, pale yellowish, waved antemedial line tinged with red; a slight dark spot at upper angle of cell; postmedial line pale yellowish, somewhat punctiform, oblique from costa to vein 5, then inwardly oblique, incurved in

submedian interspace; the veins of terminal area streaked with fiery red; a terminal series of black points with bluish-white points before them. Hind wing golden orange-yellow, the termen slightly tinged with fiery red, running up vein 2 nearly to cell; cilia fiery red, dark at middle. Underside of fore wing orange, the costal and terminal areas red.

Hab. JAMAICA, Runaway Bay (*Walsingham*), 1 ♀ type.
Exp. 22 mm.

(2.) *Murgisca Marshalli*, sp. n.

♂. Palpi with tuft of hair on upperside near base protrusible from a fold; antennæ with long cilia; hind wing with vein 8 free.

Head, thorax, and abdomen pale vinous red. Fore wing pale vinous red slightly irrorated with darker scales; a medial golden-yellow band with some darker red scales on its edges, not reaching costa but ending in a point at upper angle of cell, and with its outer edge angled at lower angle of cell and vein 1. Hind wing golden yellow, with the termen and cilia reddish.

Hab. NATAL, Karkloof (*Marshall*), 1 ♂ type. *Exp.* 22 mm.

Genus CYCLIDALIS, nov.

Palpi extending about three times length of head and very strongly downcurved; frons with large tuft of hair; antennæ of male almost simple; tibiæ moderately clothed with hair. Fore wing with the costa strongly arched, the apex rounded; vein 2 from towards angle of cell; 3, 4, 5 from angle; 6 from below upper angle; 7, 8 stalked; 9 absent; 10, 11 from cell; male with a glandular swelling containing flocculent hair at base of costa on underside. Hind wing with vein 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle; 7 anastomosing with 8.

Cyclidalis chrysealis, sp. n.

♂. Head and thorax chestnut-brown suffused with purple; abdomen dark brown. Fore wing golden-copper mostly suffused with purple to the postmedial line and on apical part of costa; an indistinct highly curved antemedial line with cupreous on its inner side; a discoidal spot; a postmedial indistinct line, very oblique from costa to vein 5, where it is angled, then incurved. Hind wing fuscous brown, the termen suffused with purple; cilia purplish, pale at base and tips.

Hab. BRAZIL, São Paulo. *Exp.* 24 mm. Type in Coll. Rothschild.

For *Chalinitis* insert LEPIDOMYS, Guen. Noct. ii. p. 201 (1852), which has priority.

For *Chalinitis olealis*, Rag., read LEPIDOMYS IRRENOSA, Guen. Noct. ii. p. 201 (1852).

♂. Fore wing without costal vesicle; antemedial tufts of scales on median nervure and below the cell.

(2 a.) *Lepidomys albisectalis*, sp. n.

♀. Head, thorax, and abdomen fuscous brown slightly mixed with greyish, the last with slight greyish segmental lines. Fore wing fuscous brown slightly tinged with red and with a greyish gloss; the costa slightly excised beyond middle, with a small, oblique, wedge-shaped, white mark from the excision and with minute white points towards apex. Hind wing fuscous brown with a greyish gloss, the cilia greyish at tips; the underside slightly irrorated with white and with rather diffused, curved, whitish postmedial line.

Hab. PANAMA, La Chorrera (*Dolby-Tyler*), 2 ♀ type. *Exp.* 14–16 mm.

(4.) *Lepidomys cuprealis*, sp. n.

♂. Head and thorax dull reddish brown; pectus, legs, and abdomen grey-brown, the last with slight grey segmental lines. Fore wing brown tinged with cupreous red and with slight dark irroration, the vesicle at base dark brown; an indistinct dark medial line, slightly incurved in submedian interspace, angled outwards on vein 1, then oblique to inner margin; an indistinctly double dark postmedial line, excurved from below costa to vein 2, and incurved in submedian interspace. Hind wing grey-brown with a silky gloss; the underside with curved dark postmedial line.

♀. Fore wing less tinged with red.

Hab. TRINIDAD; VENEZUELA, Aroa, 1 ♂ type, type ♀ in Coll. Schaus; BRAZIL, Santarem (*Leech*), 1 ♂. *Exp.* 12 mm.

(5.) *Lepidomys medialis*, sp. n.

♀. Head, thorax, and abdomen dark brown mixed with some grey. Fore wing greyish, suffused and irrorated with

glossy reddish brown, the medial area slightly greyer, especially towards antemedial line, which is prominent, whitish, obliquely curved; postmedial line less distinct, whitish, outwardly oblique from below costa to vein 5, then inwardly oblique; the termen slightly darker; cilia greyish, dark at tips. Hind wing glossy fuscous brown; cilia greyish, dark at tips.

Hab. ARGENTINA, Tucuman, Los Vasquez (*Dinelly*), 1 ♀ type. *Exp.* 14 mm.

(2.) *Ochresia flammealis*, sp. n.

Fore wing with the costa strongly excised beyond middle, the termen strongly excurved at middle; male with tympanic vesicle at base of costa fringed with large scales.

Head and thorax fiery red mixed with dark brown; abdomen dark brown. Fore wing deep fiery red with slight darker irroration, the antemedial area except towards inner margin and the apical area to below vein 5 reddish orange; an indistinct, very oblique, silvery antemedial line from cell to inner margin; an oblique pure white postmedial line from vein 6 to submedian fold; the termen fiery red except at apex. Hind wing uniform dark brown.

Hab. FR. GUIANA, Cayenne (*Schaus*), 1 ♀; BRAZIL, Amazons, Para (*Goeldi*), 1 ♂ type. *Exp.* 30-32 mm.

(2 a.) *Epitamyra purpurascens*, sp. n.

♀. Head and thorax purplish red; pectus and legs fuscous; abdomen greyish fuscous with slight pale segmental lines. Fore wing purplish red, the costal half somewhat darker except towards apex; traces of greyish slightly oblique medial and postmedial lines; the apical half of termen with slight dark line with some greyish scales on it. Hind wing fuscous brown with a silky gloss.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♀ type. *Exp.* 16 mm.

(5.) *Epitamyra thermalis*, sp. n.

♂. Head and thorax dark red-brown; abdomen pale grey-brown with slight grey segmental lines. Fore wing deep red-brown; the scales fringing the costal vesicle leaden fuscous; traces of a pale waved antemedial line with redder band before it; a pale waved postmedial line, oblique from costa to vein 2, then erect and with redder band beyond it except towards costa; a whitish point on costa well beyond

middle. Hind wing pale greyish fuscous slightly tinged with red towards termen and with traces of a curved pale subterminal line between vein 4 and submedian fold; the underside grey, the costal and terminal area down to vein 2 suffused with rufous; an indistinct, pale, curved postmedial line.

Hab. JAMAICA, Newcastle, 1 ♂ type. *Exp.* 20 mm.

Genus PYRAUGE, nov.

Palpi downcurved, extending about three times length of head, the second joint fringed with hair below towards extremity, the third thickly scaled; frons smooth; antennæ of male almost simple; mid tibiæ very thickly clothed with hair and scales. Fore wing with the costa highly arched near base, then slightly excised, the termen nearly straight; vein 3 from angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8 stalked; 9, 10 absent; 11 from cell. Hind wing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle, 8 anastomosing with 7.

Pyrauge flummealis, sp. n.

♂. Head whitish; palpi with the second joint brownish at extremity, the third blackish; tegulæ ochreous; thorax red; legs whitish, the mid tibiæ and tarsi black; abdomen whitish tinged with fuscous, the ventral surface red-brown, white at extremity. Fore wing fiery red, the basal area deeper red; an oblique black striga from costa before the excision, which is whitish; cilia white, with strong, slightly waved, black line through them. Hind wing pale fuscous brown, the terminal area tinged with red-brown to vein 2; cilia fuscous, with a fine white line at base. Underside with the basal costal area of both wings suffused with fuscous; fore wing with postmedial line slightly incurved below costa, then excurved and ending at vein 2; hind wing with blackish band from costa to lower angle of cell and sinuous postmedial line.

Hab. BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♂ type. *Exp.* 16 mm.

(1 a.) *Nachaba diplagialis*, sp. n.

♂. Black; frons, hind tarsi, and ventral surface of abdomen greyish. Fore wing with large, triangular, bright golden-yellow patch on basal half, leaving the margin black and running out to a point above inner margin beyond

middle; a patch from below costa beyond middle to just above tornus, its edge towards apex rounded. Hind wing bright golden yellow; the apical area black, its inner edge curved from costa just beyond middle to vein 2, where there is a diffused black spot just inside it, then continued as a narrow terminal band to tornus.

Hab. SURINAM, Paramaribo (*Ellacombe*); BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♂ type. *Exp.* 12 mm.

(8.) *Nachaba nyctalis*, sp. n.

♂. Head and thorax black-brown with a silvery-blue gloss; tarsi whitish; abdomen fuscous brown. Fore wing black-brown; the basal area, a medial band, and the terminal area glossed with silvery blue. Hind wing black-brown, the terminal area glossed with silvery blue, running up below vein 2 to the cell.

Hab. FR. GUIANA, St. Jean Maroni (*Schaus*), 1 ♂ type. *Exp.* 20 mm.

(3.) *Arouva castanealis*, sp. n.

♀. Head and thorax deep red-brown; tarsi whitish; abdomen fuscous brown. Fore wing deep glossy red-brown; a slight black discoidal point; traces of a minutely dentate whitish postmedial line, with more prominent white point on costa, slightly excurved between veins 6 and 2 and angled inwards in submedian fold; cilia dark brown at base, greyish fuscous at tips. Hind wing fuscous brown with a reddish tinge; cilia dark brown at base, greyish fuscous at tips; the underside with indistinct, curved, minutely dentate post-medial line.

Hab. TRINIDAD (*Kaye*), 1 ♀ type. *Exp.* 30 mm.

ENDOTRICHINÆ.

(3 a.) *Endotricha lobibasalis*, sp. n.

Fore wing of male with a lobe at base of costa, the apex produced upwards to a point, the inner margin not lobed at base.

♂. Grey-brown with a fulvous tinge and slightly irrorated with dark scales. Fore wing with dark spot at upper angle of cell; the terminal area pinkish; a fine black terminal line. Hind wing suffused with ferruginous scales; a terminal pinkish band with fine pale line on its inner side; cilia with black line through them, pink at base, white at tips. Under-

side of fore wing with pale subterminal line; hind wing with curved blackish postmedial line.

Hab. QUEENSLAND, Cedar Bay (*Meek*), 1 ♂ type. *Exp.* 22 mm.

(3 b.) *Endotricha trichophoralis*, sp. n.

♂. Fore wing with thick fringe of hair on base of costa; hind wing with fold and fringe of hair on inner area above; fore coxæ very long, with toothed fringe of hair above. Head, thorax, and abdomen yellow mixed with purplish pink and black; fore coxæ with the fringe of hair black; ventral surface of abdomen with medial black patch. Fore wing pink suffused with purplish fuscous and irrorated with black; a slight curved black antemedial line; a discoidal point; a punctiform black terminal line; cilia pink, with a black line through them. Hind wing pink suffused with purplish fuscous and irrorated with black, the basal area slightly suffused with black; a medial yellowish band except on inner area suffused with pink and irrorated with black, with pale lines defined by black before and beyond it, the inner line curved, the outer waved; a lunulate black terminal line; cilia pink, with a punctiform black line through them; the underside with oblique black antemedial line; a double, diffused, minutely waved postmedial line from costa beyond middle to termen before tornus, the area between the two lines whitish.

Hab. SINGAPORE (*Ridley*), 1 ♂ type. *Exp.* 16 mm.

(3 c.) *Endotricha hypogrammalis*, sp. n.

♂. Hind wing without fold in cell.

Head, thorax, and abdomen pale rufous tinged with purplish pink, the last rather darker, with slight pale segmental lines; palpi tinged with fuscous, the third joint whitish. Fore wing pale rufous suffused and slightly irrorated with purplish pink. Hind wing purplish pink, the costal area and cell pale; cilia fuscous at base, white at tips; traces of medial and postmedial lines on inner area. Underside pinker, with dark irroration; fore wing with series of slight yellowish spots on costa, black discoidal bar, and pale, very minutely waved, subterminal line, defined on each side by dark scales; hind wing with black discoidal point and slightly sinuous line from it to inner margin, postmedial line black and diffused from costa to vein 3, then whitish defined on each side by black; traces of a pale subterminal line towards costa.

Hab. CENTR. CHINA, Ichang (*Mrs. Pratt*), 2 ♂ type.
Exp. 20 mm.

(3 d.) *Endotricha nicobaralis*, sp. n.

♂. Fore wing normal ; hind wing on underside with fovea below base of cell.

Head, thorax, and abdomen ochreous tinged with purplish pink. Fore wing ochreous slightly suffused and irrorated with purplish pink ; a series of small whitish spots on costa with dark points in centres ; a small black discoidal lunule ; a minutely waved whitish subterminal line, defined by dark scales on outer side, incurved to costa, the area beyond it purplish pink ; a fine black terminal line ; cilia purplish pink at base, white at tips. Hind wing ochreous suffused and slightly irrorated with purplish pink, the costal area and cell pale ; a fine dark terminal line ; cilia purplish pink at base, white at tips. Underside of fore wing with indistinct dark postmedial line arising at vein 5 and below vein 3 excurved to near tornus ; hind wing with traces of two lines from costa beyond middle to near tornus.

Hab. NICOBAR IS. (*Rogers*), 3 ♂ type. *Exp.* 20 mm.

(4 a.) *Endotricha (Perisseretma) phæalis*, sp. n.

♂. Tegulæ not reaching beyond metathorax.

Head and thorax brown irrorated with black ; palpi, tegulæ, and abdomen blackish. Fore wing brown suffused and irrorated with fuscous ; traces of an antemedial sinuous dark line, angled outwards below cell ; a discoidal black point ; some dark points on costa towards apex ; a pale dentate subterminal line, bent outwards towards inner margin, the area beyond it darker. Hind wing black-brown ; a pale line from costa near base to lower angle of cell, then waved to inner margin ; a pale waved subterminal line, bent outwards near tornus ; both wings with terminal series of black points and pale line at base of cilia.

Hab. BRIT. N. GUINEA, Moroka (*Anthony*). *Exp.* 22 mm.
Type in Coll. Rothschild.

(6 a.) *Endotricha denticostalis*, sp. n.

♂. Head and thorax fuscous brown tinged with pink ; abdomen yellow tinged with pink, some black scales in anal tuft, the basal half of ventral surface fuscous ; legs with some whitish. Fore wing purplish pink slightly irrorated with black ; the basal area suffused with black, bounded by

an obliquely curved, slightly waved, yellow line, defined by black on outer side towards costa; the costa with series of scale-teeth, edged by a waved black line, with series of small yellow spots between them; a slight black discoidal point; a curved, double, minutely waved, subterminal black line; a punctiform black terminal line; a slight black line through the cilia. Hind wing purplish pink irrorated with black, the basal area suffused with black, bounded by a somewhat paler pink medial band with slightly waved black edges; a punctiform black terminal line; a series of black points on the cilia; the underside with sinuous black antemedial line, incurved in cell before the discoidal point; a double, diffused, waved postmedial line.

Hab. BORNEO, Pulo Laut (*Doherty*), 1 ♂ type. *Exp.* 20 mm.

(7 a.) *Endotricha niveifimbrialis*, sp. n.

♀. Bright purplish pink; abdomen irrorated with black. Fore wing rather thickly irrorated with black; a series of minute white spots with pink centres on costa, with dark striæ between them; a slight black discoidal spot; an indistinct curved subterminal line; a punctiform black terminal line; cilia purple-pink mixed with black, a pure white patch on them below apex, then their tips white to middle. Hind wing thickly irrorated with black; a punctiform black terminal line; cilia pink with series of black spots, their tips white from apex to vein 2; the underside with indistinct, slightly waved, pale antemedial line, defined by fuscous on outer side, and pale waved postmedial line defined by fuscous on both sides.

Hab. SIERRA LEONE (*Clements*), 1 ♀ type. *Exp.* 12 mm.

(8 a.) *Endotricha flavirubralis*, sp. n.

♂. Head and thorax fiery red; fore tibiæ dark in front; abdomen yellow dorsally suffused with fiery red except at base and extremity and irrorated with a few dark scales. Fore wing yellow; the basal area suffused with fiery red, bounded by the waved yellow antemedial line, slightly defined by red on outer side; the medial area with the costal area and inner margin suffused with red, some slight yellow spots on costa; the area beyond and below angle of cell suffused with fiery red; postmedial line yellow, excurved from costa to vein 2, then slightly angled inwards; terminal area fiery red, yellowish at apex; cilia fuscous, with a fine pale line at base. Hind wing yellow, the basal and inner

areas suffused with fiery red and dark scales and with traces of an oblique waved antemedial line; postmedial line yellow, excurved at middle, the area beyond it fiery red; cilia fuscous, with a fine pale line at base; the underside with some blackish irroration.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♂ type. *Exp.* 24 mm.

(28 a.) *Endotricha mediolineata*, sp. n.

♀. Vinous purple irrorated with fuscous; head paler. Fore wing with black lines just before and after middle, the former slightly angled on median nervure, the latter just below costa. Hind wing with two slightly sinuous, almost medial, black lines. Underside pinker, the antemedial line absent, the postmedial more prominent.

Hab. SIKHIM, 2800 feet (*Pilcher*), 1 ♀ type. *Exp.* 14 mm.

(2.) *Scenedra flavibasalis*, sp. n.

Purplish brown; vertex of head, the greater part of legs, and base of abdomen yellowish. Fore wing irrorated with fuscous scales; an obscure discoidal point and terminal series. Hind wing with the basal half orange-yellow; a discoidal point; a curved postmedial line defined by yellow on outer side; the terminal area brown tinged with vinous red towards tornus; cilia purplish with a pale line at base.

Hab. QUEENSLAND, Cooktown, Cedar Bay (*Meek*); Geraldton (*Meek*), 1 ♀ type. *Exp.* 18 mm. Type ♂ in Coll. Rothschild.

(1.) *Callasopia semirufalis*, sp. n.

♂. Head and thorax grey mixed with rufous; abdomen grey mixed with black and rufous. Fore wing with the basal half rufous bounded by a white line; the terminal half grey irrorated with black; a black discoidal spot; a postmedial white line excurved between veins 6 and 2, with a broad area of rufous suffusion on its inner side except below costa and black marks above vein 5 and below 2, and rufous patches beyond it on costa and inner margin. Hind wing white.

Hab. BRAZIL, Castro Parafña (*Jones*), 1 ♂ type. *Exp.* 16 mm.

(3.) *Cangetta aurantiaca*, sp. n.

♂. Differs from *C. albocarnea* in being bright orange-red. Fore wing with a narrow whitish band before the postmedial

line, which is very slightly excurved at vein 4 instead of angled or broken : a marginal red line instead of the series of points just inside the margin. Hind wing with the post-medial line defined by whitish on inner side ; a marginal red line.

Hab. NEW GUINEA, Humboldt Bay (*Doherty*). *Exp.* 14 mm. Type in Coll. Rothschild.

(2.) *Diplopseustis nigerialis*, sp. n.

♀. Head, thorax, and abdomen brown suffused with fuscous, the last paler at base, then with slight whitish segmental lines ; tibiæ and tarsi whitish ringed with fuscous. Fore wing brown suffused with fuscous ; a white antemedial striga from costa ; medial white strigæ from costa and inner margin ; a small black discoidal spot ; some white points on postmedial part of costâ ; a white subterminal line slightly incurved from costa to discal fold, then strongly incurved to inner margin ; a sinuous fuscous line just before termen ; a fine black terminal line ; cilia whitish, fuscous at tips. Hind wing pale suffused and irrorated with fuscous brown ; diffused blackish medial and postmedial bands ; a sinuous fuscous line just before termen ; a fine black terminal line ; cilia whitish with fuscous tips.

Hab. NIGERIA, Old Calabar (*Crompton*), 1 ♀ type. *Exp.* 12 mm.

(3.) *Diplopseustis selenalis*, sp. n.

♀. Head, thorax, and abdomen brown mixed with whitish ; palpi above and frons white ; pectus and legs whitish, the latter tinged with brown. Fore wing brown ; a whitish antemedial line defined by fuscous on outer side, angled outwards below costa and incurved in submedian interspace ; the costa beyond antemedial line with series of small white spots, the four towards apex with slight brown centres ; a black discoidal lunule defined by white on outer side ; subterminal line white defined by fuscous on inner side, arising from the costal spot nearest apex, incurved to vein 5, where it is angled outwards, obliquely incurved to vein 3, where it is again slightly angled, then strongly incurved to inner margin ; a fine black terminal line ; cilia brown at base, then with fine black line and white tips. Hind wing brown ; a sinuous white subterminal line bent inwards at vein 2 and with some fuscous suffusion before and beyond it in submedian interspace ; cilia whitish with a fuscous line through them ; the underside whitish strongly

mottled and striated with brown; a black discoidal lunule and ill-defined sinuous subterminal line.

Hab. NEW GUINEA, Fergusson I. (*Meek*), 1 ♀ type. *Exp.* 18 mm.

(4.) *Hendecasis melalophalis*, sp. n.

♀. White; palpi blackish at sides; abdomen with black dorsal crest on third segment. Fore wing with the apical area suffused with golden yellow, the inner half tinged with pale fulvous; a black antemedial point on costa, with a straight, erect, pale fulvous line just beyond it; an obliquely curved pale fulvous postmedial line; a fine dark terminal line from just below apex to vein 5; cilia golden yellow, with a fine line at tips. Hind wing with the terminal area tinged with pale fulvous; fine fulvous ante- and postmedial lines, with black points at inner margin; cilia fuscous at base, then whitish with brownish tips.

Hab. QUEENSLAND, Townsville (*Dodd*), 1 ♀ type. *Exp.* 12 mm.

(5.) *Hendecasis diplogrammalis*, sp. n.

♀. White; palpi black; frons tinged with fuscous; abdomen with black dorsal crest on third segment. Fore wing with the terminal area tinged with pale fulvous; a curved pale fulvous antemedial line, with small black spot at costa; an obliquely curved double postmedial line, the outer line indistinct; a fine black terminal line from apex to vein 5; cilia golden yellow, with fine brown lines at middle and tips. Hind wing with the terminal area tinged with pale fulvous; fine brown antemedial and postmedial lines, with black points at inner margin, the latter double; a dark terminal line, stronger towards tornus; cilia white with brown tips.

Hab. BALI, Low Country (*Doherty*), 1 ♀ type. *Exp.* 12 mm.

(6.) *Hendecasis minutalis*, sp. n.

♂. Palpi extending about the length of head, the third joint minute; fore wing with veins 7 and 10 stalked, 8, 9 absent.

White; palpi slightly tinged with rufous at sides; wings slightly tinged with rufous. Fore wing with black point below base of cell; an oblique, fuscous, almost medial line from cell to inner margin and traces of a fine brown line from costa beyond middle to inner margin near tornus.

Hind wing with oblique brown antemedial line and faint sinuous line from costa beyond middle to tornus.

Hab. CEYLON, Hambantota (*Pole*), 1 ♂ type. *Exp.* 12 mm.

(2.) *Parachmidia picta*, sp. n.

♂. Fore wing without fovea in cell; a fold at base of costa.

Head and thorax pale rufous and ochreous; fore coxæ black; abdomen ochreous. Fore wing rufous to the straight oblique white antemedial line ending at middle of inner margin; its costal half defined on outer side by some black scales, followed by a broad area of pink suffusion; the postmedial line white, minutely waved, oblique from costa to vein 5, then erect to submedian fold, where it is angled inwards, then sinuous; a large white patch irrorated with black scales, and defined on inner side by black on inner side of costal half of postmedial line, and a similar patch on inner area between the ante- and postmedial lines; a pinkish patch irrorated with black scales on inner area beyond the postmedial line, defined above by an oblique waved black line from below costa to termen at vein 2; a fine white terminal line. Hind wing whitish tinged with brown, especially towards termen. Underside of fore wing with the costal fold white, the costal area of both wings purplish red, with white patch or line beyond the black postmedial line, which is obsolescent except towards costa.

Hab. VENEZUELA, Cucuta. *Exp.* 14 mm. Type in Coll. Rothschild.

(2 a.) *Cotachena bivitreata*, sp. n.

♂. Head, thorax, and abdomen pale fulvous yellow mixed with black, abdomen with a white band on basal segment. Fore wing fulvous yellow suffused with black except on inner area as far as the postmedial line; a series of white marks on costa; two hyaline white patches in cell forming slight foveas; the postmedial line with a series of hyaline points on it, expanding into a large trifid white spot between veins 8 and 5, and a bifid spot on inner side of the retracted portion below vein 2; a series of conjoined leaden-fuscous spots just inside the margin and a marginal series of black points. Hind wing pale yellow; a black discoidal point; a fuscous postmedial line, minutely waved and bent outwards between veins 5 and 2; a waved fuscous line just inside the margin.

Hab. OINAINISSA (*Doherty*), 1 ♂; FERGUSSON I. (*Meek*), 1 ♂ type. *Exp.* 18 mm.

Genus OXYCHIROTA, Meyr.

- A. Palpi extending twice the length of head; ground-colour rufous *ceylonica*.
 B. Palpi extending one and a half times length of head.
 a. Palpi broadly scaled; ground-colour rufous *paradoxa*.
 b. Palpi slenderly scaled; ground-colour whitish tinged with rufous *mesocola*.

(1.) *Oxychirota ceylonica*, sp. n.

♂. Head, thorax, and abdomen rufous mixed with some whitish. Fore wing rufous overlaying pale scaling and with slight dark irroration; the scale-teeth on inner margin black; black points at middle and end of cell. Hind wing rufous overlaying pale scaling and with slight dark irroration; the scale-teeth on inner margin black.

Hab. CEYLON, Peradeniya (*Thwaites*), 1 ♂ type. *Exp.* 14 mm.

(2.) *Oxychirota paradoxa*, Meyr. Trans. Ent. Soc. 1884, p. 438.

Hab. QUEENSLAND; N. S. WALES.

(3.) *Oxychirota mesocola*, sp. n.

Oxychirota paradoxa, Wlsm. Monograph of Christmas I. p. 75 (1900), nec Meyr.

Head, thorax, and abdomen whitish tinged with rufous and irrorated with a few dark scales. Fore wing whitish tinged with rufous; medial, postmedial, and subterminal bands formed of fuscous and silvery scales; the small scale-teeth of inner margin formed of black scales. Hind wing whitish tinged with rufous and sparsely irrorated with black; obscure antemedial, medial, postmedial, and terminal pale rufous bands; the small scale-teeth of inner margin formed of black scales.

Hab. INDIAN OCEAN, Christmas I. (*Andrews*), 2 ♂, 5 ♀ type. *Exp.* 8 mm.

PYRALINÆ.

(2 a.) *Vitessa glaucoptera*, sp. n.

Head and thorax orange-yellow; third joint of palpi, antennæ, and spots on collar and tegulæ black; legs and abdomen black banded with greenish grey; anal tuft orange. Fore wing greenish grey with orange patch at base, with a

metallic blue-black basal band from below costa, curved and running along inner margin, and bounded by a blue-black band varying in width; a blue-black patch in end of cell, sometimes with a patch below the end; the interspaces of outer third of wing broadly streaked with blue-black, the streak in discal fold expanding at basal end. Hind wing black with very broad curved bluish-white band occupying nearly half the wing; cilia of both wings black tipped with white.

Hab. QUEENSLAND, Cooktown, Cedar Bay. *Exp.* 30 mm. Type in Coll. Rothschild.

(5 a.) *Vitessa vitalis*, sp. n.

♀. Head and thorax orange; third joint of palpi and antennæ black; tegulæ and shoulders with metallic-blue patches; pectus and legs black with some metallic-blue scales; mid and hind legs with whitish stripes on femora and the extremity of tibiæ whitish; abdomen black-brown, the ventral surface shot with metallic blue, lateral and ventral white segmental lines, the anal tuft orange. Fore wing black shot with metallic blue; a subbasal orange band from just below costa to vein 1; a narrow white antemedial band; a somewhat oblique white band from upper angle of cell to vein 1, rounded above and pointed below; the veins of terminal area streaked with white; cilia white at tips. Hind wing black shot with metallic blue; cilia white at tips; the underside with the veins streaked with white towards termen.

Hab. FIJI, 1 ♀ type. *Exp.* 60 mm.

(5 b.) *Vitessa cyanea*, sp. n.

♂. Head and thorax bright orange; third joint of palpi, antennæ, and spots on collar and tegulæ black; abdomen black with ventral white bands, anal tuft orange. Fore wing metallic blue-black, with small orange basal patch with black spot on it; a bluish-white antemedial line, slightly bent inwards to costa and not reaching inner margin; a large discal white patch with its outer edge dentate and with streaks on the veins towards apex. Hind wing black; cilia of both wings black tipped with white.

Hab. N. GUINEA, Fergusson Island, 1 ♂ type. *Exp.* 44 mm.

(8.) *Vitessa unipectinalis*, sp. n.

Antennæ of male unipectinate, with long branches, the apex serrate.

♂. Head orange, the palpi and antennæ black; thorax and abdomen black shot with metallic blue, the latter with the terminal segment orange. Fore wing black shot with metallic blue; a narrow medial white band incurved to costa, which it does not quite reach; a white streak on vein 6 and slight streak on vein 7 to the wedge-shaped white band just before termen from just below costa to a point at vein 4. Hind wing black-brown with a metallic-blue gloss.

Hab. SOLOMONS, Gizo I. (*Meek*), 2 ♂ type. *Exp.* 34 mm.

(1 a.) *Aglossa rhodalis*, sp. n.

Head and thorax ochreous more or less completely suffused with bright purplish red; abdomen ochreous tinged with red. Fore wing ochreous thickly irrorated or sometimes largely suffused with deep purplish red; the lines ochreous, diffused, defined on each side by deep red; the subbasal line waved, bent outwards to inner margin; the antemedial line excurved in interspaces and angled inwards on median nervure and vein 1; a red discoidal spot; postmedial line more strongly defined towards costa, irregularly waved, bent outwards at vein 5; a terminal series of small deep red spots. Hind wing ochreous tinged with red and with terminal series of obscure dark points; the underside pale ochreous.

Ab. 1.—The marking darker red.

Hab. C. COLONY, Deelfontein (*Col. Sloggett*), 5 ♂, 4 ♀ type. *Exp.* 30–40 mm.

(1 b.) *Aglossa phæalis*, sp. n.

♂. Head and thorax red-brown mixed with black and some fuscous; tibiæ and tarsi fuscous with slight ochreous rings; abdomen fuscous with ochreous segmental lines, the ventral surface ochreous. Fore wing ochreous slightly tinged with rufous and thickly irrorated with black; the lines diffused ochreous strongly defined by black; subbasal line waved, from costa to vein 1; antemedial line excurved in submedian interspace; a black discoidal spot; postmedial line not clearly defined on outer side, angled inwards in discal and submedian folds, excurved and minutely dentate between veins 4 and 2; a terminal series of black spots. Hind wing fuscous, with ill-defined pale postmedial line between veins 5 and 2, where it is angled outwards; a pale mark on inner margin above tornus; an obscure terminal series of dark spots; a fine ochreous line at base of cilia.

Hab. BASUTOLAND, Maseru (*Crawshay*), 2 ♂ type. *Exp.* 32 mm.

(1 c.) *Aglossa infuscalis*, sp. n.

♂. Proboscis minute. Fuscous black-brown. Fore wing with traces of a pale waved subbasal line; a more distinct antemedial line; a black discoidal spot; the postmedial line pale, angled inwards at veins 5 and 2, bent outwards and dentate between veins 4 and 2; a terminal series of black points. Hind wing paler towards base; an indistinct pale, curved, and waved postmedial line; a fine pale terminal line defined by black on each side.

Hab. ZAMBESI, Loangwa R., M'peta (*Coryndon*). *Exp.* 24 mm. Type in Coll. Rothschild.

(2 a.) *Aglossa oculalis*, sp. n.

♂. Head and thorax reddish brown mixed with fuscous; palpi with fuscous band on second joint; tibiæ and tarsi fuscous with pale rings; abdomen ochreous suffused with brown. Fore wing ochreous slightly tinged with rufous and largely suffused with black-brown, the terminal area ochreous with dark streaks on the veins; antemedial line diffused, ochreous defined by dark scaling on each side, oblique from costa to submedian fold, where it is acutely angled outwards, and obsolete below vein 1; four small ochreous spots on medial part of costa; a brown discoidal spot with pale annulus; postmedial line only defined by the pale terminal area, minutely dentate, excurved from costa to vein 4, then incurved. Hind wing pale ochreous slightly tinged with brown; the underside with faint traces of curved postmedial line.

Hab. U.S.A., Texas (*Belfrage*), 2 ♂ type. *Exp.* 20 mm.

(3 a.) *Aglossa ommatalis*, sp. n.

♂. Head, thorax, and abdomen ochreous irrorated with dark brown, the last with pale segmental bands. Fore wing ochreous thickly irrorated with dark brown; antemedial line indistinct, pale, defined by dark scales, with dark marks before and beyond it at costa and in submedian fold, angled outwards below the cell, then incurved; a black discoidal spot on a pale mark; a pale streak in submedian fold on medial area; postmedial line indistinct, pale, defined on inner side by dark scaling and slight dentate black marks above and below vein 6 and in submedian fold, excurved from costa

to vein 4 and angled inwards in submedian fold; a terminal series of black points. Hind wing ochreous suffused and irrorated with dark brown; a terminal series of slight dark points; the underside whitish, with slight discoidal point and indistinct curved postmedial line.

Hab. CYPRUS plains (*Miss D. Bate*), 1 ♂ type. *Exp.* 28 mm.

(5 a.) *Aglossa rubralis*, sp. n.

♀. Head and thorax purplish red; abdomen ochreous tinged with rufous. Fore wing purplish red; traces of a waved antemedial line, with more prominent black points below cell and on inner margin; some black points on medial part of costa; a black discoidal spot; postmedial line rather ill-defined, black, somewhat angled inwards at discal and submedian folds; a terminal series of black points. Hind wing fuscous brown with terminal series of somewhat darker points; cilia with a fine pale line at base; the underside paler and suffused with red, a slight discoidal point and indistinct curved postmedial line.

Hab. BR. C. AFRICA, Likomo (*de Jersey*), 3 ♀ type. *Exp.* 22-24 mm.

(5 b.) *Aglossa approximalis*, sp. n.

♀. Head, thorax, and abdomen ochreous tinged with brown. Fore wing ochreous tinged with reddish brown and sparsely irrorated with dark brown; the costa with series of small alternating brown and ochreous spots; antemedial line brown, obliquely curved; a black discoidal spot; postmedial line very indistinctly double, brown, diffused, incurved to costa, then oblique and approximated to antemedial line at inner margin; a terminal series of slight dark points; cilia white with slight dark line near tips. Hind wing yellowish white, the cilia with slight dark line near tips; the underside with the costal area irrorated with brown, an indistinct discoidal spot, and traces of a curved postmedial line.

Hab. NIGERIA, Borgu, Yelwa L. (*Migeod*), 1 ♀ type. *Exp.* 16 mm.

(7.) *Aglossa ferrealis*, sp. n.

Fore wing with veins 4, 5 stalked; hind wing with veins 4, 5 coincident.

♀. Uniform pale ferruginous brown; hind wing rather darker brown.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♀ type.
Exp. 26 mm.

(8.) *Aglossa ocelliferalis*, sp. n.

Fore wing with veins 4, 5 stalked; hind wing with veins 3, 5 stalked, 4 absent.

♂. Head and thorax ochreous; sides of palpi and frons and tips of tegulæ and patagia deep purple-red; legs suffused with red, the fore tarsi ringed with ochreous; abdomen ochreous with dorsal reddish bands. Fore wing narrow, deep purple-red; a waved ochreous subbasal line, diffused towards inner margin; a waved ochreous antemedial line, forming ocelli with red centres at costa and above inner margin, where there is an ochreous striga before it; the medial part of costa with small ochreous spots; a medial series of three conjoined ochreous ocelli with red centres in and below cell and above inner margin; an ochreous line from costa beyond middle to tornus, dilated at middle and enclosing an irregular red mark; the termen irregularly ochreous with series of small red spots; cilia ochreous tinged with red. Hind wing yellowish white with fine punctiform reddish terminal line; the underside with the costal area tinged with rufous.

Hab. UGANDA, Karasa (*Betton*), 1 ♂ type. *Exp.* 18 mm.

GENUS PARAGLOSSA, NOV.

Type, *P. zonalis*.

Proboscis absent; palpi upturned, the second joint fringed with scales in front, the third rather long, naked, and acuminate. Fore wing rather broad, the apex rounded, the termen evenly curved; vein 3 from near angle of cell; 4, 5 from angle; 6 from upper angle; 7, 8, 9 stalked; 10, 11 from cell. Hind wing with veins 3 from near angle of cell; 4, 5 from angle; 6, 7 from upper angle.

SECT. I.—Antennæ of male pectinate, with paired, long, fine branches followed by shorter finer branches from each joint; fore and hind wings with veins 4, 5 somewhat approximated.

(1.) *Paraglossa atrisquamalis*, sp. n.

♂. Head, thorax, and abdomen olive-yellow tinged with brown and slightly irrorated with black. Fore wing olive-yellow sparsely irrorated with large black scales; a slight black discoidal spot and traces of postmedial line from costa

to vein 2; a terminal series of small black spots; cilia with fuscous lines at middle and tips. Hind wing olive-yellow strongly irrorated with large black scales; a terminal series of small black spots; cilia with fuscous lines at middle and tips; the underside with traces of curved subterminal line.

Hab. BR. E. AFRICA, Boiyuba (*Betton*), 1 ♂ type. *Exp.* 24 mm.

SECT. II.—Antennæ of male minutely serrate and fasciculate; fore and hind wings with veins 4, 5 radiating from angles of cell.

(2.) *Paraglossa zonalis*, sp. n.

♂. Head, thorax, and abdomen olive-ochreous, tinged with red and irrorated with black. Fore wing ochreous tinged with purplish red and irrorated with black; the costa narrowly black, with a series of ochreous specks on medial area; ante- and postmedial erect sinuous ochreous lines, the former defined externally with black, the latter internally; a black discoidal point; cilia blackish fuscous. Hind wing ochreous, the outer half suffused with purplish pink; a broad antemedial fuscous-black band, edged by slightly sinuous ochreous lines; cilia fuscous black.

♀ darker and redder.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type; NIGERIA, Warri (*Roth*), 1 ♀. *Exp.* 20 mm.

[To be continued.]

XXVIII.—*Descriptions and Records of Bees.*—VIII.

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

Panurginus Cressoniellus calochorti, subsp. n.

♀.—Length about $6\frac{1}{2}$ mm.

Black; flagellum black, with only a faint brown tinge beneath on apical half; tegulæ shining black; stigma and nervures dark fuscous; marginal cell less obliquely truncate; basal half of second abdominal segment (seen with compound microscope) lineolate all over and with stronger punctures. On account of the dark flagellum this might be taken for *P. atriceps* (*Cresson*), but the microscopical characters are quite different. In *atriceps* the clypeus is microscopically tessellate, with smaller and much sparser punctures, which

emit hairs. In *Cressoniellus* and *calochorti* the clypeus is smooth and shining, with very large widely separated punctures and some exceedingly minute ones between. In *atriceps* the basal half of second abdominal segment is microscopically tessellate, not punctate; in *Cressoniellus* it is smooth, with only rudiments of the tessellation, and with sparse but distinct punctures. In *Cressoniellus* the sides of the mesothorax mesad of the tegulæ are shining, with large and small punctures irregularly mixed; in *calochorti* nearly the same. *P. Cressoniellus* has the apical half of mandibles red, in *calochorti* they are black. These insects are known from the ordinary American species of *Panurginus* by the first recurrent nervure meeting the first transverso-cubital.

Hab. Ward, Colorado, 9000 feet, at flowers of *Calochortus Gunnisoni*, var. *immaculatus*, July 18, 1905 (*Cockerell*).

Halictoides Harveyi, sp. n.

♀.—Length about or not quite 7 mm.

Black, without the least metallic tinge; the scanty pubescence greyish white, the long hairs arising from under clypeal margin reddish, the hair of mesothorax and scutellum somewhat infuscated, that at apex of abdomen merely stained with brown; the abundant scopa of hind femora and tibiæ, and even sides of metathorax, filled in the type specimen with very pale greenish pollen; head broad; clypeus shining, with large punctures; punctures of front strong and distinctly separated on a shining ground; flagellum short and very thick, almost clavate, dark reddish beneath; mesothorax shining, the punctures neither dense nor strong, median impressed line distinct; area of metathorax irregularly wrinkled all over; tegulæ shining piceous, the outer margin a little reddish. Wings slightly smoky, iridescent, nervures and stigma black or almost; b. n. curved, meeting t.-m.; first r. n. joining second s.m. quite near its base, nearer than the second to its apex. Legs black, with white hair; abdomen shining, sparsely hairy, without distinct bands, the hind margins of the segments more or less reddened.

This small species is quite different from *H. Tinsleyi*, Ckll., in the colour and sculpture of the mesothorax, and also differs in the venation.

H. oryx, Viereck, has the mesothorax like *Tinsleyi*, and is probably its male.

Hab. Harvey's Ranch, Las Vegas Range, New Mexico, Aug. 22 (*W. Porter*); another from Ward, Colorado, at flowers of *Drymocallis*, July 1905 (*T. D. A.* & *W. P. Ckll.*). It occurs at altitudes of 9000 feet and upwards.

Andrena johnsoniana, sp. n.

♀.—Length about 8 mm.

Conspicuous for its broad, convex, very black, shining, minutely but very distinctly punctured abdomen, and the shining mesothorax and scutellum, with strong but irregularly scattered and sparse punctures. Black, pubescence dull white; facial quadrangle conspicuously broader than long; clypeus with strong rather close punctures; facial foveæ with white tomentum, broad, especially above, occupying more than half the distance between eye and antenna, not departing noticeably from orbital margin, overhung on each side of antennæ by a conspicuous tuft of white hair; cheeks ordinary; metathorax dull and rough, the enclosure obscurely defined but very rough and wrinkled; tegulæ nearly black in front and at base, otherwise subhyaline testaceous. Wings clear, iridescent; stigma and nervures ferruginous; second submarginal cell narrow. Legs dark, with dull white hair; second segment of abdomen at apex much broader than first (breadth of abdomen 3 mm.); all the segments *very* narrowly margined with fulvo-testaceous; hair of apex reddish fuscous.

Hab. Johnson Mesa, New Mexico, July 7, 1905 (*Anna Gohrman*, no. 1).

Andrena Wilmattæ, sp. n.

♀.—Length 8 mm.

Black; thorax above covered with fulvous hair, long and dense and very bright orange-fulvous on scutellum and postscutellum; runs in Robertson's table exactly to *corni* (which is a synonym of *commoda*, Smith), except that the abdomen is shining. Hair of face greyish white, the clypeus hairy; process of labrum broadly rounded; clypeus dullish and closely punctured; flagellum dark ferruginous beneath except at base; third antennal joint at least twice as long as fourth; facial foveæ very broad, not departing from orbital margin, their tomentum pale ochreous; mesothorax dullish, distinctly punctured; area of metathorax scarcely defined, strongly obliquely plicate basally; tegulæ shining black. Wings yellowish, apical margin broadly dusky; stigma and nervures ferruginous; second submarginal cell large, receiving the first recurrent nervure a long distance from the end. Hind tarsi clear red, their tibiæ largely red; hair of hind tibiæ and tarsi pale reddish golden. Abdomen shining, minutely but distinctly punctured; segments 2 to 4

with a fine white pile, giving a pruinose appearance, most apparent at the sides; no hair-bands; apical hair orange-fulvous. A very beautiful species.

Hab. Boulder, Colorado, June 4, 1905 (*W. P. Cockerell*).

Prosopis universitatis, sp. n.

♂.—Length about $5\frac{1}{2}$ mm.

Black; face-marks creamy white; mandibles with a white stripe; tegulae and tubercles light-spotted, but prothorax otherwise dark. Wings smoky, iridescent; nervures and stigma black; first abdominal segment with very minute punctures. This runs in my table ('Entomologist,' Aug. 1898) to *P. episcopalis*, to which it is closely allied; differing as follows:—flagellum clear ferruginous beneath; supra-clypeal mark broad (much broader than in *P. asinina*), shaped as in *episcopalis*, but the upper end narrowly truncate; upward extension of lateral marks narrow, gradually narrowing to a point, which is a little divergent from the orbital margin; upper border of prothorax all black; less than basal half of hind tibiae white. From *P. coloradensis* it is easily known by the much narrower, pointed, upward extension of lateral marks. The scape is ordinary (not swollen), and has a pallid streak on the outer side.

Hab. Boulder, Colorado, June 11, 1905 (*W. P. Cockerell*).

Nomada Packardiella, sp. n.

♀.—Length nearly 9 mm.

A red and black species, with the hind margins of the first three abdominal segments broadly black and that of the fourth broadly very dark brown. Closely allied in all respects to *N. nigrocincta*, Smith, but having the following distinctive characters:—antennae very long, entirely red, third joint about as long as fifth and shorter than fourth, but not greatly so; labrum red; mandibles red except at tips, simple; no yellow at lower corners of face; black above antennae and around ocelli; thorax above coarsely rugoso-punctate; mesothorax red, with a narrow median black band; the scanty hair of head and thorax above orange-fulvous; metathorax red, with a median black stripe, the sides with hardly any pubescence (dense white pubescence in *nigrocincta*). Wings dark at apex; stigma ferruginous, nervures fuscous; b. n. a long distance basad of t.-m.; second s.m. very broad below. Legs red, with black at bases of femora behind, the black more extensive on hind femora; abdomen rather long and

narrow, punctulate, banded as described above, and with very small and obscure yellow spots at extreme sides of segments 2 and 3, and evident round subdorsal yellow spots on 4 and 5; black at base of first segment divided into three marks; venter red, with short, median, transverse, black marks.

Hab. Boulder, Colorado, June 11, 1905 (*W. P. Cockerell*).
Dedicated to the memory of Dr. A. S. Packard.

Nomada vallesina, sp. n.

♀.—Length $8\frac{1}{2}$ mm.

Head, thorax, and legs bright ferruginous, without yellow, except that the postscutellum is a sort of dull orange (black at extreme sides); a little black above bases of antennæ and around ocelli, black lines along sides of supraclypeal area and halfway down clypeus, and cheeks posteriorly black, leaving a very broad red band behind eyes; mesothorax very densely punctate, with a rather obscure median black band, the places of the four yellow stripes of *Xanthidium* being very vaguely indicated by suffused stripes of a lighter shade of red; scutellum strongly bilobate, red, the posterior corners a little yellowish; pleura red; region above and in front of middle and hind coxæ black; metathorax red with a median black stripe, its sides with rather abundant pale fulvous hair; hair of head and thorax above short and scanty, pale orange-fulvous; face broad; eyes reddish grey; antennæ long, entirely red, third joint about as long as fourth; legs red, with the hind femora suffused with black behind; tegulæ large, red, strongly punctured. Wings dusky, stigma orange, nervures fuscous; b. n. just on basad side of t.-m.; second s.m. broad, about twice as broad above as third. Abdomen dullish, minutely and closely punctured, red with extremely broad lemon-yellow bands on segments 2 to 5, that on 2 invaded by red at the basal middle, but not nearly interrupted; apical plate broad; venter immaculate red; first dorsal red, with the hind margin suffusedly blackened, and some black marks at extreme base. The coloration of the abdomen recalls *N. obliterata*, but the venation is not as in that insect. In my table of Rocky Mountain *Nomada* it runs to male *coloradensis*, but it is not like the female of that species.

Hab. Las Valles, New Mexico, by the Gallinas River, at flowers of wild plum, April 20 (*Cockerell*). It was flying with many *Andrena prunorum* and a few *A. kansensis*.

Osmia lignaria lignariella, subsp. n.

Osmia lignaria, var. α , Ckll. Ann. & Mag. N. Hist., May 1900, p. 409.

Romeroville and Las Vegas, New Mexico.

I have been surprised to find that the species of this group which I have recently obtained in Colorado (viz. at Halfway House, Pike's Peak, May 30, at flowers of *Salix*; at Ward, 9000 ft., July, at flowers of *Phacelia circinata*; and at Boulder, June 12, taken by my wife; all females) is not *O. lignaria* but the Pacific region *O. propinqua*, Cresson.

Osmia hesperella, sp. n.

♀.—Length $8\frac{1}{2}$ – $9\frac{1}{2}$ mm.

Head and thorax very densely punctured, dark (slightly greenish) blue; abdomen shining dark blue, not at all greenish; pubescence, including ventral scopa, white; head rather large, the cheeks broad; antennæ black; anterior edge of clypeus straight and simple; mandibles 4-dentate, the two apical teeth large, the two inner ones small, and consisting of what is in reality a single broad bicuspidate tooth; no tubercles on front; tegulæ dark blue in front, piceous behind. Wings somewhat dusky, first r. n. twice as far from base of second s.m. as second r. n. is from its apex; b. n. meeting t.-m. (or falling a little short of it); middle and hind femora and tibiæ more or less blue, the hind femora in front a splendid purple-blue; abdomen well-punctured.

Closely allied to *O. albiventris*, Cresson, of which it may be considered a western representative; *albiventris* is smaller, with the abdomen not so blue and the legs entirely black. *O. pumila* is also allied.

Hab. Boulder, Colorado, June 12, 1905, 2 ♀ (*W. P. Cockerell*).

The apical joint of the maxillary palpus is very slender, strongly contrasting with the penultimate one, which is much thickened at end.

Osmia gaillardie, sp. n.

♀.—Length about $11\frac{1}{2}$ mm.

Dark blue-green, the sides of thorax and most of clypeus black; sides of face yellow green; hair of face and vertex partly black and partly white; of cheeks black; of pleura black; of thorax above long and white, with long black hairs sparsely intermixed; tuft behind wings white; punctures of clypeus and mesothorax excessively dense;

antennæ wholly black ; head broad ; clypeus squarely truncate, the sides sloping away, and presenting a concave edge on each side of the truncation ; two little tufts of orange hair beneath clypeus ; tegulæ slightly reddish, with a broad punctate marginal or submarginal area. Wings slightly stained with brown, with conspicuous stains in the marginal and first submarginal cells ; b. n. meeting t.-m. ; first r. n. joining second s.m. far from its base, the distance being quite as great as the length of the first t.-c. ; second r. n. joining second s.m. not far from the end. Legs black, with black hair ; hind spurs straight. Abdomen rather broad and convex, well punctured ; hair on first segment above, and basal middle of second, long and white, rest of hair, including ventral scopa, black. Allied to *O. grandior*, Ckll., but the colour of the thoracic hair above is quite different, and it is not nearly so large. The general appearance is quite like *O. nigrifrons*, Cress., but *gaillardia* differs from that in having the punctures of the third abdominal segment much more distinct and separate, the hair at sides of metathorax white, a tuft of long white hair on and around tubercles, and the sides of face greener.

Hab. Boulder, Colorado, at flowers of *Gaillardia*, July 6, 1905 (*W. P. Cockerell*).

Osmia Wilmattæ, sp. n.

♀.—Length a little over 9 mm.

Dark indigo-blue, the mesothorax slightly greenish, and abdominal segments 2 to 4 with brassy tints ; head and thorax extremely densely punctured ; head rather large ; mandibles very broad, with two sharp teeth, and a broad, obscurely bicuspidate, inner tooth ; lower edge of clypeus straight and simple ; no brushes of orange hair under margin ; antennæ black ; hair of face abundant and coarse, entirely black, as is also that of cheeks ; front (the tegument) black ; hair of vertex black, giving way to white on occiput ; hair of pleura black, but of tubercles, tuft behind wings, and sides of metathorax white, of thoracic dorsum white, with black hairs rather copiously intermixed, producing a grey effect ; tegulæ black, with a blue spot in front, submarginal area densely punctured. Wings dusky ; b. n. meeting t.-m. ; first r. n. joining second s.m. about the end of its first third, second r. n. joining it about the beginning of its last sixth. Legs black, with black hair, but that on anterior and middle tarsi largely pallid. Abdomen well punctured, shining, with short black hairs ; that on first segment long and white, and on

basal middle of second very short and white ; scopa black ; hind spurs curved at end.

Allied to *O. brevis*, Cresson, but easily known from that by the strong admixture of black hair on the thorax above. It may also be compared with *O. nigrifrons*, Cresson, but that is very much larger.

Hab. Boulder, Colorado, June 12, 1905 (*Wilmatte P. Cockerell*).

Osmia coloradella, sp. n.

♀.—Length nearly 9 mm.

Steel-blue, the head and thorax very densely punctured, the abdomen shining ; hair of head and thorax long and rather copious, entirely white, with no yellow tinge ; anterior edge of clypeus straight, with a suggestion of crenulation, but no teeth ; tufts of hair under anterior edge tipped with orange ; mandibles with the usual two large teeth and no patch of yellowish pubescence (such as is seen in *faceta*) ; middle of face somewhat greenish ; antennæ black ; no smooth spots on mesothorax mesad of tegulæ (such as are seen in *atriventris*) ; area of metathorax minutely roughened and dull, except the broad hind margin, which is shining ; tegulæ greenish in front. Wings hyaline, clouded on apical margin ; b. n. meeting t.-c. ; first r. n. only a little more distant from base of second s.m. than second is from its end. Legs black, with greenish-blue tints, which are quite conspicuous ; their pubescence white ; hind spurs curved at end. Abdomen convex, well-punctured, its dorsal hair entirely white, and forming rather indistinct bands on the apices of the segments, only seen when the abdomen is viewed from the side ; ventral scopa black.

Very close to *O. atriventris*, Cresson, but not the same.

Hab. Boulder, Colorado, June 4, 1905 (*W. P. Cockerell*).

Megachile opuntiarum, sp. n.

♀.—Length 13 mm.

Belongs to *Megachile*, s. str., as defined by Robertson, and is exceedingly like *M. cleomis*, Ckll., from which it differs as follows :—clypeus very shiny, the punctures in the middle very sparse, small, and weak ; apical border of mandibles reddened ; hair of top of head white, the vertex with only a few inconspicuous fuscous hairs ; hair of thorax above white, the disk of mesothorax posteriorly with scattered dark hairs ; disk of mesothorax somewhat shiny, the punctures rather smaller and not so coarse ; tegulæ reddened on outer side ; scutellum shining, the small punctures quite sparse in the middle ;

abdomen, seen from above, not showing black hair projecting at the sides; last dorsal segment in lateral profile not in the least concave; hair on inner side of hind tarsi longer, coarser, and redder, being very bright ferruginous. Clypeal margin straight and simple, but there is a strong submarginal channel; abdomen shovel-shaped, with very conspicuous white hair-bands; ventral scopa cream-colour, black on the last segment; maxillary palpi stout, third joint longest; second joint of labial palpi conspicuously longer than first.

Hab. Boulder, Colorado, at flowers of *Opuntia*, collecting pollen, July 3, 1905 (*W. P. Cockerell*).

University of Colorado,
Boulder, Colorado, U.S.A.,
Jan. 2, 1906.

XXIX.—*A Revision of the Fishes of the South-American Cichlid Genera Cichla, Chætobranchus, and Chætobranchopsis, with Notes on the Genera of American Cichlidæ.*
By C. TATE REGAN, B.A.

THE present paper is the last of a series describing the American Cichlidæ in the British Museum*, and has been written in order to complete my account of the group. It has seemed useful to give a synopsis of all the genera and to offer some remarks on their relationships and distribution.

I.—A REVISION OF THE GENERA *CICHLA*, *CHÆTOBRANCHUS*,
AND *CHÆTOBRANCHOPSIS*.

CICHLA.

Cichla, Schneider, Bloch's Syst. Ichth. p. 340 (1801); Cuv. Règne Anim. ii. p. 279 (1817); Heck. Ann. Mus. Wien, ii. 1840, p. 408; Günth. Cat. Fish. iv. p. 303 (1862); Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 611; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 183 (1904).

* My papers dealing with the American Cichlidæ have been published as follows:—Proc. Zool. Soc. 1905, i. pp. 152–168, pls. xiv. & xv. (*Crenacara*, *Batrachops*, and *Crenicichla*); Ann. & Mag. Nat. Hist. (7) xv. 1905, pp. 329–347 (*Acara*, *Nannacara*, *Acaropsis*, and *Astronotus*); t. c. pp. 557–558 (*Acara subocularis*); ib. xvi. 1905, pp. 60–77, 225–243, 316–340 (*Cichlosoma*); t. c. pp. 433–445 (*Petenia*, *Herichthys*, *Paraneotroplus*, *Neotroplus*, *Herotilapia*, *Uaru*, *Symphysodon*, and *Pterophyllum*); ib. xvii. 1906, pp. 49–66 (*Retroculus*, *Geophagus*, *Heterogramma*, and *Biobocus*).

Body moderately elongate, compressed; scales small, ctenoid. Two lateral lines, which may sometimes be united; scales of the lateral line not enlarged. Mouth rather large; lower jaw projecting; maxillary nearly completely sheathed by the præorbital; a band of small pointed teeth in each jaw; upper surface of head to between the orbits, cheeks and opercular bones scaly; præoperculum entire. Gill-rakers moderately long, in moderate number (15-18 on the lower part of anterior arch). Dorsal fin with a deep notch between spinous and soft portions, with XIII-XV, I 15-18 rays. Anal with III 10-11 rays. Pectoral asymmetrical, pointed, with 15 or 16 rays; ventrals below the base of the pectorals. Caudal slightly emarginate in the young, truncate or subtruncate in the adult.

Three species from Brazil, Guiana and Venezuela.

Skeleton.

In *Cichla ocellaris* the supraoccipital crest is very strongly developed and extends to the anterior extremity of the frontals, where it bifurcates to form the posterior margin of the cavity for the præmaxillary processes. The parietal crests are well developed and extend forwards on the frontals to the level of the middle of the orbit. The vertebral column consists of 18 præcaudal and 17 caudal vertebræ; parapophyses are developed on the fourth and succeeding vertebræ and become longer and more downwardly directed posteriorly, the last four pairs being bridged to form a closed hæmal canal; the first four ribs are sessile, the rest are inserted on the parapophyses; the epipleurals, except those of the two anterior ribless vertebræ, are attached either to the ribs or to the parapophyses; the third vertebra bears a pair of very small inferior apophyses. The pelvic bones do not diverge anteriorly. The lower pharyngeal bones are united by a straight suture anteriorly, but diverge posteriorly; corresponding to the incomplete union of the lower pharyngeals, the third and fourth upper pharyngeals on each side are separate from each other.

Synopsis of the Species.

- I. Origin of dorsal above axil of pectoral.
 - Scales 83-102 $\frac{9-12}{23-28}$ 1. *ocellaris*.
 - Scales 104-121 $\frac{12-14}{32-36}$ 2. *temensis*.
- II. Origin of dorsal above posterior part of pectoral .. 3. *multifasciata*.

1. *Cichla ocellaris*.

Cichla ocellaris, Schneider, Bloch's Syst. Ichth. p. 340 (1801); Müll. & Trosch. in Schomb. Guiana, iii. p. 625 (1848); Günth. Cat. Fish. iv. p. 304 (1862); Steind. Denkschr. Ak. Wien, xlv. 1883, p. 3, pl. i. fig. 2; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 611; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 184 (1904).

Cichla monoculus, Agass. in Spix, Pisc. Bras. p. 100, pl. lxiii. (1829); Heck. Ann. Mus. Wien, ii. 1840, p. 408; Schomb. Fish. Guiana, ii. p. 197, pl. xxvi.

Cichla orinocensis, Humboldt, Obs. Zool. ii. p. 167, pl. xlv. fig. 3 (1833); Schomb. t. c. p. 199, pl. xxvii.

Cichla atabapensis, Humboldt, t. c. p. 168 (1833).

Cichla argus, Val. in Humboldt, t. c. p. 169; Schomb. t. c. p. 149, pl. viii.

Cichla nigromaculata, Schomb. t. c. p. 147, pl. vii.

Cichla trifasciata, Schomb. t. c. p. 151, pl. ix.

Acharnes speciosus, Müll. & Trosch. t. c. p. 622, and Hor. Ichth. p. 27, pl. v. fig. 3 (1849); Günth. o. c. iii. p. 369 (1861).

Crenicichla orinocensis, Günth. t. c. p. 309.

Cichla ocellaris, var. *argus*, Pellegr. Bull. Mus. Paris, 1902, p. 183.

Depth of body equal to or greater than the length of head, about 3 in the length. Diameter of eye $3\frac{1}{4}$ – $5\frac{1}{2}$ in the length of head, length of snout $2\frac{3}{4}$ – $3\frac{1}{3}$, depth of præorbital $4\frac{1}{3}$ – $6\frac{1}{2}$, interorbital width $3\frac{1}{4}$ – $3\frac{3}{4}$. Maxillary extending nearly to below middle of eye (young) or well beyond it (adult). 15–17 gill-rakers on the lower part of anterior arch. Scales 83–102 $\frac{9-12}{23-28}$. Dorsal XIII–XV, I 16–18, commencing above the axil of pectoral, the third and fourth or fourth and fifth spines the longest, $\frac{1}{3}$ – $\frac{2}{5}$ the length of head; the soft fin scaleless. Anal III 10–11, covered with scales in the adult. Pectoral $\frac{3}{4}$ – $\frac{5}{6}$ the length of head. Caudal slightly emarginate in the young, truncate or subtruncate and covered with scales in the adult. Caudal peduncle $1\frac{1}{3}$ – $1\frac{3}{4}$ as long as deep. Brownish or olivaceous, with 3 or 4 broad dark cross-bars on the upper part of the body and an ocellus on the upper part of the base of caudal; cross-bars sometimes replaced by large ocelli; sometimes a series of small blackish spots which are covered by the pectoral fin; vertical fins with alternate light and dark spots.

Brazil; Guiana.

1, 2. (410 and 220 mm.)	Brit. Guiana.	Sir R. Schomburgk.
3. (390 mm.)	Cudaja.	Prof. A. Agassiz.
4. (97 mm.)	—?	Zool. Soc.
5. (173 mm.)	—?	

The above are the specimens on which my description is based; in addition there are 28 specimens, all about 60 mm. in total length, from Tefé, collected by Dr. Bach. In colour

these are olivaceous above, silvery below; a blackish stripe extends from the middle of the side to the extremity of caudal and is usually continued forward by a series of 2 or 3 spots. In some specimens there are 2 or 3 faintly marked dark cross-bars passing through the spots above mentioned.

2. *Cichla temensis*.

? *Perca brasiliensis*, Bloch, Ausl. Fische, vi. p. 84, pl. cccx. fig. 2 (1792).

? *Cichla brasiliensis*, Schneider, Bloch's Syst. Ichth. p. 339 (1801).

Cichla temensis, Humb. Obs. Zool. ii. p. 169 (1833); Heck. Ann. Mus. Wien, ii. 1840, p. 413; Günth. Cat. Fish. iv. p. 304 (1862); Bleek. Versl. Ak. Amst. vii. 1873, p. 32; Steind. Denkschr. Ak. Wien, xlvi. 1883, p. 3, pl. i. fig. 3; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 611; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 185 (1904).

Cichla tucunare, Heck. t. c. p. 409.

Cyehla flavomaculata, Schomb. Fish. Guiana, ii. p. 145, pl. vi. (1843).

Cichla conibos, Casteln. Anim. Am. Sud, Poiss. p. 18, pl. x. fig. 3 (1855); Günth. t. c. p. 305.

Depth of body equal to or less than the length of head, $3\frac{1}{3}$ – $3\frac{3}{5}$ in the length. Diameter of eye $4\frac{2}{3}$ – $5\frac{1}{2}$ in the length of head, length of snout $2\frac{3}{4}$ –3, depth of præorbital $4\frac{1}{4}$ – $5\frac{1}{3}$, interorbital width $3\frac{1}{3}$ –4. Maxillary extending to below middle of eye. 16–18 gill-rakers on the lower part of anterior arch. Scales 104–121 $\frac{12-14}{32-36}$. Dorsal XIV–XV, I 15–17, commencing above the axil of pectoral, the third and fourth or fourth and fifth spines the longest, from more than $\frac{1}{3}$ to more than $\frac{2}{5}$ the length of head; the soft fin scaleless. Anal III 10–11, covered with scales in the adult. Pectoral $\frac{2}{3}$ – $\frac{4}{5}$ the length of head. Caudal slightly emarginate in the young, truncate and covered with scales in the adult. Caudal peduncle $1\frac{2}{3}$ –2 as long as deep. Brownish, with three dark cross-bars on the upper part of the body and an ocellus on the upper part of the base of caudal; cross-bars sometimes represented by 1 or 2 series of large ocelli; body and vertical fins usually covered with series of light spots; sometimes an oblique dark stripe in front of the eye and a horizontal stripe or series of spots behind it.

R. Amazon; R. Orinoco.

1-2. (245 and 360 mm.)	R. Capin.	
3. (217 mm.)	R. Cupai.	
4. (355 mm.)	Tabajas.	Prof. A. Agassiz.
5. (237 mm.)	Santarem.	Paris Mus.

In addition to the above specimens, on which my description is based, there are two, 60 and 65 mm. in total length, from Santarem, collected by Messrs. Austen and Cambridge.

These are olivaceous above, silvery below, with a dark stripe from eye to middle of caudal; 3 faint cross-bars pass through 3 blackish spots on the lateral stripe. This is very nearly the coloration of *C. brasiliensis*, Bl., which I believe may be founded on young examples of this species. Certainly none of the species of *Crenicichla* which have been referred to *C. brasiliensis* resemble it to anything approaching the degree that these young examples of *C. temensis* do.

3. *Cichla multifasciata*.

Cichla toucoumarai (non *Cichla tucunare*, Heck.), Casteln. Anim. Am. Sud, Poiss. p. 17, pl. x. fig. 1 (1855).

Cichla multifasciata, Casteln. o. c. p. 18, pl. x. fig. 2; Günth. Cat. Fish. iv. p. 305 (1862).

Castelnau's figures certainly suggest that a distinct species of *Cichla* inhabits the Peruvian Amazon, differing from the two preceding species in the more slender body, the more backward position of the dorsal fin, which commences above the posterior part of the pectoral, and in having more than 3 or 4 dark cross-bars on the upper part of the body.

CHÆTOBRANCHUS.

Chætobranchus, Heck. Ann. Mus. Wien, ii. 1840, p. 401; Günth. Cat. Fish. iv. p. 310 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 128; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 609; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 200 (1904).

Body of moderate length, compressed; scales large, ctenoid. Two lateral lines. Mouth moderate; lower jaw slightly projecting; maxillary nearly completely sheathed by the præorbital; a narrow band of small pointed teeth in each jaw; upper surface of head to between the orbits, cheeks, and opercular bones scaly; præoperculum entire. Gill-rakers very long, slender and numerous (60 or more on the lower part of anterior arch). A single dorsal, without notch between spinous and soft portions, with XIII-XIV 13-15 rays. Anal with III 10-15 rays. Pectoral asymmetrical, pointed, with 14 to 16 rays; ventrals below the base of the pectorals. Caudal rounded or truncate.

Two species from the Amazon and Guiana.

Synopsis of the Species.

2 scales between last dorsal spine and lateral line 1. *flavescens*.
4 scales between last dorsal spine and lateral line 2. *semifasciatus*.

1. *Chætobranchus flavescens*.

Chætobranchus flavescens, Heck. Ann. Mus. Wien, ii. 1840, p. 402; Günth. Cat. Fish. iv. p. 310 (1862); Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 128, pl. vi.; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 200 (1904).

Chætobranchus brunneus, Heck. t. c. p. 405; Günth. l. c.

Chronys ucayalensis, Casteln. Ann. Am. Sud, Poiss. p. 15, pl. vi. fig. 2.

Acara ucayalensis, Günth. t. c. p. 281.

Chætobranchus robustus, Günth. t. c. p. 310.

Geophagus badiipinnis, Cope, Proc. Ac. Philad. 1871, p. 251, pl. xi. fig. 1, and Proc. Am. Phil. Soc. xvii. 1878, p. 697; Pellegr. t. c. p. 190.

Depth of body 2–2 $\frac{2}{3}$ in the length, length of head 2 $\frac{1}{3}$. Diameter of eye 4 in the length of head, length of snout 3 $\frac{1}{5}$, depth of præorbital 4 $\frac{1}{2}$ –4 $\frac{2}{3}$, interorbital width 2 $\frac{1}{2}$. Maxillary extending to below anterior margin of eye. Cheek with 5 or 6 series of scales. Scales 27–29 $\frac{3\frac{1}{2}-4}{11}$, 2 between last dorsal spine and lateral line. Dorsal XIII 13–14, the spines increasing in length to the last, which is nearly $\frac{1}{2}$ the length of head. Anal III 11–12. Pectoral extending beyond middle of anal. Caudal peduncle $\frac{1}{2}$ – $\frac{2}{3}$ as long as deep. Olivaceous; a large dark blotch on the middle of the side; vertical fins with alternate light and dark stripes.

R. Amazon; Guiana.

- | | | |
|--------------|---------------|--------------------|
| 1. (268 mm.) | Brit. Guiana. | Sir R. Schomburgk. |
| 2. (253 mm.) | Teffé. | Prof. A. Agassiz. |

2. *Chætobranchus semifasciatus*.

Chætobranchus semifasciatus, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 130, pl. vii.; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 201 (1904).

Depth of body less than 2 in the length, length of head 2 $\frac{3}{4}$. Diameter of eye 3 $\frac{3}{4}$ in the length of head, length of snout 3 $\frac{1}{5}$, depth of præorbital 4 $\frac{2}{3}$, interorbital width 2 $\frac{1}{4}$. Maxillary extending to below anterior margin of eye. Cheek with 4 series of scales. Scales 31 $\frac{6}{12}$, 4 between last dorsal spine and lateral line. Dorsal XIV 15 (XIII 14), the spines subequal from the fifth, the last nearly $\frac{1}{2}$ the length of head. Anal III 14 (15). Pectoral extending beyond middle of anal. Caudal peduncle $\frac{3}{5}$ as long as deep. Olivaceous, with 4 more or less distinct dark cross-bars on the upper part of the body; an ocellus on the upper part of the base of caudal; vertical fins with alternate light and dark stripes.

R. Amazon.

- | | | |
|--------------|-----------|-------------------|
| 1. (188 mm.) | Hyanuary. | Prof. A. Agassiz. |
|--------------|-----------|-------------------|

CHÆTOBRANCHOPSIS.

Chætobranchus (part.), Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 128.

Chætobranchopsis, Steind. *t. c.* p. 133; Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 609; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 201 (1904).

Closely allied to *Chætobranchus*, but with more than 3 anal spines.

A single species from the Amazon.

Chætobranchopsis orbicularis.

Chætobranchus (*Chætobranchopsis*) *orbicularis*, Steind. Sitzb. Ak. Wien, lxxi. 1875, p. 133.

Chætobranchopsis orbicularis, Eigenm. & Bray, Ann. Ac. N. York, vii. 1894, p. 610; Pellegr. Mém. Soc. Zool. France, xvi. 1903, p. 202 (1904).

Depth of body $1\frac{2}{3}$ in the length, length of head $2\frac{1}{2}$. Snout shorter than eye, the diameter of which is 3 in the length of head, interorbital width $2\frac{2}{5}$. Depth of præorbital less than $\frac{1}{2}$ the diameter of eye. Maxillary extending to below anterior margin of eye. Scales $27\frac{4}{11}$. Dorsal XVI 13 (XV–XVI 11–13), the spines increasing in length to the last, which is $\frac{3}{5}$ the length of head; soft fin scaly at the base. Anal VI 16 (13–16). Pectoral extending nearly to posterior end of base of anal. Caudal truncate. Caudal peduncle very short. Olivaceous, with traces of darker cross-bars; a dark blotch on the middle of the side of the body; vertical fins with alternate light and dark stripes or series of spots.

R. Amazon.

1. (83 mm.)

Marajo Is.

Paris Mus.

II.—NOTES ON THE GENERA OF AMERICAN CICHLIDÆ.

The diagnostic characters are shown in the following synopsis:—

- I. A notch between spinous and soft portions of dorsal fin; anal fin with 3 spines; teeth conical 1. *Cichla*.
- II. No notch between spinous and soft portions of dorsal fin; gill-rakers very long and slender, numerous; teeth conical.
- Anal fin with 3 spines 2. *Chætobranchus*.
- Anal fin with more than 3 spines 3. *Chætobranchopsis*.
- III. No notch between spinous and soft portions of dorsal fin; gill-rakers short or of moderate length, in small or moderate number.
- A. Anal fin with 3 spines; teeth conical.
1. Præoperculum finely denticulated.
- Dorsal XIV–XVII 8–9; jaws equal anteriorly. 4. *Crenacara*.

Dorsal XXII-XXIV 10-13; lower jaw projecting; none of the teeth depressible 5. *Batrachops*.
 Dorsal XVI-XXV 11-19; lower jaw projecting; inner teeth depressible 6. *Crenicichla*.

2. Præoperculum entire; no lobe on the anterior branchial arch.
 a. Soft vertical fins scaleless or scaly at the base only. Dorsal XIII-XVI 7-12. Anal III 6-11.
 a. Maxillary not exposed; præmaxillaries moderately protractile.

Upper lateral line well separated from spinous dorsal fin 7. *Acara*.
 Upper lateral line, for most of its length, separated by only $\frac{1}{2}$ a series of scales from the dorsal fin 8. *Nannacara*.

β . Maxillary exposed; præmaxillaries very protractile.
 9. *Acaropsis*.
 b. Soft vertical fins covered with scales. Dorsal XII-XIV 19-21. Anal III 15-16 10. *Astronotus*.

3. Præoperculum entire; a compressed lobe on the upper part of the anterior branchial arch.
 a. Upper gill-rakers of the outer series of the first branchial arch running at the base of the lobe. 11. *Retroculus*.
 b. Gill-rakers of the outer series of the first branchial arch, when developed, continued on to the free edge of the lobe.

Dorsal XII-XIX 9-14; upper lateral line well separated from spinous dorsal fin 12. *Geophagus*.
 Dorsal XV-XVI 5-7; upper lateral line, if complete, separated from the dorsal fin, for most of its length, by only $\frac{1}{2}$ a series of scales 13. *Heterogramma*.
 Dorsal VII-VIII 14-15 14. *Biotococcus*.

B. Anal fin with more than 3 spines.

1. Dorsal XIII-XX 10-16. Anal IV-XII 7-16.

a. Teeth all conical or cylindrical, not compressed.

Præmaxillary processes shorter than the head 15. *Cichlosoma*.
 Præmaxillary processes as long as the head 16. *Petenia*.

b. A band of small conical teeth, with an outer series of larger compressed teeth 17. *Herichthys*.

c. Teeth all rather broad and strongly compressed; scales large, those of the lateral line of the same size as the others.

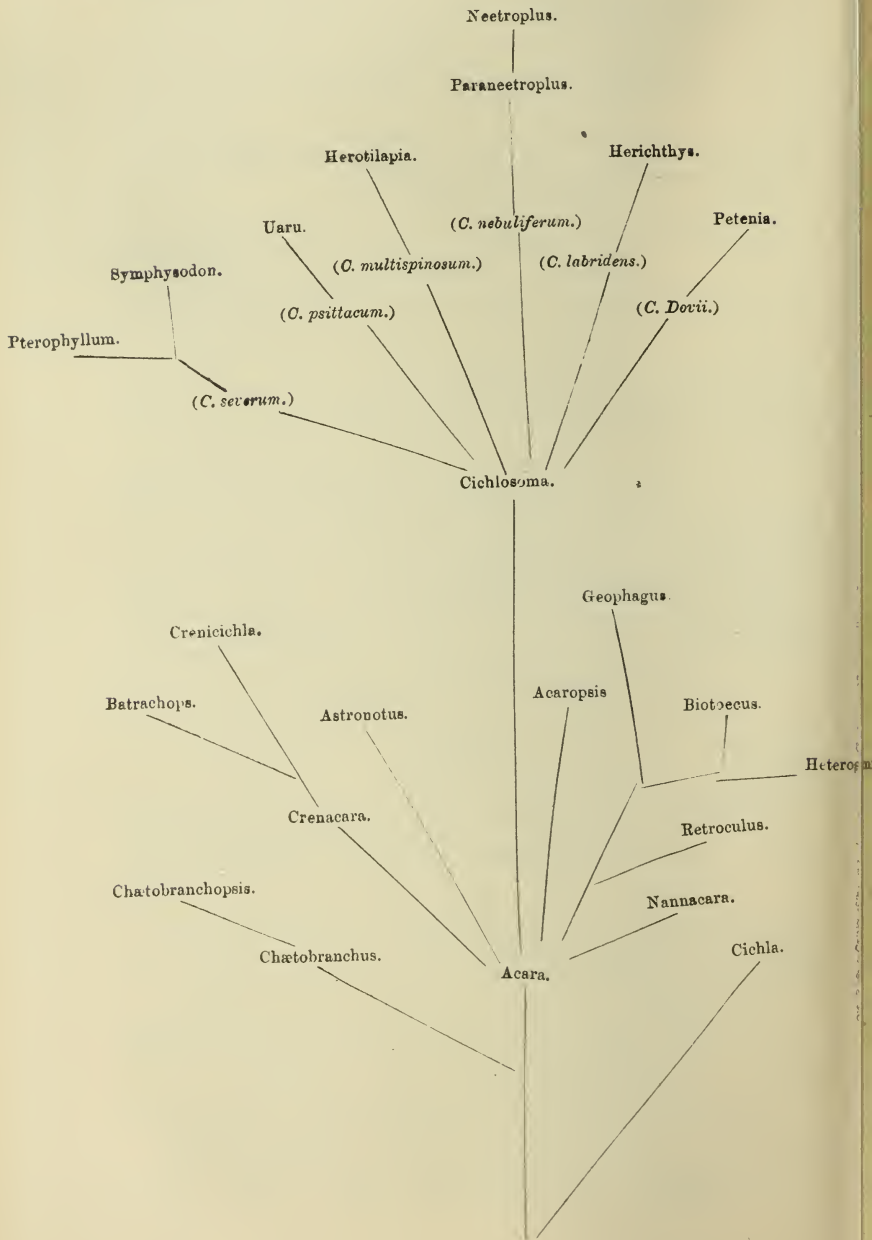
Teeth entire, with pointed or rounded apices 18. *Paraneetroplus*.
 Teeth entire, with truncate apices 19. *Neetroplus*.
 Median teeth of outer series entire, truncate; others tricuspid 20. *Herotilapia*.

d. Teeth slender, compressed, pointed in the young, rounded in the adult; scales rather small, those of the lateral line larger than the others 21. *Uaru*.

2. Dorsal VIII-XIII 24-31. Anal V-IX 24-32. Teeth conical.

Teeth confined to the anterior part of each jaw 22. *Symphysodon*.
 Teeth extending on to the sides of the jaws 23. *Pterophyllum*.

The probable relationships of the genera may be expressed diagrammatically thus:—



The 23 genera comprise 149 species, of which 85 are South American. The exclusively South-American genera are *Cichla* (3 species), *Chætobranchus* (2), *Chætobranchopsis* (1), *Crenacara* (2), *Batrachops* (5), *Crenicichla* (16), *Nannacara* (1), *Acaropsis* (1), *Astronotus* (1), *Retroculus* (1), *Heterogramma* (5), *Biotoecus* (1), *Uaru* (1), *Symphysodon* (1), and *Pterophyllum* (2). *Acara* has 18 species in South America and 1 in Panama, *Geophagus* 11 in South America and 1 in Panama, and *Cichlosoma* 13 species in South America, 53 in Mexico and Central America, 1 in Cuba and 1 in Barbadoes. The remaining genera all pertain to Mexico and Central America, one species of *Herichthys* reaching Texas. They are *Pet-nia* (1 species), *Herichthys* (3), *Paraneetroplus* (1), *Neetroplus* (1), and *Herotilapia* (1).

It is interesting to note that not one of the genera with 3 anal spines is found north of the Isthmus of Panama and that all the South-American forms have simple conical teeth. The South-American species with more than 3 anal spines are either those species of *Cichlosoma* which come nearest to *Acara* or else may usually be regarded as directly modified from them, whilst the genera peculiar to Mexico and Central America are exaggerations of the types of *Cichlosoma* found there.

With the exception of *Cichla*, and possibly of *Chætobranchus*, *Acara* is the starting-point for the evolution of the genera inhabiting South America; of these *Cichlosoma* only has reached Central America and Mexico, and has there given rise to a variety of still more specialized forms, very few of which have again spread southwards*.

When we consider that the Cichlid fauna of Mexico and Central America has undoubtedly been derived from South America, that the most primitive South-American genus, *Acara*, is scarcely generically distinct from the African *Paratilapia* and that there is no reason to believe that the Cichlids have ever been other than a freshwater group, we may find in them considerable support for the view that there was a land-connexion between South America and Africa in Eocene times.

Priscacara, from the Eocene of Wyoming and Utah, has been regarded as a Cichlid, but it has not the reduced number of branchiostegals nor the toothless palate which characterize all living Cichlidæ, and appears to me to have no bearing on their geographical distribution.

* *Cichlosoma ornatum* and *C. Festeæ* from W. Ecuador, *C. Kraussi* from Colombia and Venezuela, and *C. spectabile* from the Amazon belong to Central-American types.

XXX.—On the Dentition of the Characinoid Genus *Piabuca*:
a new Generic Character. By WALTER S. ROWNTREE,
B.Sc., F.L.S.

THE Characinoid genus *Piabuca* is represented in the collections of the British Museum of Natural History by both the recognized species—*Piabuca argentina* (seven spirit-specimens and one prepared skeleton) and *Piabuca spilurus* (one spirit-specimen); all from Brazil.

Careful examination of these specimens, in the course of an extended study of the Characinidæ generally*, has revealed to me certain dental characters which appear to have hitherto escaped observation.

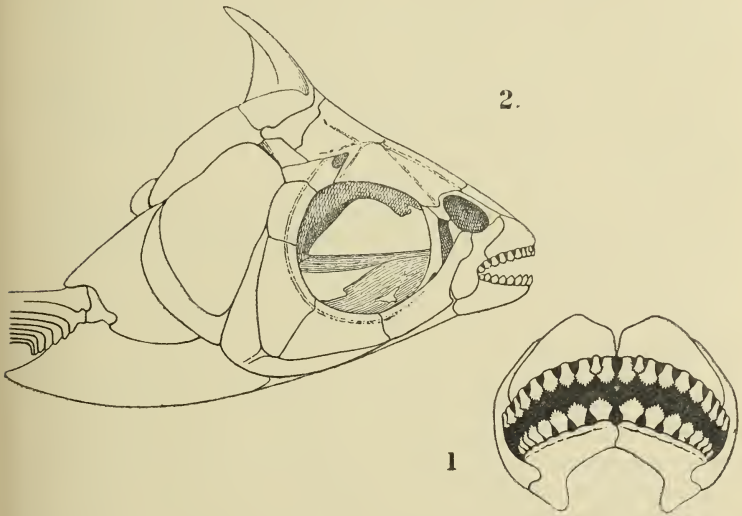
The teeth in these fishes are of singular beauty, being arranged in uniform series and having spatulate crescentic crowns edged with minute gold-tipped serrations. In the mandible the teeth are in single series, eight in number on each side. In the upper jaw a similar series of nine teeth is at once apparent. The teeth are all similar in form, diminishing in size towards the angle of the mouth.

These more obvious dental characters have been recorded or figured with more or less accuracy by various observers: but two points of some significance have been misrepresented or overlooked. These are (a) the existence of additional teeth, not in series with the others, and (b) the existence of teeth in the maxilla as well as the premaxilla.

(a) *The additional Teeth.*—Careful examination with the aid of a lens reveals, in the premaxilla of each side, a minute tooth situated in front of the general series and higher on the gums, so that its crown is little more than level with their roots. Its position is between the first and second teeth of the series. These two supernumerary teeth appear from their size and position to be quite useless, and their form does not show the symmetrical perfection characteristic of the functional teeth, although they are of the same general type. If found in a single specimen, they might be regarded as mere replacement teeth; but the consistency with which they appear in all the specimens I have examined places them, I consider, in a different category. They suggest in a striking way the outer series of teeth in another Characinid, *Petersius Hilgendorfi*, which are also small and placed alternately with regard to the teeth of the main series. The chief difference is that in *Petersius* there are four teeth in the outer series

* Permitted me through the kindness of G. A. Boulenger, Esq., F.R.S.

instead of only two. In an allied species, *Petersius Leopoldianus*, these four teeth are but slightly displaced from the general series, to the teeth of which they approximate more closely in size and structure. Clearly, we may infer, in the case of *Petersius Hilgendorfi*, that the outer series has arisen by extrusion from the older main series, and it seems reasonable to infer a similar origin for the supernumerary teeth to which I seek to draw attention in *Piabuca*. But, however this may be, the upper teeth of *Piabuca* must be described as forming two series. The condition is shown in fig. 1.



Teeth of *Piabuca argentina* (enlarged).

Fig. 1 shows the supernumerary premaxillary teeth, forming an outer series.

Fig. 2 shows the existence of two teeth in the maxilla.

The figures are outlined from photographs made for me by Mr. J. Green.

Müller and Troschel * figure the mouth of *Piabuca argentina* without giving any indication of these supernumerary teeth. Moreover, in their classification of the Characinidæ they refer the genus to a group characterized by the possession of teeth in a single series. No other original figure of the teeth of *Piabuca*, I believe, exists; but the figure referred to

* 'Horæ Ichthyologicæ. Beschreibung und Abbildung neuer Fische, Characiniden.' Berlin, 1845.

has been reproduced in the 'Cambridge Natural History,' 1904 (vol. vii. p. 577), under the erroneous name of "*Piabucina*" *argentina*. Needless to say, the genus *Piabucina* is distinct from the genus *Piabuca*, and, moreover, contains no species "*argentina*." The text does not in any way correct these errors in the plate, since by an oversight the name *Piabuca* is omitted from Boulenger's provisional scheme of classification of the Characinidæ which immediately precedes the figure. It should be referred, as Mr. Boulenger agrees, to group B, the Hydrocyoninæ.

It may be added that the above statement does not exhaust the errors of the plate referred to, inasmuch as the lettering is responsible for the transposal of the representations of two other Characinids, *Serrasalmo rhombeus* and *Chalceus angulatus*. These errors of nomenclature, however, are apart from the main issue under discussion, which is the failure of the figure to represent correctly the dental conditions existing in *Piabuca*.

Following Müller and Troschel, Günther, in the 'Catalogue of Fishes,' 1864 (vol. v. pp. 280 and 343), in part characterizes and differentiates the genus *Piabuca* by the possession of uniserial teeth.

Other authorities make no reference to the serial arrangement of the teeth.

(b) *The Maxillary Teeth*.—Of the nine teeth (on each side) in the main series of the upper jaw seven are situated in the premaxilla, whilst the last two are in the maxilla. The arrangement is shown in fig. 2 of the illustration. Nevertheless, although the condition is perfectly clear and unmistakable in the prepared skull, it has not, I believe, hitherto been recognized, and such observations as have been recorded are incorrect.

Müller and Troschel* make use of the character in their artificial scheme of classification of the Characinidæ, according to which *Piabuca* is to be associated with *Citharinus*, *Hydrocyon*, *Cænotropus* (*Chilodus*), *Anostomus* (*Schizodon*), and *Leporinus*, on the one hand, and dissociated from *Gastropelecus*, *Anacyrtus* (*Epicyrthus*), and *Cynodon* (*Raphiodon*), on the other, on the very ground of the presence in it of teeth in the premaxilla and their absence in the maxilla.

Günther †, in his synopsis of the genera of the Characinidæ and in his description of the genus *Piabuca*, has fallen similarly into error.

* 'Horæ Ichthyologicae,' p. 24.

† 'Catalogue of Fishes,' pp. 278-280 and pp. 343-344.

Cuvier and Valenciennes * only recognize the existence of teeth in the premaxilla and mandible, not in the maxilla.

I have referred also to the descriptions of *Piabuca argentina* which are to be found in the earlier literature of the subject, but with negative results. The original account (accompanied by a roughly executed figure) is that of Marcgrave, in the 'Historia Naturalis Brazilæ,' 1648. Koelreuter describes and figures the fish under the name of *Trutta dentata* (Nov. Comm. Petrop. 1761, vol. viii. p. 413, tab. xiv. fig. 4). Bloch also describes and figures it under the name of *Salmo argentinus* ('Systema Ichthyologicæ' (Schn.), 1801, and taf. cccclxxxii. fig. 1); and Lacépède describes it, without figure, under the name of *Characinus piabucu*, referring to the teeth merely as regards their form ('Histoire Naturelle des Poissons,' 1803, tome v. p. 272).

The point is of interest in view of the wide range of modification in the relations of the premaxilla and maxilla existing within the limits of the family Characinidæ. All intermediate stages are found between, on the one hand, the presumably primitive condition in which the maxilla bears teeth throughout its length and forms the major part of the border of the mouth, and, on the other, the condition in which the maxilla is toothless and so reduced as to be practically excluded from the gape. This has already been pointed out by Sagemehl †, Boulenger ‡, and others, and I hope to treat of the matter in some detail in a future paper. I would only point out here that in respect of these conditions *Piabuca* is one of the forms which occupy a somewhat central position in the group. It is in this connexion that the question of the presence or absence of maxillary teeth assumes interest and importance.

XXXI. — *Descriptions of new Australian Pupinæ and Pupinellæ, with a Note on Pupina pineticola, Cox.*
By HUGH C. FULTON.

[Plate IX.]

OWING to the fact that Dr. James C. Cox, C.M.Z.S.L., &c., when describing his species, attached no importance to separating one particular specimen as the type, it is very difficult

* 'Histoire Naturelle des Poissons,' 1849, vol. xxii. pp. 107 & 109.

† Morphol. Jahrb. x. 1885, p. 102.

‡ 'Les Poissons du Bassin du Congo,' 1901, p. 132.

to identify with certainty some of his species, more especially the smaller ones. Some of the figures on the plates of his work 'A Monograph of Australian Land-Shells' were evidently drawn by an incompetent amateur artist, and are of very little use for purposes of identification; this applies particularly to the figures of *pineticola*, pl. xvi. figs. 8, 8 A, 8 B; none of these figures are like specimens of *pineticola* from the collection of Dr. Hungerford, given to him by Dr. Cox himself, and which are now figured (Pl. IX.). I may say that these shells agree well with Dr. Cox's description.

In the following descriptions, by *anterior canal* I mean the opening on the columellar lip, the *posterior* being the one at point of insertion of the upper right margin of outer lip, and which would be posterior when the animal was crawling.

Pupina pineticola, var. *modesta*, nov. (Pl. IX. fig. 1.)

Compared with *pineticola* this variety is slightly more globose, the spire is shorter, and the opening of the posterior canal is narrower. The peristome is inclined more to the spire and the basal portion is also more produced in front than in *pineticola*.

Further, as seen from the front the auricle, which partly covers the anterior canal, forms an acute triangle, whereas in *pineticola* it is truncate.

Maj. diam. 3, alt. $4\frac{1}{2}$ mm.

Hab. Queensland (Voyage of 'Challenger').

Pupina clara, sp. n. (Pl. IX. fig. 2.)

Shell imperforate, oblong-conic, rather thin, subtransparent, polished, orange-yellow colour, apex lighter, suture margined; whorls $6\frac{1}{2}$, earlier ones decidedly convex, later only slightly so; aperture subcircular, orange-yellow within; peristome white, its margins thickened, opening of anterior canal at rear, narrow in front, opening of posterior canal *as seen from front of shell* narrow, its direction a little towards the right-hand side.

Maj. diam. 6, alt. $12\frac{1}{2}$ mm.

Hab. Port Denison, Australia (*ex Coll. Dr. Cox*).

This shell has been distributed as *meridionalis*, Pfr., from which it can be readily separated by its larger aperture, more rapidly increasing whorls, its brighter, smoother, and highly polished surface, and its different shaped auricle above the anterior canal.

P. meridionalis, Pfr., is a duller shell, with fine, close-set,

oblique striæ upon the middle whorls ; it is also rather more cylindrical in form than *clara*.

Pupina subpolita, sp. n. (Pl. IX. fig. 4.)

Shell imperforate, oblong-oval, shining, light horn-colour, finely striated by growth-lines ; suture rather deep, narrowly margined at last half-whorl ; whorls $5\frac{1}{2}$, regularly increasing, convex, penultimate as wide as the last ; aperture circular ; peristome white, thickened and narrowly expanded, margins joined by a parietal callus, anterior and posterior canals subcircular, the openings as seen from the front being very narrow ; operculum horny, whorls 5, sharply defined by raised spiral ridges, last four about equal in diameter.

Maj. diam. 3, alt. 5 mm.

Hab. Richmond River, New South Wales (*Sid. W. Jackson*).

This species is allied to *P. pineticola*, Cox, but the latter is smoother, the whorls increase rather more rapidly, are less convex, and the last whorl is rather broadly and distinctly margined at the suture, whereas *subpolita* is only indistinctly and very narrowly margined on the last half-whorl.

In *pineticola* the anterior canal cuts much more deeply and widely through the peristome than in *subpolita*, in which it goes only about halfway through ; in *subpolita* the posterior canal is narrower and its direction is slightly to the right, not towards the apex as in *pineticola*.

Pupinella densecostata, sp. n. (Pl. IX. fig. 7.)

Shell rather deeply rimate, oblong-conic ; sculptured with close-set raised striæ, dirty white colour ; whorls 7, earlier very convex, later ones moderate, slowly and regularly increasing ; aperture circular, whitish within ; peristome white, moderately expanded, continuous ; anterior and posterior canals circular, both piercing deeply into the lip, but not cutting right through.

Maj. diam. $4\frac{1}{2}$, alt. 11 mm.

Hab. Port Curtis, Queensland.

Closely allied to *simplex*, Fult. but readily separated by its shorter stouter form.

Pupinella simplex, sp. n. (Pl. IX. fig. 3.)

Shell narrowly umbilicated, ovately conic, finely obliquely striated, dirty white colour ; whorls 6, moderately convex, regularly increasing ; aperture circular, whitish within ; peristome thickened and slightly expanded, white, continuous ;

anterior canal circular, not piercing quite through the lip, posterior canal cutting about halfway only through peristome; operculum horny, smooth, about 5 whorls.

Maj. diam. $4\frac{1}{2}$, alt. 9 mm.

Hab. Port Curtis, Queensland.

Intermediate between *planilabris*, Pfr., and *densecostata*, Fult.; it is smaller than the former species, not so smooth, and the anterior canal is situated lower, the opening as seen from the front being larger; from the latter species it differs in having one whorl less, rather less conspicuous sculpture, and the whorls are also less convex and increase more rapidly than in *densecostata*. I have seen this shell labelled as *P. Covi*, Morelet, but that species, according to the type specimen now in the British Museum, is the same as *P. planilabris*, Pfr.

XXXII.—*Description of a new Species of Unio* (*Cuneopsis*)
from Yunnan. By HUGH C. FULTON.

[Plate IX.]

Unio (*Cuneopsis*) *tauriformis*, sp. n. (Pl. IX. fig. 9.)

Shell obliquely ovate, truncate anteriorly, wedge-shaped posteriorly, solid, periostracum dark, having a silky lustre, exterior umbonal region with raised zigzag ridges, concentric striæ below, the umbones turned slightly inwards, decorticated; two cardinal teeth in the left valve, the anterior rather thin, the posterior thick with a deep triangular pit between, right valve with one thick cardinal tooth situate below the umbo, lateral teeth long and roughly striated; nacre silvery; a deep pit marks the place of the anterior adductor, the posterior scar being only moderately indented.

Diameter: anterior-posterior 31 mm., umbo-ventral margin 20; thickness $16\frac{1}{2}$.

Hab. Yunnan-fu, Yunnan.

I have been unable to find any species closely allied to this, which I take to belong to the genus *Cuneopsis*, Simpson (Proc. U.S. Nat. Mus. vol. xxii. 1900, p. 804).

XXXIII.—*Descriptions of new Species of Pleurodonte* (Caracolus), Planispira, and Kaliella. By HUGH C. FULTON.

[Plate IX.]

Pleurodonte (*Caracolus*) *manifesta*, sp. n.
(Pl. IX. fig. 10.)

Shell very slightly perforate, solid, depressed, light yellowish brown, almost covered by two very dark spiral bands, one broad one in the middle of the whorl and the other just below the suture, apex much lighter in colour; whorls 5, very convex, first three finely reticulated, the penultimate and upper part of last whorl sculptured with *very coarse granular spiral sculpture*, underside of body-whorl almost smooth, having only oblique growth-lines, and being ornamented by one dark spiral band about 2 mm. wide situated about the same distance from the periphery; the upper wall of the last third of body-whorl is swollen and ascends to the middle of the penultimate whorl, descending rather suddenly a little distance from its termination; aperture very oblique, white within except parietal wall, which is yellowish and on which the colour-band is continued; peristome thickened and very narrowly expanded, white, margins connected by a white raised callus.

Maj. diam. 32, alt. 17 mm.

Hab. ? (probably Cuba).

This shell, of which I have two specimens before me, is readily distinguished by its strong granular sculpture and the prominent swelling situated behind the upper margin of the peristome: *jactata*, Gundl., has the same kind of sculpture, but in that species it is very fine and scarcely seen without a lens; *manifesta* also differs by its darker coloration and the greater convexity of its whorls.

In Tryon's 'Manual of the Mollusca,' ser. 2, vol. v., *jactata* (Gundl., MSS.), Pfr., is put as = *mina*, Pfr.; but on examination of a large series of *mina* I cannot find any with the granular sculpture characteristic of *jactata*.

Planispira cingarus, sp. n. (Pl. IX. fig. 8.)

Shell discoidal, umbilicus about 2 mm. wide at opening, spire flat, light below, dark brown above, with a darker supra-peripheral band about 1 mm. wide encircling the body-whorl,

apex lighter in colour, covered with short white hairs and hair-scars; whorls $4\frac{1}{2}$, first $3\frac{1}{2}$ slightly convex, last rather inflated near its termination, then somewhat constricted behind the peristome, the last third of body-whorl descending to a point just below the periphery; aperture subcircular, bluish grey within; peristome rather broadly expanded, white below, upper margin brownish.

Maj. diam. 24, alt. 11 mm.

Hab. Halmahera Island (*Waterstradt*).

Nearest to *P. Kurri*, Pfr., of which species it may be but a variety; it can, however, be easily separated from that species by its very dark coloration.

P. cingarus is not so compressed in front, and its peristome is slightly more oblique and somewhat more circular than in *Kurri*.

Kaliella microbembix, sp. n. (Pl. IX. fig. 6.)

Shell trochiform, narrowly umbilicated, apex white, remainder of a light horn-colour, rather thin, almost smooth, the oblique striæ or lines of growth only visible under a lens; whorls 8, very gradually increasing, slightly convex, the last having a rather obtuse keel at the periphery, underside of last whorl microscopically spirally striated; aperture subovate; peristome scarcely thickened, slightly expanded at the columellar and basal portions, triangularly dilated at point of insertion.

Maj. diam. 6, alt. $5\frac{1}{2}$ mm.

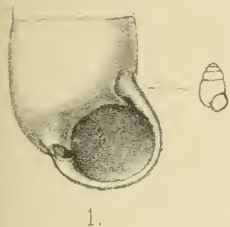
Hab. Changyang, Hupé (*Schmacker*).

The nearest species known to me appears to be *Kaliella cuneus*, Heude, which is probably a *Ganesella*; but that has one whorl less and it appears to have conspicuous oblique striæ.

Some time ago I sent a specimen of *microbembix* to the late Father Heude, who replied that it was not his *cuneus*.

EXPLANATION OF PLATE IX.

- Fig.* 1. *Tupina pineticola*, var. *modesta*.
Fig. 2. *Pupina clara*.
Fig. 3. *Pupinella simplex*.
Fig. 4. *Pupina subpolita*.
Fig. 5. *Pupina pineticola*.
Fig. 6. *Kaliella microbembix*.
Fig. 7. *Pupinella densecostata*.
Fig. 8. *Planispira cingarus*.
Fig. 9. *Unio (Cuneopsis) tauriformis*.
Fig. 10. *Pleurodonte (Caracolus) manifesta*.



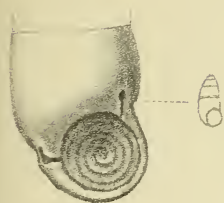
1.



2.



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10.



9.



PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

January 10th, 1906.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

‘On Footprints from the Permian of Mansfield (Nottinghamshire).’

By George Hickling, B.Sc.

These fossils were discovered in 1897 by Mr. Francis Holmes in the Rock-Valley Quarry, Mansfield, in a local, lenticular, mass of sandstone intercalated in the Magnesian Limestone. The impressions formed two double rows, approximately parallel, and 7 and 2 feet long respectively. Nearly the whole of the longer series is in the Nottingham Museum, and part of the shorter series in the Manchester Museum. Both sets were made by the same species of animal, the stride in one case being 8, and in the other $8\frac{3}{4}$ inches. The prints show a well-marked heel and comparatively-slender digits, and there is evidence of a membrane between the toes. There is wide separation between the right and left sides, this separation being more marked in the fore than in the hinder footprints. The prints present some resemblance to those named *Ichnium acrodactylum*, from the Upper Permian of Thuringia. Recently the Author has found other prints in the same quarry.

MISCELLANEOUS.

The Echinoderm Name Calveria hystrix. By F. A. BATHER.

IN their “Preliminary Report of the Scientific Exploration of the Deep-Sea in H.M.S. ‘Porcupine,’ during the Summer of 1869” (Proc. Roy. Soc. xviii. pp. 397–492; 1870, ? June), W. B. Carpenter, J. Gwyn Jeffreys, and Wyville Thomson, describing the echinoderm fauna of the Cold area, wrote as follows (p. 445):—“In the Shetland channel we procured a full-sized specimen of the remarkable Clypeastroid *Pourtalesia*, of which young examples had been obtained in the First cruise, and a very singular Asterid allied to *Pteraster*, which is covered with a regular brush of long paxillæ. Since, for the reason formerly mentioned, we have found ourselves precluded from dedicating the former of these types (as we had intended) to our friend Capt. Calver, we propose to give the generic name *Calveria* to the latter, with the specific designation *hystrix*.” “The reason formerly mentioned” was that the same Echinoid had shortly before been discovered by Pourtales in the Gulf of Mexico and had been described by Prof. A. Agassiz under the name *Pourtalesia miranda* (see same Report, p. 421).

The next occurrence of the name *Calveria hystrix* is in “Report on Deep-sea Researches . . . during . . . 1870 in H.M.S. ‘Porcupine,’” by W. B. Carpenter and J. Gwyn Jeffreys (Proc. Roy. Soc. xix. pp. 146–221; 1871 [probably February or March]). On p. 154 the authors write:—“Thursday, July 14, passed Cape Finisterre and dredged in 81 fathoms (Station 10), about nine miles from the coast of Spain. . . . We then steamed out, and dredged in 332 fathoms (Station 11). . . . On the tangles were

two specimens (one adult and the other young) of that singular Echinoderm, or soft sea-urchin, belonging to the *Diadema* family, which was procured last year [1869] in nearly 60 degrees of North Latitude. It will soon be described by Professor Wyville Thomson under the name of *Calveria hystrix*." Thus was the name *Calveria hystrix* transferred from an Asteroid to an Echinoid. The Report for 1869 mentions the "large Echinid allied to *Astropyga*" on p. 450; from this passage and from p. 155 of Wyville Thomson's 'Depths of the Sea' (London, 1873), it appears that the original specimen of the Echinoid *Calveria hystrix* was dredged on Sunday, 5 September, at Station 89, 59° 38' N., 7° 46' W.

It is a curious thing that three such men as Carpenter, Gwyn Jeffreys, and Wyville Thomson should, both collectively and individually, have calmly jettisoned the name *Calveria hystrix*, which they originally proposed for an Asteroid, and should in the very next year have accepted it, not for anything allied to *Pourtalesia*, as we are given to understand was their first intention, but for an entirely different form of Echinoid, with which the name was in no way associated in their first Report. Perhaps it may be thus explained:—When Wyville Thomson lifted the panting Echinothurid from the deck of the 'Porcupine,' he probably at once announced his intention of calling it *Calveria hystrix*. The Report on the cruises of the 'Porcupine' in 1869 was prepared in a great hurry, chiefly by Carpenter and Jeffreys. They remembered the name *Calveria hystrix*, but confused the Echinothurid with the *Pourtalesia*. Then, learning at the last minute from Thomson that the *Pourtalesia* had previously been named by Agassiz, they, wishing to preserve the name *Calveria hystrix*, transferred it to an Asteroid. After the Report was published, Wyville Thomson saw that his colleagues had made a mistake, and explained to them that the Echinoid for which he had proposed the name *Calveria hystrix* was not the *Pourtalesia*. Consequently, in their next Report, Carpenter and Jeffreys tacitly admitted their error by restoring the name *Calveria* to the Echinothurid.

Later in the year 1871 [not before April], Professor A. Agassiz (Bull. Mus. Comp. Zool. ii. p. 457) described a minute sea-urchin collected by Pourtales, and ended his account with these words:—"A specimen of a genus closely allied to *Asthenosoma*, Grube, has been dredged by the 'Porcupine' Expedition off Cape Wrath and south of Cape Finistère, off Vigo; I presume this [young sea-urchin] will prove to be the young of it. Professor Wyville Thomson will soon describe this species as *Calveria hystrix*." Although a description of the young is given by Agassiz, it can hardly give validity to the name *C. hystrix*. The actual description by Thomson appeared in his paper "On the Echinidea of the 'Porcupine' Deep-sea Dredging Expedition" (Proc. Roy. Soc. xx. No. 137, pp. 491-497; 1872, not before July). He there (p. 494) established and diagnosed the Echinothurid genus *Calveria*, and briefly diagnosed two species—*C. hystrix*, "one specimen in deep water off the Butt of the Lews," and *C. fenestrata*, "two specimens from the coast of Portugal, and fragments in deep water off the

south and west of Ireland." At the close of this paper he accepted Agassiz's reference of Pourtales's small specimens to *C. hystrix*.

The reason for raking up all this ancient history is that, in 1903, Dr. Mortensen ('Ingolf' Echinoidea, p. 51) considered that the species till then usually known as *Asthenosoma hystrix* belonged to a different genus from *Asthenosoma varium*, which is the genotype of *Asthenosoma*; "accordingly," says he, "it must form a separate genus keeping the name of *Calveria*, which was originally given to it by Wyv. Thomson and which it has unjustly been deprived of." Dr. Mortensen further separated *Asthenosoma fenestratum* as the genotype of yet another genus which he called *Aræosoma* (*op. cit.* p. 53). Professor A. Agassiz in 1904 (on p. 84 of "Panamic Deep-sea Echini," Mem. Mus. Harvard, xxxi.), while rejecting these new genera of Mortensen's, drew attention to the prior use of *Calveria hystrix* for an Asteroid. In the same year Delage and Hérouard ('Traité de Zoologie concrète,' iii. p. 100) reinstated *Calveria*, Carp., Jeffr., & Thoms., as a genus of their family Pterasterinæ. But, since the name had been "accepté universellement pour un Oursin régulier remarquable," they proposed for the Asteroid the new name *Calveriaster*.

One ought to assume that Professors Delage and Hérouard have examined the species on which they base *Calveriaster*, and that they have satisfied themselves of its generic independence. None the less, it appears that their action was long ago anticipated by Wyville Thomson himself, and that he proposed for the starfish in question the name *Korethraster hispidus*, which is placed by the two French authors in a different family.

Korethraster hispidus was introduced on p. 120 of the 'Depths of the Sea' in the following words:—"A curious little group of cushion stars, hitherto supposed to be confined to high latitudes, were represented by *Pteraster militaris*, M. & T., and *P. pulvillus*, Sars, and by two forms new to science,—one, *Korethraster hispidus*, sp. n., with the whole of the upper surface covered with long free paxillæ like sable brushes. Ranges of delicate spatulate spines border the ambulacral grooves. As in *Pteraster*, there is a double row of conical water feet." In short, Thomson here described "a very singular Asteroid allied to *Pteraster*, which is covered with a regular brush of long paxillæ," those words being, however, the original description of *Calveria hystrix*.

The type specimen of *Korethraster hispidus*, preserved in the British Museum, where my colleague Prof. Jeffrey Bell has kindly assisted me to examine it, was obtained by the 'Porcupine' in 1869, on the same cruise as that which produced the Asteroid *Calveria hystrix*. Among the Asteroids obtained in that year the only other which could possibly be described as "a very singular Asteroid allied to *Pteraster*" is now known as *Hymenaster pellucidus*, Wyv. Thomson; but the paxillæ of this, as is well known, are short and support a membrane. The absence from the bottle of any MS. label bearing the name *Calveria hystrix* was only to be expected if the history here suggested were correct.

The identity of *Korethraster hispidus* and *Calveria hystrix* would not be doubted if it could be shown that both were obtained at the

same Station. Unfortunately the Station of the Asteroid *Calveria hystrix* was never given; the only locality mentioned by the authors was the "Shetland Channel." Now Station No. 57, which is that of the type-specimen of *Korethraster hispidus*, is always quoted as in the "Færoe Channel," and these are the words on the British Museum label. It appears, however, from internal evidence that these two names were applied indifferently by Carpenter, Jeffreys, and Thomson to what the last mentioned ('Depths of the Sea,' p. 108) called the "deep channel between Færoe and Shetland." Mr. W. Garstang tells me that this channel might well be termed either the Shetland Channel or the Færoe Channel. Therefore, the statement that the type-specimen of the Asteroid *Calveria hystrix* came from the Cold area and from the Shetland Channel applied equally to the type-specimen of *Korethraster hispidus*; so that on these grounds there is no objection to considering the two specimens identical.

Having now traced the history of certain names, it remains for us to apply to them the usual rules of nomenclature.

Calveriaster obviously disappears,

"Cut off even in the blossoms of [its] sin,
Unhousel'd, disappointed, unaneled."

Should *Korethraster hispidus* follow it, as being a synonym of *Calveria hystrix*? Although by a lengthy argument it has been possible to prove this identity, still it is sincerely to be hoped that all zoologists will agree as to the inadequacy of the original description of *Calveria* by Carpenter, Jeffreys, and Thomson. Only by such agreement can we avoid resuscitating that name for the Asteroid, now that the question has once been raised by the action of Professors Agassiz, Delage, and Hérouard. But, even though the name *Calveria hystrix* be not accepted in place of *Korethraster hispidus*, its prior use for an Asteroid allied to *Pteraster* must, by the rules of nomenclature, bar its application to any other animal: *Calveria hystrix* cannot be used to denote the Echinothurid, as Professor Agassiz has most justly pointed out. So long as systematists follow that eminent authority in considering the species in question congeneric with *Asthenosoma varium*, they will be under no difficulty regarding the generic name. But the rule "Once a homonym, always a homonym" affects the specific component of the name no less than the generic. Therefore the combination *Asthenosoma hystrix* is invalid. For those who, with Jeffrey Bell (B.M. Catal. Brit. Echinoderms, p. 143), consider *Calveria fenestrata*, Thomson, as identical with *Calveria hystrix*, Thomson, there is no difficulty here either, since they will simply adopt the name *Asthenosoma fenestratum*. On the other hand, those who, with Mortensen, make *Calveria fenestrata* the type of a distinct genus, and who attempt to make *Calveria hystrix*, Thomson, the type of another genus, are bound to find a new name for both genus and species. Being myself quite unqualified to pronounce an opinion upon the validity of these proposed genera, I shall refrain from giving a name to a conception about which I know nothing.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 99. MARCH 1906.

XXXIV.—*On new Thyrididæ and Pyralidæ.*

By Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S., &c.

[Continued from p. 222.]

Genus LAMPROPYGIA, nov.

Proboscis fully developed; palpi short, upturned, not reaching vertex of head; maxillary palpi filiform; antennæ with cilia and bristles, a tuft of hair between and behind them. Fore wing with the apex rather produced and acute, the termen slightly excised below it; vein 3 from angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked, 7 from beyond 9; 10, 11 from cell. Hind wing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle.

Lampropygia metachrysalis, sp. n.

♂. Head and thorax purplish brown mixed with grey; pectus and legs orange, the latter rufous in front; abdomen orange with obscure brown dorsal bands. Fore wing purplish brown suffused and irrorated with silvery grey; the costal area silvery white from before middle to near apex, with series of small brown spots on it; traces of an almost medial silvery band oblique from costa to median nervure, then inwardly oblique, almost erect below vein 1; small silvery

spots in end of cell and on discocellulars; an indistinct, diffused, silvery, subterminal band, incurved below vein 2; a silvery terminal line; cilia pale, with a purple-brown line through them. Hind wing golden orange; an almost terminal series of small black-brown spots.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♂ type. *Exp.* 26 mm.

(1 a.) *Pyralis ænalis*, sp. n.

♂. Head and thorax purplish grey mixed with reddish brown; legs whitish, the fore tarsi black with whitish rings; abdomen purplish grey, with obscure dark dorsal bands. Fore wing purplish grey irrorated with dark reddish brown; a dark patch at base of costa; antemedial line dark brown, expanding into a patch at costa, excurved at median nervure and above inner margin; some brown points on medial part of costa; a dark discoidal spot; postmedial line expanding into a patch on costa and defined by whitish on outer side, angled inwards below costa, excurved and minutely dentate between veins 5 and 2; a terminal series of dark points. Hind wing yellowish white, with some slight dark points on termen.

Hab. CEYLON (*Mackwood*), 1 ♂ type. *Exp.* 12 mm.

(1 b.) *Pyralis costipunctalis*, sp. n.

♂. Fore wing with veins 4, 5 stalked. Head, thorax, and abdomen yellow-brown. Fore wing brown, thickly irrorated with fuscous, leaving the costal area yellowish brown, with a prominent series of black spots on the costa. Hind wing fuscous with a yellowish tinge; cilia of both wings pale.

Hab. BORNEO, Sandakan (*Pryer*), 1 ♂ type. *Exp.* 16 mm.

(1 c.) *Pyralis flavimedialis*, sp. n.

Head pale yellow; thorax and abdomen purplish red, the latter with the last two segments orange; legs orange; wings purplish red irrorated with a few white scales. Fore wing with quadrate orange patch on medial costal area, bounded by the sinuous white ante- and postmedial lines, which are approximated below the cell, then obsolescent; a dark discoidal point. Hind wing with two fine, sinuous, medial white lines; both wings with the termen and cilia orange.

Hab. NIGERIA, Warri (*Roth*); Borgu, Yelwa L. (*Migeod*), 1 ♂ type. *Exp.* 20 mm. Type ♀ in Coll. Rothschild.

(15 a.) *Pyralis bryalis*, sp. n.

♂. Head, thorax, and abdomen rufous mixed with whitish and black; fore tarsi ringed with whitish; abdomen with whitish band at base. Fore wing whitish suffused with rufous on basal, inner, and terminal areas and irrorated with rufous and black; traces of a pale waved subbasal line from costa to submedian fold; antemedial line black with a whitish band before it, curved and slightly waved; the medial part of costa with series of whitish points; a small whitish discoidal spot, obscurely ringed with black and with some blackish suffusion below it; postmedial line whitish defined on each side by black scaling, expanding into a whitish spot on costa, excurved and minutely waved at middle, incurved at submedian fold; a series of black points at base of cilia. Hind wing yellowish white largely suffused with fiery red and thickly irrorated with black; a waved whitish subbasal line defined on each side by black scaling; a waved whitish medial line from upper angle of cell to inner margin defined on each side by black scaling; an obscure whitish subterminal line defined on inner side by black scaling, incurved to costa, angled inwards in discal fold and obsolete towards tornus; a series of black points at base of cilia.

♀. Fore wing rather darker, the whitish bands before the ante- and postmedial lines reduced.

Hab. SIERRA LEONE (*Clements*), 2 ♂, 1 ♀ type. *Exp.*, ♂ 12, ♀ 14 mm.

(16 a.) *Pyralis cautalis*, sp. n.

Head, thorax, and abdomen ochreous suffused and irrorated with fiery red; palpi and fore legs banded with black. Fore wing ochreous with a slight olive tinge; the basal and terminal areas suffused and the medial area irrorated with fiery red; a sinuous ochreous antemedial line defined on each side by red scaling; medial part of costa with series of ochreous points with short blackish streaks between them; postmedial line indistinct, ochreous, bent outwards and minutely waved between veins 5 and 2, then retracted to below end of cell and bent outwards to inner margin; cilia fuscous with a fine ochreous line at base. Hind wing ochreous suffused with fiery red, the basal and medial areas suffused with black, the terminal area irrorated with black; a slightly sinuous oblique whitish antemedial line; two black discoidal points on confluent whitish spots; a curved dentate postmedial line; cilia fuscous with fine ochreous line at base.

Hab. SIERRA LEONE (*Clements*), 1 ♂, 2 ♀ type. *Exp.*, ♂ 14, ♀ 16 mm.

(16 b) *Pyralis ectæmialis*, sp. n.

Head, thorax, and abdomen brownish ochreous; palpi and fore legs in front fuscous. Fore wing brownish ochreous tinged with red; traces of a brownish antemedial line; a small black discoidal spot; some faint pale points on medial part of costa; postmedial line indistinct, red, slightly excurved, the terminal area from just beyond it crimson; a terminal series of black points; cilia fuscous with a fine pale line at base. Hind wing brownish ochreous irrorated with fuscous and suffused with reddish especially on terminal area; curved dark ante- and postmedial lines; a terminal series of black points; cilia fuscous with a fine pale line at base.

Hab. SIERRA LEONE (*Clements*), 2 ♂ type; ASHANTI, Kumassi (*Whiteside*), 1 ♂, 1 ♀. *Exp.* 16-18 mm.

(18 a.) *Pyralis flavicapitalis*, sp. n.

♂. Black-brown; head and extremity of abdomen orange-yellow; legs yellow in parts. Fore wing with fine curved antemedial and slightly sinuous postmedial yellow lines; the costal area between them yellow with series of black points on costa; a black discoidal point. Hind wing with indistinct, fine, curved, yellow medial line; both wings with fine pale line at base of costa.

Hab. SIERRA LEONE (*Clements*), 2 ♂ type. *Exp.* 16 mm.

(19 a.) *Pyralis anæmicalis*, sp. n.

♂. Head and thorax ochreous tinged with rufous; fore legs fuscous in front; abdomen ochreous, dorsally irrorated with brown. Fore wing ochreous thickly and evenly irrorated with pale rufous; an indistinct pale postmedial line excurved from costa to vein 4, then incurved, the area beyond it slightly darker. Hind wing ochreous slightly irrorated with brown; a rather broad terminal more thickly irrorated band.

Hab. BR. E. AFRICA, Kikuyu (*Crawshay*), 1 ♂ type. *Exp.* 16 mm.

(20.) *Pyralis lorymalis*, sp. n.

Palpi with the second joint triangularly tufted with hair in front at extremity, the third long and acuminate.

♀. Head, thorax, and abdomen whitish suffused with red-

brown. Fore wing whitish tinged with red-brown; a red-brown fascia on inner margin from near base to middle, then obliquely bent upwards and ending in a point just above vein 1; a large triangular reddish-brown patch defined by a dark line extending on costa from before middle to near apex and down to submedian fold with a series of brown points on costa, the median nervure and vein 5 remaining pale; a fine brown terminal line; cilia brownish with a fine white line at base. Hind wing white tinged with brown.

Hab. ADEN (*Yerbury*), 1 ♀ type. *Exp.* 22 mm.

(21.) *Pyralis digonialis*, sp. n.

Head and thorax whitish tinged with yellow-brown; abdomen whitish, dorsally irrorated with black. Fore wing whitish tinged with red-brown; a series of small quadrate black spots with whitish spots between them on costa from base to near apex; an oblique triangular wedge-shaped patch from inner margin rather before middle to submedian fold below end of cell, defined by whitish; a large triangular blackish patch extending on costa from before middle to near apex and down to vein 2, defined by whitish; a rather punctiform dark terminal line; cilia whitish with fuscous line through them, and fuscous tips. Hind wing white slightly tinged and irrorated with brown; a fine terminal line; cilia with a fuscous line near base; the underside with oblique dark line from costa beyond middle to lower angle of cell.

Hab. BASUTOLAND, Mohalishoek (*Crawshay*), 2 ♂, 3 ♀ type; CAPE COLONY, Annshaw (*Miss F. Barrett*), 1 ♀. *Exp.* 20-24 mm.

Genus *ELÆALIS*, nov.

Proboscis fully developed; palpi upturned, the second joint reaching vertex of head and fringed with hair in front, the third moderate, acuminate; maxillary palpi filiform; antennæ of male ciliated. Fore wing rather narrow, the apex somewhat produced and the termen obliquely curved; vein 3 from before angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked; 10, 11 from cell. Hind wing with vein 3 from before angle of cell; 4, 5 radiating from angle; 6, 7 stalked.

Elæalis olivalis, sp. n.

Head and thorax olive-yellow, more or less tinged with rufous and irrorated with black; abdomen ochreous, the terminal half irrorated with black. Fore wing olive-yellow,

more or less strongly tinged with rufous and irrorated with large black scales; the basal part of costa suffused with black; an antemedial diffused black band oblique from costa to median nervure, then incurved; medial part of costa with series of small pale spots with short black streaks between them; a small discoidal tuft of raised black scales; a diffused oblique postmedial black band defined by whitish on outer side and somewhat angled inwards in submedian fold; the terminal area usually somewhat redder; a terminal series of small black spots. Hind wing ochreous slightly tinged with rufous, especially on terminal area; some black points on termen; the underside redder with blackish discoidal spot and curved postmedial line.

Hab. BR. E. AFRICA, Kikuyu (*Crawshay*), 1 ♂, Uganda Ry., Mile 478 (*Betton*), 6 ♂, 2 ♀ type. *Exp.* 22 mm.

(1 a.) *Tegulifera camptoceralis*, sp. n.

♂. Patagia extending to middle of abdomen; palpi with the second joint nearly straight, the third upturned; antennæ with the basal joint very long, dilated with hair towards extremity forming a slight hollow, the shaft then pectinate with short branches at base on upperside and with rather long branches to one half on underside, the apical half simple.

Head and thorax pale dull olive-green, the latter with a rufous tinge on dorsum; abdomen fulvous yellow irrorated with a few black scales. Fore wing dull olive-green slightly tinged with rufous; an indistinct red-brown antemedial line, slightly excurved at middle; a slight discoidal point; postmedial line rather near termen, indistinct, red-brown, excurved from costa to vein 4, then incurved; the medial part of costa with series of minute grey spots with brownish streaks between them; a terminal series of dark points. Hind wing golden yellow with a reddish tinge; an indistinct curved brownish postmedial line ending near tornus; a terminal series of dark striæ. Underside paler; fore wing with the discal area suffused with rufous; hind wing with the costal area suffused with rufous and irrorated with brown; both wings with slight discoidal lunule and distinct postmedial line.

Hab. ASHANTI, Kumassi (*Whiteside*), 3 ♂, 1 ♀; NIGERIA, Old Calabar (*Sampson, Crompton*), 4 ♂ type. *Exp.* 28 mm.

(1 b.) *Tegulifera sanguicilialis*, sp. n.

♂. Patagia extending to middle of abdomen; fore wing with veins 4, 5 stalked.

Head and thorax pale olive-brown; abdomen brown, the anal tuft tinged with crimson. Fore wing pale olive-brown slightly irrorated with fuscous; a fuscous antemedial line slightly excurved at middle; a small black discoidal spot; medial part of costa with series of pale and black points; postmedial line fuscous, slightly excurved at middle and ending near tornus; apex slightly suffused with black; a terminal series of black points; cilia bright crimson with fine pale line at base. Hind wing pale olive-brown irrorated with fuscous; a rather oblique antemedial fuscous line; a curved line from middle of costa to inner margin near tornus; a terminal series of black striæ; cilia bright crimson with fine pale line at base; the underside without the antemedial line, the post-medial line stronger.

Hab. SIERRA LEONE (*Clements*), 4 ♂ type; ASHANTI, Kumassi (*Whiteside*), 1 ♂. *Exp.* 14–18 mm.

(2 a.) *Tegulifera chrysoproctalis*, sp. n.

♂. Head and thorax dark red irrorated with black, tips of patagia black; abdomen ochreous suffused with fuscous, the anal tuft orange-yellow. Fore wing fuscous suffused with dark red; ante- and postmedial sinuous black lines, the former curved and defined by ochreous on inner side, the latter slightly excurved at middle and defined by ochreous on outer side; ochreous specks on medial part of costa; a black discocellular spot; a marginal series of black specks. Hind wings fuscous with fine yellow line at base of cilia.

Hab. S. LEONE (*Clements*), 1 ♂, 1 ♀ type; NIGERIA, Old Calabar (*Crompton*), 2 ♂. *Exp.* 24 mm.

(2 b.) *Tegulifera nigricinctalis*, sp. n.

Ochreous tinged with rufous; abdomen with dorsal black band on second segment. Fore wing with the basal third dark rufous, its outer edge angled below costa; the medial area ochreous irrorated with rufous and with a dark discoidal point; the terminal area rufous, with oblique, slightly sinuous, dark line on its inner edge. Hind wing fuscous, with indistinct curved postmedial line; cilia of both wings with pale line at base.

Hab. S. LEONE (*Clements*, *F. C. Smith*), 1 ♂, 1 ♀ type, Port Lokko (*Penny*), 1 ♀; NIGERIA, Old Calabar (*Crompton*), 1 ♀. *Exp.*, ♂ 20, ♀ 22 mm.

(3 a.) *Tegulifera craspedalis*, sp. n.

Head and thorax greyish rufous; abdomen greyish slightly tinged with rufous and irrorated with black. Fore wing

brownish grey irrorated with large black scales; a black discoidal point; the postmedial line near termen whitish, somewhat oblique and slightly bent outwards below vein 2, the area beyond it chocolate-brown; cilia black at base, white at tips. Hind wing brownish grey irrorated with large black scales; indistinct, slightly curved, pale ante- and postmedial lines; cilia black at base, white at tips.

Hab. PANAMA, La Chorrera (*Dolby-Tyler*), 1 ♂; BRAZIL, Organ Mts., Tijuca (*Wagner*), 1 ♂, 1 ♀ type. *Exp.* 16-18 mm.

(3*b.*) *Tegulifera epipyralis*, sp. n.

♀. Head, thorax, and abdomen bright red-brown; palpi, pectus, legs, and ventral surface of abdomen fuscous, the mid tarsi and hind tibiæ and tarsi pale. Fore wing bright red-brown with slight dark irroration; antemedial line nearly straight, fuscous, defined by whitish on inner side; the medial area with series of slight pale points on costa; a small blackish discoidal spot; postmedial line fuscous defined by whitish on outer side, very slightly incurved; a terminal series of slight black points; cilia tinged with fuscous, with fine pale line at base. Hind wing bright red-brown, with slight dark irroration; ante- and postmedial lines oblique, nearly straight, fuscous defined by whitish, the former on inner side, the latter on outer; cilia tinged with fuscous and with fine pale line at base.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♀ type. *Exp.* 24 mm.

(4*a.*) *Tegulifera vinotinctalis*, sp. n.

♂. Vertex of head with upturned tufts of hair; head, thorax, and abdomen olive-ochreous, thorax tinged with red; abdomen irrorated with black. Fore wing with the basal and outer areas deep purplish pink bounded by ochreous lines, the basal area with its edge concave, the outer oblique and sinuous; the medial area olive-ochreous, with black discoidal spot and series of red specks on costa. Hind wing fuscous, with two ochreous medial lines converging towards anal angle; cilia purplish pink, with fine ochreous line at base.

Hab. S. LEONE (*Clements*), 4 ♂ type. *Exp.* 20 mm.

(6*a.*) *Tegulifera holothermalis*, sp. n.

♂. Head, thorax, and abdomen bright rufous. Fore wing bright rufous with slight dark irroration; an indistinct erect antemedial line defined by yellowish on inner side; a small

blackish discoidal spot; an indistinct postmedial line defined by yellowish on outer side, slightly incurved below vein 5; cilia with fine pale line at base and fuscous tips. Hind wing whitish suffused with fiery red especially on terminal area; traces of a pale curved postmedial line; cilia with fine pale line at base.

♀. Fore wing with the lines and discoidal spot indistinct; hind wing redder.

Ab. 1.—Head, thorax, and fore wing sometimes suffused with brown. Umtali.

Hab. MASHONALAND, Salisbury (*Marshall*), 2 ♂, 1 ♀ type; Umtali (*Marshall*), 1 ♀. *Exp.* 24 mm.

(5 a.) *Stemmatophora xanthozonalis*, sp. n.

♂. Head yellow; thorax red-brown; legs yellowish and brown, the tarsi yellow; abdomen reddish brown mixed with yellow. Fore wing yellowish suffused and irrorated with dark red-brown; broad, straight, somewhat oblique, pale yellow ante- and postmedial bands defined by dark lines on outer side of former and inner side of latter; cilia black at base, whitish at tips. Hind wing suffused with dark red-brown, especially on terminal area; a broad, curved, pale yellow postmedial band defined by a dark line on inner side.

Hab. CAPE COLONY, Transkei (*Miss F. Barrett*), 1 ♂ type. *Exp.* 20 mm.

(6 a.) *Stemmatophora rubricostalis*, sp. n.

♂. Dull brown; abdomen tinged with black at base and middle. Fore wing with the costal area suffused with red, a series of pale specks on the costa; the wing sparsely irrorated with black scales; traces of a pale waved antemedial line; a black discoidal spot; a minutely dentate blackish postmedial line defined by ochreous on outer side, pale at costa and excurved from below costa to submedian fold, where it is strongly angled inwards; terminal and cilia series of blackish points. Hind wing suffused with fuscous black; an indistinct waved blackish antemedial line; a minutely dentate postmedial curved line, defined by ochreous on outer side; terminal and cilia series of black points.

Hab. JAVA. *Exp.* 20 mm. Type in Coll. Rothschild.

(6 b.) *Stemmatophora olivalis*, sp. n.

♂. Head, thorax, and abdomen olive-yellow, the last irrorated with a few dark scales. Fore wing olive-yellow with slight dark irroration; traces of a sinuous antemedial

line; a black discoidal point; some black specks on medial part of costa; the postmedial line placed towards termen, slight, dark, somewhat excurved at middle and narrowly defined by olive on outer side; the terminal area purple-red irrorated with black; cilia with fine pale line at base, followed by a black line. Hind wing purple-red irrorated with black; a curved subbasal black line defined by whitish on inner side; the medial line defined by whitish on outer side, oblique from costa to submedian fold, then sinuous; cilia with fine pale line at base, followed by a black line.

Hab. CEYLON, Haldamulla (*Mackwood*), 1 ♂ type. *Exp.* 20 mm.

(6 c.) *Stemmatophora rubicundalis*, sp. n.

Head, thorax, and abdomen purplish red, legs streaked with black, metathorax with a black patch, abdomen with a dorsal black band at middle. Fore wing purplish red; an indistinct antemedial pale line slightly angled at median nervure; a black discoidal spot; a pale curved line from costa before apex to tornus, with the area beyond it blackish slightly tinged with red. Hind wing whitish suffused with fuscous and slightly tinged with red; a pale slightly sinuous postmedial line ending at tornus; a terminal black line; a pale line at base of cilia. Underside of fore wing with series of pale points.

Hab. CAPE COLONY, Transkei (*Miss F. Barrett*), 3 ♂ type. *Exp.* 24 mm.

(11 a.) *Stemmatophora scotalis*, sp. n.

♂. Head, thorax, and abdomen fuscous black mixed with some grey; tarsi ringed with white. Fore wing grey almost wholly suffused and thickly irrorated with black; the medial area darker, with some pale points on costa; antemedial line pale defined by black on outer side, bisinuate; a black discoidal spot; postmedial line pale defined by black on inner side, slightly angled inwards below costa and at submedian fold; a terminal series of black points. Hind wing fuscous with a fine pale line at base of cilia.

The specimen from Kashmir is browner and less black, the lines of fore wing closer together, and the antemedial line more sinuous.

Hab. KASHMIR, Goorais Valley (*Leech*), 1 ♂; PUNJAB, Kangra Valley, 4500 feet (*Dudgeon*), 1 ♂ type. *Exp.* 22-24 mm.

(11 b.) *Stemmatophora fuliginalis*, sp. n.

♀. Sooty black; head dull rufous; palpi ochreous white; fore coxæ with some pale scales at extremity; mid tarsi and hind tarsi except basal joint ochreous white; abdomen with slight pale segmental rings. Fore wing with the antemedial line represented by a whitish point in submedian fold, with traces of a pale line from it to inner margin; the postmedial line whitish, excurved and almost obsolete between veins 7 and 2, and with a more prominent small spot in submedian fold. Hind wing with the base of costal area greyish; an obliquely curved whitish antemedial line, waved and stronger on inner area; postmedial line whitish, curved, obsolescent on costal half, strong and waved on inner half, bent inwards to inner margin.

Hab. BENGAL, Calcutta, 1 ♀ type. *Exp.* 30 mm.

(14 a.) *Stemmatophora glaucalis*, sp. n.

♂. Head and thorax pale yellow-brown with an olive tinge; abdomen ochreous. Fore wing pale olive-brown, the costal area strongly tinged with pink; indistinct, nearly straight, pale ante- and postmedial lines, with ochreous points between them on costa and dark discoidal point; a terminal series of dark points; cilia fuscous. Hind wing pale yellow-brown with nearly straight dark postmedial line, the area beyond it tinged with fuscous; a fine dark terminal line; cilia fuscous.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type. *Exp.* 24 mm.

(18 a.) *Herculia flammealis*, sp. n.

♀. Fiery red; tarsi whitish. Fore wing slightly irrorated with deeper red; a straight, erect, whitish antemedial line defined by deep red on outer side; some white points on medial part of costa and a faint deep red discoidal spot; postmedial line whitish defined by deep red on inner side, slightly excurved at middle; a fine pale line at base of cilia. Hind wing rather paler; an obliquely curved whitish postmedial line; a fine pale line at base of cilia.

Hab. MADRAS, Bellary, Ramandrug, 3000 feet (*Campbell*). *Exp.* 24 mm. Type in B.M.

(23 a.) *Herculia ignefimbrialis*, sp. n.

♂. Head, thorax, and abdomen dark purplish red-brown; pectus and legs paler; abdomen with the ventral surface yellow. Fore wing deep red suffused with fuscous and

irrorated with black; the ante- and postmedial lines yellowish, slightly sinuous, arising from yellow patches on costa; the medial part of costa with slight yellowish points; traces of a small blackish discoidal spot; termen black with a silvery gloss; cilia yellow with a fiery-red line through them. Hind wing deep red suffused with fuscous and irrorated with black; ante- and postmedial lines yellowish, slightly sinuous; termen black with a silvery gloss; cilia yellow with a fiery-red line through them; the underside with whitish postmedial line defined by blackish on each side.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♂ type. *Exp.* 18 mm.

(24 a.) *Herculia tristalis*, sp. n.

Head and thorax dull greyish fuscous, the head tinged with rufous, the palpi yellowish; abdomen greyish fuscous, reddish irrorated with fuscous towards extremity. Fore wing greyish suffused and irrorated with fuscous brown, the medial area reddish especially towards costa; a slight antemedial line with yellowish mark at costa; the medial area with yellowish points on costa, with fuscous streaks between them; postmedial line rather near termen, pale, oblique from costa to submedian fold, then bent outwards; a slight dark terminal line; cilia fuscous, with a fine pale line at base. Hind wing fuscous brown with a greyish gloss; traces of pale curved antemedial and medial lines defined by dark scales on inner side.

Hab. NIGERIA, Sapele (*Sampson*), 1 ♂ type; Old Calabar (*Crompton*), 1 ♀. *Exp.*, ♂ 16, ♀ 22 mm.

(28 a.) *Herculia albifimbrialis*, sp. n.

♀. Head, thorax, and abdomen pale red; tarsi and hind legs grey-white. Fore wing pale cupreous red; the costal edge dark with slight pale points on medial area; a whitish antemedial line slightly defined by fuscous on outer side, excurved from costa to submedian fold, then incurved; a small fuscous discoidal spot; postmedial line whitish slightly defined by fuscous on inner side, somewhat incurved below vein 3; cilia black at base, white at tips. Hind wing pale cupreous red with slight dark irroration; an oblique whitish antemedial line slightly defined by fuscous on outer side; a curved whitish postmedial line slightly defined by fuscous on inner side; cilia black at base, white at tips. Underside of both wings paler irrorated with brown.

Hab. C. CHINA, Kiukiang (*Pratt*), 1 ♀ type. *Exp.* 28 mm.

(5 a.) *Triphassa flammealis*, sp. n.

♂. Head, thorax, and abdomen fiery red; pectus, base of legs, tarsi, and ventral surface of abdomen except at extremity whitish. Fore wing fiery red; the basal and costal areas red-brown with a purplish gloss; antemedial line brown, straight, somewhat outwardly oblique; postmedial line brown, somewhat oblique, almost straight; a fine dark terminal line. Hind wing fiery red with brown ante- and postmedial lines, nearly straight, and meeting above tornus so as to form a U-shaped mark; termen somewhat deeper red; the underside pale yellowish with curved red-brown postmedial line, the termen tinged with red-brown.

Hab. ASHANTI, Kumassi (*Whiteside*), 1 ♂ type. *Exp.* 24 mm.

(7 a.) *Triphassa anæmialis*, sp. n.

♂. Head, thorax, and abdomen very pale olive. Fore wing very pale olive; the antemedial line very indistinct, oblique from costa to median nervure; a faint discoidal spot; the medial part of costa with slight pale points with faint dark streaks between them; postmedial line hardly traceable, excurved from costa to vein 4 and ending at tornus; a fine dark terminal line; cilia whitish. Hind wing very pale olive; traces of obliquely curved ante- and postmedial lines; a fine dark terminal line; cilia whitish. Underside of fore wing with the disk suffused with crimson and irrorated with brown, a small black discoidal spot, the postmedial line oblique from costa to vein 4, then excurved; hind wing suffused with crimson and irrorated with brown at base of costa, in submedian fold, and on terminal area; a slight subbasal line, the postmedial line oblique from costa to vein 3.

Hab. LAGOS (*Sir J. Carter*), 1 ♂ type. *Exp.* 20 mm.

(3.) *Hyboloma pallidalis*, sp. n.

♀. Head and thorax pale rufous; abdomen grey tinged with pale rufous at base and irrorated with black. Fore wing pale rufous slightly irrorated with black, the terminal area somewhat deeper rufous; a small rather diffused black discoidal spot and two obliquely placed postmedial points below the costa. Hind wing pale ochreous, the terminal area tinged with rufous.

Hab. BURMA, Karen Hills, Thandsung (*Doherty*), 1 ♀ type. *Exp.* 22 mm.

(3 a.) *Sacada rhodinalis*, sp. n.

♂. Head and thorax crimson-red; abdomen fuscous, the extremity and ventral surface red. Fore wing deep crimson-red; the rather narrow medial area pale reddish slightly tinged with fuscous, bounded by the white ante- and post-medial lines, the former highly curved, the latter oblique below vein 4; a deep black discoidal spot; some blackish suffusion beyond the postmedial line widest at middle and in submedian interspace; cilia blackish with fine pale line at base. Hind wing yellowish white, with pale crimson terminal band, even in width throughout; the underside with the costal area suffused with crimson, a curved white postmedial line.

Hab. MASHONALAND (*Dobbie*), 1 ♂ type. *Exp.* 28 mm.

(3 b.) *Sacada nigripuncta*, sp. n.

♂. Head, thorax, and abdomen purplish rufous; antennæ with the branches fuscous. Fore wing purplish rufous irrorated with fuscous; the antemedial pale line defined by fuscous on outer side, very highly curved, oblique from costa to below cell, where there is a large yellowish-rufous patch on its inner side; a very prominent black spot at lower angle of cell, with pale discocellular spot above it; the postmedial pale line defined by fuscous on inner side and by yellowish rufous on outer, oblique from costa to vein 5, then sinuous; a fine terminal pale line. Hind wing pale rufous tinged with fuscous; a curved fuscous postmedial line; cilia rufous with fine pale line at base.

Hab. N. GUINEA, Kapaur (*Doherty*), 2 ♂ type. *Exp.* 30 mm.

(3 c.) *Sacada metaxantha*, sp. n.

♂. Differs from *S. nigripuncta* in the fore wing being without black spot; the hind wing golden yellow without trace of postmedial line.

♀. Head, thorax, and abdomen redder; fore wing purplish red with some fiery red in submedian interspace before antemedial line, in and beyond end of cell, and beyond post-medial line; hind wing coppery red.

Hab. N. GUINEA, Kapaur (*Doherty*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 32, ♀ 42 mm.

(10 a.) *Sacada rosealis*, sp. n.

♀. Greyish brown strongly suffused with pink. Fore wing with nearly straight oblique antemedial grey line defined

by black on inner side, most strongly towards inner margin, and with some rufous on its inner side, met at inner margin by the grey postmedial line, which is angled at vein 5, then defined by black on outer side; a black point at lower angle of cell; the costa towards apex and cilia tinged with olive-yellow. Hind wing pink, with indistinct curved postmedial line and some fuscous suffusion towards tornus.

♂. Fore wing with the medial area reddish ochreous; hind wing yellowish white, with curved white postmedial line, the area beyond it slightly tinged with red.

Hab. MASHONALAND, Salisbury (*Marshall, Dobbie*), 2 ♂, 2 ♀ type. *Exp.* 32 mm.

SECT. III.—Antennæ of male ciliated: fore wing broad, the outer margin evenly curved; vein 7 from just beyond 9.

(12.) *Sacada prasinalis*, sp. n.

Head dark rufous; thorax and abdomen pale yellow-green, pectus and legs dark rufous; hind tarsi white. Fore wing pale yellow-green, with fine slightly darker ante- and postmedial lines, the latter slightly excurved beyond cell; a discoidal point; cilia rufous. Hind wing yellowish tinged with red and with green towards tornus; a discoidal point and slightly sinuous postmedial line; a rufous line at base of cilia, which are tipped with pink from middle to near tornus.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type; ASHANTI, Kumassi (*Whiteside*), 1 ♀; NIGERIA, Warri (*Roth*), 1 ♀, Old Calabar (*Crompton*), 1 ♂, 2 ♀. *Exp.* 26–36 mm.

(2 a.) *Paractenia thermalis*, sp. n.

Antennæ of male with short fine branches ending in strongly fasciculate cilia.

Head and thorax bright deep rufous; mid tibiæ blackish; abdomen whitish tinged with rufous and irrorated with fuscous. Fore wing bright deep rufous irrorated with black; antemedial line black, oblique, almost straight, defined by paler rufous on inner side; medial part of costa with minute pale points; discoidal spot deep black; postmedial line defined by paler rufous on outer side, somewhat oblique from costa to vein 5, then slightly incurved. Hind wing whitish tinged with rufous, in female wholly suffused with pale reddish brown; an indistinct curved postmedial line; the underside suffused and irrorated with rufous, the costal area slightly irrorated with black, a small blackish discoidal spot.

Hab. MASHONALAND, Salisbury (*Marshall*), 5 ♂, 1 ♀ type. *Exp.* 28-32 mm.

(2 b.) *Paractenia phæomesalis*, sp. n.

♀. Head and thorax dark red-brown, the frons paler; abdomen greyish suffused and irrorated with fuscous, the extremity and ventral surface tinged with rufous. Fore wing red-brown slightly irrorated with fuscous, the medial area rather darker; antemedial line black, very minutely waved, excurved below the cell; the medial part of costa with slight pale points; a small black discoidal spot; postmedial line black slightly defined by paler rufous on outer side, minutely dentate, excurved between veins 7 and 2; a terminal series of black points; cilia with fuscous line near tips. Hind wing whitish tinged with rufous, especially on terminal area; a dark postmedial line defined by whitish on outer side, slightly excurved between veins 5 and 2; a slight dark terminal line; cilia pale, with rufous line near base; the underside with small black spot at upper angle of cell.

Hab. E. AFRICA, Rabai (*Rogers*), 1 ♀; NATAL, 1 ♀ type. *Exp.* 30-34 mm.

(2 c.) *Paractenia atrisparsalis*, sp. n.

♀. Head and thorax rufous irrorated with fuscous; abdomen grey-brown irrorated with fuscous. Fore wing rufous with a cupreous tinge and thickly irrorated with black; antemedial line fuscous, oblique from costa to submedian fold, where it is angled outwards, then angled inwards on vein 1; a small black discoidal spot; postmedial line slightly defined by paler rufous on outer side, excurved and minutely dentate between veins 7 and 2, then slightly angled inwards in submedian fold; a terminal series of slight black points; cilia with slight fuscous line near base. Hind wing whitish tinged with brown, the terminal area rather darker; an indistinct, curved, minutely dentate postmedial line; cilia pale brown at base, whitish at tips; the underside with the costal and terminal areas suffused with reddish brown and irrorated with fuscous.

Hab. MASHONALAND, Salisbury (*Marshall, Dobbie*), 2 ♀; CAPE COLONY, Kokstad (*Miss Pringle*), 1 ♂ type. *Exp.* 32-34 mm.

(2.) *Prosaris pulvereæ*, sp. n.

Hind wing of male without tuft of scales.

♀. Head, thorax, abdomen, and fore wing vinous red thickly irrorated with black, the last with very oblique prominent black medial line angled just below costa, and

similar postmedial line angled at vein 6, the area between them except towards costa and the basal inner area suffused with dirty white; a series of black spots just inside termen, a terminal line, and line through cilia. Hind wing fuscous, with some rufous along vein 2 and on termen; a terminal series of black spots and two lines through the cilia.

♂ darker.

Hab. NATAL, Estcourt (*Hutchinson*), 1 ♀ type; Weenen, 1 ♂. *Exp.* 34 mm.

(3.) *Prosaris rufalis*, sp. n.

♀. Rufous; tarsi fuscous with pale rings. Fore wing rather thickly irrorated with fuscous brown; a dark ante-medial line, somewhat oblique from cell to inner margin; an oblique black line on discocellulars; postmedial line slightly excurved from costa to vein 4, then oblique; cilia tipped with fuscous. Hind wing paler rufous, slightly irrorated with fuscous. Underside of fore wing with indistinct dark spot in middle of cell; hind wing with curved postmedial line.

Hab. MASHONALAND (*Dobbie*), 1 ♀ type. *Exp.* 36 mm.

(1 a.) *Trebania glaucinalis*, sp. n.

Trebania muricolor, Leech, Trans. Ent. Soc. 1901, p. 431 (nec Hmps.).

Head, thorax, and abdomen brownish ochreous; palpi blackish brown at sides. Fore wing uniform glossy very pale olive-green, with traces of discoidal point and curved postmedial line, the costal edge and cilia brownish. Hind wing brownish white with a faint green tinge. Underside of fore wing browner; both wings with traces of a diffused curved postmedial line.

Hab. W. CHINA, Chang Yang (*Pratt*), 2 ♂, 1 ♀ type, Putsu-Fang, 1 ♀, Kia-Ting-Fu, 1 ♀, Ta-Chien-Lu (*Pratt*), 1 ♂. *Exp.* 34-38 mm.

[To be continued.]

XXXV.—On *Hipposiderus caffer*, *Sund.*, and its closest Allies; with some Notes on *H. fuliginosus*, *Temm.* By KNUD ANDERSEN.

Nomenclature.

Rhinolophus caffer, *Sund.*; 1847*.—The type was obtained by J. Wahlberg, "circa Port Natal." Sundevall's short

* C. J. Sundevall, "Nya Mammalia från Sydafrika," *Öfv. Kgl. Vet.-Akad. Förh.* iii. no. 5 (May 13, 1846), pp. 118-119; Stockholm, 1847.

Latin description does not touch any of the characteristic features of the species, the only important points being the length of the "cubitus" (48 mm.) and the habitat. But the British Museum possesses a mounted specimen of *caffer* from Port Natal, presented by the Stockholm Museum, and in all probability collected by Wahlberg; the forearm of this specimen measures 47·5 mm., the maxillary width 6·2 mm., the upper tooth-row 6 mm.; secondly, Yngve Sjöstedt has published more detailed measurements of the type preserved in the Stockholm Museum*, measurements which completely agree with those of the form called *caffer typicus* in the present paper; and, thirdly, *caffer typicus* is the only subspecies (and species) of *Hipposiderus* as yet recorded from Port Natal. These facts combined remove all doubt as to the identification of Sundevall's species.

Phyllorhina gracilis, Ptrs.; 1852 †.—Type from Tete, Lower Zambesi. The British Museum has specimens from other places at or near Zambesi (Shupanga, Mazoe).—Only two points in the original description of *gracilis* need some comment:—(1) the third metacarpal is stated to be a little longer than the fourth, in *caffer* a little shorter than the fourth; this character, however interesting from another point of view, has no taxonomic value; as a rule the third metacarpal is slightly the longer (see table of measurements and wing-indices below on p. 282), but in all races of *caffer*, and independently of age and sex, we find it sometimes equal to, sometimes a little shorter than, the fourth; the variation is purely individual: (2) the plagiopatagium is in *gracilis* inserted "etwas oberhalb der Fusswurzel," in *caffer* on the tarsus; I find in all races of *caffer*, independently of age and sex, the insertion of the wing-membrane to be a little variable, on the tarsus (very rarely on the base of the metatarsus) or between 0·5 and 2 mm. above the tarsal joint.—The rest of the very careful description, as well as the figures, clearly show that *Ph. gracilis* is, superspecifically at least, inseparable from *H. caffer*. The next question is, to which race of *caffer gracilis* belongs. The forearm measures, according to Peters, 46 mm.; this is probably the length of the radius, for in the life-size figure, pl. vii. fig. 1, the forearm measures 47·5 mm.; the length of the skull is 17·5 mm.; maxillary width (pl. xiii. fig. 15) 6 mm.; length of upper tooth-series (same plate, fig. 14) 6 mm. These facts, when compared with the table

* Yngve Sjöstedt, Bih. Kgl. Svenska Vet.-Akad. Handl. xxiii. Afd. iv. no. 1, p. 18; Stockholm, 1897.

† W. Peters, 'Naturwissenschaftliche Reise nach Mossambique,' Säugeth. pp. 36-38, pl. vii. figs. 1-4; pl. xiii. figs. 14-15; Berlin, 1852.

of measurements below (p. 282), settle the identification: *Ph. gracilis* is a synonym of *H. caffer typicus* of the present paper.

Nineteen years later * Peters arrived at the conclusion that *Ph. gracilis* was based on aged individuals of *H. caffer*, and pointed out the following four differences between old specimens and full-grown youngs: in old individuals the ears are longer; the third metacarpal always somewhat longer than the fourth (in young adults a little shorter than, or equal to, the fourth); the tibia longer; the wing-membrane inserted higher up on the tibia. I have carefully tested these statements on the large series, of all races and ages, at my disposal, and found that none of them holds good †; I often found in young adults (epiphyses of metacarpals not ossified) one, or several, or even all of the peculiarities believed by Peters to be characteristic of aged specimens. The slight variations are quite individual.

Phyllorhina fuliginosa, Temm.; 1853 ‡.—Based on a single specimen, an adult female, from the Gold Coast, collected by M. Pel. From Temminck's original description it appears that he separated *Ph. fuliginosa* from *Ph. caffa* mainly on account of its colour, which is stated to be "d'un roux de rouille vif" on the upperside; he gives the length of the forearm "2 pouces" (54.5 mm.), and mentions that the specimen has no frontal sac; as to the latter point he adds that the type and only individual examined being a female, "on ne peut indiquer . . . s'il est certain que le mâle soit pourvu d'un syphon." With regard to these three characters it must be said that the red colour of *fuliginosus* would be no proof of its specific distinctness, since also *H. caffer* has a red phase; that the forearm, if Temminck's statement were correct, would be only 0.5 mm. longer than in the largest *caffer* I have seen; and that the absence of a frontal sac in the female of *fuliginosus* does not imply that it is different from *caffer*, in which the sac is also invariably absent in the females. Thus the author of *H. fuliginosus* does not give us any means by which to distinguish it from *H. caffer*.

Peters § examined the type of *fuliginosus* in the Leiden Museum, and he had, furthermore, an example from

* W. Peters, "Ueber die Gattungen und Arten der Hufeisennasen, *Rhinolophi*," MB. Akad. Berlin, 1871, p. 325.

† See also my remarks on *H. Commersoni* and *gigas*, Ann. & Mag. N. H., Jan. 1906, p. 40, footnote.

‡ C. J. Temminck, 'Esquisses zoologiques sur la côte de Guinée,' pp. 77-78; Leiden, 1853.

§ W. Peters, MB. Akad. Berlin, 1871, p. 324.

“Guinea” in the Berlin Museum (no. 3559), referred by him to the same species. On the basis of these two specimens he writes:—(1) “Das Original exemplar zu der Temminck’schen Beschreibung hat keineswegs die Behaarung der Rückseite, wie er sagt, lebhaft rostroth, sondern nur die Basis der Haare, während der freie Theil dunkelbraun erscheint, wie dieses auch nur mit seiner Benennung ‘fuliginosa’ (rauchbraun) zu vereinigen ist”: (2) the length of the forearm is 50 mm.: (3) the species has no frontal sac.—But on closer examination these statements lose all practical value. Whether *H. fuliginosus* is red or brownish does not, in taxonomic respect, matter much, since both colour-phases occur in *H. caffer*; the length of the forearm (50 mm.) cannot have been taken on the type, for this latter is, as I shall have to show later on, a much larger bat, even markedly larger than indicated by Temminck; the measurement was probably taken by Peters on the Berlin specimen, and if so, *this cannot be a H. fuliginosus*; as to the absence of the frontal sac, a statement which, in fact, is correct also for the *males* of *fuliginosus*, I fail to see from where Peters derives it; he cannot have taken this character from the type, which is a female, and if he has based it on the Berlin specimen, we cannot rely upon its correctness, for this latter example is not a *fuliginosus*, provided the measurement of the forearm is correct. Thus, Peters does not add much to our knowledge of the true *fuliginosus*.

According to Dobson* *H. fuliginosus* may at once be distinguished from *H. caffer* by the much larger thumb and foot, by the different form of the ears, and especially by the absence of a distinct frontal glandular sac. Most of these statements are true, but unfortunately Dobson himself arouses our suspicion as to their correctness, for the following reasons:—he gives as length of the forearm 1¹¹/₁₆ (49.5 mm.), which is very far below the true size; the figure of the head (pl. ix. fig. 6) stated to be of a *fuliginosus* is undoubtedly drawn from a *H. caffer*; and of the four specimens registered by Dobson under *fuliginosus* three (“a,” which is a female, not a male, “c,” and “d”) are *H. caffer*, therefore in strong contrast to his own description of *fuliginosus*, whereas the fourth (“b,” a male, not a female) differs so widely from the other three specimens that I do not understand how Dobson could put them all under one heading.

So far the literature on the subject. Subsequent authors

* G. E. Dobson, Cat. Chir. Brit. Mus. pp. 139-140, pl. ix. fig. 6; London, 1878.

not infrequently record "*H. fuliginosus*" from W. Africa, especially from the countries bordering the Gulf of Guinea and from the islands in the Gulf, but they do not give any definite reasons why they call their specimens *fuliginosus* and not *caffer*. In these circumstances I am much indebted to Dr. Jentink for having kindly given me some cranial and external measurements of the type of *fuliginosus*, on the strength of which I am able to definitely settle the identification of Temminck's species. The true *H. fuliginosus* is specimen "b" in Dobson's Catalogue (p. 140), a male, obtained in Old Calabar. This example and the type in the Leiden Museum are the only specimens known to me, with certainty, to exist in any collection. All other records of *H. fuliginosus* in literature—in so far as the authors give any information (apart from localities) about the specimens which they call *H. fuliginosus*, and provided that the information when given touches any characteristic feature—seem to rest on confusion with some race or other of *H. caffer*, most often, probably, with the race described below as *H. caffer guineensis*, which lives in the same region as *H. fuliginosus*, sometimes, it would seem, with *H. c. centralis* or *angolensis*. The true *H. fuliginosus* may be briefly described as follows:—Similar to *H. caffer* in the general shape of the nose-leaves, the number of lateral leaflets (two), and the wing-structure, but differing, at a glance, by the much larger skull and teeth, by the markedly larger size, by the, also proportionately, much longer foot, and by the absence, in either sex, of a frontal sac; range, so far as hitherto known, from Old Calabar to the Gold Coast. This brief diagnosis, combined with the detailed measurements given below (p. 282), will easily prevent its confusion with any race or species of the *caffer* type.

Phyllorhina bicornis, Heugl.; 1861*.—The two typical specimens, a ♂ ad. and a ♀ ad. (in alcohol), from Keren, Erythrea, are preserved in the Stuttgart Museum. By the kindness of Prof. Dr. Lampert I have had them for examination in the British Museum. They are in every respect indistinguishable from the East-African, small-toothed and narrow-jawed form of *H. caffer* (*H. c. typicus*).

Phyllorhina rubra, Noack; Dec. 23, 1893 †.—The type, a male (skin), obtained by Emin Pasha at "Lugerrunjere Fluss," German East Africa, is in the Berlin Museum. The

* Th. v. Heuglin, "Beiträge zur Fauna der Säugethiere N.O.-Afrika's," N. Acta Acad. Cæs. Leop.-Car. xxix. pp. 7-8 (cf. p. 4); Jena, 1861.

† Th. Noack, "Neue Beiträge zur Kenntniss der Säugethier-Fauna von Ostafrika," Zool. Jahrb., Syst. vii. pt. iv. pp. 586-588, pl. xviii. figs. 14, 15; Dec. 23, 1893.

principal points in Noack's description are these two:—"An der Seite hat das Nasenblatt drei Falten"; and "die beiden Seiten der [Schwanz-] Flughaut sind statt des Schwanzes durch ein schmales sehniges . . . Band getrennt, in welchem jede Spur von Schwanzwirbeln fehlt." Also it must be mentioned that Noack compares this bat with "*Phyllorhina bicolor*, var. *fulva*" and *Rhinonycteris aurantia*, but not with *H. caffer*; that the figures of the skull (figs. 14, 15), though stated to be "natürliche Grösse," are considerably larger than the measurements given by the author (pp. 587-588); and that the forearm is said to measure 52 mm.—Prof. Matschie, who, with customary kindness, consented to re-examine the type, informs me that it has two, not three, supplementary leaflets external to the horseshoe (in giving the number of "Falten" Noack probably counted the margin of the horseshoe together with the lateral leaflets); that the proximal tail-vertebræ have undoubtedly been extracted by the taxidermist*; that a few distal vertebræ are still left in the tail-membrane; that all the skull-measurements (with one exception) as given by Noack are too large; that the forearm measures 51 mm.; and that the type is unquestionably a *H. caffer*. This evidence coincides with the result at which I myself had independently arrived by a perusal of Noack's exceedingly long and detailed description of *Ph. rubra*.—Some measurements of the skull placed at my disposal by Prof. Matschie enable me to determine still more precisely the affinities of *Ph. rubra*. The maxillary width, across the antero-external corners of m^3 , is 6.7 mm.; the width across the cingula of the upper canines 4.5; the zygomatic width 10.2; the length of the maxillary tooth-series 6.4,—facts which all prove, conclusively, that the type of *Ph. rubra* is one of the (apparently rare) individuals which are intermediate between *caffer typicus* and *caffer centralis*. This result also agrees with the fact that *Ph. rubra* was obtained in that region of East Africa where the areas of the typical form and *c. centralis* overlap each other. There is a similar individual in the British Museum, from the same region.

Phyllorhina angolensis, Seabra; Dec. 1898.—In March 1897 Barboza du Bocage † pointed out some differences between the Angola representative of *H. caffer* and specimens

* On this particular point see also Matschie, in SB. Ges. naturf. Fr. Berlin, 1894, p. 206, footnote.

† J. V. Barboza du Bocage, "Mamíferos . . . d'África de que existem exemplares typicos no Museu de Lisboa," Journ. Sci. Math. &c. Lisboa, (2) iv. no. 16, p. 188; March 1897.

“de outras proveniências d’Africa”; a technical name was, however, first proposed in the following year by Sr. de Seabra*. In reply to some questions about *Ph. angolensis* Sr. de Seabra was kind enough to send a cotype (Rio Coroca, Angola; Sr. Anchicta coll.) as a gift to the British Museum.—I shall have to show later on in this paper that the characters emphasized by Bocage do not stand a practical test; but the Angola form differs in other respects, and the name *angolensis* therefore is to be retained.

Synopsis of Species and Subspecies.

Frontal sac present in males; forearm 42-54 mm.; foot (c. u.) 7·8-10.	
Forearm 46·5-54; tail 27·5-38; lower leg 18·8-22·8.	<i>caffer</i> .
Maxillary width (across antero-external corners of m ³) 6-6·2; maxillary tooth-series 5·7-6·2; forearm 46·5-51·8 (average 48·6)	<i>caffer f. typicus</i> .
Maxillary width 6·8-7·1; maxillary tooth-series 6·7-7; forearm 49-54 (average 50·9)	<i>caffer centralis</i> .
Maxillary width 7-7·7; maxillary tooth-series 6·8-7·2; forearm 48-53 (average 50·3)	<i>caffer guineensis</i> .
Maxillary width 6·2-6·6; maxillary tooth-series 6·2-6·7; forearm 48-52·2 (average 50·3)	<i>caffer angolensis</i> .
Forearm 42·2-44·2; tail 20·5-22; lower leg 15·2-16; maxillary width 7; maxillary tooth-series 5·9-6·2	<i>beatus</i> .
No frontal sac in either sex; forearm 57-61; foot (c. u.) 12·8; maxillary width 8·7; maxillary tooth-series 8·3	<i>fuliginosus</i> .

1 a. *Hipposiderus caffer*, Sund., *typicus*.

Small-toothed, small-skulled, and narrow-jawed.

The skull is smaller and in every respect slenderer than in *H. c. centralis*. The zygomatic width is equal to, or very often slightly smaller than, the mastoid width, a peculiarity which gives the skull a very characteristic aspect as compared with that of *E. c. centralis*. The maxillary width is markedly smaller: 6-6·2 mm., as against 6·8-7·1 in *centralis*; in conformance with this the width across the canines and the anteorbital width are smaller. The teeth are considerably smaller, the mandible shorter.

* A. F. de Seabra, “Sobre um caracter importante para a determinação dos generos e especies dos ‘Microchiropteros’ e lista das especies d’este grupo existentes nas collecções do Museu Nacional,” *Jorn. Sci. Math. &c. Lisboa*, (2) v. no. 20, p. 256; Dec. 1898 (by a lapsus memoriae Seabra quotes Bocage as author of the name *angolensis*; Bocage (*l. s. c.*) called this bat *Phyllorhyna* n. sp., Seabra named it and described its palatal ridges).

Externally, the typical form is *on an average* smaller than *H. c. centralis*, but the difference is practically far less well marked than in the skulls. The following details illustrate the difference in the length of the forearm between *H. c. typicus* on the one side, *H. c. centralis* and *guineensis* (which for all practical purpose are identical in size) on the other:—In 40 full-grown specimens of *H. c. typicus* 46·5–51·8 mm., in 50 full-grown *H. c. centralis* and *guineensis* 48–53·8; thus, practically, for the discrimination of the races, *the measurement of the forearm is far less reliable than the characters of the skull and teeth*. But in *typicus* the average is 48·6, in *centralis-guineensis* 50·6. Of *typicus* only 10 per cent., of *centralis guineensis* 65 per cent., have the forearm 50 mm. or more.—There is no fixed difference in size between the sexes, neither in this race nor in the others.

The colour of the fur in the ordinary dark phase is *markedly lighter* than in *H. c. centralis* and *guineensis*:—Back light “Prout’s brown,” this colour confined to the tips of the hairs; base of hairs very light greyish “drab,” more or less tinged with “ecru-drab,” as is also the upperside of the head and neck and the whole of the underside; base of hairs of underside dark grey.—Young adults are still lighter coloured: Back more approaching “hair-brown”; head, neck, base of hairs of the upperside, as well as the whole of the exposed part of the underside, almost whitish grey; base of hairs of underside dark grey.

Also the red phase is *markedly lighter* than in *H. c. centralis* and *guineensis*:—Upperside throughout “orange-rufous”; underside between “orange-rufous” and “vinaeous-cinnamon.”—In this, as in all races of *H. caffer*, there are transitional stages between the dark phase and the red phase. All the red specimens are fully adult individuals. The red phase occurs both in males and females.

43 specimens* have been examined, from the following localities:—Keren, Erythrea (2 spcms., the types of *Ph. bicornis*); El Obeid, Kordofan (1) †; Ft. Hall, Mt. Kenia, British East Africa (2); El Dongo eb Urru, 415 miles up the Mombasa-Uganda Railway, B. E. A. (1); Machakos, B. E. A. (3); Kilimanjaro, German East Africa (2); Ft. Johnston, Nyasa (2) ‡; Shupanga, Lower Zambesi (5) §;

* Only the measurements of full-grown specimens are included in the table below, p. 282.

† Oldfield Thomas, P. Z. S. 1903, i. p. 295; *H. caffer*.

‡ Oldfield Thomas, P. Z. S. 1896, p. 791; *H. caffer*.

§ J. Kirk, P. Z. S. 1864, p. 650; *Ph. gracilis* and *Ph. caffra*.

Mazoe, Mashonaland (4); De Kaap, Transvaal (1); Barberton, Transvaal (3); Zuurbron, Wakkerstroom (4)*; Jususie Valley, Zululand (6) †; Pt. Natal (2); Pondoland (1); Huxe, Benguela (1); uncertain localities (4).—29 skulls, from all the localities enumerated, with the exception of Keren ‡.

According to this, the range of *H. c. typicus* is from Erythrea and Kordofan in the north, along the eastern side of the continent, southwards to Transvaal and Pondoland; it also occurs in Angola, where it probably is rather rare, and where it meets *H. c. angolensis*, the predominant form in that region.

1 b. *Hipposiderus caffer centralis*, subsp. n.

Large-toothed, large-skulled, and broad-jawed.

The skull is larger and in every respect more heavily built than in the typical form. The zygomatic width is almost invariably slightly larger than, or at least equal to, the mastoid width, which gives the skull in upper view a very characteristic aspect as compared with that of *H. c. typicus*. The maxillary width is markedly larger: 6·8–7·1 mm., as against 6–6·2 in the typical form; in conformance with this the width across the canines and the anteorbital width are slightly larger. The teeth are considerably larger, the mandible longer.

Externally, this form is *on an average* larger than *H. c. typicus*, but the difference is practically far less well marked than in the skulls and teeth (for details, see *H. c. typicus*).

The colour of the fur, both in the dark and red phase, is darker than in the typical form, but lighter than in *H. c. guineensis* (see this latter, below).

Type:—♂ ad. (skin). Entebbi, Uganda. Presented by F. J. Jackson, Esq. Brit. Mus. no. 99. 8. 4. 8.

26 specimens have been examined, from:—Takaungu, Mombasa, British East Africa (4); Dar es Salam, German East Africa (1); Zomba, Nyasa (1) §; Entebbi, Uganda (9); Stanley Falls, Upper Congo (3); Leopoldville, Lower

* Oldfield Thomas & Harold Schwann, P. Z. S. 1905, i. p. 130; *H. caffer*.

† Oldfield Thomas & Harold Schwann, P. Z. S. 1905, i. p. 256; *H. caffer*.

‡ For some measurements of the skull of a ♀ ad. from Keren see A. Senna, Archivio Zoologico, ii. pt. iii. p. 274; Napoli, 1905; they are precisely as my measurements of *H. c. typicus*.

§ Oldfield Thomas, P. Z. S. 1894, p. 138; *H. caffer*.

Congo (2)*; Wathen, Lower Congo (1); 75 miles up the Congo River (4)*; Caiala, Bihé, Angola (1) †.—16 skulls, from all the localities enumerated.

According to this, *H. c. centralis* is distributed in a broad belt across the Equatorial region of Africa, from British and German East Africa and Nyasaland in the East, through Uganda and the whole of the Congo Valley, to the western coast of the continent; like the typical form it extends to Angola.

1 c. *Hipposiderus caffer guineensis*, subsp. n.

The extreme in the maxillary width of the skull and the intensity of the colour of the fur.

The skull and teeth of this form are of the same size as in *H. c. centralis*, but the maxillary width on an average decidedly larger: 7-7.7 mm., as against 6-8-7.1.

External dimensions as in *H. c. centralis*.

The colour of the fur is markedly darker than in any other race:—Back approaching “seal-brown,” base of hairs scarcely lighter; upperside in front of the shoulders “hair-brown,” base of hairs next to “bistre”; underside dull “drab,” base of hairs next to “bistre.”—I have seen no very young specimen of this form.

Also the red phase is darker than in the other races:—Upperside “cinnamon-rufous,” in some individuals so dark as to approach “chestnut”; underside “cinnamon-rufous” or “hazel.” Different at a glance from the corresponding phase of the typical form.

Type:—♀ ad. (skin). Como River, 70 miles from Gaboon, almost sea-level; June 3rd, 1897. Collected by G. L. Bates, Esq. Brit. Mus. no. 97. 12. 1. 11.

27 specimens examined, from:—Como River (4); Gaboon (1); Benito River (4); Fernando Po (9) †; Cameroon Mts. (1); Efulen, Bulu Country, Cameroon, 1500-1800 ft. (4); Old Calabar (1); Mt. Coffee, Liberia (3) §.—23 skulls, from all the localities enumerated.

According to this, *H. c. guineensis* is distributed from

* From the collection of the United States National Museum (nos. 21663, 21664, and 102513-16).

† Oldfield Thomas & R. C. Wroughton, Ann. & Mag. N. II. (7) xvi. p. 170 (Aug. 1905); *H. caffer*.

‡ Oldfield Thomas, P. Z. S. 1904, ii. p. 188; *H. fuliginosus*.

§ From the collection of the U.S. National Museum (nos. 83800-802).—Gerrit S. Miller, Jr., Proc. Wash. Acad. ii. p. 647 (1900); *H. caffer*, partim.

Como River westwards, through the countries bordering the Gulf of Guinea (including the island of Fernando Po), at least as far as Liberia.

1 d. *Hipposiderus caffer angolensis*, Seabra.

In cranial and dental characters and in colour intermediate between *H. c. typicus* and *H. c. centralis*; in external dimensions next to this latter.

Prof. Barboza du Bocage, who first drew attention to this form (*l. s. c.*), emphasized two distinctive characters: the slightly broader horseshoe and the coalescence of the right and left supplementary leaflets in front of the horseshoe. Neither of these points holds good. The horseshoe is not broader than in many individuals of *H. c. typicus* and *centralis*; as to the lateral leaflets, I find them meeting in front in two *H. c. angolensis* (one of them is a cotype of *Ph. angolensis*), separated, sometimes broadly separated, in all the others; on the other hand, in one *H. c. typicus* (Kilimanjaro) and two *H. c. centralis* (Stanley Falls) they are almost or quite connected in front of the horseshoe. The only claim of *H. c. angolensis* to have a technical name of its own is therefore that it is neither the typical form nor *H. c. centralis*, but intermediate between these races, and has a separate geographical distribution.

12 specimens (7 skulls) have been examined, from various places in Angola. I have reason to believe that this form extends northwards beyond the limits of Angola into the coast-region, where the predominant forms are *H. c. centralis* and *guineensis*.

2. *Hipposiderus beatus*, sp. n.

Smaller than *H. caffer*, with very short tail and tibia. Skull small and very broad-jawed.

In all forms of *H. caffer* the maxillary width (across the antero-external corners of m^3) is practically equal to the length of the maxillary tooth-series; in *H. beatus* the former is markedly greater than the latter (7 mm. as against 5.9–6.2); the great maxillary width, combined with the small size of the skull, makes the cranium of *H. beatus* easily distinguishable from that of any race of *H. caffer*. The zygomatic width is larger than the mastoid width, as in *H. c. centralis* and *guineensis*.

The teeth are of the same size as in the small-toothed *H. c. typicus*. The dentition, although in all essential respects

as in *H. caffer* *, seems to be a trifle more advanced : p^2 is in all the three specimens examined exceedingly small, so small indeed as to be very easily overlooked.

Externally this bat is readily distinguished from *H. caffer* by its small size and very short tail and tibia (see measurements below, p. 282). The wing-membrane is inserted on the middle or distal part of the metatarsus or on the base of the phalanges; in *caffer* it is never produced further backwards than the base of the metatarsus, and this but very rarely.

Type:—♀ ad. (in alcohol). 15 miles from Benito River; Feb. 1899. Collected by G. L. Bates, Esq. Brit. Mus. no. O. 2. 5. 45.—A second specimen (Brit. Mus. no. 5. 5. 23. 11), also obtained by Mr. Bates, is from Efulen, Cameroons. A third specimen †, from Mt. Coffee, Liberia, is preserved in the Washington Museum (no. 83857) ‡.

Judging from this, *H. beatus* is distributed over the countries bordering the Gulf of Guinea, from Benito River to Liberia. Thus it inhabits the same region as the large-skulled and large-toothed *H. c. guineensis*.

General Remarks.

The conclusions recorded in the foregoing pages are based on a study of 111 specimens and 79 skulls, from localities scattered over almost the whole explored part of the Ethiopian Region. Without so extensive a material—probably the largest ever brought together in one place—I should not have ventured an attempt to disentangle the various species and geographical races of this particularly difficult group of

* Dentition in 76 skulls of *H. caffer* (all races):— p_3 always wanting. p_2 and p_4 never separated; in 10 specimens in simple contact, in 66 overlapping each other at base. p^2 always external to the series and always easily observable. Upper canines and p^1 in 21 specimens distinctly separated; in 39 extremely slightly separated or almost in contact; in 3 completely in contact on one side of the jaw only, in 13 on either side.

† For the loan of this specimen I am indebted to the Authorities of the United States National Museum. It is one of the *Hipposiderus caffer* mentioned by Gerrit S. Miller in his paper on a collection of small mammals from Mount Coffee, Liberia (Proc. Wash. Acad. ii. (1900) p. 647; forearm 42 mm.).

‡ A fourth specimen, not examined by me, is in a Continental (probably Swedish or German) Museum:—In his "Säugethiere aus Kamerun, West-Afrika" (Bih. Kgl. Svenska Vet.-Akad. Handl. xxiii. Afd. iv. no. 1, p. 18; 1897) Dr. Yngve Sjöstedt gives some external measurements of 10 "*H. caffer*"; no. 1 is Sundevall's type, from Port Natal; nos. 2-8 and 10, all from Cameroon, are probably *H. c. guineensis*; no. 9, also from Cameroon, with the forearm measuring 44 mm., the tail 24, and the tibia 16, is undoubtedly a *H. beatus*.

bats. The taxonomic and zoogeographical facts, as derived from an examination of this material, may be briefly epitomized as follows:—

(1) A small toothed and narrow-jawed form, *H. caffer typicus*, occurs from Erythrea and Kordofan in the north, through British East Africa, German East Africa, Nyasaland, and Lower Zambesi, to Transvaal, Zululand, and Pondoland; a perfectly continuous area, comprising the eastern side of the continent. I know of no record of any bat of the *caffer* type north of Erythrea or south of Pondoland.—From the southern part of this area, no doubt through the Zambesi Valley, this form has spread to Angola. There are parallels to this among other Ethiopian species of Horseshoe-Bats: *H. Commersoni*, essentially East-African, but occurring also in Angola*; *Rhinolophus Darlingi*, distributed from Mazoe to Angola †.

(2) A large-toothed and broad-jawed form, *H. c. centralis*, inhabits the Equatorial region of the continent, from the Congo Estuary in the west, through the whole of the Congo Valley and Uganda, to British and German East Africa.

It will be observed that the geographical areas of these two forms overlap each other in the east; from the southern part of British East Africa to Zomba, *i. e.* within the area where *H. c. typicus* is the predominant form, we also find *H. c. centralis*. When the two forms occur together we might anticipate, in view of their very close relationship, that intermediate specimens would prove to be rather common. Such is, however, not the case; the two races preserve, also in these circumstances, their peculiarities, so well indeed that, with very rare exceptions, they are distinguishable at a glance by their cranial and dental characters. I know of only two intermediate examples, the one in the British Museum (from Zanzibar, the other in the Berlin Museum (from German East Africa; the type of *Ph. rubra*).

The reason why *H. c. centralis* inhabits a part of the area occupied by *H. c. typicus* is probably this:—All the examples I have seen from Uganda and the Congo Valley are perfectly clearly pronounced *H. c. centralis*; it is therefore but reasonable to suppose that this “clean area,” Uganda and the Congo Valley, is the true home of *H. c. centralis*, and that from there it has spread eastwards into British and German East Africa, south-eastwards to Zomba.

* Knud Andersen, Ann. & Mag. N. H., Jan. 1906, p. 41, footnote, and p. 47.

† Id., Ann. & Mag. N. H., Jan. 1905, pp. 71-72; P. Z. S. 1905, ii, p. 118.

(3) A large-toothed and very broad-jawed form, *H. c. guineensis*, inhabits the countries from Como River to Liberia. This area is a direct western continuation of the region inhabited by *H. c. centralis*, and, in accordance with this fact, *H. c. guineensis* is nothing but an "exaggeration" of *H. c. centralis*; one of the chief characters of *centralis*, the large maxillary width, finds a climax in *guineensis*.

(4) Angola is, geographically, intermediate between the areas of *H. c. typicus* and *H. c. centralis*; and we find in Angola a representative of the *caffer* type, *H. c. angolensis*, which in almost every respect is thoroughly intermediate between the two races.—The geographical position of Angola is such as to have invited *H. c. typicus* to immigrate from east (Zambesi Valley), *H. c. centralis* to immigrate from north-east (Congo Valley); thus we find in Angola three forms of *H. caffer*: not only *H. c. angolensis*, the predominant form, but also *H. c. typicus* and *H. c. centralis*.

(5) In the Guinean coast-region, from Benito River to Liberia, lives a representative of the *caffer* type, *H. beatus*, which in its cranial and external characters is so sharply separated from all the forms just mentioned that we have no other choice than to regard it as a distinct species.

(6) Finally, in the region inhabited by *H. c. guineensis* and *H. beatus*, from Old Calabar to the Gold Coast, we find the very different *H. fuliginosus*. It has been necessary to give an account of this species in the present paper, owing to its confusion with *H. caffer*. But it belongs to a different group of the genus.

The probable phylogeny of *H. caffer*, *beatus*, and *fuliginosus* will be discussed in a subsequent paper, on some Oriental species of *Hipposiderus*.

XXXVI.—*New and little-known Species of Heterocera from the East.* By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family Deltoididæ.

Oxænanus indentifascia, nov.

♂ ♀. Of a uniform dark olive-brown; palpi with ochreous-white hairs, the sides nearly black: fore wings with the orbicular and reniform black, the first represented by a small spot, the other larger and ear-shaped; antemedial and post-medial lines whitish and sinuous, the first edged with black

inwardly, the latter outwardly and limiting a broad black discal line, which is outwardly edged with whitish, is deeply excavated above its middle, and has also a smaller excavation below: on the hind wings also the discal band can be traced; it is edged on both sides with whitish and is nearly uniform in width. Underside paler; a brown spot at the end of each cell and medial and submarginal sinuous, whitish, transverse lines.

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

Khasia Hills; ♂ ♀ types in B.M., also one female from Bhutan. I also have one male from the Khasia Hills.

One of the B.M. examples is labelled *Isomastix indentifascia*, Warren, type; but I can find no reference.

Family Epiplemidæ.

Epiplema enthearia, nov.

♂. Pure white, marked with dark chestnut-brown, the palpi of that colour, white beneath, and with the last joint white at the base and at the tip; some marks on the head and collar: fore wings with speckles on the costa, the most prominent before and beyond the middle; two small patches close together in the disk, the inner patch connected with the costa by an oblique line: hind wings with a larger patch, occupying more than the lower third of the wings, marked with white on the outer border; the brown colour runs into the upper tooth of the wing and also in two lines from the patch to near the costa beyond the middle. On the underside the fore wings are suffused all over with brown except the cilia and a small space along the hinder margin; the hind wings are without markings.

Expanse of wings $\frac{8}{10}$ inch.

Khasia Hills; a fine series.

One example has the inner portion of both wings above suffused with pale brown. The species belongs to the *desistaria* group, which I have from Assam, Bombay, Gilolo, and Queensland. It is also nearly allied to *E. restricta*, Hampson, which is in my collection from the Khasia Hills, but it constantly differs from both.

Family Geometridæ.

Mimomiza flavescens, nov.

♂ ♀. Of a uniform yellow colour; shaft of the antennæ with the basal half dark brown; palpi brown at the sides,

last joint dark brown: wings sparsely irrorated with brown atoms; a black spot at the end of each cell; a blackish straight band, with its inner edge formed by a thick black line, from apex of fore wings to the middle of the abdominal margin of hind wings, passing just inside of the black discal spot of the hind wings; a brown oval-shaped line on the costa near the apex enclosing a whitish space, intersected by two longitudinal brown lines, the spot formed by the lower line pure white: hind wings with a curved row of seven or eight black discal dots. Underside similar, but the black markings are more prominent and the general colour of a deeper yellow.

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

Khasia Hills; a nice series.

Like *M. cruentaria*, Moore, without any of its rufous markings. I have both sexes of each, and it is wonderful what little variation they show.

Cidaria mediovitaria.

Cidaria mediovitaria, Moore, P. Z. S. 1867, p. 656.

Somatina azonaria, Oberth. Etude d'Ent. xviii. p. 32, pl. iv. fig. 50 (1893).

Moore's type came from Darjiling, Oberthür's from Chinese Thibet. I have it from Kashmir, Sikkim, and Kiong-Tcheou, the latter received from Oberthür; they are identical.

Actenochroma subochracea.

Actenochroma subochracea, Warren, Nov. Zool. i. p. 381 (1894).

Pseudoterpna elæaria, Hmps. Journ. Bo. N. H. Soc. xiv. p. 654 (1903).

Khasia Hills.

These are undoubtedly identical.

Family Thyrididæ.

Rhodoneura atomosalis.

Rhodoneura atomosalis, Hmps. P. Z. S. 1897, p. 621.

Port Blair, Andamans; two examples.

Khasia Hills; two examples.

The type from Mysol is in the B.M., also an example from Java; not previously recorded from the Indian Region. There are a number of examples from the Andamans in the Indian Museum, Calcutta, collected by Roepstorff.

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*Rhodoneura dorilusalis.**Brixia dorilusalis*, Walker, xix. 890 (1859).*Pyralis imbutalis*, Walker, xxxiv. 1524 (1865).*Siculodes acutipennis*, Pag. JB. Nass. Ver. 1886, p. 167.*Banisia elongata*, Warren, Nov. Zool. iii. p. 340 (1896).

Nancowry, Nicobars; one example.

Not previously recorded from the Indian Region. The type from Sarawak is in Mus. Oxon., as also is the type of *imbutalis* from Mysol; the type of *acutipennis* came from Aru Island; and the type of *elongata* from Queensland is in Coll. Rothschild, from which locality I have an example in my own collection. *Pyralis albiferalis*, Walker, xxxiv. 1524, the type of which from Batjan is in Mus. Oxon., is, I believe, also a very slight variety of the same species.

Family Pyralidæ.

Genus LOPHOPALPIA, Hmpsn.

Lophopalpia, Hmpsn. Trans. Ent. Soc. 1896, p. 526.*Lophopalpia pauperalis.**Cataprosopus pauperalis*, Leech, Entom. xxii. p. 70, pl. iv. fig. 11 (1889).*Lophopalpia pauperalis*, Hmpsn. *l. c.*

Khasia Hills; several examples.

The type from Yokohama is in the B. M.; not previously recorded from India; there are examples in the B. M. from Pulo Laut.

Family Hydrocampidæ.

*Mabra fauculalis.**Hydrocampa fauculalis*, Walker, xix. 962 (1859).*Mabra fauculalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 221.

Khasia Hills; not uncommon.

Not previously recorded from India; I have it also from Sarawak, from which place the type in Mus. Oxon. came.

Genus CAMPTOMASTYX, Warren.

Camptomastyx, Warren, Ann. & Mag. Nat. Hist. (6) ix. p. 439 (1892);

Hmpsn. Moths India, iv. p. 238 (1896).

*Camptomastyx hisbonalis.**Botys hisbonalis*, Walker, xviii. 707 (1859).*Camptomastyx hisbonalis*, Hmpsn. Trans. Ent. Soc. 1897, p. 215.*Botys pacalis*, Leech, Entom. xxii. p. 69, pl. iv. fig. 15 (1889).*Diplotyla longipalpis*, Butler, Ill. Het. vii. p. 95, pl. cxxxv. fig. 4 (1891).

Khasia Hills ; fairly common. Also recorded from China, Burma, Dharmasala, and Sarawak.

Warren created the genus on Lecch's species *pacalis*.

Tatobotys biannulalis.

Botys biannulalis, Walker, xxxiv. 1439 (1865).

Tatobotys biannulalis, Hmps. Trans. Ent. Soc. 1897, p. 197.

Rangoon (*Noble*).

Not previously recorded from the Indian Region.

Family Pyraustidæ.

Subfamily HYMENINÆ.

Massepha marginalis, nov.

♂. Palpi dark brown, last joint paler, with white at its base ; frons, head, and collar whitish ; thorax and fore wings grey, tinged with pinkish and thickly irrorated with brown ; a brown, double, lunular, indistinct mark at the end of cell, an obscure brown mark in the cell, and two or three others towards the base ; a broad blackish-brown marginal band, attenuated and sometimes interrupted in its middle, and edged inwardly by a whitish line ; marginal line dark grey ; cilia grey, interlined with whitish : hind wings white, sparsely irrorated with grey ; a large blackish-brown apical patch, blackish-brown marginal spots, and whitish cilia : abdomen whitish, with three dark brown bands on the middle segments and a brown anal tip.

Expanse of wings $\frac{8}{10}$ inch.

Khasia Hills ; five examples.

Allied to *M. absolutalis*, Walker, which I have from Sarawak and Bombay, but that is a uniformly coloured insect. There is a worn example from Bhutan in the B. M. with *M. absolutalis*, which appears to be the same as my Khasia Hills form.

Rehimena villalis, nov.

♀. Pale yellow ; palpi white at the tips ; body below and legs silvery white : fore wings with the apical half of the costal line brown ; a moderately large black spot close to the costa beyond the middle, another slightly larger below it in the disk : hind wings with a still larger black spot at the apex, and a lunular black spot in the disk, with its lower end near the outer margin ; the outer marginal line black.

Expanse of wings $\frac{8}{10}$ inch.

Andamans ; one example.

Being a female, I am not sure about its position.

Bocchoris vedonalis.

Chabula vedonalis, Swinhoe, Ann. & Mag. N. H. (6) xiv. p. 197 (Sept. 1894).

Margaronia sphenocosma, Meyrick, Trans. Ent. Soc. 1894, p. 456.

Khasia Hills; common.

Sir George Hampson, in 'Moths of India,' iv. p. 284, and again in P. Z. S. 1898, p. 652, gives precedence to *sphenocosma*; but this is incorrect. My paper was published on the 1st September, Meyrick's paper is in part iii. of the Trans. Ent. Soc. 1894, and was not published till later in the month: his type came from Pulo Laut and is in Coll. Elwes; I have not seen it. If his species is the same as *vedonalis* (not *vedrualis*, as incorrectly spelt by Sir George), his name must sink.

Bocchoris fazanalis, nov.

♂. Palpi blackish brown, white beneath; frons luteous white, with a black middle stripe; top of head and body glaucous brown; collar and two stripes on each side of thorax luteous white; body below and legs whitish: wings ochreous brown-pink, variegated in beautiful shades of colour; markings somewhat resembling those in *B. telphusalis*, Walker, but the white markings are larger and ochreous-tinged; the stripe running parallel to the abdominal margin of the hind wing is continuous throughout, and there are ochreous-shaded submarginal broad stripes on both wings; each spot and stripe is thickly margined with dark brown-pink, as also are the outer margins.

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

Khasia Hills; three examples.

A beautiful little insect of the *acamasalis* group, but nearest in markings to *telphusalis*, but very different in colour from either or from *vedonalis* or *terealis*. I have a very fine series of the group in my collection.

Platamonia oggalis, nov.

♂ ♀. Palpi dark chocolate-brown; head, body, and wings pale luteous grey: fore wings with a blackish spot in the middle of the cell and a lunule at the end; an antemedial, outwardly curved, brown line; a discal line, more or less crenulated, commencing from a spot on the costa, sharply bent inwards below the middle until it nearly reaches below the discal lunule, then straight to the hinder margin, and continued across the hind wings in a nearly straight form,

but is disjointed in the middle; the space beyond the outer line suffused with purple; marginal line brown; cilia grey, interlined with luteous.

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

Khasia Hills; one pair.

There is an example in the B. M. from the Khasia Hills, Drawer 18; it is allied to *P. camillusalis*, Led., which I have from Borneo, and is marked in a somewhat similar manner, but is undoubtedly distinct.

Subfamily PINACIINÆ.

Genus MACARETÆRA, Meyrick.

Macaretæra, Meyrick, Trans. Ent. Soc. 1886, p. 255.

Trichoptychodes, Swinhoe, Ann. & Mag. Nat. Hist. (6) xiv. p. 207 (1894).

Macaretæra delicata.

Trichoptychodes delicata, Swinhoe, l. c.

Macaretæra hesperis, Hmps. (part.), Moths India, iv. p. 296 (1896), and P. Z. S. 1898, p. 670.

Khasia Hills; many examples.

Sir George Hampson's description of the male is from *delicata*, of the female (which differs in many particulars) from Meyrick's unique type of *hesperis* from Fiji: unfortunately I have never seen a female of the former, but such sexual differences in the sexes are not common in the Pyraustidæ, and I do not think it is probable, considering the immense distances apart of the localities, that they can belong to the same species; neither do I think it is reasonable to sink a common local species from the Khasia Hills to a form from the South Pacific on such slender and unsatisfactory evidence.

Omiodes ovenalis, nov.

♂. Pale brown, with an ochreous-pinkish tinge: fore wings with an antemedial, outwardly curved, indistinct blackish line; a spot at the end of the cell of all the wings; a discal line of black dots curved outwardly in its middle almost in the form of a square on both wings; cilia brown interlined with pale ochreous. Underside much paler, somewhat glossy, the lines and spots more prominent.

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

Sarawak; two male examples (type).

Port Blair, Andamans; two female examples (type).

There are two examples in the B. M. from Singapore under *Sylepta nigriscripta*, Warren, Pyraustid Drawer 11, and one from Sarawak, three from Sandakan, and one from Singapore in Drawer 27 with *Phryganodes crithonalis*.

Euglyphis procopia.

Phalæna Pyralis procopia, Cram. Pap. Exot. iv. p. 152, pl. 368. fig. E (1782).

Neornia procopia, Hmps. P. Z. S. 1898, p. 676.

Fergusson Island; two examples.

There are two examples from New Guinea and one from Fergusson Island in the B.M. Drawer 31. Cramer's type came from Amboina, and his figure, though a little exaggerated in colour, represents both in size and colour this insect, and not the common Indian form which has heretofore been called *procopia*; the latter is a much smaller insect, and the white basal space, especially in the hind wings, is much more limited; in the typical form it bulges out to more than half the breadth of the wing. For the Indian form I propose the name of *falsalis*, and make an example from the Khasia Hills (where it is very common) the type. I have a long series from many parts of India.

Saroscelis earlalis, nov.

♂. Of a uniform dull and rather pale blackish-brown colour above; top of head and collar tinged with chestnut; anal tuft of abdomen ochreous grey; body and legs below brownish grey; fore tarsi with black bands; hind tibiæ with the upper hairs ochreous, the lower hairs black. Wings with the transverse lines blackish, but indistinct: fore wings with traces of a submarginal line; a spot in the cell, through which runs the antemedial line; a postmedial line, curving slightly inwards below the costa, then well curved outwards and suddenly bent inwards below the end of the cell, then obliquely to the hinder margin a little beyond the middle; a lunular mark at the end of the cell of both wings: hind wings with a curved discal line, abruptly bent inwards below the cell-mark; cilia of both wings brown, with an ochreous basal line.

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

N. Borneo; one example.

There are three examples from Singapore in the B. M., with *Phryganodes nicoalis*, Walker, to which it is structurally allied, but from which it is, in my opinion, quite distinct.

Saroscelis nicoalis.

Botys nicoalis, Walker, xviii. 700 (1859).

Phryganodes nicoalis, Hmpsn. P. Z. S. 1898, p. 680.

Saroscelis nicoalis, Swinhoe, Cat. Het. Mus. Oxon. ii. p. 475, pl. viii. fig. 3 (1900).

Khasia Hills; eight examples.

The type from Sarawak is in Mus. Oxon.; I also have it from the same locality. Not previously recorded from India; it is in the B. M. from Borneo, Sumbawa, and Singapore.

GENUS PHOSTRIA, Hübner.

Phostria, Hübner, Verz. p. 130 (1827).

Phostria origoalis.

Botys origoalis, Walker, xviii. 681 (1859).

Phryganodes origoalis, Hmpsn. P. Z. S. 1898, p. 679.

Nicobars (*Rogers*); one example of this very distinct species.

The type from Celebes is in the B. M., also examples from Borneo; it has not been previously recorded from the Indian Region.

GENUS ANTENNODES, nov.

Palpi upturned, reaching vertex of head, second and third joints conically scaled and tapering to apex, frons rounded; antennæ of male with the basal joint greatly dilated and bearing tufts of hair, the base of shaft excised, the patagia short; abdomen long: fore wings with veins 3, 4, and 5 from angle of cell, 7 curved: hind wings with the cell short, veins 3, 4, and 5 from angle of cell, 6 and 7 from upper angle, 7 anastomosing with 8. Corresponds to Section II. of Hampson's genus *Phryganodes*, erected by Guenée for a South-American insect, differing in many characteristics from the Eastern forms.

Type, *radicalis*, Walker.

Antennodes radicalis.

Botys radicalis, Walker, xxxiv. 1417 (1865).

Phryganodes radicalis, Hampsn. P. Z. S. 1898, p. 678.

Port Blair, Andamans; three examples.

There is an example from the Andamans in the B. M.; not previously recorded from the Indian Region. The type from N. Guinea is in Mus. Oxon.; two from Ceram and two from Sarawak are in the B. M.

Subfamily *DICHOCROCINÆ*.*Dichocrocis veisealis*, nov.

♂. Of a uniform pale luteous colour; palpi pure white, black above. Wings with the lines and spots black-brown: fore wings with a basal dot, followed by a subbasal short line, a small spot in the middle of the cell, a large spot with a white centre at the end; ante- and postmedial transverse lines each commencing from a spot on the costa, both more or less crenulated, the former curving slightly outwards, the latter bent outwards above the middle and then inwards in the form of a square and then straight to the hinder margin; these lines are continued across the hind wings, the outer one in a sinuous form: outer margin of both wings with a little brown suffusion; cilia luteous white with brown tips.

Expanse of wings 1 inch.

Khasia Hills; common.

There are two examples from Sikhim and one from the Khasia Hills with *D. megillalis*, Walker, in the B. M. drawer 29; but it is quite distinct from that form. I have a series of each: *megillalis* is a larger insect with a prominent brown patch in the middle of the fore wings, this form never has; in the former the palpi are dark brown, in this form they are pure white, and the cell-spot is short and not lunular as in that form, in which also the outer line of the fore wings is deeply indented in its curved portion.

Nacoleia gratalis.

Botys gratalis, Led. Wien. ent. Mon. vii. p. 475, pl. xi. fig. 18 (1803);

Snellen, Tijds. voor Ent. xxvi. pl. viii. figs. 2, 2 a (1883).

Goniorhynchus gratalis, Hmps. (part.), P. Z. S. 1898, p. 706; Swinhoe (part.), Cat. Het. Mus. Oxon. ii. p. 486 (1900).

Nacoleia gratalis, Swinhoe, Ann. & Mag. Nat. Hist. (7) viii. p. 137 (1901).

Flores, in Mus. Oxon.

I point this out, because it is, in so far as I have been able to ascertain, the only example of Lederer's *gratalis* in any collection in this country (the type of which came from Amboina): Dr. Dixey has very kindly examined it and says, in reply to my enquiries, "under *Goniorhynchus gratalis* there is one specimen from Flores, one from Khasia Hills, and three from Cherra Punji; the Flores specimen, though generally resembling the rest, shows slight differences in marking; it has no antennæ, these having been broken off close to the head; its palpi correspond with Snellen's figure, while those of the others do *not*; the antennæ of the others show no spine, as that figured by Snellen."

Subfamily *SYLEPTINÆ*.*Sylepta paucinotalis*.

Notarcha paucinotalis, Warren, Ann. & Mag. Nat. Hist. (6) xviii. p. 166 (1896).

Sylepta nigriscriptalis, Hmps. (part.), P. Z. S. 1898, p. 725.

Khasia Hills ; six examples.

There are two examples in the B. M. from the Khasia Hills, with a coloured figure of Warren's *nigriscriptalis* from Queensland, from which it is quite distinct.

Sylepta desmialis.

Nagia desmialis, Walker, xxxiv. 1320 (1865).

Sylepta quadrimaculalis, Hmps. (part.), P. Z. S. 1898, p. 724 ; Swinhoe (part.), Cat. Het. Mus. Oxon. ii. p. 495 (1900).

Botys quadrimaculalis, Brem. Motsch. Ent. p. 37 (1860) (preocc.).

Sylepta inferior, Hmps. P. Z. S. 1898, p. 724.

Chalcidoptera incomitata (♂ only), Swinhoe, Ann. & Mag. Nat. Hist. (7) viii. p. 25 (1900).

Khasia Hills ; several examples.

I described the male of this form as *Chalcidoptera incomitata* by mistake, being misled by a coloured figure in my collection of the female of that species, which I had described in Ann. & Mag. Nat. Hist. (6) xiv. p. 205 (1894), and Sir George Hampson sunk it to *Sylepta quadrimaculalis*, Kollar, in Journ. Bo. Nat. Hist. Soc. xv. p. 216 : but I have since received females of this form from the Khasia Hills and find them to be identical with *quadrimaculalis* of Bremer, which was rechristened *inferior* by Hampson. Having received an identical female from Padang, Sumatra, I thought it advisable to have it compared with Walker's type of *desmialis*, a female from Sarawak, which is in Mus. Oxon. : I therefore sent the Sumatran example and a female from the Khasia Hills to Dr. Dixey at Oxford, whose verification can be relied on, and he replies that my specimens are identical with Walker's type of *Nagia desmialis* ; it is much like Kollar's insect from N. India, but is about half the size and darker in colour, and the prominent white spot at the end of the cell of fore wings and the dot in the middle of the cell are wanting, though in one example there are traces of them. There are several examples in the B. M. from Japan.

Subfamily *MARGARONINÆ*.*Agathodes sumatralis*, nov.

♂. Differs from *A. ostentalis*, Geyer, in its brow

coloration, the medial oblique band of the fore wing is narrower, does not expand on the hinder margin, and is dark brown, instead of pinkish red as in that species: it differs from *A. modicalis*, Guen., in its white hind wings, the latter having blackish-brown hind wings, and the entire fore wings suffused with brown: the markings are somewhat similar to those of *ostentalis*, but *sumatralis* can at once be separated by the great difference in colour, there being an entire absence of the pinkish-red band and stripes of that species.

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

Padang, Sumatra; six examples.

There is an example in the B. M. from Padang with *A. ostentalis*.

Margaronia salmenalis, nov.

♂. Palpi dark chocolate-brown, silvery white beneath; head, collar, and fore wings bright chocolate-brown; patagia and abdomen greenish grey, stripe down the middle of thorax chocolate-brown, end of the abdomen and anal tuft ochreous grey: fore wings with an elongated, triangular, silvery-white patch, its lower portion extending from below the middle of the cell to one third before outer margin on vein 2, then upwards to vein 6, where it runs outwards in a short streak, its upper edge running just below the cell; the costal space somewhat pale; there is a row of dark chocolate lunular marks outside the outer edge of the white triangular space and another row of similar marks parallel with it: hind wings silvery white; costal space tinged with pale chocolate and a broad uniform chocolate-brown marginal border, including a dark band just outside the outer edge of the white portion: cilia of fore wings brown, of the hind wings silvery white: fore tibiæ pale chocolate, tarsi and mid and hind legs white.

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

Khasia Hills; seven examples.

Allied to *M. lacustralis*, Moore, similarly shaped, markings somewhat similar, but that species has the white patch of the fore wings disjointed in the middle.

GENUS TELESPASTA, nov.

Differs from the genus *Pygospila*, Guen., in the hind wing of the male having vein 8 widely separated from 7 and joined to it by a bar a little beyond the end of the cell; 6 much bent downwards, the veins beyond the cell prominently roughly scaled.

Type, *T. cuprealis*, Swinhoe, Trans. Ent. Soc. 1882, p. 19, pl. i. fig. 4.

It forms Section II. of Hampson's genus *Pygospila*.

Subfamily PYRAUSTINÆ.

Isocentris rubralis, nov.

♂. Of a uniform ochreous-red colour: hind wings with the costal space pure white; marginal line of both wings black and minutely crenulated, no brown suffusion, as in all the other forms of the *illectalis* group; cilia pure white; wings with the transverse lines brown, inner line evenly curved, outer line with the upper portion, on the fore wings, evenly curved as in *opheltesalis*, Walker, not produced to an angle as in *illectalis*; top of head white, palpi white beneath; abdomen scarlet-pink; underside of body and legs white.

Expanse of wings $\frac{8}{10}$ inch.

Khasia Hills; seven examples.

Isocentris minimalis, nov.

♂. Dark orange-red: both wings with the outer margin suffused with brown, and with a thick black marginal line, its outer edge minutely crenulated, cilia pure white, some brown suffusion in the lower half of the cilia of fore wings; transverse lines brown, the inner line evenly curved, the outer line with a slight inward curve below the costa of the fore wings, before it begins to bend inwards below the end of the cell: abdomen red; body below, legs, and wings dull brownish ochreous: fore wings with the upper and outer portions suffused with black.

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

Sarawak, Borneo; one example.

The smallest example in the genus I have yet seen; much smaller than *nudilinea*, Hampsn., a perfectly good species, though sunk by Hampson to *equalis*; I have many examples of both.

Monocrocis habisalis.

Botys habisalis, Walker, xviii. 702 (1859).

Crocidophora habisalis, Hampsn. P. Z. S. 1899, p. 193.

Khasia Hills; several examples.

Type from Sarawak in B. M.; not previously recorded from India.

Tetridia murinalis, nov.

♂. Of a uniform dark greyish mouse-colour; palpi and collar below white; antennæ and top of head orange-ochreous, fore tibiæ banded black and white, mid and hind legs mouse-colour, lateral tufts on abdomen black: fore wings with a dark lunular mark at end of cell; both wings with the lines indicated as in *caletoralis*, Walker, but hardly distinguishable; costa of fore wings faintly tinged with ochreous, marginal line dull ochreous with black points, cilia dull ochreous with a glaucous sheen; on the underside the wings are coloured as above without any markings.

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

Kinikunang, Neu-Pommern; one example.

Of the shape of *T. caletoralis*, Walker, = *vinacealis*, Moore, much larger and of a perfectly distinct and new type.

GENUS APHYTOCEROS, Meyrick.

Aphytoceros, Meyrick, Trans. Ent. Soc. 1884, p. 320.

Aphytoceros grossalis.

Botys grossalis, Guen. Delt. et Pyral. p. 327 (1854).

Polygrammodes grossalis, Hmps. P. Z. S. 1899, p. 198.

Port Blair, Andamans; one example.

The type came from Java; not previously recorded from the Indian Region.

Pachyzancla miniatalis, nov.

♂ ♀. Palpi dark pink-brown, pure white beneath, and pectus white; head, body, and fore wings dark brick-red strongly tinged with pink, a black spot in the cell and a lunule at the end; no visible antemedial line; postmedial line brown, crenulated, from costa at one fifth from apex, curving outwards slightly at first, then nearly straight to the hinder margin, a little beyond the middle: hind wings dark blackish brown; both wings with dark, minute, marginal lunules, brown cilia, with a pale luteous basal line: abdomen blackish brown; underside pale pinkish grey, with an obscure discal line across both wings.

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

Padang, Sumatra; one pair.

The discal line of fore wings is shaped somewhat as in *P. ustulalis*, Hmps., from Ceylon, which I have also from the Khasia Hills, but that is a smaller insect with both wings of a purplish-brown colour; the colour of the fore wings is

more like that of *P. intensalis*, Swinhoe, from the Khasia Hills, but of a much brighter red.

Cybolomia pentadalis.

Cybolomia pentadalis, Led. Verh. z.-b. Ver. Wien, 1855, p. 217, pl. iii. fig. 13; Hmpsn. P. Z. S. 1899, p. 229.

Karachi, November 1885; one example.

The type came from Syria; I have it from Bushire: not previously recorded from India.

Pionea albifimbrialis.

Botys albifimbrialis, Walker, xxxiv. 1446 (1865).

Pionea albifimbrialis, Hmpsn. P. Z. S. 1899, p. 246.

Khasia Hills; one example.

Type from Java in B. M., also from Sumatra and Formosa; not previously recorded from India.

Tegostoma disparalis.

Æschremon disparalis, Herr.-Schäff. Schmett. vi. p. 140, figs. 134-135 (1864).

Tegostoma disparalis, Hmpsn. P. Z. S. 1899, p. 277.

Karachi, May 1886; one example.

The type came from Armenia. I took one at Kandahar in November 1880, recorded in Trans. Ent. Soc. 1885, p. 353, but it has not previously been recorded from India.

XXXVII.—*Preliminary Descriptions of Two new Species of Carida from the West Coast of Ireland.* By STANLEY W. KEMP, B.A., Department of Agriculture, Fisheries Branch, Dublin.

THE two species here described were caught in deep water by the S.S. 'Helga,' Fishery Patrol Cruiser of the Fisheries Branch, Department of Agriculture and Technical Instruction for Ireland.

Leontocaris is a genus only founded last year for the reception of a species taken in South African waters. The occurrence of two species of such a highly specialized genus in such widely distant localities is of considerable interest.

Ægeon Brendani, of which several specimens were trawled in 320-370 fathoms, is closely allied to *A. cataphractus*,

Olivi, a species which is comparatively abundant in the Mediterranean at depths of 20 or 30 fathoms.

The genera of the Crangonidæ are, as all who have studied them will admit, in a deplorable state of confusion. Ortmann and, more recently, Stebbing have done much to evolve order out of chaos, but the classification, even of the species occurring off our own coasts, is still far from satisfactory.

Stebbing has pointed out* that *Pontocaris*, Sp. Bate, is a synonym of *Ægeon* (type sp. *cataphractus*), which is distinct from most if not all other genera of Crangonidæ by the fact that the inferior extremities of the gills are turned forwards, the whole gill being C-shaped.

This feature, however, is not present in the two British species, *sculptus*, Bell, and *fasciatus*, Risso, which have hitherto been placed in this genus. It may also be mentioned that the first trunk-legs of these two species do not bear at their base the small exopod which is present in *cataphractus*.

I would suggest that, at any rate until the genera have been fully revised, *sculptus* and *fasciatus* should be referred to *Philocheras*, Stebbing (nom. nov. vice *Cheraphilus*), for the distinction as to the number of branchiæ, which has been put forward as separating *Ægeon* and *Philocheras*, seems to be based on a misunderstanding.

The presence or absence of an exopod at the base of the first pair of trunk-legs is a characteristic which has rarely been taken into account by those who have treated of this family; it should be noted that although Alcock has stated † that no such exopod exists in the genus *Pontophilus*, it is nevertheless present in *P. spinosus* (type sp. of genus) and also in *P. norvegicus*.

The British genera of Crangonidæ may be thus defined in tabular form:—

1.	{ Second pair of trunk-legs simple.	1. <i>Sabinea</i> .
	{ Second pair of trunk-legs chelate, 2.	
2.	{ Second pair of trunk-legs about equal in length to first	2. <i>Crangon</i> .
	{ Second pair of trunk-legs shorter than first, 3.	
3.	{ Second pair of trunk-legs scarcely one third the length of first	3. <i>Pontophilus</i> .
	{ Second pair of trunk-legs about three quarters the length of first, 4.	
4.	{ Inferior apices of gills turned forwards, small exopod at base of first pair of trunk-legs	4. <i>Ægeon</i> .
	{ Inferior apices of gills turned backwards, no exopod at base of first pair of trunk-legs	5. <i>Philocheras</i> .

* Stebbing, 'South African Crustacea,' pt. i. p. 48 (1900).

† 'Descrip. Cat. Macrura in Indian Museum,' p. 114 (1901).

*Ægeon Brendani**, sp. n.

This species closely resembles *A. cataphractus*, from which it may be distinguished by the spinulation of the carapace and telson and the shape of the antennal scale. The whole animal is, moreover, much more slender and the sculpture is not so coarse.

There are seven longitudinal carinæ, represented by rows of teeth, on the carapace; the middle carina is straight, the others more or less curved. There are four sharp teeth, which point forwards, on the middle carina, the penultimate being the longest. The first lateral row bears six (rarely seven) sharp teeth; the posterior four are not semiobsolete, as is the case in *cataphractus*. The second lateral carina has eight teeth, the five posterior being small and obscure; and the third lateral carina consists of twelve blunt spinules, anterior to which is a sharp spine.

The outer edge of the antennal scale is concave in *Brendani*, whereas in *cataphractus* it is convex, the whole scale being more or less ovate.

The telson is longer than the inner uropods and is dorsally grooved; it terminates in a very sharp point, on each side of which in perfect specimens are three long setæ. Two pairs of dorsal spinules are also present on the telson.

As in *cataphractus*, the inferior extremities of the gills turn forwards, and a small setose exopod is present at the base of the first pair of trunk-legs.

The type specimen measures 32 mm. from the tip of the eyes to the tip of the telson; the other six specimens are between 23 and 30 mm. in length. All were caught by trawling about 50 miles W. by N. of Inishtearaght Lighthouse, Co. Kerry, in 320 to 370 fathoms.

Leontocaris † *lar*, sp. n.

Carapace furnished with a dorsal carina on its anterior half, which is produced into three teeth, the anterior being the largest and the posterior the smallest.

The rostrum is longer than the carapace and reaches slightly beyond the tips of the antennal scales; it is armed above with ten long sharp teeth, which decrease regularly in size from behind forwards.

* St. Brendan, the navigator, who travelled about the west coast of Ireland in the sixth century.

† For generic description, see Stebbing, 'South African Crustacea,' pt. iii. p. 98 (1905).

Below, the rostrum bears thirteen teeth similar to those on the upper margin; the two posterior teeth are not so closely approximated to each other as are the rest.

The character of the rostral dentition alone easily distinguishes this form from *L. Paulsoni*, the only known species of the genus.

The branchiostegal spine is flanked by a short carina, which is not half the length of the carapace.

The abdominal somites are all dorsally rounded; the third is not posteriorly toothed.

The telson is hardly so long as the uropods and bears four pairs of lateral spines; the apex is broadly rounded and furnished with four spines, the central pair being the longer.

The eyes appear to be somewhat larger than in *L. Paulsoni*. The peduncle of the first antennæ does not quite reach the tip of the antennal scale, and the outer flagellum is about the same length as the peduncle. The antennal scale is three times as long as broad, with the distal part of its outer edge armed with about seventeen sharp teeth.

The epipod of the first maxillipede is smaller than is the case in *L. Paulsoni*, and the outer lobe of the second maxilla has a slightly different outline to that which Stebbing has figured for the type species of the genus; the other oral appendages are practically the same.

The first pair of pereopods bear small chelæ, while the second are asymmetrical and have the carpus divided into four articulations. Of this second pair, the chela on one side is small, although larger than that of the first pair, while on the other it is remarkably long and furnished with a peculiar flattened dactylus. Both chelæ are of almost precisely the same shape as in *L. Paulsoni*. In the type specimen the large chela is on the left side, while in the second specimen it is on the right.

The two specimens each measure about 21 mm.; they were caught in a tow-net fastened to a beam-trawl, in 500 fathoms, outside the "Porcupine Bank," lat. 53° 07' N., long. 14° 50' W. The bottom was stony, and large numbers of Alcyonarians and *Lophohelia* were brought up in the trawl.

I hope to publish shortly, in the 'Report of the Sea and Inland Fisheries of Ireland,' a full account of these two species, with figures.

XXXVIII.—*Synonymic Notes on Musca marginalis, Wied., and the Genus Pycnosoma, Br. & von Berg.* By ERNEST E. AUSTEN.

LIKE many another much-collected species, *Musca marginalis*, Wied., one of the commonest and most striking of African Muscids, has had the misfortune to be much and variously described. In 1894, however, Brauer and von Bergenstamm fixed its systematic position by making it the type of their new genus *Pycnosoma*, the synonymy of which is as follows:—

PYCNOSOMA, Br. & von Berg.

Pycnosoma, Brauer and von Bergenstamm, Denkschr. math.-naturwiss.

Cl. k. Akad. Wiss. Bd. lxi. (1894) p. 623.

Cosmina, Robineau-Desvoidy, Essai sur les Myodaires (1830), p. 423.

Chrysomya, Robineau-Desvoidy, *ibid.* p. 444 (*pro parte*).

Somomyia, Rondani, Mem. dell. Accad. dell. Scienze dell' Istituto di Bologna, t. xii. (1861) p. 44, note.

Paracompsomyia, Hough, Proc. Acad. Nat. Sci. Philadelphia, 1898, p. 184.

Brauer and von Bergenstamm (*loc. cit.*) defined the genus *Pycnosoma* as—"Callophorinæ, which have sternopleural bristles 1, 1; which exhibit a row of (often fine) hypopleural bristles, and in which the bristles of the dorsum of the thorax are frequently not developed. Female with orbital bristles, but these often small. In the male the upper facets of the eyes are frequently enlarged. Type *marginalis*, Wied.: Africa." Subsequently (Sitzgsber. k. Akad. Wiss. math.-naturw. Cl., cviii. Bd., Abth. i. (1899) pp. 496-497), Brauer gave the following further characteristics of *Pycnosoma*:—"Face hairy; body blue or green, metallic; facial angles moderately high above the oral margin, clypeus less prominent [than in *Thelychæta*, Br. & von Berg.], facial keel small or absent. Third longitudinal vein bare or sometimes hairy (Eastern hemisphere, India &c., Africa)."

Cosmina, Rob.-Desv., must be cancelled as insufficiently characterized. Of the three species described (*loc. cit.*) by Robineau-Desvoidy, one is mentioned below as possibly identical with *Pycnosoma marginale* (*Musca marginalis*), Wied., while the other two are probably also synonyms of one or other of Wiedemann's species described under *Musca* and now assigned to *Pycnosoma*.

Chrysomya, Rob.-Desv., is a hybrid genus and is also insufficiently characterized.

Somomyia, Rond., appears never to have been described. The reference given above is apparently that alluded to by Rondani himself, Dipt. Ital. Prodr. vol. iv. (1861) p. 9; but on turning to the work in question we find that the genus *Somomyia* is merely alluded to in an extract from a letter from Rondani to Prof. Giuseppe Bertolini, which is quoted by the latter in a note to a paper on the Diptera of Mozambique: there is nothing whatever in the shape of a description.

The following is the synonymy of *Pycnosoma marginale*, Wied.:—

Pycnosoma marginale, Wied.

Musca marginalis, Wiedemann, Auss. Zw. Ins. (1830) p. 395.

? *Cosmina arabica*, Robineau-Desvoidy, Essai sur les Myodaires (1830), p. 424.

Chrysomya regalis, Robineau-Desvoidy, *ibid.* p. 449.

Somomyia marginalis, Bertolini, Mem. dell. Accad. dell. Scienze dell' Istituto di Bologna, t. xii. (1861) p. 44.

Paracompsomyia nigripennis, Hough, Proc. Acad. Nat. Sci. Philadelphia, 1898, pp. 184-186: figs. of details in text.

Pycnosoma marginale, Austen, Journal of the Royal Army Medical Corps, June 1904, pp. 13-14, pl. ii. fig. 4.

Paracompsomyia nigripennis, Adams, Kansas University Science Bulletin, vol. iii. no. 6 (Oct. 1905), p. 201.

Pycnosoma marginale is very widely distributed in Africa, and even ranges eastward as far as Quetta; westward the writer has met with it in St. Vincent, Cape Verde Islands. The British Museum collection includes specimens from the following localities:—Sierra Leone; Congo Free State; Cape Colony; Natal; Transvaal; N.E. Rhodesia; Uganda; Abyssinia; Sokotra; Muscat, Arabia; and Quetta. Dr. A. Donaldson Smith took it in Somaliland on Aug. 23, 1894*, and Colonel Yerbury found it at Aden.

As pointed out by Bezzi (Bull. Soc. Ent. Ital. xxxiii. (1901) p. 23), *Musca chloropyga*, Wied., and *Somomyia cuprinitens*, Rond., also belong to *Pycnosoma*. *P. cuprinitens* was described from Keren, Abyssinia. The synonymy of *Pycnosoma chloropyga*, Wied., is as follows:—

Pycnosoma chloropyga, Wied.

Musca chloropyga, Wiedemann, Auss. Zw. Ins. ii. (1830) p. 400.

* Hough, *loc. cit.* p. 184.

? *Chrysomya buccalis*, Robineau-Desvoidy, Essai sur les Myo-laires (1830), p. 448.

Pycnosoma chloropyga, Austen, Journal of the Royal Army Medical Corps, June 1904, p. 14, pl. ii. fig. 5.

Paracompsomyia Houghi, Adams, Kansas University Science Bulletin, vol. iii. no. 6 (Oct. 1905), p. 201.

This species, the type of which was from the Cape of Good Hope, seems to be essentially a South-African form, but, in addition to a series of examples from Cape Colony, the British Museum possesses two specimens from the East Africa Protectorate (*C. S. Betton*). The types of Adams's description are stated to be from Rhodesia.

Other African species in the British Museum collection belonging to the genus *Pycnosoma* are *Musca megacephala*, Fabr. (Ent. Syst. iv. p. 317), *Musca putoria*, Wied. (Auss. Zw. Ins. ii. p. 403), and *Musca elara*, Walk. (List Dipt. Ins. in Coll. Brit. Mus. iv. (1849) p. 870). Of *Pycnosoma putorium*, Wied., we have a series of specimens from Sierra Leone (Aug. 1899, *E. E. Austen*; and Aug. 1904, *Major F. Smith, R.A.M.C.*); Lagos (*Dr. H. Strachan*); Old Calabar, Nigeria, May 1900 (*Dr. H. E. Annett*); and Lutete, Congo Free State, Nov. 12, 1903 (*Drs. Dutton, Todd, and Christy*). Of *P. elara*, Walk., we have specimens from the "Interior of S. Africa" (*Lord Derby*); "S. Africa" (*Dr. A. Smith*); Leopoldville, Congo Free State, Dec. 10, 1903 (*Drs. Dutton, Todd, and Christy*); and Kafu River, near Mruli, Uganda, Sept. 1903 (*T. Grant*).

Lucilia fasciata, Macq. (Dipt. Exot. ii. 3, p. 144, 1843), from the Cape of Good Hope, and *Dexia hypsa*, Walk. (List Dipt. Ins. in Coll. Brit. Mus. iv. (1849) p. 866), locality unknown, also belong to the genus *Pycnosoma*, as doubtless do other species described by Wiedemann and Macquart under *Musca* and *Lucilia* respectively. In addition to the species mentioned above, Adams (*loc. cit.* p. 202) also describes from Rhodesia *Paracompsomyia splendida* (*sic*) and *P. verticalis*; in all probability these will prove to be identical with species of *Pycnosoma* previously described by Wiedemann or Macquart under the genera mentioned.

The Oriental species of *Pycnosoma* in the British Museum collection have yet to be studied; but *Lucilia flaviceps*, Macq. (Dipt. Exot. ii. 3, p. 145), of which we possess three specimens from India, must be transferred to this genus, as also *Musca remuria*, Walk. (*op. cit.* iv. p. 871), from China; of the latter species the Museum has recently received two specimens from Tanghai, Hong Kong, "sea-level," June 30, 1899 (*C. Ford*).

The habits of the species of *Pycnosoma* are similar to those of the well-known "green-bottle flies" (*Lucilia*), and there can be little doubt that *P. marginale* and *P. chloropyga*, in addition to *Musca domestica*, L., were partly responsible for the spread of enteric fever among the British Army during the late war in South Africa*.

British Museum (Natural History),
Cromwell Road, S.W.
Jan. 30, 1906.

XXXIX.—*On the Freshwater Medusa Limnocoñida tanganicæ and its Occurrence in the River Niger.* By EDWARD T. BROWNE, Zoological Research Laboratory, University College, London.

IN the collection brought back by the late J. S. Budgett from the delta of the Niger in 1903 there were five specimens of a Medusa taken in a freshwater lagoon near Assay, on the Forcados River, one of the western branches of the Niger, and about 102 geographical miles from the sea. The occurrence of a Medusa in the Niger was, however, first noticed by Dr. Tautain in 1888. He caught specimens near Bamakou, in the French Soudan, but failed to preserve them. As he was unable to carry out his intention of obtaining a fresh supply, a description of the Medusa was never published, but only the fact of its occurrence (1).

The Medusa found by Budgett is, I am sure, *Limnocoñida tanganicæ*, Böhm. It has, however, many more tentacles and sense-organs than are mentioned by Günther (2) in the original description of the species, and it comes nearer to the description given by Gravier (3) of the specimens found in the Victoria Nyanza.

The presence of *Limnocoñida tanganicæ* in the Niger is, I think, more interesting than the discovery of a new freshwater species, as the Medusa is found in a river far away from the Great African Lakes.

The occurrence of freshwater Medusæ in a river which has direct communication with the sea naturally suggests the idea that the Medusæ have gradually migrated up the river and

* See E. E. Austen, "The House-Fly and certain Allied Species as Disseminators of Enteric Fever among Troops in the Field," *Journal of the Royal Army Medical Corps*, June 1904, pp. 1-16, pls. i. & ii.

have changed their habitat from salt to fresh water, just as the Hydroid *Cordylophora* has done. Even if the change of habitat originally took place in the Niger, and not in Lake Tanganyika, we should still have to find the means of conveyance across the African continent. Mr. Boulenger, in his Presidential Address to the Zoological Section of the British Association at its meeting last year in South Africa, appears to me to have clearly shown the road ('Nature,' Aug. 1905, p. 417). Palæontological evidence points to the fact that a sea extended over the greater part of Africa above the Equator during a part of the Eocene period. "On this retreating northwards after the Lutetian period, Medusæ became land-locked and gradually adapted themselves to fresh water." With a sea stretching across the Soudan one can account for the presence of *Limnocoñida* in the Niger and in the Great Lakes. It removes the need to speculate about the Medusæ ascending the Niger from the Atlantic and migrating across Africa.

Our knowledge of the life-history of *Limnocoñida* is due to Mr. Moore's observations in Lake Tanganyika. In his "Tanganyika Problem" he states that the sexually mature individuals swarm during September and October. The ova and spermatozoa are evacuated, and he found "numbers of small planulæ and small Medusæ which were growing rapidly; but these showed no tendency to form buds during the autumn, and had, without doubt, been formed from the fertilized ova of the sexual forms." Mr. Moore states clearly that the Medusa reproduces only by direct development, and has no intervening hydroid stage.

It appears to me that the weakest part in the chain of evidence for direct development is the connexion between the planulæ and the young Medusæ. Granting that the planulæ belonged to the Medusa and not to some other animal, there is no mention made of the very important stages between the planula stage and the young fully-formed Medusa. These are just the stages of which we require a full account, as they are likely to give a clue to the relationship of this peculiar Medusa to other members of the group.

The presence of young Medusæ late in the year, when the sexual adults are breeding, is a common occurrence among those Medusæ of our seas which belong to species known to have an intervening hydroid stage. These young Medusæ are late arrivals, either from a hydroid or from a Medusa which reproduces asexually by gemmation, and they usually die off without reproducing.

My knowledge of the habits of our marine Medusæ leads me to believe that *Limnocnida* has a hydroid stage in its life-history. So far as I am able to foresee, there should be no great difficulties to be overcome in rearing the fertilized ova of *Limnocnida* in small bell-jars. It would be a much quicker method than that of trying to find the hydroid in the lakes. The hydroid may have a special habitat which might take many years to find. If, on the other hand, the Medusa reproduces by direct development only, one would be able by rearing the ova to observe and preserve all the stages.

Limnocnida still remains outside any system of classification. It looks at first sight a Narcomedusa, on account of the shape of the stomach and the position of the gonads; but I do not think that it has any connexion whatever with the Narcomedusæ. Whether it is an Anthomedusa or is closely related to the Anthomedusæ should be decided when its development and life-history are definitely and clearly known. At present I am inclined to look upon *Limnocnida* as a specialized Anthomedusa. I have promised to give a description, with figures, of the specimens from the Niger in the "Budgett Memorial Volume."

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5th February, 1906.

XL.—*Descriptions and Records of Bees.*—IX.

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

Andrena (Trachandrena) perforatella, sp. n.

♀.—Length about 8 mm.

Black, with the middle and hind tarsi, and the hind tibiæ, clear red; pubescence greyish white, the hair at apex of abdomen golden; wings strongly yellowish, the stigma and nervures clear ferruginous; flagellum dusky reddish beneath. Process of labrum very broad, truncate; clypeus exceedingly densely punctured, with no smooth line; facial foveæ, seen

from above, white, occupying about two thirds of the distance between eye and antenna, separated from eye only by a narrow shining band or line, and ending at about the level of the antennæ; mesothorax with very large and deep, widely separated punctures; area of metathorax with large coarse rugæ; abdomen shining, with small but distinct punctures, the bands represented only by patches of white hair at sides of segments 2 to 4; second segment in middle depressed more than one half, but not as much as two thirds.

The sculpture of the head and thorax practically agree with those of *A. Mariæ*, Rob., but, apart from the colour of the abdomen, legs, and caudal fimbria, *perforatella* is a smaller insect. The sculpture of the area is much coarser than in *A. sphaerocodina*.

Hab. Boulder, Colorado, June 11, 1905 (*W. P. Cockerell*).

The following table separates this species from its nearest allies:—

Mesothorax between the punctures shiny; tarsi dark; abdominal segments 2 and 3 with conspicuous lateral patches of white hair	<i>multiplicata</i> , Ckll.
Mesothorax between the punctures dullish	1.
1. Tarsi of middle and hind legs, and tibiæ of hind legs, clear red: size smaller	<i>perforatella</i> , Ckll.
Tarsi dark reddish or blackish: size larger	2.
2. Abdomen nearly always red; stigma red	<i>Mariæ</i> , Rob.
Abdomen always black; stigma dark	<i>grandior</i> , Ckll.

Andrena (Pterandrena) Gardineri, sp. n.

♀.—Length 10–11 mm.

Black, the thorax dull and granular, the abdomen shining and punctured; pubescence greyish white, rather long and dense on thorax above; abdominal segments with the hind margins hyaline, but covered by very conspicuous continuous white hair-bands, that on the first a little weakened in the middle; apical fimbria pale yellowish. Head ordinary; process of labrum strongly bidentate; clypeus shining, with strong punctures, distinctly separated in the middle; no dark hairs about head; apical six joints of flagellum red beneath; foveæ, seen from above, greyish white, rather narrow, not occupying more than half of distance between eye and antennæ, not separated from eye, and quite short, scarcely reaching level of antennæ; mesothorax quite dullish, with small but distinct punctures; area granular; tegulæ hyaline, with a reddish spot. Wings a little dusky; stigma small and narrow, light ferruginous, margined with darker,

nervures ferruginous; third s.m. narrowed more than half to marginal. Legs dark, the small joints of the tarsi reddish; basal joint of middle tarsus broad and flat, with light golden hair beneath; hind legs with a copious, beautifully plumose scopa, which is filled with bright orange pollen, presumably of one of the Compositæ; abdomen rather broad.

Allied to *A. Krigiana*, Rob., and *A. lauracea*, Rob., but considerably larger. In Viereck's table of north-western species it runs nearest to *A. nudimediocornis*, Vier., but it is not that. In Bruner's table it runs nearest to *macilenta*, Prov., and *trizonata* (Ashm.), but it is neither of these.

Hab. Boulder, Colorado, June 4, 1905, two (*W. P. Cockerell*).

Dedicated to the memory of Professor John Gardiner, who was Professor of Biology at the University of Colorado.

Andrena lupinorum, sp. n.

♀.—Length a little over 13 mm.

Black, robust, of the group of *A. Carlini*; hair of thorax above, tubercles, and sides of metathorax fox-red, especially bright on tubercles and scutellum; hair of pleura rusty black; of head pale reddish, blackish at sides of occiput; no black hair on face, but the scape has dark fuscous hair; abdomen very shiny, with piliferous punctures, the very scanty pubescence black, the caudal fimbria heavy and purple-black; second segment depressed hardly over a third, with slight purple tufts in the middle, and a faint longitudinal keel; legs black, with black hair, that on anterior femora behind pale ferruginous; hair on inner sides of basal joints of tarsi black; spurs black, tipped with reddish; scopa coarse, that on hind femora and metathorax especially filled with creamy-white pollen; tegulæ with a red band posteriorly. Wings strongly smoky; stigma very small and narrow, ferruginous, the nervures fuscous; first r. n. joining second s.m. well beyond the middle. Process of labrum very broad, broadly truncate; clypeus shiny, nude, very densely punctured, and with a median raised line; flagellum faintly reddish beneath; third antennal joint longer than 4+5; facial foveæ, seen from above, light reddish, very broad, occupying practically all the space between eye and antenna, not separated from eye-margin, ending a little above level of top of clypeus; face on each side of clypeus with well-separated punctures, conspicuously of two sizes, on a shining ground; mesothorax dull, but well-punctured; area of metathorax broadly triangular, very coarsely granular.

This has nearly the colours of *A. perimelas*, Ckll., but it is smaller, and the hair of the head is quite differently coloured; it is something like *A. perplexa*, but the hair of legs is quite a different colour, &c.; it differs at once from *vicina* in the colour of the thoracic hair, and from *Carlini* it is easily separated by the area of metathorax more coarsely granular, and broader above, colour of hair at sides of metathorax, &c. The colour of the thoracic hair recalls *A. Halli*, but it is not that species.

Hab. Boulder, Colorado, at flowers of *Lupinus*, June 27, 1905 (*Cockerell*).

Andrena pyrura, sp. n.

♀.—Length about 11 mm.

Black; hair of head and thorax long, greyish white, with a slight creamy tinge on scutellum, &c.; that on legs mostly yellower, on inner side of basal joints of tarsi light golden fulvous; abdomen without hair-bands, but with some fine white hair, which in certain lights shows up as patches at the sides of the segments (very much as in *A. Wilmattæ*); caudal fimbria very bright golden red; tegulæ piceous with a reddish spot. Wings yellowish, with the apical margin broadly smoky; stigma and nervures ferruginous, the stigma fairly large; first r. n. joining second s. m. about the middle; second s. m. oblique. Process of labrum very broad, subtruncate; clypeus strongly and densely punctured, with an ill-defined median line; antennæ dark, third joint conspicuously longer than 4+5; mesothorax dull, rather obscurely punctate; area of metathorax triangular, not bounded by a rim, dull and granular, with weak plications; abdomen rather shining, with small but very distinct punctures; basal joints of tarsi large and flattened; spurs light brownish. Facial foveæ, seen from above, very pale greyish, or greyish white, very broad, occupying about three quarters of the distance between eye and antenna, separated from eye only by a narrow line, ending at the level of the top of the clypeus.

Very much like *A. salicifloris*, Ckll., but the second abdominal segment is depressed much less than half, and that feebly, whereas in *salicifloris* it is depressed two thirds; the area of metathorax wholly lacks the transverse ridge posteriorly, seen in *salicifloris*; the wings are much yellower, and the sculpture of the mesothorax is entirely different. In Robertson's tables it runs as near to *corni* (= *commoda*) as anything. It is evidently near to *commoda*, but differs by the clypeus lacking a distinct median ridge,

the paler tibial scopa, darker tarsi, &c. In Bruner's table it runs to *Dunningi* and *errans*, but it is not closely related to these.

Hab. Boulder, Colorado, June 4, 1905 (*W. P. Cockerell*).

Andrena Birtwelli, Ckll., 1901.

This species was found at Ward, Colorado, July 18, 1905, visiting flowers of *Drymocallis*. As it is somewhat variable, and my original description did not allude to certain important characters, I give a new description, from the Ward material.

♀.—Length about or not quite 10 mm.

Black, with greyish-white hair, that on dorsum of thorax very pale ochreous; head broad; process of labrum rather narrow, truncate, the end thickened; clypeus with strong, rather irregularly placed punctures, and a strong smooth median ridge; antennæ dark, third joint longer than 4+5, flagellum a little reddened apically; facial foveæ broad, dark chocolate-colour, seen from above not diverging from eye-margin, ending near level of top of clypeus; mesothorax dull, with feeble punctures, in the middle it is more shining, with the punctures evanescent; scutellum shining, sparsely punctured; area of metathorax very ill-defined, dull, and granular; tegulæ very dark brownish, shining. Wings a little dusky, especially apically, stigma dull reddish, nervures fuscous; first r. n. joining second s.m. *about the beginning of its last fourth*. Legs dark, hair on inner side of basal joints of anterior and middle tarsi dark shining reddish, that on hind tarsi more fuscous; scopa on hind tibiæ short and dark chocolate-colour (the hind femora and sides of metathorax carry a large amount of very pale greenish-yellow pollen, but the tibiæ little); tuft over hind knees brown-black; the very large metathoracic scopa is shining white. Abdomen nearly nude, shining black, with no bands, and only very sparse piliferous punctures; second segment in middle depressed more than half, but feebly; caudal fimbria purplish black.

Andrena edwinia, sp. n.

♀.—Length about 13 mm.

Black, with the general appearance of the species of the *vicina* group. Hair of face, top of head, thorax above, first abdominal segment and middle of second, long, coarse, and yellowish white, of sides of occiput, hind part of cheeks, and pleura black, of lower anterior part of cheeks pallid; head

broad; clypeus shining, distinctly but sparsely punctured, the punctures of two sizes, a broad median smooth band, and near the apex a broad but shallow depression; process of labrum broad, truncate; antennæ dark, only the last joint faintly reddish, third joint only just longer than 4+5; facial foveæ, seen from above, broad, blackish, the lower part pallid, hardly departing from orbital margin, ending just below level of antennæ; supraclypeal area dull and roughened; mesothorax dull and rough, inconspicuously punctured; area of metathorax ordinary, finely roughened, dull, not plicate; tegulæ shining black. Wings quite fuliginous; stigma reddish, long and narrow, nervures fuscous; second s.m. broad, nearly square, not oblique, receiving the first r. n. beyond its middle. Legs black, the small joints of tarsi reddish; hair of legs mainly black, but the long hair on anterior femora behind is yellowish white; hair on inner side of basal joint of anterior tarsi reddish; scopa of hind femora brownish, of hind tibia black, both coarse and very abundant, carrying a large amount of very pale yellowish pollen; spurs reddish brown. Abdomen rather shining, without distinct punctures, the sides of the second and all of the following segments with coarse, but not dense, black hair; fimbria black.

In Bruner's table this runs at once to *A. impuncta*, Kirby, but differs in the colour of the thoracic hair, which is not rufescent. It is also allied to *A. Washingtoni*, Ckll., but is larger, and differs in the abundant pale hair of head, shape of process of labrum, &c. It agrees in size with *A. advarians*, Viereck, a species which has only been indicated in a table (Canad. Ent. 1904, p. 192), but the few characters given indicate a different species. It might also be compared with *A. hemileuca*, Vier., but that is said to have the scopa pale, and is only 10 mm. long.

Hab. Ward, Colorado, prox. 9000 ft., at flowers of *Edwinia americana*, July 1905, two (*T. D. A. & W. P. Ckll.*). One specimen is old, with tattered wings and abraded pubescence.

Colletes Andrewsii, sp. n.

♀.—Fully 12 mm. long.

The hair of head and thorax fulvous, very bright and abundant on scutellum, not at all mixed with black; antennæ short, black; malar space about twice as broad as long; head broad, orbits not strongly converging below; anterior coxæ with large hairy spines. Wings yellowish; stigma small, it and the nervures dark reddish. Abdomen with narrow apical

hair-bands; the disks of the segments with short hair, white in the middle of 2, giving place to black laterally, coarse and entirely black on 3 to 5; hair on segment 6 long and light fulvous; hair on inner side of tarsi light orange; claws bifid.

In all respects very closely related to *C. æstivalis*, Patton, but larger, with the pubescence more brightly coloured, the ridges on base of metathorax wider apart, the second s.m. broader, and the flagellum darker. It agrees nearly with the description of *C. Kincaidii*, Ckll., but the second s.m. is not so large as the third, the orbits converge less below, the punctures of the first abdominal segment are not so large and strong, the apical segment has pale fulvous hair; so that, with more the appearance of *Kincaidii*, the insect is actually nearer to *æstivalis*. The colour of the hair of the scutellum is suggestive of the European *C. nasutus*, Smith.

Hab. Boulder, Colorado, at flowers of *Heuchera ribifolia* in cultivation (the hind legs carry much bright red pollen), June 26, 1905 (*Cockerell*).

It was taken in the garden of Mr. D. M. Andrews, and is named after him, in recognition of his numerous botanical discoveries in the vicinity of Boulder.

Colletes opuntiae, sp. n.

♂.—Length about $8\frac{1}{2}$ mm.

Black, the pubescence white, and quite abundant on head and thorax, on scutellum largely blackish, and slightly stained with blackish on hind part of mesothorax, but not at all blackened on top of head; eyes very strongly converging below; face very densely covered with white hair; malar space very short, more than twice as broad as long; mandibles dark reddish apically; labrum with a very strong apical pit; antennæ short, like those of a female, the middle joints not longer than broad, third joint considerably longer than fifth; vertex shining, punctured; mesothorax very shiny, with large, well-separated punctures, very sparse on the disk posteriorly; scutellum shining, with large punctures; postscutellum closely punctured; area of metathorax with the usual basal quadrate spaces, these mostly longer than broad, the whole bounded posteriorly by a sharp rim; lateral faces tuberculate; legs black, with white hair, only the end of the claw-joint reddish; anterior coxæ without spines; abdomen with large, very strong punctures, well-separated on the first segment, closer on the second and third; apical hair-bands weak on the first two segments, strong on the next three; tegulæ shining black. Wings hyaline, a little dusky, nervures

and stigma dark fuscous; stigma small; b. n. falling far short of t.-m.; second s.m. higher than broad, receiving first r. n. before its middle. Agrees with the description of *C. brevicornis*, Rob., ♂, except as follows: vertex rather closely punctured; mandibles less red; nervures and stigma dark, not testaceous; tegulæ very dark, shining; apical joints of tarsi dark.

♀.—Similar, but broader; the face broader, and not so covered by hair as to hide the surface; clypeus strongly, very densely punctured, only moderately convex.

Hab. Boulder, Colorado, 1905; type ♂ at flowers of *Opuntia*, July 3 (*W. P. Cockerell*); another male, July 5; female at flowers of *Campanula*, June 27 (*W. P. Cockerell*).

The female carries pollen, presumably of the *Campanula*, having a delicate lilac tint, the grains very small. The male also has a fair amount of pollen attached to the pubescence, and may very well be a means of cross-fertilization.

This species is the western representative of *C. brevicornis*, Rob.; the differential characters are not of great importance, but sufficient to indicate a distinct species.

Colletes hydrophilus, sp. n.

♂.—Length about $10\frac{1}{2}$ mm.

Black, with white pubescence, blackish on scutellum and posterior disk of mesothorax; apical half of mandibles dark reddish; labrum with a row of pits; malar spaces very short, more than twice as broad as long; eyes strongly converging below; face densely covered with white hair; antennæ dark, long, the flagellum stout, crenulate, its joints much longer than wide; third antennal joint dull velvety black, contrasting with the pruinose appearance of the rest of the flagellum; joint 4 about or nearly as long as 2 + 3; 5 much longer than 4 (in *C. gilensis* it is only a little longer than 4); mesothorax shining, with uniformly-placed, well-separated, large and strong punctures; scutellum with close very large punctures; postscutellum with exceedingly dense, smaller punctures, and a row of roundish pits along its anterior margin; area of metathorax with a very strong transverse ridge bounding the basal area, which is divided into very large quadrate spaces by about six carinæ; lateral posterior faces shining, not much roughened, and not at all reticulate; prothoracic spines evident; tegulæ shining black. Wings hyaline, clearer (and greyish, not at all reddish) than in *C. gilensis*; stigma ferruginous, nervures rather light fuscous; b. n. nearly reaching t.-m.; second s.m. broader

than high, receiving the first r. n. at or a little beyond the middle. Legs black, with white hair, spurs and claws ferruginous; abdomen shining, with very strong, well-separated punctures, and narrow white hair-bands on the apices of the segments; last ventral segment with the longitudinal carina barely indicated.

In my table in 'Psyche,' 1905, this runs straight to *C. gilensis*, Ckll., but that is a considerably larger insect, and the sculpture of the metathorax is quite different. In Robertson's table it appears to run closest to *C. nudus*, Rob., but it is easily known from that by the very strong punctures of the abdomen. It has a very close resemblance to *C. oꝝuntia*, described above, but differs entirely in the antennæ, and otherwise in various small details.

Hab. Boulder Cañon, a few miles above Boulder, Colorado, June 26, flying over damp sand (*Cockerell*).

Colletes Kincaidii, Ckll., 1898.

Both sexes were taken at Ward, Colorado, 9000 ft., in July (*T. D. A. & W. P. Ckll.*). The female was at flowers of *Frasera*, while two males were taken at flowers of *Geranium Fremontii*. The male has never been described in full, so a description is here offered:—

♂.—Length about 9 mm.

Black, with pale yellowish pubescence, bright ochraceous, with no intermixture of black, on dorsum of thorax, light ochreous on face; labrum shining, with a distinct central pit and feeble lateral ones; malar space about as broad as long; mandibles only slightly red apically; antennæ entirely dark, long, the flagellar joints much longer than wide; flagellum stout, not crenulated; fifth antennal joint longer than fourth, fourth longer than third; prothoracic spines distinct; mesothorax shining, with large strong punctures, dense anteriorly and laterally, absent in the middle of the disk posteriorly; scutellum smooth anteriorly, otherwise with punctures like those of mesothorax; postscutellum roughened; base of metathorax with the usual transverse area, of which the cross-plications are rather numerous but irregular; apical middle (lower part of triangle) concave and very shiny; lateral faces roughened, not very shiny; tegulæ brown. Wings hyaline, a little milky, stigma very dark ferruginous, nervures piceous; b. n. a moderate distance short of t.-m.; second s.m. very broad, receiving the first r. n. beyond the middle; second r. n. with a very strong double curve. Legs black, only the claws ferruginous. Abdomen strongly punctured, and with very conspicuous pale

ochraceous hair-bands; first two segments transversely sulcate; last ventral segment smooth; ventral segments not strongly bearded laterally.

In Robertson's table runs to *C. eulophi*, Rob., but is distinguished from that by the dense strong punctures of first abdominal segment, dark posterior tarsi, &c.

This is smaller than the type male from Washington State.

Colletes phaceliae, sp. n.

♀.—Length slightly over 9 mm.

Similar to *C. salicicola*, Ckll. (with just the same abdominal pubescence, with broad white bands, and much hair at base of second segment; the same white hair on pleura and metathorax, and very light ochreous—exactly the same tint—on mesothorax and top of head), but differing thus:—clypeus with much smaller and closer punctures (in *salicicola* they are very large and sparse, except at extreme sides); malar space shorter, being about twice as broad as long; first abdominal segment, except the depressed hind margin, dull, with small well-separated punctures (very shiny in *salicicola*); black (bare) band on abdominal segment distinctly narrower than the apical hair-band, dullish, with very numerous minute but distinct punctures; apical dorsal segment black (covered with light hair in *salicicola*); second s.m. broader, receiving the first r. n. about the middle (conspicuously beyond the middle in *salicicola*). From *C. americana*, Cresson, it is readily known by the colour of the thoracic pubescence, dull surface of first abdominal segment, much darker stigma, somewhat larger malar space, and labrum with the lateral pits distinct. The anterior coxæ have a small apical hairy prominence, but nothing deserving to be called a spine; the wings are whitish hyaline (not at all yellowish); the inner claw-tooth is shorter than the outer, and arises from the middle of the claw; the hind spur is very obliquely microscopically pectinate, but with a hand-lens the appearance of a very fine ciliation is all that can be seen, and that with difficulty; the clypeus is shining, with strong punctures running in grooves, and a median depression.

In Robertson's table this runs to *C. eulophi*, Rob., but the colour of the thoracic pubescence is quite different, the posterior tarsi are black, and the abdominal hair-bands are very broad. The sculpture of the first and second abdominal segments is quite different from that of *C. salicicola geranii*, Ckll.

Hab. Ward, Colorado, 9000 ft., at flowers of *Phacelia circinata*, July (*W. P. & T. D. A. Ckll.*).

Chalicodoma cæmentaria (Meinecke).

Apis muraria nitida, Retzius, Gen. et Spec. Ins. 1783 (not *Apis nitida*, O. F. Müller, 1776).

Apis cæmentaria, Meinecke, Naturforscher, 1784, p. 208.

? *Apis bryorum*, Schrank, Enum. Ins. Austr. 1781 (not of Fabricius, 1775, which is a *Xylocopa*).

Chalicodoma muraria (Olivier), auctorum.

Halictus arapahonum, sp. n.

♀.—Belongs to *Halictus* s. str., sens. Robertson, and is allied to *H. fasciatus*, "Nyl.," Rob.*

Length about $6\frac{1}{2}$ mm.

Head, thorax, and abdomen olive-green; hind margins of abdominal segments rather broadly and conspicuously rufescent, but covered with short whitish hair, except the middle of first; base of third and fourth segments also broadly hairy, the hair having a decided yellowish tint; clypeus black, shining and very sparsely but distinctly punctured, supra-clypeal area somewhat brassy; flagellum ferruginous beneath, darker toward base; tegulæ large, colourless and transparent, except for a cream-coloured spot. Wings somewhat reddish, stigma and nervures amber-colour; second s.m. narrow, not half as broad as third; outer nervures strong. Legs black, the knees, tibiæ at base and apex, and anterior tibiæ within, and all the tarsi (except a black mark on basal joint of hind ones) ferruginous; hind spurs strongly curved at end, and with four to six short dark blunt teeth, the last two or three rudimentary. Compared with *H. fasciatus*, "Nyl.," Rob., the clypeus is larger, the punctures of front are somewhat stronger, the area of metathorax is larger (finely reticulate all over, without any plicæ), the abdomen is conspicuously broader, and the general colour is much greener. Compared with *H. meliloti*, Ckll. (which occurs at Boulder), the face is longer, with the clypeus much more produced, the tegulæ are larger, the area of metathorax is different, &c.

Hab. Boulder, Colorado, June 4, 1905 (*W. P. Cockerell*).

With a compound microscope, the area of metathorax in *meliloti* (type specimen examined) shows fine oblique grooves

* This common species of the Eastern States is no doubt the one lately separated as *H. nearcticus*, Vachal, but Mr. Crawford is confident that the earlier name *H. Provancheri*, D. T. (*constrictus*, Prov. not Sm.), is applicable to it.

or striæ at the sides, but the posterior middle has finer concentric ones, in half-circles with the concavity caudad. *H. tripartitus*, Ckll., shows the same sort of thing, but not so distinctly. It is nearly certain that *meliloti* and *tripartitus* are races of one species.

University of Colorado,
Boulder, Colorado, U.S.A.,
Jan. 1906.

XLI. — *Descriptions of new Batrachians discovered by Mr. G. L. Bates in South Cameroon.* By G. A. BOULENGER, F.R.S.

Rana goliath.

Vomerine teeth in two very strong oblique series, narrowly separated in the middle, their outer extremities touching the choanæ. Head much depressed, a little broader than long; snout obtusely pointed, as long as the orbit; canthus rostralis very obtuse; loreal region deeply grooved; nostril a little nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum small, hidden. Fingers rather short, obtuse, bordered by a very distinct dermal fold, first and second equal, fourth but slightly shorter than third; one large, oval, flat, subarticular tubercle under each finger. Toes moderate, the tips dilated into small but very distinct disks, which are embraced by the very broad full web; subarticular tubercles large, oval, flat; a flat, elliptical inner metatarsal tubercle, measuring $\frac{2}{3}$ its distance from the end of the inner toe; no outer tubercle; a strong dermal fringe on the outer side of the fifth toe. The tibio-tarsal articulation reaches the tip of the snout; tibia as long as the foot, a little more than half length of head and body. Skin finely shagreened above, with small warts, especially on the sides; upper surface of thigh and tibia with narrow longitudinal glandular folds; throat and belly with small granules; a strong curved fold from the eye to the shoulder. Dark olive-brown above, with small darker spots on the body and irregular cross-bars on the limbs; hinder side of thighs blackish, dotted with white; yellowish white beneath.

This remarkable frog is described from a single specimen, from Efulen, measuring 250 mm. from snout to vent. A still larger specimen was caught along the Kribi River,

between Efulen and the coast, in a pool which some women were fishing out with scoop-nets. It was kept alive in a large spirit-drum half filled with water; but it unfortunately escaped.

R. goliath, the largest frog known, exceeding in size even *R. Guppyi*, is most nearly related to the West-African *R. crassipes*, Peters.

Arthroleptis Batesii.

Tongue with a conical median papilla. Head moderate, as long as broad; snout obtusely pointed, as long as the eye, with distinct canthus and nearly vertical, concave, loreal region; nostril a little nearer the tip of the snout than the eye; interorbital region as broad as or a little broader than the upper eyelid; tympanum rather indistinct, about half the diameter of the eye. Fingers rather short, first and second equal; toes with a short but very distinct basal web, extending as a fringe on each side; tips of fingers and toes dilated into well-developed disks; subarticular tubercles strong; two small metatarsal tubercles, inner oval, outer round; a small tubercle on the tarsus, its distance from the inner metatarsal tubercle less than that between the two metatarsal tubercles. Tibio-tarsal articulation reaching between the eye and the tip of the snout. Skin smooth, upper eyelids and flanks with small warts; two curved glandular folds on the back, behind the eyes, converging on the scapular region; a strong fold from the eye to the shoulder. Brown above, sometimes tinged with crimson, the outer edge of the dorsal glandular folds sometimes blackish; a light cross-bar between the eyes; an oblique dark brown band, edged with whitish behind, from the eye over the temple to the front of the arm, where it terminates in a point; loreal region sometimes bright crimson; limbs with oblique dark cross-bands; a triangular dark brown patch on the anal region; lower parts yellow, uniform or with small brown blotches on the breast and on the sides of the belly; a series of brown spots bordering the lower lip.

From snout to vent 31 mm.

Two specimens from Efulen and four from Zima.

Apart from the very slightly webbed toes and the united outer metatarsals, this very distinct species bears a striking resemblance to *Phrynobatrachus plicatus*, Gthr., which inhabits the same district.

Arthroleptis cornutus.

Tongue with a conical median papilla. Head moderate, as long as broad; snout rounded, not quite as long as the eye, with obtuse canthus and concave loreal region; nostril a little nearer the tip of the snout than the eye; interorbital space narrower than the upper eyelid; tympanum hidden. Fingers rather short, first and second equal; toes with a short but very distinct basal web; tips of fingers and toes dilated into small disks; subarticular tubercles small but very prominent; two small but very prominent metatarsal tubercles, inner oval, outer round; a small rounded tubercle on the inner side of the tarsus, connected with the inner metatarsal tubercle by a narrow dermal ridge; the distance between the two metatarsal tubercles nearly equals the distance between the inner and the tarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin of upper parts with prominent warts of unequal size; a conical or spine-like tubercle on the posterior part of the upper eyelid. Grey above, with darker spots, and more or less distinct cross-bars on the limbs; a light vertebral stripe may be present; hinder side of thighs with a more or less distinct whitish dark-edged stripe; lips and lower parts white, with large roundish black spots.

From snout to vent 20 mm.

Two specimens from Zima.

Closely allied to *A. calcaratus*, Peters; distinguished by the stouter form and shorter hind limbs and by the lesser distance between the inner metatarsal tubercle and the tarsal.

Arthroleptis tenuiatus.

Tongue with a conical median papilla. Head moderate, as long as broad; snout rounded, as long as the eye, with distinct canthus and nearly vertical loreal region; nostril equally distant from the eye and from the end of the snout; interorbital space broader than the upper eyelid; tympanum very distinct, two fifths the diameter of the eye. Fingers very unequal in length, first and fourth much shorter than second, which is barely half the length of third (*male*), the tips dilated into small but very distinct disks; toes slender, nearly free, with a very slight rudiment of web, the tips dilated into rather large disks; subarticular tubercles small and moderately prominent; a small, oval, inner metatarsal tubercle, measuring about half the length of the inner toe. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Skin smooth. Olive-brown above, with a

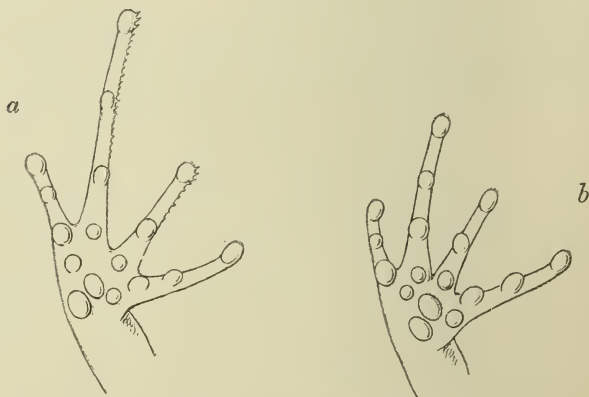
greyish-white, dark-edged streak on each side of the back, beginning behind the upper eyelid and converging towards its fellow on the scapular region; a greyish streak round the snout, above the canthi, and a broader band of the same colour, forming a very open chevron, across the interorbital region; limbs with ill-defined dark cross-bars; sides of head, body, and limbs with white dots; lower parts white, throat brown. Male with a subgular vocal sac.

From snout to vent 21 mm.

A single specimen from Zima.

The extraordinary elongation of the third finger I have ascertained to be a character of the males in the species of *Cardioglossa*, Blgr., and in *Arthroleptis variabilis*, Matsch., and *A. pæcilonotus*, Peters, with which I now regard *A. macrodactylus*, Blgr.*, *A. bivittatus*, F. Müll. (both males), and *A. inguinalis*, Blgr. (female), as specifically identical. For the same reason I now hold *A. Seimundi*, Blgr., to be the male of *A. variabilis*. In well-preserved specimens, the inner side of the second and third fingers of these males may be seen to be furnished with a fine serrature of tooth-like, translucent granules, differing from any of the nuptial excrescences with which I am acquainted in Batrachians.

Fig. 1.



Hand of *Arthroleptis pæcilonotus*. a, ♂; b, ♀.

The species described under the name of *Arthroleptis* are much in want of revision. I may here note that *A. sechellensis*, Boettger, differs in the entire, elliptical tongue, and

* The figure of the type (Cat. Batr. Ecaud. pl. xi. fig. 5) is taken from a badly preserved specimen, and very inaccurate as regards the shape of the snout.

deserves to be made the type of a distinct genus, for which I propose the name of SOOGLOSSUS; that I overlooked the absence of teeth in *A. Boettgeri*, Blgr., and *A. leucomystax*, Blgr., which must be referred to *Cacosternum*, Blgr., and *Cardioglossa*, Blgr., respectively; and that, to my great surprise, the specimens of *A. africanus* (*Heteroglossa africana*, Hallow., *A. gabonensis*, Mocq., *A. verrucosus*, Werner) collected by Mr. Bates have shown the males to be provided with a powerful dentition in the lower jaw. This fact, together with the presence of a deep groove between the outer metatarsals, which in the typical *Arthroleptis* are completely bound together, justifies the establishment of a new genus, DIMORPHOGNATHUS, for *Heteroglossa africana*, the generic name proposed by Hallowell being preoccupied.

Fig. 2.

Upper and lower jaws and pectoral girdle of *Dimorphognathus africana*, ♂.

The mandibular dentition of *Dimorphognathus africana* consists of a very large fang in front, followed by ten or eleven smaller sharp acrodont teeth, of unequal size. This discovery further emphasizes the artificial nature of the dentition as a family character in the Tailless Batrachians*. The fact that the extraordinarily lengthened and serrated third finger of the male occurs both in *Arthroleptis* and *Cardioglossa* shows these two genera to be closely allied. *Cardioglossa* is simply a toothless *Arthroleptis*, just as *Dendrobates* may be described as a toothless *Phyllobates*.

I may add that the maxillary teeth of *Dimorphognathus africana* are longer than in most frogs, and that the præcoracoids (clavicles) are remarkably slender; the bony style of the omosternum is forked at the base.

Cardioglossa elegans.

Closely allied to *C. leucomystax*, but fingers and toes more elongate and more distinctly dilated at the end, and inner

* See my remarks in these 'Annals,' (6) i. 1888, p. 188, and (7) xii. 1903, p. 186.

metatarsal tubercle smaller, much shorter than the inner toe. Tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout (the tympanum or the eye in *C. leucomystax*). Greyish brown above, with large and small symmetrical dark brown spots with a fine pale outline; the first large spot begins between the eyes and is triangular with the base turned forwards; it is immediately followed by a second and by a third, each subtriangular or cordiform with the point turned forwards; a large oval spot on the lumbar region; a whitish line round the eye and the temporal region; limbs with spots and bars edged with lighter, as on the body; throat and belly brown, or much spotted with brown.

From snout to vent 37 mm.

Four specimens from Efulen.

Rappia pleurotenia.

Nearly allied to *Rappia argus*, Peters, with a variety of which it agrees very closely in the coloration. Likewise with the tympanum hidden, the tibio-tarsal articulation reaching the eye, and no fold across the throat, but distinguished by the very short, quite rudimentary web between the fingers. Dark purplish brown above, with scattered white dots; a white, black-edged streak on each side of the head and body, meeting its fellow on the tip of the snout, bordering the upper eyelid, widening on the side of the body, and terminating more or less abruptly in advance of the groin; a few small black spots on the lateral streak; upper surface of thighs brown; lower parts bright yellow.

From snout to vent 31 mm.

A single specimen from Zima; another had been previously obtained by Mr. Bates on the Benito River.

Hylambates calcaratus.

Vomerine teeth in two small rounded groups between the choanæ. Head broader than long; snout rounded, nearly as long as the eye; canthus rostralis distinct; loreal region concave; interorbital space as broad as the upper eyelid; tympanum very distinct, about two thirds the diameter of the eye. Fingers rather short, much depressed, one-third to half webbed, the tips dilated into large disks; toes three-fourths webbed, the web reaching the disk of the fifth toe; subarticular tubercles strong; a strong, feebly compressed, oval inner metatarsal tubercle. Tibio-tarsal articulation reaching the

eye or between the eye and the tip of the snout; tibia about half the length of head and body. Skin shagreened above, granular beneath; a conical tubercle on the heel (tibio-tarsal articulation). Reddish brown, purplish brown, or olive above, uniform or with ill-defined darker or lighter markings; upper lip with more or less distinct dark bars; sides of head sometimes dark brown; sides of body and sides and lower surface of limbs dark brown; belly spotted or marbled with brown. Male with a subgular vocal sac.

From snout to vent 42 mm.

A single specimen from Efulen; also several from Cape St. John and the Rio Benito District (Spanish West Africa), which I had previously confounded with young *H. rufus*. This species stands very near *H. rufus*, Reichen., differing only in the rather less depressed head and in the presence of a conical tubercle on the heel.

Hylambates cubito-albus.

Vomerine teeth in two small groups on a level with the posterior border of the choanæ. Head broader than long, strongly depressed; snout rounded, as long as the eye; interorbital space broader than the upper eyelid; tympanum very distinct, two thirds the diameter of the eye. Fingers rather short, with a mere rudiment of web; toes half webbed, three phalanges of fourth and two of fifth free; disks well developed; subarticular tubercles strong; inner metatarsal tubercle moderate, oval, feebly prominent. The tibio-tarsal articulation reaches the eye. Skin smooth above, granular beneath. Green above, with a fine black areolation; a white line bordering the upper lip, another above the anal region; elbow, knee, and heel with a large round white spot; sides of thighs purplish brown; lower parts white.

From snout to vent 33 mm.

Two specimens from Zima. The British Museum has since received from Dr. C. Christy two further specimens obtained by him in Unyoro, east of Lake Albert, along with examples of two other frogs common in Cameroon, *Rana albilabris*, Hallow., and *Phrynobatrachus plicatus*, Gthr.

In coloration this new species resembles very strikingly *H. notatus*, Peters, which is the young of *H. rufus*, Reichen., and which differs in a more slender form and a more developed web between the fingers and toes. It is more nearly allied to *H. Vannutellii*, Blgr., likewise obtained in Unyoro by Dr. Christy, but differs from it in the broader interorbital space.

XLII.—*New Mammals from the Australian Region.*
By OLDFIELD THOMAS.

Hydromys esox, sp. n.

Size rather less than in the Australian forms of the genus. General colour of body above mummy-brown, this colour being produced by an even intermixture of black and buffy-tipped hairs. Sides more buffy, passing on the lower surface into a dull whitish, strongly suffused with a peculiar brownish-salmon tone (between Ridgway's "vinaceous cinnamon" and "vinaceous buff"); this suffusion is strongest on the chest, weakest in the inguinal region. Top of head, above a line from halfway between the nose and mouth running back below the eye and ear, blackish, markedly darker than the body on the crown, and quite black laterally on the sides of the muzzle and on a large patch round each ear. Ears small, practically naked. Fore limb wholly like belly, except for a dark mark running down the outer side of the wrist. Back of legs brown, front of legs and top of feet buffy whitish. Tail with about three fifths of its short-haired part black, two fifths white.

Skull decidedly smaller than that of the Australian *H. chrysogaster*, but similar in general characters. The nasals do not so far surpass posteriorly the frontal premaxillary processes, which are themselves more slender, only 1 mm. broad at their narrowest point above the anteorbital foramina. Front of nasals above hinder edge of incisors, more usually above their anterior surface. Palatal foramina penetrating well into maxillæ.

Dimensions of the type (measured in skin):—

Head and body 295 mm.; tail 225; hind foot (wet) 50; ear (wet) 15.

Skull: basal length (c.) 46; zygomatic breadth 24·7; nasals 15·5 × 5·4; intertemporal breadth 6·7; breadth of brain-case above meatus 18·8; height of muzzle behind incisors 8·5; palatilar length 23·7; diastema 14·2; palatal foramina 5·3; length of upper molar series 8·1, of m^1 5·9.

Hab. Port Moresby, British New Guinea.

Type. Adult male. B.M. no. 6. 1. 26. 1.

The only species with which this water-rat need be compared is *H. Beccarii*, Peters *, described originally from the

* Ann. Mus. Genov. vi. p. 303 (1874); Peters and Doria, *op. cit.* xvi. p. 706, pl. xviii. (1881).

Key Islands, but afterwards stated to occur in New Guinea. Its colour, however, is said to be suffused with ochraceous above and below, while there is none of this colour in *H. esox*. Its tail also is only black for one third its length, while in *H. esox* considerably more than half is black.

LIMNOMYS, gen. nov.

Closely allied to *Hydromys*, but less strongly specialized for aquatic life.

Fur coarse and harsh, not straight and glossy as in *Hydromys*, or at least only slightly so on the belly. Muzzle, whiskers, and ears as in *Hydromys*. Feet intermediate in character, nearly normal in general shape, not strongly twisted as in *Hydromys*; hallux and last hind toe with practically no webbing at their bases; webbing between second and third and third and fourth toes narrow, not reaching halfway along the toes; fifth hind toe, without claw, reaching nearly to the end of the basal phalanx of the fourth; surface of soles nearly normal, smooth or very slightly granulated, the pads distinct, their size and position nearly as in *Hydromys*, but more distinct, owing to the smoother general surface. Tail long, heavily clothed as in *Hydromys*, but the end with a distinct brush of hairs, some of which attain an inch in length.

Skull, as compared with that of *Hydromys*, curiously short and "stumpy," the brain-case short and broad, its breadth greater than its length from the hinder edge of the interparietal to the intertemporal constriction; muzzle broad, conical, its middle region increased in breadth owing to the inflation of the lateral capsules over the roots of the incisors; nasals less extended forwards than in *Hydromys* and more backwards, much broader behind than the narrow frontal premaxillary processes. Anteorbital foramina very large, equally wide above and below. Palatal foramina peculiarly short, practically wholly in the premaxillæ, a small process of the maxillæ only just bordering their posterior end. Sides of mesopterygoid fossa more rounded, less sharply edged than in *Hydromys*, this being apparently due to a reduction in the height of the entopterygoids, while the ectopterygoids are practically obsolete. But the pterygoid region is imperfect in the typical skull, so that it cannot be exactly described. Bullæ as in *Hydromys*.

Incisors feebler in every way than in *Hydromys*, shorter, narrower, shallower in antero-posterior section, the upper ones set at a greater angle to each other owing to the increased

breadth of the muzzle; no perceptible external capsule over the roots of the lower pair, which do not extend further back than the level of the front of the low coronoid process. Molars practically as in *Hydromys*, though larger, and the segments of m^1 rather more extended transversely.

Type:—

Limnomys asper, sp. n.

Size that of a rather small *Hydromys*. Fur crisp and harsh; hairs of back about 8 mm. in length; underfur thick and woolly, about 6 mm. long. General colour of upper surface coarsely grizzled grey-brown (nearest to "hair-brown" of Ridgway), the ends of the longest hairs black, those of the shorter ones dull creamy whitish; underfur glossy whitish at base, slaty brown terminally. Lower surface dull greyish washed with buffy, not sharply defined laterally. Head like back. Whiskers very strong and numerous, the upper ones black, the lower white. Ears short, rounded, finely haired, greyish brown. Upper surface of hands and feet pale brownish. Tail above and below brownish black for rather more than half its length, the remainder white.

Skull and teeth as described above.

Dimensions of the type (taken in skin):—

Head and body (perhaps shrunk) 240 mm.; tail 260; hind foot (wet) 54.5; ear 15.

Skull: basilar length 40.2; zygomatic breadth 26.5; nasals 15.5×6.1 ; interorbital breadth 11.7; intertemporal breadth 8.3; breadth of brain-case 21.5; breadth of muzzle at centre 12.2; height of muzzle 11.2; palatilar length 23; diastema 12.5; palatal foramina 4.4×2.7 ; length of m^1 9.6. Lower jaw, condyle to incisor-tip 34.

Hab. Mount Gayata, Richardson Range, British New Guinea. Alt. 2000-4000'.

Type. Adult male. B.M. no. 99. 4. 4. 1.

This interesting rat would seem to be an early development of the *Hydromys* type, less modified for aquatic life than in that genus, but showing many characters in common with it. In its dentition, however, it is fully as specialized, having only $\frac{2}{2}$ molars, and showing no trace of the more Murine type of teeth, such as may be perceived in certain other members of the subfamily Hydromyinae.

Mus niobe, sp. n.

Allied to *M. verecundus*, Thos.*, but smaller. Under surface little lighter than upper. Size decidedly less than in *M. verecundus*. Fur very fine and soft, without any intermixture of flattened hairs or spines; hairs of back about 11–12 mm. in length. General colour above uniform bistre-brown, with a very fine buffy ticking; sides slightly lighter, their colour passing imperceptibly into the broccoli-brown of the under surface, the hairs of which are slaty with dull buffy points. Muzzle dark greyish brown, crest of head like body. Ears rather small, uniformly dark brown. Fore limbs dark; the digits white, these being the only light-coloured part of the whole animal. Hind limbs and feet dark brown throughout, the feet proportionately long and narrow, as in *M. verecundus*. Tail about as long as the head and body, finely scaled (15 rings to the cm.), almost naked, the hairs not hiding the scales; uniformly dark brown throughout, above and below.

Skull very similar to that of *M. verecundus*, but considerably smaller. Interorbital region and brain-case rounded, practically without ridges. Anteorbital plate slanting, narrow, little projected forward. Palatal foramina much smaller than in *M. verecundus*, not reaching nearly to the level of the molars. Bullæ fairly large.

Teeth as in *M. verecundus*, the characteristic simplicity, absence of supplementary cusps, and unusually slight bowing of the laminæ all as marked as in that species.

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

Head and body 126 mm.; tail 134; hind foot 27; ear 16.

Skull: greatest length 32.5; basal length 25.3; greatest breadth 14.8; nasals 12 × 3.6; interorbital breadth 5.7; breadth of brain-case 14; height of muzzle behind incisors 5.2; diastema 8.3; palatal foramina 4.9 × 2.3; length of upper molar series 5.4.

Hab. Ougarra, Angabunga R., S.E. British New Guinea.

Type. Young adult. B.M. no. 5. 11. 28. 7. Collected 15th November, 1904, by Mr. A. S. Meek.

Uromys platyops, sp. n.

A medium-sized species, with a low flat skull.

Size about as in *U. Moncktoni*, rather less than in *U. levipes*. Fur soft, fine, and close; hairs of back about 10 mm. in length. General colour above dark cinnamon-brown,

* Nov. Zool. xi. p. 598 (1904).

blackened along the dorsal area, turning to rufous on the rump. Under surface greyish throughout, the hairs everywhere slaty at base, greyish white terminally, not tinged with buffy. Head markedly greyer than body. Ears brown. Hands and feet finely haired, whitish; the digits almost naked. Tail decidedly shorter than the head and body, practically naked, the hairs as minute and few in number as in *U. levipes*; in colour the tail is blackish brown above and white or whitish below for its whole length.

Skull peculiarly broad, low, and flat, the height from the molars to the supraorbital edges nearly 2 mm. less than in either *Moncktoni* or *levipes*. Interorbital space broad, flat, square-edged. Rudimentary processes present at the antero-external corners of the brain-case. Palatal foramina narrow. Bullæ small.

Dimensions of the type (measured in skin):—

Head and body about 144 mm.; tail 116; hind foot 30; ear 15.

Skull: greatest length 37; basilar length 29·4; greatest breadth 18·5; length of nasals 12·7; interorbital breadth 6; breadth of brain-case 14·7; height of muzzle behind incisors 7; height of supraorbital edge above palate behind m^1 8·2; palatilar length 17; diastema 10; palatal foramina 5; length of upper molar series 7.

Hab. Head of Aroa River, S.E. British New Guinea.

Type. Adult male. B.M. no. 5. 11. 28. 18. Collected 25th April, 1905, by Mr. A. S. Meek. Two specimens.

This species is allied only to *U. levipes* and *U. Moncktoni*. From the first it differs by its much shorter hind feet, from the latter by its clear greyish belly and naked tail, and from both by its unusually low skull. The height of the skull from the outer posterior base of m^1 to the supraorbital edges is in *U. levipes* 10·1 mm. and in *U. Moncktoni* 9·9, as compared with 8·2 in *U. platyops*.

Uromys gracilis, sp. n.

A medium-sized species with a long tail and narrow skull.

Size about as in *U. Stalkeri*. Fur long and close; hairs of back about 11 mm. in length. General colour above uniform cinnamon-brown, the sides rather brighter and lighter than the back. Under surface pure white (the hairs white to the roots) on the throat, chest, middle line of belly, and in the inguinal region, but the hairs are slaty at base along the sides of the belly. Head rather greyer than the back. Ears short, thinly haired, brown. Hands and feet almost naked,

pale brown, the digits lighter. Tail longer than in the other allied species, finely scaled (15 rings to the cm.), dark brown above and below to the tip.

Skull delicately built, rather narrow, its interorbital edges with a fairly distinct beading. Anteorbital plate slightly projected forward. Bullæ small.

Dimensions of the type (measured in skin):—

Head and body about 140 mm.; tail 175; hind foot 27; ear 16.

Skull: greatest length 33·8; basilar length 27·5; greatest breadth 17·2; length of nasals 11; interorbital breadth 5; breadth of brain-case 14; height of muzzle behind incisors 6·4; palatilar length 14·8; diastema 9·5; palatal foramina 4·4 × 2; length of upper molar series 6·2.

Hab. Ougarra, Angabunga R., S.E. British New Guinea.

Type. Adult female. B.M. no. 5. 11. 28. 15. Collected 13th November, 1904, by Mr. A. S. Meek. Two specimens.

This species is readily distinguishable from its nearest ally, *U. Stalkeri*, Thos.*, with which it agrees in colour, by its longer tail and markedly narrower interorbital region.

Pseudochirus avarus, sp. n.

Very like *Ps. canescens*, but without the dark ear-patch.

Fur close and fine; hairs of back 10–11 mm. in length. General colour of body above grey (near "smoke-grey"), the middle line darker and more brownish. Under surface ochraceous buff, not sharply defined laterally. Head tawny ochraceous, duller above, richest on the cheeks, a narrow sharply defined blackish frontal line present. Ears naked internally, well-furred but not tufted externally, their backs tawny, not blackened as in *Ps. canescens*, and with no darkening round their bases. Forearms and hands, feet and inner sides of legs ochraceous. Tail greyish basally, getting rather more brownish terminally, but not blackening at the tip; under surface ochraceous along the middle line from the basal half; tip naked below for about two inches.

Skull apparently as in *Ps. canescens*, the ridges strongly marked. Molars slightly smaller than in the type of *Ps. canescens gyrator*.

Dimensions of the type (measured in skin):—

Head and body 250 mm.; tail 210; hind foot (wet) 29; ear (wet) 14.

Skull: occipital ridge to tip of nasals 49; zygomatic breadth 29·5; nasals 17 × 6·6; interorbital breadth 7·2;

* Ann. & Mag. Nat. Hist. (7) xiv. p. 202 (1904).

palatal length 25·5; palatal foramen 5; length of three anterior molariform teeth 7·6; length of lower tooth-row 13·5.

Hab. Port Moresby, British New Guinea.

Type. Adult male. B.M. no. 6. 1. 26. 2.

This Phalanger may be readily distinguished from all forms of *Ps. canescens* by its tawny-backed ears, without darkening either on or round them. In most other respects it is very like that species, or at least like *Ps. canescens gyратор**, with which alone I have been able directly to compare it.

Dasyuroides Byrnei pallidior, subsp. n.

Similar in essential characters to true *Byrnei*, but slightly smaller, paler, and with smaller bullæ.

Hair of back about 12 mm. in length. General colour above near "drab-grey" of Ridgway, or very slightly yellower, the brown of *D. Byrnei* being near "isabella." Basal portion of tail pale yellowish white, as compared with the orange of *D. Byrnei*. Colour otherwise as in that animal.

Skull rather shorter than in *Byrnei*, and the teeth slightly smaller. Bullæ markedly smaller than those in the corresponding sex of *D. Byrnei*, their greatest length in the male type of *pallidior* 14 mm., as compared with 15·5 in the male *Byrnei*, and the vertical height of the brain-case and bullæ combined only 16 mm. as compared with 17·5. The mastoid portion of the bullæ also obviously smaller, its diameter at right angles to its longer axis about 5 mm. in *pallidior*, 6 mm. in *Byrnei*; the part behind and above the meatus is also obviously more inflated in *Byrnei* than in *pallidior*. The female even of *D. Byrnei* has slightly larger bullæ than the male *pallidior*.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 146 mm.; tail 132; hind foot 40; ear 26.

Skull: greatest length 42; basal length 39; greatest breadth 24·5; constriction 7·2; palate length 21·8; combined length of three anterior molariform teeth 8·7.

Hab. Killalpanima, E. of Lake Eyre North, South Australia.

Type. Adult male. B.M. no. 5. 8. 9. 7. Collected and presented by H. J. Hillier, Esq.

Both the type of *D. B. pallidior* and the topotypical examples of *D. Byrnei* with which I have compared it have been skinned out of spirit, so that their coloration may have been more or less affected.

* Ann. & Mag. Nat. Hist. (7) xiv. p. 401 (1904).

It is a curious fact that both in *Dasyuroides* and *Antechinomys*, genera in which the bullæ are greatly developed, the male has decidedly larger bullæ than the female. Whether there is any adaptive reason for this or whether it is that the male leads the way in the development of specialized characters it is not easy to say.

Antechinomys Spenceri, sp. n.

A sandy-coloured species with larger ears and much larger bullæ than *A. laniger*. Size averaging slightly larger than in *A. laniger*. Fur long, soft and fine; hairs of back about 9-10 mm. in length. General colour dull sandy, the hairs slaty for their basal three fifths, with a buffy subterminal ring and a brown or blackish tip. Under surface white, the hairs slaty for their basal third. Head paler than back. Ears very large, their short fine hairs pale buffy on the proctote, whitish on the metentote. Hands and feet of the same structure as in *A. laniger*, their upper surfaces white or creamy white. Tail long, more heavily tufted than in *A. laniger*, pale buffy on the sides, mixed with brown on the top and below, the tuft dark seal-brown, its hairs 7-8 mm. in length.

Skull with a longer slenderer muzzle than that of *A. laniger*. Bullæ in female distinctly larger than those of the male type of *A. laniger*, and in the male immensely larger, their height (measured vertically downwards from the glenoid surface) 4.5 mm. in the male *A. Spenceri*, 4.1 in the female and 3.5 in the male *A. laniger*.

Teeth as in *A. laniger*.

Dimensions of the type (measured on the spirit-specimen):—

Head and body 87; tail 133; hind foot 32.3; ear 23.

Skull: greatest length 29; basal length 26.7; greatest breadth 15.7; muzzle to orbit 12.6*; interorbital breadth 5.6; palate length 15.3; horizontal length of bulla taken parallel to the middle line 7.5†; combined length of three anterior molariform teeth 4.9.

Hab. Charlotte Waters, Central Australia.

Type. Female in spirit. B.M. no. 97. 11. 3. 12. Collected on the Horn Expedition by Prof. Baldwin Spencer.

In the 'Report of the Horn Expedition' ‡ Prof. Spencer referred the Central-Australian *Antechinomys* to *A. laniger*, but the recent donation by Mr. R. T. Maurice of a pair

* In *A. laniger* 11.

† In the male 8.3; in *A. laniger* (♂) 6.6.

‡ Mamm. p. 40 (1896).

of specimens from Charlotte Waters has drawn my attention to the animal, and I find such differences between the Central-Australian form and the type from New South Wales that I have no hesitation in distinguishing them specifically. The specimen chosen as the type is one of those referred to by Prof. Spencer, in whose honour I have much pleasure in naming the species.

XLIII.—*Descriptions of Two new Cyprinid Fishes from Yunnan Fu, collected by Mr. John Graham.* By C. TATE REGAN, B.A.

Cyprinus micristius.

Pharyngeal teeth molar-like, 3.1.1—1.1.3. Depth of body about 3 in the length, length of head $3\frac{1}{2}$ — $3\frac{3}{4}$. Snout as long or nearly as long as eye, the diameter of which is $3\frac{1}{3}$ — $3\frac{1}{2}$ in the length of head and equal or nearly equal to the interorbital width. Jaws nearly equal anteriorly; maxillary extending to below the nostrils; two barbels on each side, the anterior shorter than the posterior, which is equal in length to $\frac{1}{2}$ the diameter of eye. Scales 37—38 $\frac{6\frac{1}{2}}{7}$, 4 between lateral line and root of ventral. Dorsal IV 11, its origin equidistant from tip of snout and base of caudal or slightly nearer the latter; last simple ray a serrated spine; first branched ray the longest, $\frac{2}{3}$ the length of head. Anal III 5, with a serrated spine exactly similar to that of the dorsal. Pectoral extending almost to the root of the ventral; ventrals with 9 to 11 rays, inserted below or slightly in advance of the origin of dorsal, extending to the vent. Caudal forked. Caudal peduncle $1\frac{1}{3}$ — $1\frac{1}{2}$ as long as deep. Olivaceous above, silvery below; each scale with a dark vertically expanded spot at its base; dorsal, base of caudal, and anterior part of anal with numerous blackish dots.

Three specimens, 90 to 120 mm. in total length.

This fish differs considerably from the carp, *Cyprinus carpio*, in the smaller number of rays in the dorsal fin, but they are strikingly similar in all other characters. The general appearance of the head, the shape and extent of the suborbital and opercular bones, the size and structure of the scales, the shape and size of the fins other than the dorsal, are almost exactly as in *Cyprinus carpio*, whilst the pharyngeal dentition differs in no respect from that of the carp.

Nemachilus Grahami.

Depth of body $5\frac{1}{3}$ in the length, length of head $4-4\frac{1}{3}$. Snout as long as or longer than postorbital part of head, nearly twice as long as eye, the diameter of which is $4\frac{1}{2}-4\frac{2}{3}$ in the length of head and equal to the interorbital width. Breadth of head $1\frac{3}{5}-1\frac{3}{4}$ in its length and a little less than its depth. Cleft of mouth extending nearly or quite to below the nostrils; lips smooth, the lower interrupted medianly; barbels six; outer rostral barbel extending to anterior $\frac{1}{3}$ of maxillary barbel, which is twice as long as the eye. Scales entirely wanting. Dorsal III 9, its origin a little nearer to the tip of snout than to the base of caudal; free edge of the fin slightly concave. Anal III 6. Pectoral extending $\frac{2}{3}-\frac{3}{4}$ of the distance from its base to the base of ventrals. Ventrals 8-rayed, extending to the vent. Caudal slightly emarginate. Caudal peduncle $\frac{3}{4}$ the length of head and $2-2\frac{1}{2}$ as long as deep. 5 or 6 broad transverse dark bars on the back which give rise to irregular dark marbling on the sides of the body; dorsal and caudal with from one to three series of dark spots on the fin-rays; lower fins pale.

Two specimens, 70 and 82 mm. in total length.

BIBLIOGRAPHICAL NOTICE.

Genera Avium. Parts 1-5.

V. Verteneuil and L. Desmet: Brussels, 1905.

To the working ornithologist and Curators of Museums this latest contribution to systematic ornithological literature should prove a most valuable help. Mr. P. Wytzman has undertaken the arduous task of Editor, and has called to his aid most of those who are regarded as the leaders in the ornithological world of to-day, as, for example, Dr. P. L. Sclater, Dr. R. Bowdler Sharpe, W. R. Ogilvie-Grant, Dr. Ernst Hartert, and Count Salvadori.

Very properly, Part 1 deals with the Eurylæmidæ and has been written by Dr. Hartert. The author, in a short Introduction, after commenting on the earlier views as to the position of these birds in the system, passes on to remark that later research has shown them to be truly Passerine types; and here, without further comment, he leaves this aspect of the subject. More, perhaps, at the time this part was written could scarcely have been said, but it has just been, we think, conclusively shown that the nearest allies of the Eurylæmidæ are the Cotingidæ.

We notice two slips in this part, all the more remarkable because they appear in Dr. Hartert's work. Thus, in the trinomial designation of two species of *Serilophus* he writes *lunoatus* for *lunatus*, and this, too, while in the synonymy immediately below he spells the word correctly.

Part 2 is by the Editor. We note here, as in other parts, a very decided unfamiliarity with the anatomical characters, which are, we suspect, introduced rather as a make-weight, or for appearance' sake, than for the conviction they convey to the authors. We are forced to this conclusion by the selection of the characters used and by the perpetuation of old and obvious blunders. Thus, for example, the Todies are described as having *no* carotids, a misprint for *two* carotids first made by Seebohm, and copied from this author into more than one work of importance!

Parts 3, 4, 5 deal with the Parrots—the Nestoridæ, Cacatuidæ, and Stringopidæ. These have been written by Count Salvadori. Here, as in the other groups dealt with in these parts, no allusion is made to the nestling, nor any account given of the coloration of the first plumage, by which we are left to infer that it resembles that of the adult. But surely in a work of this kind such information would be more valuable than such scraps of anatomical lore as that the "orbital ring is complete"! No mention is made of the possession of powder-down patches among the Parrots, or of the movable hinge of the beak, nor are the feet anywhere described as zygodactyle.

There are numerous coloured figures in these parts, which serve their purpose well enough, but the drawing of the overlap of the wing-coverts of the Parrots is hopelessly inaccurate.

MISCELLANEOUS.

Note on the Genus Iaspis, Kaye.

By HAMILTON H. DRUCE, F.Z.S., F.E.S.

MR. W. J. KAYE, in his paper entitled "A Catalogue of the Lepidoptera Rhopalocera of Trinidad," published in the Trans. Ent. Soc. 1904, has described, under the family Lycænidæ on p. 196, a new genus, to which he gives the name *Iaspis*, and states that its type is *Symmachia temesa*, Hew. He furthermore, under the heading of the species (no. 159) *Iaspis temesa*, gives an incorrect reference, thus:—" *Symmachia temesa*, Hew., Ill. D. L. p. 1. no. 2. 1868."

Now Hewitson described his *Symmachia temesa* in Equat. Lep. p. 52, in 1870, and figured it in his Exot. Butt. iv. *Symm.* and *Charis*, t. ii. figs. 17, 18, in 1871.

A perusal of Mr. Kaye's description shows that it does not represent the insect of which I have quoted the synonymy.

Hewitson, however, described a *Thecla temesa* in 'Descriptions of Lycænidaë,' p. 1 (1868), and afterwards figured it in Ill. Diurn. Lep. pl. lii. figs. 284, 285, and this is doubtless the insect to which Mr. Kaye intended to refer; the type, therefore, of the genus *Iaspis* should be written as *Thecla temesa*, Hew., not *Symmachia temesa*, Hew., *Symmachia* being a well-known genus of Erycinidæ.

Amongst the "Errata" in Trans. Ent. Soc. 1904 I notice that the word "band," which is several times used by Mr. Kaye in his descriptions, should be replaced by the word "brand," but no notice has been published, so far as I am aware, with regard to the type of *Iaspis*.

Notes on the Dates of Publication of the Natural History portions of some French Voyages.—'Voyage autour du Monde . . . sur . . . la Coquille pendant . . . 1822-25 . . . Par L. J. DUPERRY,' &c.—A Correction. By C. DAVIES SHERBORN, F.Z.S. &c., and B. B. WOODWARD, F.L.S. &c.

In 1901 (Ann. & Mag. Nat. Hist. ser. 7, vol. vii. pp. 391-2) we gave the following dates for vol. ii. of the "Zoologie" of this Voyage:—

Livr. "16."	3 sheets.	Vol. II. pp. 1-24.	Bibl. Franç.	12 June, 1830.
18.		[25-471.		1830.]
19.	1 }			11 Dec. "
20.	1 }			30 Apr. 1831.
21.	1 }	Wrappers [with plates?]		11 June, "
22.	1 }			2 July, "
23.	1 }			6 Aug. "
24.	1 }			17 Sept. "
25.	27 sheets.		{ Vol. II. pt. 2 } pp. 1-216.		12 Nov. "
		{ (Crust. & Ins.) }		
26.	29	{ " } pp. 217-319.		} 10 Dec. "
		{ (Zoophytes.) } pp. 1-128.		
27.	1	{ " } pp. 129-135.		28 Jan. 1832.
28.		{ " } pp. 136-155.	Ann. Soc. Ent. Fr. i.	115 [i. e. 116]. 1832.

Our attention was soon drawn to the fact that our computation of the contents of these parts must be in error, since the preface to vol. ii. pt. 2 was dated 1838, and other dates were cited in the general text quite dissonant from our conclusions.

For some time we were quite at a loss to obtain correct data for rectifying the error. At length one of us found the following passage in one of Lesson's later works (Hist. nat. Zooph. Acalèph. 1843, pp. 47-48):—"En 1829, j'ai publié le texte des acalèphes découverts de 1822 à 1825, dans le Voyage autour du Monde de la corvette *la Coquille*, et dont les planches in-folio et coloriées avaient successivement été livrées au public depuis 1827; mais ce texte, mis en magasin chez le libraire, n'a pu paraître qu'avec celui des insectes et des crustacés, fait par un autre auteur, et n'a été livré

au publique qu'en 1838. Cependant la description des acalèphes de *la Coquille* a souvent été citée sous sa date dans plusieurs publications." And, again, a little later (p. 56) he says of the portion "Zoophytes":—"Tiré à part et mise dans le commerce en 1829."

Lesson's authority may be taken as conclusive, of course, in this matter, and we may therefore at once expunge vol. ii. pt. 2 from our previous record.

A re-inspection of the entries in the 'Bibliographie de la France' shows that livr. 27 "et dernier" was *folio*, and consequently refers to the Atlas; similarly we conclude that the livr. 28 and last recorded in the Ann. Soc. Ent. Fr., tom. i. p. 116, as containing 6 pls. with text, also refers to the Atlas.

As regards the definite statement in the Bibl. Franç. that livr. 25 contained the Crustacea and Insects, this being the only one of the entries in that work where a statement of contents is made, we are of opinion that it is a clerical error, probably due to the transcriber seeing some announcement on the wrapper concerning the forthcoming parts, and in his haste assuming that it had to do with the part before him; for if the number of sheets given for livr. "16" [*i. e.* 17], 25, and 26 be added together they amount to 59, or exactly those of vol. ii. pt. 1. The unrecorded contents of livr. 18 were probably like the succeeding six, a wrapper and plates.

We would therefore amend our former conclusions as follows:—

- Livr. "16." 3 sheets [=Vol. II. pt. 1, pp. 1-24]. Bibl. Franç. 12 June, 1830.
 18. [Wrapper and plates.]
 19. }
 20. }
 21. } 1 wrapper and 6 plates each. Dates as above given.
 22. }
 23. }
 24. }
 25. 27 sheets [=Vol. II. pt. 1, pp. 25-240]. Bibl. Franç. 12 Nov. 1831.
 26. 29 " [" " " 241-471]. " " 10 Dec. "
 27 and last of Atlas: wrapper [and plates]. " " 28 Jan. 1832.
 28 [60 sheets=Vol. II. pt. 2. Preface dated 15 Nov. 1838]. 1838.

This was probably the Livr. 28 and last received by the Société Géographique de France on 5 April, 1839 (Bull. Soc. Géogr. Fr., sér. ii. tom. xi. pp. 362-3). The authors' copies of the section "Zoophytes" were sent out in 1829.

In corroboration of the above we may mention that Guérin refers to the year 1837 on pp. 212 and 220, while on p. 272 the year 1838 is quoted for the first time.

The citation of this work by Laporte in 1832, by Boisduval in 1835, and others, as pointed out by G. W. Kirkaldy ('Entomologist,' xxxv. 1902, p. 316), is accounted for by the now widely recognized fact that the contemporary writers working on the different French Voyages, then in course of compilation, often interchanged the proofs of their several works. This was done even in the days of Erxleben and Pallas, and much confusion in nomenclature has been caused thereby.

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XLIV.—*On new Species of Histeridæ and Notices of others.*
By G. LEWIS, F.L.S.

THIS is the twenty-seventh paper on the Histeridæ in this Magazine, and in the series, beginning in 1884, about 470 species have been described.

List of Species.

Hololepta sternalis.	Contipus immarginatus.
Plæsius bengalensis.	Santalus, gen. nov.
— ruptistrius.	Epiglyptus, gen. nov.
Apobletes marginicollis, <i>Lew.</i>	Hister fractistrius.
— runensis.	— sodalis.
Liopygus punctatus.	Spilodiscus, gen. nov.
Platysoma sibiricum, <i>Reitt.</i>	Notolister nodicornis.
Contipus oblongus.	

Hololepta sternalis, sp. n.

Oblonga, subconvexa, nigra, nitida; fronte haud striata; elytris striis 1-2 brevibus cum appendicibus apicalibus; prosterno antice tuberculato; tibiis anticis obtuse dentatis.

L. 11 mill. (absque mandibulis).

Oblong, somewhat convex, black and shining; the head rather flat on the vertex and without frontal striæ, the mandibles are long, with impressions on the upper surfaces, the mentum is deeply and evenly excavated and has no carina;

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the thorax is somewhat straightened near the anterior angles, not arched like most of its congeners, the marginal striæ terminate near the eyes and the margin thickens slightly at the fovea or fossette, and the fossette is farther away from the head than in any other known species of *Hololepta* or *Lioderma*. The elytra, the humeral furrow is shortened at both ends and is similar to that of *Lioderma acutipectum*, Lew.; the first and second dorsal striæ are short, basal, and well-marked, the first has a short appendage and the second has an appendage quite twice as long; the propygidium is bi-impressed apically and has punctures of varying sizes on either side; the pygidium is transverse and densely punctured except the apex, which is transversely smooth; the prosternum is triangular at the base and narrow before the coxæ, and the apex is slightly tuberculate or raised in the middle, with a tubercle on either side of its point.

This species is peculiar in the width of the space between the head and the thoracic fovea and in the form of the anterior edge of the keel. I have placed the species in *Hololepta* rather than in *Lioderma*, but only after some hesitation.

Hab. Begoro, Ashanti. One male example.

Plasius bengalensis, sp. n.

Oblongus, subconvexus, niger, nitidus; fronte stria interrupta, mandibulis haud conspicue convexis; pronoto stria marginali integra, laterali valida impressa, haud sinuata; elytris striis 1 integris, 2 parum abbreviata; propygidio grosse haud dense punctato; prosterno distincte bistriato, lobo punctato; mesosterno antice profunde marginato; tibiis postice distincte punctatis.

L. 12 mill.

Very similar to *P. laevis*, Lew., but its outline is more oblong, owing to the thorax being more transverse and less narrowed anteriorly; the mandibles also are not so conspicuously convex, the lateral stria is not sinuous, the elytral humeral stria is not much shortened, but reaches a little beyond the basal oblique stria, the second dorsal is well defined and is nearly complete, the punctures of the propygidium are more coarse, and the posterior tibiæ are distinctly punctured. The tibiæ of *P. laevis* are smooth or very finely and sparingly punctulate along the outer edge.

This is the fourth species now known with a marginal furrow in the mesosternum.

Hab. Darjiling, North Bengal.

Plæsius ruptistrius, sp. n.

Oblongo-ovatus, convexiusculus, niger, nitidus; fronte bistriata, striis haud arcuatis; pronoto antice bisinuato, stria marginali post caput leviter interrupta; elytris striis subhumerali interna antice, externa postice, abbreviatis, dorsalibus nullis; propygidio disco parte impunctato; prosterno haud striato; mesosterno stria late interrupta; tibiis anticis bidentatis.

L. 12 mill.

The species somewhat resembles *P. bisinuatus*, Sch., but it is more oblong and more parallel laterally. It differs also by the frontal striæ being feebly bent, not arcuate, by the thoracic lateral stria being less deep and more distinctly hamate at the anterior angle, by the marginal thoracic stria being fine anteriorly and slightly interrupted behind the head. The dorsal striæ are wholly wanting in one example, but are represented by a few punctures in another, and the smooth basal space of the propygidium encroaches on the discal area, while in *bisinuatus* there is a marginal smooth band only. Superficially *P. ruptistrius* resembles *P. levigatus*, Mars., but the latter has a mesosternal furrow.

Schmidt's specimens of *P. sinuatus* came from the Aru Islands, and I possess a series of examples from Run Island, on the northern coast of New Guinea; between these two islands the intervening land is at its narrowest.

Hab. Ougarra, British New Guinea (*A. S. Meek*).

Apobletes marginicollis, Lew. Ann. Mus. Genova, vi. p. 633 (1888).

In 1891 (*l. c.* xii. p. 20) I wrote that this species was a variety of *A. Schaumi*, Mars.; but this was an error, owing to my having an example of *Schaumi* wrongly labelled by the author of the species.

Apobletes runensis, sp. n.

Oblongo-ovatus, planiusculus, niger, nitidus; fronte anticus depressa, stria utrinque interrupta; pronoto lateribus obscure punctato, stria antice valida interrupta; elytris striis dorsalibus 1-3 integris, 3 distincte sinuata, 4 apicali brevissima, cæteris nullis; propygidio pygidioque basi sparsim grosso-punctatis, hoc immarginato; prosterno lato, tenuissime punctulato; mesosterno late sinuato, margine lato, stria postice paulo abbreviata; tibiis anticis minute 4-dentatis.

L. 3-3½ mill.

The above is very similar to *A. amphibius*, Mars., but it is

broader, the breadth being most marked in the mesosternum. It differs also by the frontal stria being interrupted on either side. *A. expansis*, Mars., from Ansus I., is another similar species, but it also has an entire frontal stria.

Hab. Run Island, Geelvink Bay. Many examples.

Liopygus punctatus, sp. n.

Oblongo-ovatus, niger, nitidus, supra impunctatus; fronte stria integra, recta, leviter impressa; pronoto stria marginali antice interrupta, postice ad angulos continuata; elytris striis sub-humerali integra, 1-2 dorsalibus integris, 3 in medio interrupta, 4 apicali brevissima; propygidio transversim grosse punctato; pygidio bifoveato, foveæ grosse punctatæ; mesosterno sinuato, marginato; tibiis anticis 4-dentatis.

L. $3\frac{1}{2}$ mill.

From the other known species of *Liopygus* this species differs by the lateral thoracic stria being rather fine and continued well round the basal angle, by the foveæ in the pygidium being conspicuously punctate, and by the fine mesosternal marginal stria.

Hab. Island of Lombok (*Fruhstorfer*).

Platysoma sibiricum, Reitter, Deutsche e. Zeitschr. xxiii. p. 214 (1879).

In the Catalogue of 1905 I followed Schmidt (Berl. e. Zeitschr. xxix. p. 326, 1885) in considering this species to be *P. deplanatum*, Gyll.; but I have now a large number of specimens, and they all agree in being more oval in outline and in having four complete dorsal striæ. It is a distinct species, and having lately been found at Sapporo, its name must be added to the faunistic list of Japan.

Contipus oblongus, sp. n.

Oblongus, parum convexus, niger, nitidus; mandibulis dentatis externis et internis marginatis; fronte stria valida, recta; pronoto ciliato, stria interna flexuosa, basi ad angulos rugosa; elytris striis 1-3 integris, 4 dimidiata, cæteris nullis; propygidio (in medio excepto) pygidioque dense punctatis; prosterno inter coxas bistriato; mesosterno emarginato, stria integra.

L. $8\frac{1}{2}$ mill.

This species differs by its oblong form from *C. flexuosus*, Sch., and *C. immarginatus*, Lew., the other species known with a flexuous thoracic stria, and it may be also distinguished from either of these by the mandibles being marginate inter-

nally as well as externally, and there are marginal furrows which join posteriorly, by the thorax being rugose at the basal angles, by the different dorsal striation, and by the prosternal keel being bistriate. The inner humeral stria is complete, the outer humeral basal and dimidiata.

Hab. Pretoria, Orange River Colony.

Contipus immarginatus, sp. n.

Ovalis, convexiusculus, niger, nitidus; mandibulis extus marginatis, tenuiter punctulatis; fronte stria integra; pronoto ciliato, stria interna postice flexuosa; elytris striis dorsalibus 1-3 integris, 3 basi sinuata, 4-5 fere obsolete, suturali dimidiata; propygidio pygidioque sat dense punctulatis; mesosterno emarginato, stria marginali interrupta.

L. $7\frac{1}{4}$ mill.

The above is also similar to *C. flexuosus*, Sch., in the form of its lateral thoracic stria, but it is oval, while Schmidt's species is somewhat quadrate. The other differences are the interstice between the thoracic striæ behind the anterior angle is less wide, the fourth and fifth dorsal striæ are very short and apical, the sutural is fine and dimidiata, the punctuation of the pygidia is finer, and the mesosternal stria is interrupted and not continued anteriorly round the emargination. The inner humeral stria is shortened before the base, the outer is basal and scarcely reaches the middle.

Hab. Milmil, on the northern border of Somaliland (*Smith*).

SANTALUS, gen. nov.

Body oblong, parallel laterally, and somewhat convex; head retractile, labrum rather prominent and semicircular in outline, mandibles somewhat long and bidentate; antenna, scape long and bent, each joint of funiculus gradually widens from the base, club oval; thorax transverse, with the lateral inner stria distant from the margin; antennal fossettes longitudinally excavated behind the angle and not open to view from above; elytra striate; pygidium convex; tibiæ dilated, anterior 3-4-dentate. In all the known species but one (*Hister latitibius*, Mars.) the elytral striæ 1-4 are complete and the fifth much shortened anteriorly, but in *latitibius* there is also a sutural stria. The genus is established to receive *Hister mandibularis* Sch., *rupestris*, *congruens*, *tabellio*, and *latitibius*, Mars., *orientalis*, Payk., *parallelus*, Redt., and *piraticus*, Lew. Hitherto these species have been variously placed in *Hister* and *Contipus*, but grouped together they form a natural genus.

Type, *piraticus*, Lew.

EPIGLYPTUS, gen. nov.

Body more or less oblong, somewhat convex, black and opaque, sculptured above; head retractile, mandibles canaliculate; club of the antenna circular in outline, labrum transverse and carinate in the middle of the anterior half; thorax transverse; antennal fossettes open, well defined, and circular; elytra carinate; propygidium marginate laterally, carinate in the middle; prosternum, keel distinctly marginate; mesosternum widely sinuous and marginal stria complete.

I have founded this genus for the reception of *Hister costatus*, Mars.; the characters given above show how widely it differs from *Hister unicolor*, L. (the type of the genus *Hister*), with which it has hitherto been associated. Marseul apparently only knew the female of *Hister costatus*, of which he gave an excellent figure in his monograph. The male has a densely punctate thoracic disk, which in some specimens extends nearly to the lateral carina, and the anterior portion of the metasternum has two lobe-shaped depressions.

Hister fractistrius, sp. n.

Ovalis, convexiusculus, niger, nitidus; stria frontali semicirculari; pronoto stria laterali interna unica integra; elytris striis conspicue crenatis, subhumerali valde impressa basi abbreviata, 1-3 integris, 4 vix abbreviata appendice arcuata, 5-6 dimidiatis; propygidio pygidioque vix dense punctatis; prosterno inter coxas bistriato; mesosterno leviter sinuato, stria marginali integra; tibiis anticis 6-7-spinosis.

L. $5\frac{3}{4}$ -6 mill.

This species was formerly assigned to *H. indicus*, Lew. (Ann. Mus. Genova, xii. p. 26, 1888), but it is larger and less convex and the dorsal striæ are more conspicuously crenulate. The note (*l. c.* p. 26) refers to this species and states that "a long series of specimens shows that the rudiment of a stria at the base of the elytra belongs to the fourth stria, not to the fifth." In several specimens the rudiment is attached to the fourth stria on one side, while on the other the stria is detached. This shows to which stria the rudiment belongs; Marseul, in relation to *H. navus* (Mon. p. 541), considered it part of the fifth stria. The species which belong to this group are *H. multidentis*, Sch., *navus* and *stercoriger*, Mars., *gentilis*, *stenocephalus*, *sinuaticollis*, *fragosus*, *indicus*, *occidentalis*, *niponicus*, *impiger*, *fractistrius*, and *sodalis*, Lew., all having the detached appendage.

Hab. Carin Cheba, Burma (*L. Fea*, 5th December, 1888). Many examples.

Hister sodalis, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte stria semicirculari; pronoto stria antice leviter sinuata, fovea ante scutellum distincte impressa; elytris striis 1-3 integris, 4 basi abbreviata cum rudimento arcuato, 5 dimidiata, suturali ante medium abbreviata. L. $4\frac{1}{4}$ - $4\frac{1}{2}$ mill.

Oval, rather convex, black and shining; the forehead has a semicircular stria; mandibles somewhat long; the thorax, lateral stria slightly hamate at the base, crenulate anteriorly and sinuous behind the eyes, and there is a small antescutellar puncture; the elytra, striæ, inner humeral shortened at the base and rather wide and deep below the shoulders, dorsal striæ crenulate, 1-3 complete, 4 shortened at the base, with a bent appendage, 5 dimidiate, sutural a little longer (sometimes the fourth and fifth are joined apically); the propygidium is evenly but not so closely punctured as the pygidium; the prosternum has two fine striæ between the coxæ and the anterior lobe is markedly marginate; the mesosternum is feebly sinuous and the marginal stria complete; the anterior tibiæ are 7-8-spinose.

Closely similar to *Hister niponicus*, Lew., but the thoracic margin is less wide and there are other small differences.

Hab. Yunnan. Many examples.

SPILODISCUS, gen. nov.

Body oval, convex; head retractile; antenna, scape long and bent, funiculus with the basal joint longer than the next two together, the other joints are short and gradually enlarge towards the club; the labrum is transverse or semicircular; mandibles short, robust, immarginate and obscurely dentate; pygidium convex; mesosternum markedly emarginate; anterior tibiæ dilated, with two broad teeth; femora more or less robust.

The species to be included in this genus are all natives of the New World, viz. *Hister arcuatus*, Say (type), *sellatus* and *biplagiatus*, Lec., *Ulkei*, *lucanus*, *militarius*, and *Gloveri*, Horn, *patagiatus*, *sarcinatus*, *tunicatus*, and *Flohri*, Lew., *sculpticauda*, *semiruber*, *oregonis*, and *electus*, Casey, and *simplificipes*, Fall. In all the species the elytra are partly red and in *lucanius*, Horn, and *tunicatus*, Lew., there is a very small basal tooth on the anterior tibia; but this is not important, as the general form of the tibiæ is the same.

Notolister nodicornis, sp. n.

Ovalis, parum depressus, niger, nitidus, supra punctulatus, antennis pedibusque piceis; fronte anterieus depressa, haud striata; pronoto stria marginali integra; elytris striis subhumerali nulla, dorsalibus 1-3 integris, 4-5 apicali brevibus, suturali antice evanescente; propygidio pygidioque distincte punctatis; prosterno bistriato, lobo punctato; mesosterno sinuato, stria integra; tibiis anticis 7-8-spinosis.

L. $3\frac{1}{4}$ mill.

This small species is very distinct from the others described in being flatter and finely though distinctly punctured above. The prosternal striæ do not meet anteriorly and the fourth dorsal stria has a basal puncture and the fifth an elongate mark, which indicate appendages. The mesosternal stria is fine and marginal at the sinuosity only, but it is continued laterally to the posterior edge of the metasternum.

The trivial name is suggested by a prominence on the upper edge of the scape of the antenna, a character common to all the species of *Notolister*.

Hab. Cape of Amber, Madagascar.

XLV.—*On new Thyrididæ and Pyralidæ.*

By Sir GEORGE F. HAMPSON, Bart., B.A., F.Z.S., &c.

[Concluded from p. 269.]

GENUS *NEOBOSTRA*, NOV.

Proboscis present; palpi porrect extending about the length of head, the second joint fringed with hair above, the third downcurved; maxillary palpi filiform; antennæ of male ciliated. Fore wing with vein 3 from well before angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8 stalked, 9 absent; 10, 11 from cell. Hind wing with vein 3 from near angle of cell; 4, 5 coincident; 6, 7 from upper angle.

Neobostra ferruginealis, sp. n.

♂. Yellow suffused with ferruginous red; wings irrorated with pink scales. Fore wing with pink antemedial line angled outwards below costa, then oblique; a black point at upper angle of cell; a very obliquely curved postmedial pink line arising on costa from near apex, the medial part of costa with series of black points on upper and under sides.

Hind wing with traces of an oblique pink antemedial line met at inner margin by an oblique postmedial line not reaching costa; cilia of both wings pink. Underside of fore wing with the disk tinged with pink.

Hab. NATAL (*Spiller*). *Exp.* 18 mm. Type in Coll. Rothschild.

(1 a.) *Bostra dipectinialis*, sp. n.

Antennæ of male with two pairs of fine branches on each joint.

♂. Head and thorax dark red-brown; abdomen paler. Fore wing dark red-brown thickly irrorated with black; an indistinct interrupted wavy antemedial dark line with some white scales on it; a prominent black discoidal spot; a curved highly dentate postmedial line almost reduced to a double series of black and white points; a terminal series of black points; cilia pinkish. Hind wing fuscous brown with traces of curved postmedial line; a terminal series of black points; cilia pinkish.

♀ rather greyer brown.

Hab. MASHONALAND, Salisbury (*Marshall, Dobbie*), 5 ♂, 1 ♀ type, Bulawayo (*Eyles*), 1 ♀; TRANSVAAL, Pretoria (*Distant*), 1 ♀. *Exp.*, ♂ 36, ♀ 38 mm.

(1 b.) *Bostra pyroxantha*, sp. n.

♂. Antennæ bipectinate; fore wing with vein 7 from beyond 9.

Head and thorax yellow and pink; abdomen yellow. Fore wing pink with diffused yellow antemedial band, bent inwards and narrowing to costa; an indistinct discoidal yellow spot; an oblique postmedial line slightly angled below costa and at vein 2. Hind wing yellow.

Hab. MASHONALAND, Salisbury (*Marshall*), 1 ♂ type. *Exp.* 26 mm.

(1 c.) *Bostra glaucalis*, sp. n.

Antennæ of male bipectinate.

♂. Grey-white irrorated with bright ferruginous; head, prothorax, and fore legs ferruginous. Fore wing with the costal area ferruginous; a curved ferruginous antemedial line; a discoidal point; the postmedial line excurved between veins 5 and 3; a terminal series of striæ. Hind wing with oblique antemedial line; the postmedial line excurved between veins 5 and 3 and ending near tornus; a terminal line; cilia of both wings chequered with ferruginous at base.

Hab. GERM. E. AFRICA, Dar-es-Salaam. *Exp.* 16-20 mm. Type in Coll. Rothschild.

(1 d.) *Bostra sentalis*, sp. n.

Antennæ of male bipectinate with short branches, the apex simple.

Head pale, slightly tinged with rufous, the palpi red-brown at sides; thorax brownish grey, the tegulæ, patagia, pectus, and mid legs tinged with rufous and irrorated with black, hind legs whitish; abdomen pale brownish grey slightly irrorated with black. Fore wing grey tinged with rufous and sparsely irrorated with black; the base of costa with some black; a diffused black fascia in submedian fold from near base to middle, sometimes with a downturned hook at extremity; a black discoidal spot with dark streak from it to postmedial line; a maculate black postmedial line, excurved from costa to vein 3, then angled inwards in submedian fold, almost obsolete towards costa and inner margin; a terminal series of rather triangular black spots. Hind wing white with a faint brown tinge; a terminal series of more or less developed black spots; cilia with blackish line through them on apical half. Underside of fore wing suffused with fuscous, the costal area ferruginous red; hind wing with the costal area suffused with red and in female irrorated with black, strongly towards apex, a black point at upper angle of cell and maculate postmedial line, stronger towards costa and bent outwards at vein 5.

Hab. BR. E. AFRICA, Athi-ya-Mawe (*Betton*), 1 ♂, 1 ♀ type; Nairobi (*Crawshay*), 1 ♀. *Exp.* 30-32 mm.

(5 a.) *Bostra ochrigrammalis*, sp. n.

♀. Head and thorax rufous, the lower part of frons whitish; fore tarsi fuscous with pale rings, the mid and hind tarsi whitish; abdomen greyish tinged with rufous and irrorated with black, the ventral surface pale. Fore wing red-brown irrorated with black; antemedial line pale defined on each side by brown, slightly angled outwards below costa, then obliquely curved; a slight brown discoidal spot; postmedial line pale defined on each side by brown, oblique, almost straight; cilia with deeper brown line near base and fuscous line at middle. Hind wing fuscous brown with a reddish tinge and slight dark irroration; a pale slightly sinuous postmedial line; cilia yellowish with a rufous line near base; the underside pale suffused with rufous and irrorated with brown, the postmedial line defined by brown on inner side.

Hab. NIGERIA, Old Calabar (*Crompton*), 2 ♀ type. *Exp.* 36 mm.

(5 b.) *Bostra flammalis*, sp. n.

♂. Bright fiery red; head and thorax with a crimson tinge. Fore wing with the costal area tinged with crimson and slightly irrorated with black; a strong, slightly sinuous, fuscous antemedial line; an oblique discoidal bar; post-medial line strong, obliquely curved. Hind wing with strong, oblique, fuscous antemedial line, joined at inner margin by the curved postmedial line.

Hab. CEYLON, Maskeliya (*de Mowbray*), 2 ♂ type. *Exp.* 32 mm.

(5 c.) *Bostra conflualis*, sp. n.

♀. Head and thorax fiery red; abdomen pale red. Fore wing fiery red sparsely irrorated with black; the ante- and postmedial lines white, the former excurved, the latter incurved, confluent in submedian interspace, then slightly separating towards inner margin, the area between them below the cell and towards inner margin suffused with purplish grey, the medial part of costa with some white points. Hind wing with the basal half whitish slightly tinged with red, the terminal half strongly suffused with red; a faint pale medial line; cilia with fuscous line near base and fuscous tips; the underside with fuscous irroration, the medial line dark.

Hab. CAPE COLONY, Grahamstown, 1 ♀ type. *Exp.* 32 mm.

(6 a.) *Bostra rufimarginalis*, sp. n.

♂. Head and thorax greyish flesh-colour; abdomen pale yellowish, the ventral surface suffused and irrorated with black. Fore wing greyish flesh-colour; a small black discoidal spot; the terminal area rufous suffused with fuscous towards termen, its inner edge curved inwards below vein 5; cilia blackish at base, greyish at tips. Hind wing pale orange-red; cilia blackish at base, greyish at tips; the underside with black point at upper angle of cell, the costal and terminal areas slightly irrorated with black.

Hab. CAPE COLONY, 1 ♂ type. *Exp.* 30 mm.

(10 a.) *Bostra suffusalis*, sp. n.

♂. Pale reddish; head and thorax suffused with purplish

fuscous. Fore wing strongly suffused with purplish fuscous; very faint traces of sinuous antemedial and curved post-medial lines. Hind wing thickly irrorated with fuscous; traces of a curved postmedial line; both wings with terminal series of black points and a line at base of cilia, which are reddish.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type. *Exp.* 30 mm.

(11 a.) *Bostra ferrealis*, sp. n.

♂. Ferruginous red. Fore wing with the ante- and post-medial lines pale, the former straight and somewhat oblique, the latter angled outwards on veins 5 and 1 and inwards below vein 2. Hind wing pale reddish yellow; an indistinct pale curved postmedial line, with the area beyond it redder; cilia of both wings pale, with a rufous line through them.

Hab. TRANSVAAL, Barberton (*Rendall*), 1 ♂ type. *Exp.* 18 mm.

(12 a.) *Bostra pygmæa*, sp. n.

♂. Black-brown mixed with grey. Fore wing with curved, sinuous, antemedial whitish line, slightly angled inwards on vein 1; five white points on medial part of costa; a sinuous white postmedial line, incurved above vein 5 and below vein 2 and excurved between them; some obscure terminal dark points. Hind wing fuscous.

Hab. E. AFRICA, Teita, 3000 feet (*Jackson*), 1 ♂ type; Manda I. (*Jackson*), 1 ♂. *Exp.* 12 mm.

(12 b.) *Bostra ochrigraphalis*, sp. n.

♂. Head and tegulæ yellow; antennæ brownish except at base; thorax glossy brown, the outer side of tibiæ and tarsi whitish; abdomen glossy black-brown, the anal tuft yellow. Fore wing glossy brown; a yellowish-white medial line, obsolescent towards costa, excurved at the veins and incurved in the interspaces; postmedial line with small triangular yellow patch on costa, then very faint, excurved at middle; cilia yellow, with brown line near base and brown tips. Hind wing greyish brown; cilia yellowish, with a brown line through them.

Hab. UGANDA, Ketoma (*Doggett*), 3 ♂ type. *Exp.* 18 mm.

(13 a.) *Bostra tenebralis*, sp. n.

♂. Head yellowish, the antennæ fuscous; thorax fuscous

brown, the hind tibiæ and tarsi whitish; abdomen greyish suffused with brown and irrorated with fuscous. Fore wing grey-brown with a faint reddish tinge and thickly irrorated with black; a diffused black antemedial line defined by whitish on inner side, excurved from below costa to submedian fold, where it is slightly angled inwards; the medial part of costa with slight pale points with black streaks between them; a black discoidal spot; postmedial line black defined by whitish on outer side, minutely dentate, incurved from costa to vein 5, where it is angled outwards, then angled inwards in submedian fold; a terminal series of prominent black spots; cilia with a dark line through them. Hind wing greyish suffused and irrorated with fuscous brown; pale sinuous antemedial and medial lines, obsolescent towards costa, with blackish suffusion between them and approximated at inner margin; a terminal series of small black spots; cilia pale, with strong black line through them.

Hab. UGANDA, Ketoma (*Doggett*), 2 ♂ type. *Exp.* 18 mm.

(13 b.) *Bostra scotalis*, sp. n.

♀. Head and thorax dark red-brown suffused with fuscous; pectus and legs paler, the fore tibia on outer side and tarsus whitish; abdomen fuscous brown, the ventral surface paler. Fore wing red-brown thickly irrorated with black; antemedial line defined by greyish on inner side, oblique, slightly incurved between submedian fold and vein 1; the medial part of costa with some pale points; a black discoidal spot; postmedial line defined by greyish on outer side, minutely dentate, excurved between veins 5 and 2 and incurved in submedian fold; a terminal series of small black lunules; cilia with fuscous lines near base and at middle. Hind wing fuscous brown; a curved grey antemedial line; postmedial line grey defined by dark brown on inner side, sinuous and ending near tornus; a slight dark terminal line; cilia with fine pale line at base.

Hab. YORUBALAND, Ogbomoso (*Carter*), 1 ♀ type. *Exp.* 24 mm.

(13 c.) *Bostra flavilinealis*, sp. n.

Antennæ of male ciliated; fore wing narrow.

♂. Head yellow; antennæ rufous; thorax and abdomen rufous; pectus, legs, and ventral surface of abdomen pale. Fore wing rufous irrorated with fuscous; an ill-defined yellowish antemedial line, oblique from costa to submedian

fold, then incurved; the medial part of costa with yellow points; a postmedial yellowish band incurved below vein 4. Hind wing brown with darker irroration.

Hab. KASHMIR, Dras (*Leech*), 1 ♂ type. *Exp.* 16 mm.

(18 a.) *Bostra leucostigmalis*, sp. n.

♀. Head, thorax, and abdomen ochreous tinged with dull rufous; palpi blackish, with white band at extremity of second joint; abdomen with black segmental lines, the terminal half tinged with purplish fuscous and with a white dorsal band on subterminal segment. Fore wing grey suffused strongly with purple; some rufous at base; an indistinct, oblique, pale, waved antemedial line; some white points on medial part of costa; a black discoidal spot; a large elliptical hyaline white spot beyond lower angle of cell, with cupreous red on its outer side; a whitish postmedial line obtusely angled below costa, then bent inwards to the hyaline spot, and acutely angled outwards on vein 1; terminal area blackish with purple and cupreous reflections. Hind wing grey suffused with purple; some red below the cell; a bar-shaped white spot from lower angle of cell to vein 1, defined on outer side by the waved postmedial line, which is indistinct towards costa and inner margin, black beyond the spot, followed by a cupreous patch; terminal area fuscous towards apex; both wings with black terminal line intersected with cupreous points; cilia blackish mixed with white at tips.

Hab. GERM. E. AFRICA, Mikindani (*Reimer*). *Exp.* 18 mm. Type in Coll. Rothschild.

(18 b.) *Bostra xanthorhotalis*, sp. n.

♀. Head, thorax, and abdomen bright crimson, third joint of palpi and frons yellow; pectus and femora pale crimson, tibiae and tarsi and ventral surface of abdomen yellow. Fore wing bright crimson; the medial area bright yellow bounded by the fine black ante- and postmedial lines, the former obliquely curved, the latter excurved between veins 5 and 2. Hind wing bright crimson; the medial area bright yellow bounded by the fine black subbasal and postmedial lines, the latter obliquely excurved from costa to vein 2, then retracted.

Hab. NATAL, Durban (*Leigh*), 1 ♀ type. *Exp.* 22 mm.

(23.) *Bostra metaxanthialis*, sp. n.

♂. Head and thorax reddish brown mixed with fuscous; mid tarsi white; abdomen ochreous irrorated with fuscous and suffused towards extremity. Fore wing fuscous mixed with purple-red; cilia purple-red, fuscous at base and extremity. Hind wing pale yellow, the termen tinged with fuscous, traces of a postmedial line near vein 2; cilia with fuscous line near base.

♀. Fore wing much redder; the basal area ochreous irrorated with red and fuscous and with curved outer edge; a dark spot at upper angle of cell; a pale minutely waved postmedial line oblique below vein 4.

Hab. CEYLON, Horton Plains (*Mackwood*), 1 ♂, 1 ♀ type. *Exp.* 24 mm.

(1 a.) *Sindris bipunctalis*, sp. n.

♀. Head and thorax olive-grey; abdomen orange. Fore wing olive-grey; vein 1 and the veins beyond the cell streaked with whitish; a white patch in end of cell with a heart-shaped black spot before it and a rounded spot beyond it; the interspaces between veins 5 and 8 blackish. Hind wing orange; the costa and apex slenderly dark; a dark terminal line from apex to vein 2.

Hab. NIGERIA, Warri (*Roth*). *Exp.* 36 mm. Type in Coll. Rothschild.

(2 a.) *Sindris holochralis*, sp. n.

♂. Head and thorax brownish ochreous; abdomen ochreous white. Fore wing pale brownish ochreous, the costal edge and a fine terminal line darker; cilia whitish. Hind wing pale yellowish, the apical area tinged with brown to submedian fold.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type. *Exp.* 18 mm.

(4.) *Sindris deltoidalis*, sp. n.

Both wings with veins 4, 5 from cell, approximate for a short distance in hind wing; palpi of both sexes upturned, about five times length of head and recurved over it.

Head and thorax pale pinkish brown; patagia slightly edged with orange; abdomen orange. Fore wing pale fuscous brown suffused with red. Hind wing orange, with terminal fuscous band, broad at costa, narrowing to a point at tornus.

Hab. SIERRA LEONE (*Clements*), 1 ♀ type; YORUBALAND, Ogbomosa (*Carter*), 1 ♀; ASHANTI, Kumassi (*Whiteside*), 1 ♂. *Exp.* 30 mm.

Genus GRAMMIPHLEBIA, nov.

Proboscis minute; palpi downcurved, extending about twice the length of head; maxillary palpi triangularly scaled; frons without tuft of hair; antennæ of male bipectinate, with short branches to about half length, then ciliated, the branches rather shorter in female. Fore wing rather narrow, the termen evenly curved; vein 3 from angle of cell; 4, 5 stalked; 6 from upper angle; 7, 8, 9 stalked, 7 from beyond 9; 10, 11 from cell. Hind wing with vein 3 from angle of cell; 4, 5 stalked; 6, 7 from upper angle.

Grammiphlebia obliqualis, sp. n.

Head and thorax yellow-brown; tegulæ and patagia edged with whitish; abdomen yellow-brown mixed with whitish and irrorated with black. Fore wing yellow-brown irrorated with black; the veins streaked with yellowish white to the postmedial line; the costa with series of alternating whitish and black striæ; the lines strong, yellowish white; the first line almost medial, acutely angled outwards to lower angle of cell, then very oblique, defined by blackish on outer side; postmedial line defined by blackish on inner side, arising from costa near apex, very oblique and slightly excurved at middle; a terminal series of dark striæ; cilia with fine whitish line at base and intersected with whitish. Hind wing pure white, with some black striæ on inner half of termen and near base of cilia; the underside with some dark irroration on costal area and medial and postmedial black bars from costa.

Hab. BR. E. AFRICA, Nairowa (*Betton*), 2 ♂, 2 ♀ type; Gwelil (*Betton*), 2 ♀. *Exp.* 26-30 mm.

(3 a.) *Constantia leucogrammalis*, sp. n.

Head and thorax grey tinged with olive-green; abdomen brownish grey slightly irrorated with fuscous. Fore wing greyish suffused with olive-green and with slight dark irroration, the medial area and the area in curve of postmedial line darker; antemedial line silvery white, strong, slightly angled outwards below costa, then oblique; postmedial line strong, silvery white, arising towards apex, then curved inwards and

upwards to upper angle of cell, forming a loop, then interrupted, slightly excurved below lower angle of cell, then oblique to inner margin near antemedial line; a terminal series of dark striæ; cilia whitish. Hind wing white, with more or less brown on termen, in female forming a well-defined band, with some cupreous red at extremity of vein 2.

Hab. BR. E. AFRICA, Simba (*Crawshay*), 1 ♂; Nairobi (*Crawshay*), 1 ♂ type; Eb Urru (*Betton*), 1 ♂; Athi-ya-Mawe (*Betton*), 1 ♀. *Exp.* 18-22 mm.

(4 a.) *Constantia phaagonalis*, sp. n.

♀. Head and thorax grey tinged with brown; tarsi fuscous, with pale rings; abdomen grey. Fore wing grey irrorated with brown; the veins with slight dark streaks; a dark streak in submedian fold to postmedial line; a subbasal dark striga on inner area; antemedial line blackish defined by white on inner side, obliquely curved; a triangular dark mark beyond the cell, with dark streaks on the veins bounded by the postmedial line, which is black, defined by white on outer side, dentate at veins 5, 4, 3, then angled inwards to near middle of wing and outwards on vein 1; a fine black terminal line; cilia white at base and with fine dark line near tips. Hind wing grey tinged with brown; cilia whitish, with fine dark line near tips.

Hab. CAPE COLONY, Deelfontein (*Col. Sloggett*), 1 ♀ type. *Exp.* 22 mm.

(4 b.) *Constantia poliopastalis*, sp. n.

Constantia canifusalis, Hmps. Trans. Ent. Soc. 1900, p. 381, pl. iii. fig. 16 (♀ nec ♂).

Head and thorax white irrorated with fuscous; mid and hind tarsi tinged with ochreous; abdomen white tinged with ochreous at base. Fore wing white largely suffused with ochreous and blue-grey and irrorated with black; a small black spot below base of costa; antemedial line double, fuscous, filled in with white, oblique from costa to below cell, angled inwards in submedian fold, then oblique to inner margin; a fuscous spot in middle of cell and another on discocellulars, with a white patch between them; postmedial line fuscous, defined by white on outer side, slightly bent outwards and dentate at veins 6, 5, 4, then interrupted by an oblique blue-grey fascia from lower angle of cell to above tornus, bent inwards to below end of cell and angled outwards in submedian fold; a terminal series of blackish striæ.

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Hind wing white more or less strongly suffused and irrorated with fuscous; some blackish striæ usually on termen.

Hab. ALGERIA, Hamman-es-Salahin (*Walsingham*), 3 ♂, 4 ♀ type. *Exp.* 24–30 mm.

C. canifusalis with pectinated antennæ is probably confined to Syria.

(10 a.) *Constantia aglossalis*, sp. n.

♀. Head ochreous, the antennæ black; thorax fuscous brown; pectus and legs greyish; abdomen greyish irrorated with black. Fore wing ochreous almost entirely suffused and irrorated with fuscous brown; antemedial line defined by ochreous on inner side, oblique from costa to median nervure, then incurved; the medial part of costa with some grey points; a small black discoidal spot; postmedial line defined by ochreous on outer side, excurved from costa to vein 5, then incurved; a slight brown terminal line. Hind wing greyish suffused and irrorated with brown; cilia pale, with a brown line near base; the underside pale, irrorated with brown, a discoidal spot and diffused curved postmedial line.

Hab. CAPE COLONY, Deelfontein (*Col. Sloggett*), 3 ♀ type. *Exp.* 20 mm.

(11 a.) *Constantia fuscalis*, sp. n.

♀. Head and base of tegulæ pale ochreous yellow; antennæ blackish; thorax blackish brown irrorated with grey; fore and mid tibiæ and the tarsi whitish; abdomen greyish thickly irrorated with dark brown, the extremity of anal tuft ochreous. Fore wing dark brown thickly irrorated with grey; traces of an oblique grey antemedial line; the medial part of costa with slight grey points; postmedial line very ill-defined, greyish, excurved between veins 5 and 2, then angled inwards in submedian fold. Hind wing greyish suffused with dull reddish brown; a fine dark terminal line; cilia pale brown at base, whitish at tips; the underside whiter, suffused and irrorated with brown, a diffused sinuous postmedial line defined by whitish on outer side.

Hab. ADEN, Haithalhim (*Yerbury*), 1 ♀ type. *Exp.* 18 mm.

(1 a.) *Actenia obliquisignalis*, sp. n.

♂. Antennæ bipectinate. Dull brown mixed with white. Fore wing with oblique silvery-white antemedial mark from

just below subcostal nervure to above inner margin, shaped like an axe, its upper part being expanded on outer side, some diffused black scales beyond it; the veins beyond the cell streaked with dark brown, with the interspaces between them pale; a white subterminal line angled outwards at vein 6, obliquely excurved to vein 3, then incurved; cilia white and brown. Hind wing ochreous suffused with brown, the termen darker.

Hab. NATAL (*Spiller*). *Exp.* 22 mm. Type in Coll. Rothschild.

(2 a.) *Actenia rhodesialis*, sp. n.

♀. Head and thorax red-brown slightly irrorated with fuscous; pectus and legs grey-brown; abdomen grey-brown irrorated with fuscous and slightly tinged with rufous. Fore wing red-brown irrorated with fuscous; a curved fuscous antemedial line; a black discoidal spot; a rather diffused fuscous postmedial line excurved between veins 5 and 3; a terminal series of slight black points; cilia with a fine pale line at base. Hind wing greyish tinged with rufous and irrorated with fuscous; a fine pale line at base of cilia.

Hab. MASHONALAND (*Marshall, Dobbie*), 2 ♀ type. *Exp.* 26 mm.

(3 a.) *Actenia achromalis*, sp. n.

Head, thorax, and abdomen pale brownish grey irrorated with black; palpi blackish at sides. Fore wing pale brownish grey irrorated with black; antemedial line blackish, rather diffused, oblique from costa to submedian fold, where it is angled outwards, then incurved; the medial part of costa with series of whitish points, with black streaks between them; a black discoidal spot; postmedial line black, rather diffused, defined by whitish on outer side towards costa, excurved from costa to vein 4, angled inwards in submedian fold, some blackish suffusion beyond it on costa; a fine blackish terminal line; cilia pale, with a blackish line through them. Hind wing white, the terminal area irrorated with black; a curved blackish postmedial line; a fine dark terminal line.

Hab. NATAL, Durban (*Leigh*), 3 ♂ type; CAPE COLONY, 1 ♀. *Exp.* 18-22 mm.

(4 a.) *Actenia leucoplagia*, sp. n.

♀. Deep vinous red; palpi pale. Fore wing brownish in parts; traces of a waved medial line bent inwards below

vein 2; the postmedial line obscure, angled just below costa, then very oblique and slightly sinuous, with a large white patch beyond it between vein 5 and tornus; traces of some medial white points on costa and of a spot at origin of postmedial line; cilia chequered white and black. Hind wing fuscous brown, with curved dark postmedial line, the area beyond it tinged with vinous red; cilia white with black points.

Hab. BORNEO, Sandakan (*Pryer*), 1 ♀ type. *Exp.* 24 mm.

(7 a.) *Cledeobia styphlotricha*, sp. n.

Head, thorax, and abdomen white tinged with olive-brown; palpi tinged with fuscous at sides; abdomen suffused with fuscous above and with white segmental lines. Fore wing olive-grey, clothed with long rough scales and with very long spatulate scales on the inner margin; an antemedial whitish line, acutely angled below median nervure and with some diffused black beyond its costal half; the postmedial whitish line oblique, incurved below vein 4 and joined by a diffused whitish V-shaped mark from discocellulars; the veins from cell and vein 1 whitish defined by black scales; two indistinct terminal lines and a line through the cilia which are whitish. Hind wing whitish, almost entirely suffused with brownish fuscous; a curved subterminal white line; cilia white, with dark line through them; the area below the cell clothed with long whitish hair.

Hab. MASHONALAND (*Dobbie*), 1 ♂; ZULULAND, Lr. Tugela R. (*Reynolds*), 1 ♀; NATAL (*Heale*), 1 ♀ type, Durban, 1 ♀. *Exp.* 26-30 mm.

(7 b.) *Cledeobia palpangulalis*, sp. n.

♀. Head and thorax whitish strongly irrorated with fuscous; abdomen ochreous whitish, with diffused fuscous dorsal bands, the ventral surface white irrorated with black. Fore wing ochreous white very thickly irrorated with fuscous brown; a slight white streak in submedian fold below middle of cell with some black scales on it; a terminal series of obscure black striæ; cilia white mixed with fuscous and with two ill-defined fuscous lines through them. Hind wing fuscous black, with white patch in, below, and just beyond end of cell; the inner area whitish; cilia pure white. Underside white; fore wing with the costal area and terminal area to vein 2 irrorated with fuscous, a diffused fuscous streak below base of cell, a large rounded black patch beyond

the cell; hind wing with the area below the cell suffused with fuscous, a large rounded black patch beyond the cell extending nearly to termen.

Hab. TRANSCASPIA, Tedschen Oasis (*Hansen*), 1 ♀ type. *Exp.* 30 mm.

(13.) *Cledeobia bipunctalis*, sp. n.

♀. Head, thorax, and abdomen very pale rufous. Fore wing very pale rufous; antemedial line acutely angled outwards in submedian fold and with obscure dark spot on it below the cell, very oblique towards costa and inner margin; a small dark discoidal spot; postmedial line brown, obliquely excurved from costa to vein 3, then slightly incurved; a slight brown terminal line. Hind wing whitish tinged with rufous; a slight brown postmedial line from costa to vein 2.

Hab. ALGERIA, Hammam-es-Salabin (*Walsingham*), 1 ♀ type. *Exp.* 30 mm.

(1 a.) *Tyndis dentilinealis*, sp. n.

Patagia of male with tuft of hair extending to beyond metathorax.

Head and thorax pale reddish brown irrorated with black; abdomen grey-brown irrorated with fuscous and with dorsal black bands on second and third segments. Fore wing pale reddish brown irrorated with fuscous; the antemedial line fuscous, angled outwards below the cell; a small black discoidal spot; postmedial line dentate, slightly incurved from costa to vein 5, oblique to submedian fold, then erect; a terminal series of black points. Hind wing pale fuscous, with a slight reddish tinge and some darker irroration; an indistinct, curved, rather diffused postmedial line; a terminal series of black points; the underside paler, irrorated with fuscous, the postmedial line more distinct.

Hab. GOLD COAST (*W. H. Johnston*), 1 ♂; NIGERIA, Warri (*Roth*), 1 ♀, Old Calabar (*Crompton*), 2 ♂, 3 ♀ type. *Exp.* 20-26 mm.

(1 b.) *Tyndis proteanalis*, sp. n.

Patagia of male with the tuft of hair not extending beyond metathorax.

Head and thorax greyish fuscous more or less tinged with rufous, to pale rufous; abdomen grey-brown more or less tinged with rufous and suffused with fuscous, the second and

third segments with blackish dorsal bands. Fore wing olive grey-brown more or less tinged with rufous and irrorated with black, to greyish ochreous tinged with rufous, or fuscous black, the basal and terminal areas usually darker; ante-medial line diffused fuscous, slightly or strongly excurved below the cell; a small black discoidal spot; the medial part of costa with faint grey points; postmedial line diffused fuscous, sometimes defined by grey on outer side, sometimes with its outer edge somewhat dentate, oblique below vein 4 or more or less strongly incurved in submedian interspace, then bent outwards again; a more or less prominent terminal series of black points or a fine rather punctiform line; cilia greyish more or less mixed with rufous and black. Hind wing whitish more or less suffused with fuscous brown, especially on terminal half, sometimes tinged with rufous; a fuscous postmedial line slightly defined by whitish on outer side, somewhat angled outwards at vein 5, then oblique; a terminal series of black points or fine line; the underside with spot at upper angle of cell.

Hab. BR. E. AFRICA, Nairobi (*Betton*), 1 ♂, 1 ♀, Eb Uru (*Betton*), 1 ♂, Kikuyu (*Crawshay*), 3 ♂ type, Machakos (*Crawshay*), 1 ♀; MASHONALAND, Salisbury (*Marshall, Dobbie*), 1 ♂, 3 ♀. *Exp.* 26-32 mm.

(4.) *Tyndis pictimarginalis*, sp. n.

Maxillary palpi somewhat dilated with scales. Head, thorax, and abdomen orange-yellow, thorax and abdomen suffused with black; wings grey thickly irrorated and suffused with fuscous black. Fore wing with basal yellow spot; an obscure black spot in cell and curved subterminal line; both wings with leaden-silvery terminal line; the cilia bright orange-yellow at base, the tips grey intersected with fuscous.

Hab. SIERRA LEONE (*Clements*), 1 ♂ type; NIGERIA, Old Calabar (*Crompton*), 2 ♀. *Exp.*, ♂ 22, ♀ 30 mm.

(5.) *Tyndis megistalis*, sp. n.

♀. Head and thorax red-brown; tarsi with slight pale rings; abdomen orange, with diffused rufous dorsal bands. Fore wing red-brown with a golden gloss and some dark irroration; the first line almost medial, pale, oblique from costa to median nervure, then erect and slightly angled outwards on vein 1; an obscure grey and blackish discoidal lunule; postmedial line near termen, pale, slightly defined by fuscous on inner side, waved, excurved from below costa

to vein 2, incurved in submedian interspace and slightly angled outwards on vein 1; a fine brown terminal line; cilia yellow tinged with rufous. Hind wing golden-orange with a terminal series of brown striæ. Underside of fore wing yellow, the cell and costal area towards apex tinged with fiery red.

Hab. BR. E. AFRICA, Eb Urru (*Betton*), 1 ♀ type. *Exp.* 54 mm.

GENUS MELANALIS, NOV.

Proboscis aborted, small; palpi porrect, straight, extending about the length of head; maxillary palpi filiform; frons smooth; antennæ of female ciliated. Fore wing with vein 3 from near angle of cell; 4, 5 shortly stalked; 6 from upper angle; 7, 8, 9 stalked, 7 from beyond 9; 10, 11 from cell. Hind wing with vein 3 from close to angle of cell; 4, 5 stalked; 6, 7 from upper angle.

Melanalis perfusca, sp. n.

♀. Deep fuscous black; frons and vertex of head ochreous white; tibiæ and tarsi banded with ochreous. Fore wing with ochreous antemedial band with irregular edges, narrowing below cell; a postmedial spot on costa and two points above inner margin. Hind wing black-brown.

Hab. NATAL, Weenen. *Exp.* 18 mm. Type in Coll. Rothschild.

XLVI.—*Descriptions and Records of Bees.*—X. By T. D. A. COCKERELL, University of Colorado.

Halictoides fallugiæ, sp. n.

Halictoides fimbriatus, var., Ckll. Entom. News, 1901, p. 41.

♀.—Length about $7\frac{1}{2}$ mm.

Black, with no blue tints; pubescence white, rather abundant on head and thorax, a few fuscous hairs on scutellum; head seen from in front not far from round; clypeus projecting but not produced, shining, convex, with very few large punctures, lateral lower corners produced downwards, dentiform; front and vertex with dense small punctures; flagellum ferruginous beneath except at base, the apical part very stout; mesothorax very finely punctured; anterior part

of scutellum shining, irregularly sparsely punctured; area of metathorax sharply bordered and covered with exceedingly fine striæ; tegulæ shining rufo-piceous. Wings a little dusky, iridescent; stigma red-brown, nervures fuscous; venation essentially as in *H. marginatus*, but the stigma is larger and the marginal cell somewhat shorter. Legs black; abdomen shining, the hind margins of the segments broadly rufo-testaceous; there are basal white hair-bands and the hair of apex is pale sooty.

Easily known from *H. marginatus* by the shorter strongly margined area of metathorax, much darker stigma, &c. From *H. virgatus* it is known by the much finer striæ of the area of metathorax, much less coarsely sculptured abdomen, and colour of hair of apical segment; it is also somewhat smaller and the abdomen is narrower. From *H. fimbriatus* it differs in the colour of antennæ, shape of abdomen, &c. Last ventral segment with no longitudinal keel, but penultimate one with a transverse ridge.

Hab. Mesilla Park, New Mexico, April 30, 1900, at flowers of *Fallugia acuminata* (Wooton); two (Cockerell).

Ctenoplectra chalybea, Smith.

In Ann. & Mag. Nat. Hist., Sept. 1904, I described *C. vagans* from the Philippine Islands, separating it from a specimen of *C. chalybea*, ostensibly the type, from Celebes. I now find, however, that the real original type of *C. chalybea* was collected by Wallace at Mt. Ophir, Malacca, and is presumably in the Hope Museum at Oxford. I cannot tell from the description whether the Malacca insect is identical with the Celebes or the Philippine one, or different from both; but since Smith considered it to be the same as that from Celebes, we must so assume for the present.

Melissodes hortivagans, Ckll.

Fedor, Texas, May 29, June 7 (*Birkmann*).

New to Texas. One female is a partial gynandromorph, having the right side of the clypeus and labrum light lemon-yellow, while the other side is black, the colours sharply and evenly separated.

Melissodes suffusa, Cresson.

Fedor, Texas, May 28, 1901, ♂ (*Birkmann*). Another is dated June 9.

The male *suffusa* has no teeth at sides of seventh abdominal segment and the antennæ are only moderately long.

Melissodes grandissima, Ckll.

A male from Fedor, Texas (*Birkmann*), is referred to this species. It runs in my tables to *M. comanche*, but differs in having the hair of b. j. mainly black or blackish (clear ferruginous in *comanche*), while that of basal joint of middle tarsus is a sort of pale purplish grey; lateral patches of abdomen better developed; face a little narrower; eyes light yellowish green; third joint of antennæ shorter; last joint black above and dull reddish below (entirely light red in *comanche*).

Melissodes Baileyi, sp. n.

♀.—Length about $11\frac{1}{2}$ mm.

Hair of head and thorax white; some black on vertex and a large black patch on dorsum of thorax, not, however, nearly reaching the tegulæ; eyes silver-grey; flagellum, except at base, dull ferruginous beneath; tegulæ piceous, with light hair; just behind tegulæ, at base of wing, is a tuft of pale golden hair. Wings rather short, hyaline; stigma and nervures fuscous; second submarginal cell very small, oblique, higher than broad, receiving the first r. n. about the middle. Legs black, with pale hair, that on basal joints of tarsi within orange, that at apex of middle tibiæ without dense and dark fuscous; scopa of hind tibiæ pale fulvous, coarse and not plumose. Abdomen with conspicuous silver-grey hair-bands, one at base of second segment and very broad, even, and entire, apical ones on segments 2 to 4; no sign of a median band on 2; 5 and 6 with black hair, white hairs projecting only at extreme side; hair of labrum yellowish, contrasting with the greyish white of face.

In my tables this runs to *M. sphaeralceæ*, except that the hair on outer side of hind tibiæ and tarsi is light yellowish. It is not unlike *sphaeralceæ*, but differs by the less shining abdomen, the duller surface of which is much less distinctly punctured, while the hind margins of the segments are scarcely pallid, except the first, and that narrowly. The middle of the mesothorax also has the punctures closer and more regular, and the second submarginal cell is quite differently formed. From *M. fimbriata*, Cress., it is easily known by the wings not fuscous on apical margin; third s.m. very large, not narrowed one-half to marginal; abdominal bands broad, &c. In Robertson's table it runs to *M. vernoniæ*, Rob., but it is easily known from that by the colour of hair on hind tarsi and the ornamentation of second abdominal segment.

Hab. Fedor, Texas, April 5, 1904 (*Birkmann*).

Named after Mr. Vernon Bailey, in recognition of his work on the zoology of Texas.

Melissodes xanthopteralis, sp. n.

♂.—Length about 12 mm.

Clypeus, labrum, and basal part of mandibles yellow; flagellum red beneath; pubescence dull whitish, except that of mesothorax and scutellum, which is dull light ochreous. Wings very yellow, the apex little infuscated; tegulæ red; hind margins of abdominal segments dull white, the subapical region broadly reddened; abdominal bands white (on middle of segments 2 to 4); segments 5 to 7 with brown-black hair; 7 with lateral spines.

Runs both in my table and Robertson's to *M. comptoides*, Rob., but it does not look like *M. compta*, and the abdominal fasciæ do not seem to agree. The account of *comptoides* would seem to apply even better (except in respect to the ferruginous tarsi) to male *galvestonensis*, but the female of that species does not agree with *comptoides*. *M. xanthopteralis* differs from *galvestonensis* by the broadly whitish hind margins of abdominal segments, third segment with a narrow white hair-band (an extremely broad one in *galvestonensis*), long hair at sides of segments 3 and 4 white (without the conspicuous black bristles seen in *galvestonensis* and also in *communis*), wings yellower and not so dusky, tarsi ferruginous, hair on outside of hind tibiæ and tarsi white (fulvous in *galvestonensis*), third joint of maxillary palpi shorter. From *M. kallstræmiæ phenacoides* (which it resembles in the colour of the wings and the colour and form of the abdominal bands) it differs in the conspicuously broader abdomen, the somewhat broader face, the broadly whitish hind margins of abdominal segments, and the absence of black bristles on basal part of segment 4. The abdomen is also much broader than that of *M. tepaneca* and the bands are quite differently coloured. From the colour of the wings, ferruginous nervures, and large oblique second submarginal cell, it cannot well be the male of *M. Bruesi*, Ckll.

Hab. Fedor, Texas, May 26, 1901 (*Birkmann*).

Melissodes megacerata, sp. n.

♂.—Length 13 mm.; antennæ 10 mm.

Black; head and thorax with abundant light ochreous pubescence; clypeus lemon-yellow, except for the usual

black dot on each side; labrum black, with a large yellow spot; mandibles with no yellow spot; antennæ very long, third joint at shortest point somewhat longer than second, flagellum deep red beneath; mesothorax dullish, with strong, rather close punctures; no dark hair on thorax above; tegulæ piceous, with a ferruginous margin. Wings dusky, but not noticeably yellowish; stigma and nervures dull ferruginous. Legs black, with ochreous hair; claw-joints ferruginous; hair on inner side of basal joint of hind tarsi ferruginous. Abdomen shining, first segment with much ochreous hair, remaining segments with brown-black hair, and no evident pale bands, but there are lateral oblique bands of light hair on sides of segments 2 and 3; hind margins of segments hyaline or whitish, the first narrowly, the others broadly; sides of apex of abdomen 4-dentate, the teeth on sixth segment dark, those on seventh red and directed more outwardly; apical plate narrow, truncate; mouth-parts only moderately elongated.

In my tables this runs to *M. rivalis*, Cress., except that the abdomen is not banded. It differs entirely from *rivalis* by the very much longer antennæ as well as other characters. There is a certain superficial resemblance to *M. georgica*, Cress., but, again, the antennæ are longer and the apical plate of the abdomen is much narrower than in *georgica*, and there are many other differences. There is also a superficial resemblance to *M. carolinensis*, D. T., but *megacerata* differs from that by the smaller abdomen, teeth at sides of seventh segment, absence of a white hair-band at base of second segment, &c.

Hab. Fedor, Texas, Oct. 13, 1897 (*Birkmann*).

In Robertson's table this runs to *M. autumnalis*; but that species, as I have recognized it, has the hair on inner side of basal joint of hind tarsi black; and Robertson, contrasting *autumnalis* with *cnici*, makes no reference to the most conspicuous difference shown by *megacerata*—the very much longer antennæ.

Melissodes pimella, sp. n.

♂.—Length about 7 mm.; antennæ about $6\frac{1}{2}$ mm.

Runs in my table to *aurigenia* and in Robertson's to *agilis*, but it is smaller than these, and closely resembles *M. agilis* var. *subagilis*, from which it differs as follows:—Size somewhat smaller, especially the abdomen; orbits more parallel; eyes nearly black (not at all green); clypeus deeper (more chrome) yellow; labrum yellow; mandibles with most of

the base yellow; hair of thorax above pale fulvous; most of mesothorax and scutellum bare, shining, with sparse but distinct punctures. Wings shorter, faintly dusky, not milky; stigma and nervures fuscous, second submarginal cell less produced at lower inner corner. Claw-joints pale yellowish (not bright ferruginous); abdominal hair-bands more dense and compact and fulvous; punctures of second segment closer and finer; lateral teeth of last segment triangular, not sharp and pointed. The third antennal joint, except on upper side, is only about as long as second.

Hab. Arizona (no other particulars known).

In the Cresson collection.

Melissodes agilis semiagilis, subsp. n.

♂.—Length 10–11 mm.

Size and appearance of typical *agilis* (cotype from Texas compared), but labrum black and mandibles without a yellow spot at base. The nervures are darker and redder, the mesothorax is more shiny, and the red above the testaceous hind margins of the abdominal segments is very evident. From the *subagilis* form it is easily known by its larger size, with the face less narrowed below. The middle and hind tarsi and the tegulæ vary from dark ferruginous to black. Eyes light green.

Hab. Fedor, Texas, May 29 (type); also May 25 and Oct. 22 (*Birkmann*).

Melissodes petulciformis, sp. n.

♀.—Length about 15 mm.

Runs in my tables to *M. petulca*, Cress., to which it has the closest possible superficial resemblance, but on close examination it is seen to differ as follows:—Somewhat larger; hair of labrum white (yellow in *petulca*); fuscous patch on thorax not nearly reaching tegulæ (practically reaching tegulæ in *petulca*). Wings not so dark; second submarginal cell hardly more than half size of first (little smaller than first in *petulca*); first r. n. meeting second t.-c. (entering second s.m a considerable distance from the end in *petulca*); b. n. falling some distance short of t.-m. (meeting t.-m. in *petulca*). Abdomen finely and closely punctured, the punctures on the bare part of second and third segments very distinct (these parts practically impunctate in *petulca*); the apical bands of yellowish-white tomentum on segments 2 to 4 broad and even, not broadened in the middle, the black part of 3 and 4 scarcely wider than the

bands, but that on 2 distinctly though not very greatly wider; apical hair not reddened. In Robertson's table it runs exactly to *M. illinoensis*, Rob., but it differs from that in having the closely-punctured clypeus without a distinct median elevated line, the labrum not yellow, the nervures dark rufo-fuscous, the second s.m. much shorter than the first or third, apical margin of first abd. seg. only very narrowly testaceous. *M. petulca* has the labrum dull orange, and the submarginal cells more nearly equal, so that it is nearer to *illinoensis*. Someone had labelled the type of *M. petulciformis*, *M. intermedia*, but it cannot at all be reconciled with the description of that species.

Hab. Fedor, Texas (*Birkmann*).

A second specimen, not so large as the type, was taken at Fedor, June 20, 1898.

Melissodes Helenæ, sp. n.

Melissodes humilior, var. *α*, Ckll. Ann. & Mag. Nat. Hist., Oct. 1903, p. 447 (Las Cruces, New Mexico, Aug. 19, *C. H. T. Townsend*).

The females of the *M. humilior* group are small compact insects with black hair on middle of dorsum of thorax. *M. Helenæ* runs in my tables to *M. trifasciata*, Cress., but it is not closely allied to it. In the following table the new species is defined and separated from its allies:—

Abdominal segment 4 with a conspicuous median triangular black patch, which has black hairs at its sides; segment 2 with a narrow, entire, conspicuous, median white hair-band, the distance between it and the basal band in the median line being less than the distance between it and the hind margin; third segment with its hind margin very broadly black and bare; fourth segment with a large black basal area, covered with short black hair, and obtusely emarginate in the middle posteriorly; hair of anterior part of thorax light fulvous, of vertex with much black (especially behind the ocelli), of face white; small joints of middle and hind tarsi clear red.	<i>M. Helenæ</i> , Ckll.
Segment 4 not so marked; segment 2 without such a median band, the second band being either broader or covering the whole hind margin	1.
1. Hind margins of segments 2 and 3 broadly bare, at least in middle	2.
Hind margins of segments 2 and 3 covered	

- with hair, or only narrowly bare, the abdominal bands very broad 4.
2. Wings clear; stigma and nervures yellowish ferruginous; bare hind margin of second abd. segment reddish; hair of two apical segments chocolate-colour; hair on inner side of b. j. dark fuscous *M. intermediella*, Ckll.
- Wings smoky; stigma darker, nervures dark fuscous; bare hind margin of second segment black. Eyes greenish 3.
3. Abdominal bands white; hair on inner side of b. j. ferruginous *M. humilior*, Ckll.
- Abdominal bands yellowish; hair on inner side of b. j. rufo-fuscous *M. humilior catalinensis*
(*M. intermediella catalinensis*, Ckll.).
4. Flagellum dark red beneath *M. pecosella*, Ckll.
- Flagellum bright red beneath (*M. pecosella verbesinarum*; Ckll.).

For other distinguishing characters, see the original descriptions. *M. p. verbesinarum* was described from a single example, but I have another collected at Las Cruces, N. M., Sept. 23, at flowers of *Isocoma Wrightii*.

Melissodes confusiformis, sp. n.

♀.—Length about 12 mm.

The broad bands on abdominal segments 2 to 4 pale ochraceous, that on 4 entire and covering margin, its upper edge in median line produced to a blunt point; band on second segment broad like that on third and a little arched. The hair on inner side of b. j. is fusco-ferruginous, or ferruginous stained with black: if the insect is classed with those having this hair ferruginous, it goes in my tables to *M. gilensis*, Ckll., which, in fact, it closely resembles; if it is classed with those having this hair black or fuscous, it runs to *M. nigrosignata*, Ckll., but it is also closely similar to *M. confusa*, Cress., and *M. grindeliæ*, Ckll. (*montana*, Cress., ♀). It is best defined by comparing it with the four species mentioned. From *M. gilensis* it differs by the flatter and less robust abdomen; the band on fourth segment not nearly so broad (in *gilensis* it almost covers the segment); the wings smaller and hyaline (strongly dusky in *gilensis*), the b. n. falling short of t.-m. (meeting it in *gilensis*); the shorter black hair of scutellum; the shorter (very broad for its length) head; the yellowish (not green) eyes; and a few minor characters. From *M. nigrosignata* it differs by its much less robust form, with conspicuously narrower abdomen; yellower abdominal bands; pale ferruginous spurs; hair on middle tarsi yellowish white above (*i. e.* outside),

black in front, and pale ferruginous beneath; flagellum ferruginous beneath, &c. From *M. confusa* (with which someone had identified one of the specimens) it differs by the conspicuous tufts of light hair at extreme sides of fifth abdominal segment; the broader face; the light hair of labrum; the colour of the antennæ; the colour of hair of middle tarsi; the light hair on tegulæ, &c. From *M. grinde'ia* it differs by the sides of the mesothorax being broadly covered with pale ochreous hair, the black hair not closely approaching tegulæ; the light hair on tegulæ; the abdominal bands narrower and not so yellow; the apical plate broader; the colour of hair on middle tarsi, &c.

Hab. Fedor, Texas, May 6, 1902 (type), and Sept. 30, 1897 (*Birkmann*).

Melissodes agilis, Cresson, var. *subagilis*, Ckll.

Four males from Fedor, Texas (*Birkmann*), represent a variety between *agilis* proper and *subagilis*. The size is small and the mandibles have no yellow spot; the labrum is sometimes entirely black, sometimes with a yellow spot. The pubescence, while very pale, is yellowish, not pure white like that of *M. Snowi*. The rather narrow face agrees with *subagilis*, and they should rank with that form rather than with true *agilis*.

Melissodes Wheeleri, Ckll.

What I think must be the ♂ of this is from Fedor, Texas, May 31, 1901 (*Birkmann*). It runs in my tables to *M. perplexa*, but has a large light spot on labrum, upper part of clypeus without black, and less black hair on mesothorax. I presume that it will be impossible to certainly match the sexes of the closely allied species of this group without field-observations.

Xenoglossa brevicornis (Cress.).

Mr. Birkmann has taken both sexes at Fedor, in June. The female, which I had not before seen, runs in my tables of *Melissodes* &c. nearest to *M. spissa*, and is indeed extraordinarily like that insect, differing from it as follows:—Face broader; anterior margin of clypeus not red, but with a pair of obscure yellow spots; eyes more convex and prominent; marginal cell obliquely truncate (pointed in *spissa*); claws with a divergent basal tooth of considerable size on all

the legs (*spissa* has front and middle claws with a median notch or small tooth, hind ones with an evident tooth); abdomen not stained with red, the hair-bands much broader, and the apical hair much darker and redder. *M. spissa* has abundant light fulvous hair on the ventral surface of abdomen, that of *X. brevicornis* being much shorter and mostly paler. The tibial scopa of *spissa* is beautifully plumose.

Megachile Harrisoni, sp. n.

♀.—Length about 16 mm.

Allied to *M. amputata*, Sm., from Borneo, *M. ferruginea*, Friese, from Siam, and *M. rufipes* (Fabr.) from Africa. In Bingham's table of Indian species it runs to *M. dimidiata*, Sm., but has the abdomen and scopa differently coloured. From *M. amputata* it is readily known by the abdomen not being fasciate; from *M. ferruginea* by the dark antennæ and the greater amount of red hair on abdomen above. Black; the legs, except the coxæ and the greater part of the trochanters, ferruginous red; pubescence of body mostly short and moss-like, especially on abdomen above; hair of head and thorax entirely orange-fulvous, of abdomen above bright orange-fulvous on the first three segments and basal half of fourth, beyond that black; ventral scopa black on last three segments, more or less tipped with red, though not conspicuously; on segments 2 and 3 the scopa is bright orange-fulvous; on the first segment is no scopa, but only short yellowish-white hair; hair of legs orange-fulvous. Head rather large; eyes long, light red; antennæ black, the flagellum dark brownish beneath; clypeus shining, with punctures of two sizes, and a strong median keel, not reaching anterior margin; anterior margin straight, not at all emarginate, but appearing finely crenulate when looked at rather from above; mandibles long, with only two teeth, which are apical and occupy much less than half of the long cutting-edge; lateral ocelli much further apart than either is from eye; mesothorax shining, with very numerous and regular, but well-separated punctures; tegulæ red, rugulose. Wings strongly stained with orange, the apical region very broadly dusky; marginal cell with the obtuse apex away from costa; claws simple.

Hab. Goenong Soegi, Lampong, Sumatra, Oct.—Nov., 1901 (*A. C. Harrison, Jr., and Dr. H. M. Hiller*). In Coll. Acad. Nat. Sci. Philadelphia.

In regard to the mandibles, this approaches the subgenus

Pseudomegachile, Friese (type, *M. ericetorum*, Lep.), but in other characters there is no resemblance. The real affinity is with the subgenus *Eumegachile*, Friese, which might perhaps, with a suitable modification of the diagnosis, be regarded as a valid genus to include a large number of Asiatic species.

University of Colorado,
Boulder, Colorado, U.S.A.,
Feb. 11, 1906.

XLVII.—*Descriptions of Two new Lizards from
New Zealand.* By G. A. BOULENGER, F.R.S.

[Plate X.]

Lygosoma Suteri. (Pl. X. fig. 1.)

Section *Lirolepisma*. The distance between the end of the snout and the fore limb is contained once and two thirds in the distance between axilla and groin. Snout moderate, obtusely pointed. Lower eyelid with an undivided transparent disk. Nostril pierced in a single nasal; no supranasal; frontonasal broader than long, forming a suture with the rostral and with the frontal; latter shield as long as frontoparietals and interparietal together, in contact with the two or three anterior supraoculars; four supraoculars, third largest; seven or eight supraciliaries; frontoparietals distinct, more than twice as large as the interparietal; parietals in contact behind the interparietal, bordered by a pair of nuchals and a pair of temporals; three pairs of nuchals behind the anterior pair; fourth, fifth, and sixth upper labials below the eye. Ear-opening oval, as large as the transparent palpebral disk, without projecting lobules anteriorly. 34 scales round the middle of the body, dorsals largest and faintly striated. Præanal scales not enlarged. The adpressed limbs fail to meet. Digits moderately long, subcylindrical; subdigital lamellæ smooth, 20 under the fourth toe. Olive-brown above, with small black spots on the back and larger ones forming a band on each side of the neck and body; sides pale grey; lower parts white, throat greyish.

	mm.
Total length	183
Head	19
Width of head	14
Body	81
Fore limb	25
Hind limb	32
Tail (reproduced)	83

A single specimen from Great Barrier Island, received on loan from Mr. Henry Suter.

This species is closely allied to *L. Smithii*, Gray.

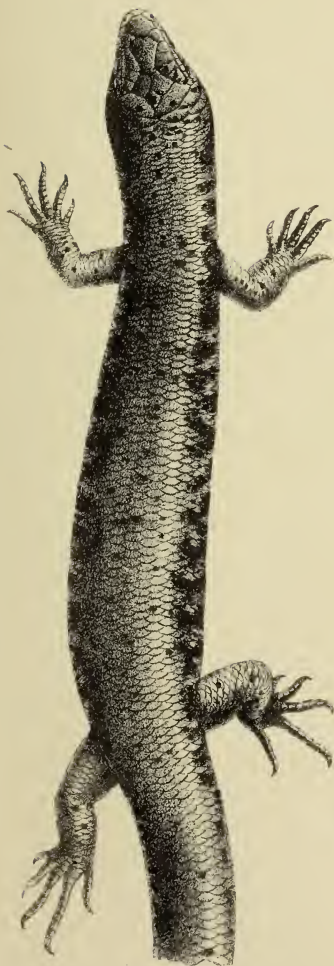
Lygosoma homalonotum. (Pl. X. figs. 2, 2 a.)

Section *Lirolepisma*. Body subquadrangular, back quite flat. The distance between the end of the snout and the fore limb is contained once and two thirds in the distance between axilla and groin. Snout rather elongate, obtusely pointed. Lower eyelid with an undivided transparent disk. Nostril pierced in a single nasal; no supranasal; frontonasal broader than long, broadly in contact with the rostral, narrowly with the frontal; latter shield a little shorter than frontoparietals and interparietal together, in contact with the two anterior supraoculars; four supraoculars, second largest; eight supraciliaries; frontoparietals and interparietal distinct, subequal in size; parietals in contact behind the interparietal, bordered by a pair of nuchals and a pair of temporals; fourth, fifth, and sixth upper labials below the eye. Ear-opening oval, a little larger than the transparent palpebral disk. 30 scales round the body, dorsals, especially the two median rows, largest and faintly striated. Præanal scales slightly enlarged. The adpressed limbs nearly meet. Digits moderately long, subcylindrical; subdigital lamellæ smooth, 20 under the fourth toe. Brown above, on the body the scales with darker striæ, head darker, tail yellowish; a series of Λ -shaped dark brown spots along the middle of the back and tail; a series of large yellowish spots on each side, most distinct on the neck and above the fore limbs; limbs with yellowish spots; two black vertical bars below the eye, with a yellowish bar between them; lower parts yellowish, dotted with brown, the dots crowded on the gular region, forming striolations; chin spotted with black.

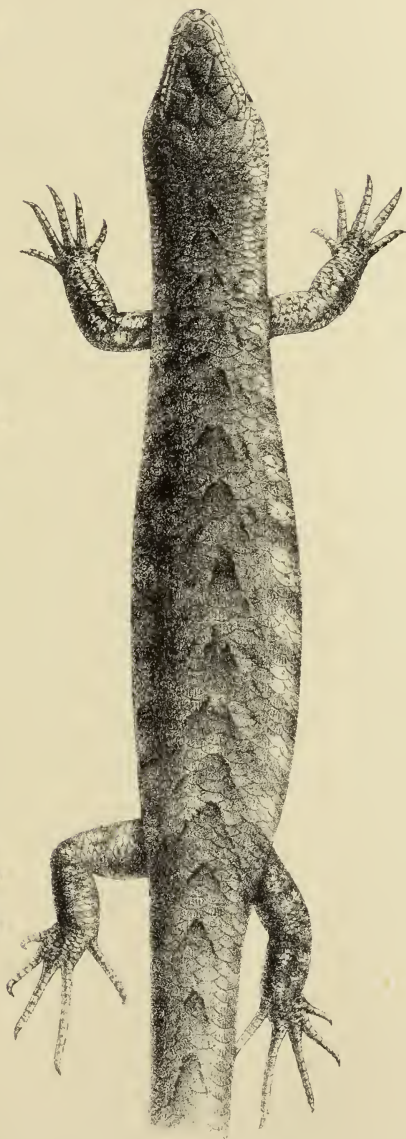
	mm.
Total length	243
Head	23
Width of head	16
Body	85
Fore limb	29
Hind limb	43
Tail (reproduced)	125



2a.



1.



2.

J. Green del et lith

1. *LYGOSOMA SUTERI*. 2. *L. HOMALONOTUM*.

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A single specimen from Flat Island, Mokohinan Group, N.W. of Great Barrier Island, also received from Mr. Suter. Allied to *L. æneum*, Girard.

EXPLANATION OF PLATE X.

Fig. 1. *Lygosoma Suteri*.

Fig. 2. *Lygosoma homalonotum*.

Fig. 2 a. Ditto, side view of head.

Natural size.

XLVIII.—*Some Voles from the Tian Shan Region.*

By GERRIT S. MILLER, Jr.

Two small collections of voles from the Tian Shan Mountains have recently been referred to me for determination by Mr. Oldfield Thomas. The first was made during August and September, 1904, by Mr. A. B. Bayley Worthington, while on a shooting-trip to the Altai Mountains, in the Tekes Valley, Southern Ili, in the Koksus Valley, Kucha, and in the intervening mountains of the Tian Shan chain. The specimens were presented to the British Museum. The second, containing ten skins, was made by Mr. A. A. Kutsenko, of Przewalsk (Karakol), in the region immediately west of that traversed by Mr. Worthington. I find that the two collections include the four following species, one of which, an *Evotomys*, is of special interest as the first member of its genus to be detected in Central Asia.

Microtus tianschanicus, Büchner.

An adult male (collector's number 20) was taken by Mr. Worthington in "open veldt near stream" in the Koksus Valley, at 10,000 feet altitude, September 16, 1904. The specimen agrees in all essential characters with Büchner's description based on material from the Juldus Valley at the same altitude. Its measurements are, however, somewhat less, and the skull appears to be smaller than the specimen figured.

Head and body 88 mm.; tail-vertebræ 21; hind foot 16.5 (14); ear 10.

Skull: upper length 22.4; condylo-basal length 22.8; palatal length 12.6; diastema 6.8; zygomatic breadth 10.2; interorbital constriction 2.8; breadth of brain-case above roots of zygomatica 11; mandible 14; maxillary tooth-row (alveoli) 5.4; mandibular tooth-row (alveoli) 5.

Nine of the specimens in the Kutsenko collection (one from Tosor, seven from Karanolyenoye ushchelié, and one from Ushchelié Malaya Kuizuil-su) are referable to the same species. They show considerable variation in size, due apparently to differences in age. The upper length of skull ranges from 22.4 to 25 mm., thus filling the gap between the Worthington specimen and that figured by Buchner. Hind foot 18.8 (17) mm. in the largest skin (that from Tosor).

Microtus near arvalis.

Two specimens (one skull) from Tekes Valley, 5800 feet, two from Big Musart, 5800 feet and 6000 feet, and nine (no skulls) from Kapkak, 8000 feet, are apparently all referable to a species closely resembling the European *Microtus arvalis*, but which, in the present uncertainty respecting the status of members of this group, I am unable to name. As compared with sixteen skins from Brunswick, Germany, they are slightly darker and the upper parts are more noticeably grizzled. In size they closely agree with the German specimens. The skulls are injured, but they appear to differ in form from those of European *arvalis* in the somewhat greater breadth of brain-case and less noticeable arching of the entire upper surface. Teeth strictly as in *Microtus arvalis*. This animal is readily distinguishable from *Microtus ravidulus* by its much darker colour and by its flattened, broadened skull.

A specimen with badly damaged skull from Zaukilenoye ushchelié (Kutsenko, no. 122) is probably referable to the same form.

Alticola Worthingtoni, sp. n.

Type.—Adult female (skin and skull), collected in the Tian Shan Mountains (Koksu), altitude 9000 feet, September 30, 1904, by A. B. Bayley Worthington. Original number 24*.

Characters.—Resembling *Alticola lama* (Barrett-Hamilton) and *A. albicauda* (True), but differing from the former in having the tail about twice as long as hind foot, and from the latter in having the ears larger, the teeth smaller, the anterior loop of m_1 narrower, and the first outer reentrant angle of m^3 deeper and better defined.

Colour (Type).—Upperparts finely blended smoke-grey and

* The specimen is now registered as B.M. 5. 12. 4. 11.

black, with a faint suffusion of pale ochraceous buff, particularly on sides. The individual hairs are blackish slate through the greater part of their length, then smoke-grey darkening to ochraceous, this succeeded by a blackish tip. Underparts white, the dark bases of the hairs appearing irregularly at surface. Feet white, with a faint creamy tinge. Tail light cream-buff, with a faint brownish tinge in pencil.

Skull and teeth.—The skull resembles that of *Alticola albicauda** in all details of structure and form. The audital bullæ appear to be less inflated than in the allied species, but this character may be purely individual. Teeth noticeably smaller than in *A. albicauda*, the length of the upper molar series (alveoli) in five skulls ranging from 5.6 to 6 mm., that of the lower row from 5 to 5.4 mm., while in the type of *A. albicauda* the same measurements are respectively 6.6 and 6.4 mm. Aside from their smaller size, the molars differ from those of *Alticola albicauda* in several details of structure. In the posterior upper tooth the first outer reentrant angle is deeper and better defined than in *A. albicauda*, usually almost isolating a small triangle; terminal loop longer and narrower. In the first lower molar the anterior loop is narrower than in the related species, and the unusual depth of the first inner reentrant angle causes it to be rather noticeably crescentic in outline.

Measurements (Type).—Head and body 101 mm.; tail 33; hind foot 19.6 (18); ear from meatus 15.

Skull: upper length 26.6; condylo-basal length 26; palatal length 13.4; diastema 8; zygomatic breadth 15; interorbital constriction 4.2; breadth of brain-case above roots of zygomata 12; mandible 16.2; maxillary tooth-row (alveoli) 5.8; mandibular tooth-row (alveoli) 5.4.

Specimens examined.—Seven: five from the type locality, one from the same valley at an elevation of 10,000 feet, and one from Kapkak, 8000 feet.

Remarks.—At the request of Mr. Thomas this species is named after Mr. Worthington.

Evotomys centralis, sp. n.

Type.—Adult male (skin and skull), collected in the Koksú Valley, altitude 9000 feet, September 24, 1904, by A. B. Bayley Worthington. Original number 21 †.

* See Proc. Acad. Nat. Sci. Philadelphia, 1899, pls. xii. and xiii. fig. 5.

† The specimen is now registered as B.M. 5. 12. 4. 14.

Characters.—A medium-sized, rather short-tailed species, with fur long and soft and tail conspicuously pencilled; general colour not very strongly red; tail conspicuously bicolor, blackish above; skull essentially as in *E. hercynicus*; molars apparently not rooted as early as in true *Evotomys*, but otherwise strictly typical; third upper molar with only two reentrant angles on inner side.

Colour (Type).—Upperparts a mixture of hazel and ochraceous buff, the former predominating on back, crown, nape, and the latter on cheeks and sides, the hairs everywhere with blackish tips, but these producing no evident dark shading except in sacral region and on outer surface of thighs. Individual hairs blackish slate through basal two thirds, then ochraceous buff darkening quickly to hazel, the extreme tips blackish. Underparts light smoke-grey, washed with ochraceous buff. Feet pale smoke-grey. Tail sharply bicolor, blackish above and at tip, pale ochraceous buff below. Ears scantily covered with fine hazel hairs.

Skull and teeth.—The skull does not appear to differ appreciably from that of *Evotomys hercynicus*, except that the zygoma is weaker and less abruptly flaring anteriorly, a character which may readily prove to be inconstant. The molar teeth differ from those of *Evotomys hercynicus* in the distinctly less rounded angles throughout and in the greater relative depth of the inner reentrant angles in the mandibular teeth. Aside from these general peculiarities the enamel pattern does not differ from that of the European animal except in the complete absence of the third inner reentrant angle in the last upper molar. Size of teeth exactly as in true *Evotomys*.

Measurements (Type).—Head and body 85 mm.; tail-vertebræ 35; pencil 9; hind foot 17.4 (16); ear from meatus 12; ear from crown 9.6.

Skull: upper length 23.4; condylo-basal length 23; palatal length 12; diastema 6.6; zygomatic breadth 13; interorbital constriction 4; breadth of brain-case above roots of zygomata 11; mandible 15; maxillary tooth-row (alveoli) 5.8; mandibular tooth-row (alveoli) 5.6.

Specimens examined.—Four: three from the Koku Valley, at altitudes of 9000, 10,000, and 10,500 feet, and one from Kapkak, 8000 feet.

Remarks.—While this animal is so easily distinguishable from the other known Asiatic species that no special comparisons are required, its characters are less unusual than its geographic isolation would lead one to expect. In all probability, however, this isolation is only apparent, and the range

of the genus will eventually prove to be continuous from the Tian Shan Mountains north-eastward to the regions in which the animals are now known to occur*.

XLIX.—On some Mammals collected by Mr. Robin Kemp in S. Nigeria. By R. C. WROUGHTON.

THE Natural History Museum has recently received a small collection of mammals made by Mr. Robin Kemp in S. Nigeria. As the geographical region is an interesting one and the collection contains several forms sufficiently distinct to merit separate names, a short account of it may be acceptable.

1. *Scotophilus nigritellus*, de Wint.

♂. 5. 12. 1. 1. Agoulerie, Anambra Creek, S. Nigeria.

2. *Pipistrellus nanulus*, Thos.

♀. 5. 12. 1. 2-4. Agoulerie, Anambra Creek, S. Nigeria.

3. *Crocidura Manni*, Peters.

♀. 5. 12. 1. 5. Abutshi, S. Nigeria.

4. *Sciurus* sp.

♂. 5. 12. 1. 6 (yg.). Agoulerie, Anambra Creek, S. Nigeria.

Probably *rufobrachiatus*.

5. *Funisciurus* sp.

5. 12. 1. 7 (imm.).

Probably *raptorum*, Thos., but too young for identification.

6. *Tatera Kempii*, sp. n.

♀. 5. 12. 1. 8. Agoulerie, Anambra Creek, S. Nigeria.

A *Tatera* about the size of *lobengulæ*, de Wint., but in

* The *Arvicola russatus* of Radde, from the eastern Sajan Mountains, currently referred to *Evotomys*, is probably not a member of this genus. Radde describes and figures the teeth as having the angles unusually sharp as compared with ordinary "*Arvicola*" (= *Microtus*), a character which is diametrically opposed to *Evotomys*. That he understood the form of the enamel folds in this genus is shown by his figure of the teeth of *Evotomys rutilus*.

pelure, coloration, &c. much resembling *valida*, Boc. General colour above a pale brown, much shaded with black, as in *valida*, but this black tinge disappearing laterally much more suddenly than in that species. Individual hairs of back 13–15 mm. long, dark slate for fully $\frac{2}{3}$ of their length, then buff, with black tips. Under surface white (the hairs white to their bases), sharply defined. The black tinge of the back produced forward over the top of the head and over the whole face between the eyes, as in *valida*, but the black streak from the eye to the ear of that species not present. Tail much longer than head and body, almost black above, almost white beneath, throughout its whole length; little or no tuft at apex.

Skull large for the size of the animal, long and narrow. Upper incisors with a well-marked groove outside the median line.

Dimensions of the type (measured in the flesh) :—

Head and body 145 mm. ; tail 174 ; hind foot 35 ; ear 20.

Skull : greatest length 42 ; basilar length 33 ; brain-case, breadth 16 ; interorbital breadth 7 ; diastema 12·5 ; molar tooth-row 6 ; bullæ 11.

Hab. S. Nigeria.

Type. B.M. no. 5. 12. 1. 8 (a very old ♀). Collected by Mr. Robin Kemp, August 21st, 1905.

This species is intermediate in size between *valida*, Boc., from Angola, and *gracilis*, Thos., from Gambia, the only two species hitherto recorded from the western side of the continent. It is interesting to note that by the absence of a tail-tuft and its comparatively long tail it is allied to the South-African rather than to the N.-African, or even Mid-African, forms. In the Angolan forms of *Tatera* the head and body and the tail are practically of equal length.

7. *Arvicanthis rufinus*.

Mus rufinus, Temm. Esquisses, p. 163 (1853).

♂. 5. 12. 1. 9, 14, 15 ; ♀. 5. 12. 1. 10–12, 16. Agoulerie, Anambra Creek.

Temminck's description of his *Mus rufinus* from Guinea was admittedly based on semi-adult specimens and is not very full ; but Mr. Thomas, who has seen the type specimen, assures me that it is undoubtedly an *Arvicanthis*. The type locality was Elmina, on the Gold Coast. Amongst the specimens of this series are some which have the usual pale ground-colour of the back a pale buff, while the rest have it

a bright russet and are markedly larger in all measurements. This larger, brighter form in my opinion, so far as I can judge without seeing the type, represents Temminck's *rufinus*. In the absence of a really mature specimen of the smaller form, and seeing that all these individuals were taken at the same time and place, I have decided not to separate it without further evidence.

If my identification is correct the normal dimensions of *rufinus* are:—

Head and body 165 mm. ; tail 150 ; hind foot 35 ; ear 20.
Skull: basilar length 32 ; zygomatic breadth 19 ; molars 6·3.

8. *Arvicanthis occidentalis*, sp. n.

♂. 4. 11. 1. 14. Bo, Sierra Leone.

This specimen was presented to the Museum some time ago by Mr. Kemp, and was provisionally identified as *rufinus*. My identification of the S.-Nigerian form as *rufinus* leaves this individual without a name.

It is smaller than even the smaller form included above in *rufinus*, which it closely resembles in coloration, though on the back it is even less rufous.

The dimensions are:—

Head and body 140 mm. ; tail 117 ; hind foot 30 ; ear 17.
Skull: basilar length 27 ; greatest breadth 17 ; molars 6·5.

Hab. Bo, Sierra Leone.

Type. ♂. 4. 11. 1. 14. An old individual with much worn teeth taken by Mr. Kemp, 21st January, 1904, and presented to the Museum.

Its duller, paler colour and smaller size of both body and skull combined with larger molars suffice to distinguish it unmistakably from *rufinus*.

9. *Arvicanthis fasciatus*, sp. n.

♂. 5. 12. 1. 17-18. Agoulerie, Anambra Creek, S. Nigeria.

An *Arvicanthis* of the *barbarus* group, but having the pale lines practically continuous ; about the same size as the specimen in the Museum collection identified by Mr. Thomas as *zebra* (P. Z. S. 1903, i. p. 298), but much darker in general appearance. The general ground-colour "bistre," the pale stripes buff, continuous, but showing signs of breaking up into spots towards the rump ; a broad, black, median dorsal stripe as in *pulchellus*. Eye-ring and a small but well-marked area on the sides of the muzzle concolorous with the

pale dorsal stripes; throat, belly, and under surface generally, almost the same colour, only slightly paler.

Skull markedly smaller than in *zebra*, closely resembling that of *Dunni*, than which it is very slightly larger, but has markedly smaller bullæ.

The following table shows comparative dimensions:—

	<i>fasciatus</i> .		<i>zebra</i> .	<i>Dunni</i> .
	No. 25.	No. 27.		
Head and body	110	95	106	90
Tail	120	120	?	70
Hind foot.....	27½	27½	25	23
Ear	16	15	15	14
Skull:				
Greatest length	28·5	28	31	28
Basilar length	22·5	22	23·5	22
Zygomatic breadth	14	14	13	13
Length of upper molar series.	4·8	4·8	5·3	4·9
Antero-posterior length of bullæ	5	5	5·8	6
Age and sex	Very old ♂.	Ad. ♂.	Ad. ♂.	Very old ♂.

Hab. Agoulerie, Anambra Creek, S. Nigeria.

Type. 5.12.1.17. Very old ♂. Two specimens taken by Mr. Robin Kemp, 21st August, 1905.

10. *Arvicanthis pulcher*, sp. n.

♂. 5.12.1.19-20. Agoulerie, Anambra Creek.

Gray's type of *pulchellus* is in the Museum collection (a stuffed specimen), but the skull has only now become available. It shows that the type was a quite young animal. There is no exact record of locality beyond West Africa, but another specimen, presented to the Museum by Mr. E. R. Alston, from "Fantee," agrees closely with Gray's type in all essential characters, and is a somewhat older individual. From these I venture to deduce the following dimensions for *pulchellus* (the dimensions in italics are from actual measurement on the type):—

Head and body 115 mm.; tail 110; *hind foot* 27; ear 14.

Skull: greatest length 30; *zygomatic breadth* 14; *molars* 5.

The specimens sent by Mr. Kemp are very much larger and stouter all round and their colouring more rufous, especially on the rump, and the tail is longer than the head and body. The following are dimensions recorded by Mr. Kemp:—

Head and body 130 mm.; tail 140; hind foot 30; ear 19.

Skull: greatest length 32; basilar length 24·5; *zygomatic breadth* 15; upper tooth-row 5·4; bullæ 5.

Hab. Agoulerie, Anambra Creek, S. Nigeria.

Type. B.M. no. 5.12.1.19 (a very old ♂). Collected by Mr. Robin Kemp, 22nd July, 1905. Two specimens.

11. *Cricetomys gambianus*, Waterh.

♀. 5.12.1.21. Agoulerie, Anambra Creek, S. Nigeria.

12. *Mus*.

5.12.1.22-26. Agoulerie, Anambra Creek, S. Nigeria.
These belong to the multimammate group of rats.

L.—*New and little-known Species of Heterocera from the East.* By Colonel C. SWINHÖE, M.A., F.L.S., &c.

Family Geometridæ.

Zamarada tenuimargo, nov.

♂. Palpi, frons, top of head, thorax, and abdomen pale chocolate-colour; wings of a uniform bright green; a minute black dot at the end of each cell; costa of fore wings chocolate; outer margin and cilia of both wings of the same colour; the outer marginal line on the hind wings is double throughout, but on the fore wings it is double on the upper half and on the lower third filled in with chocolate, forming a narrow marginal band containing a regular row of white dots: the wings below are slightly paler, the margins darker, without any white dots: body and legs pale chocolate.

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

Khasia Hills; eight examples.

Coloured as in *Z. cosmiaria*, Swinhoe, of which I have a long series from Assam.

Boarmia nobilitaria.

Boarmia nobilitaria, Staud. Iris, v. p. 173 (1892).

Kashmir; one example.

The type came from Central Asia; not previously recorded from the Indian Region.

Agathia æquisecta, nov.

♀. Antennæ, head, and body pale chocolate-red; fore part of thorax and both wings above bright emerald-green, bands

dark chocolate-red : fore wings with a narrow costal band ; a band at the base ; a medial, narrow, and rather sinuous band from a little before middle of costa, running nearly straight to the hinder margin beyond the middle, where it joins the broad marginal band, which is broadest on the costa, includes a round emerald-green subapical and a large square spot of the same colour immediately below it, followed by three white spots in a transverse row ; the inner edge of this band is white and has a rounded excavation outwards above and below the middle : hind wings with a broad marginal band, with its inner edge sinuous and white, and includes a large green spot on the outer margin above the middle and a white streak across the base of the black tail ; outer marginal line of both wings dark chocolate ; cilia luteous, with chocolate spots and a pale base. Underside much paler, almost whitish, bands bright chocolate-pink.

Expanse of wings $1\frac{8}{10}$ inch.

South Java (*Fruhstorfer*) ; one example.

The outer band somewhat resembling *A. hemithearia*, Guen., but the middle band is outwardly oblique, even more oblique than in *A. arcuata*, Moore.

Tephroclystia leucospila, nov.

♂. Antennæ and palpi brown, last joint of latter white at the tips ; frons white ; head grey ; body brown, the abdomen with a dorsal row of white spots : fore wings pale olive-brown, with four transverse, outwardly curved, incomplete bands of white spots between the base and the disk at equal distances apart ; a black spot at the end of the cell ; four submarginal white spots, two in the middle and two near the hinder angle : hind wings paler, the upper two thirds whitish, the lower third with several white spots ; cilia of both wings brown, with a complete row of white spots.

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

Khasia Hills ; a good series.

Family Thyrididæ.

Striglina curvilinea.

Striglina curvilinea, Warren, Nov. Zool. xii. p. 411 (1905).

Bali (*Doherty*), two examples ; Queensland, four examples.

Warren's type in Coll. Rothschild came from Bougainville, Solomon Islands. My examples have been examined by Mr. Warren.

Striglina conjuncta, nov.

♂. Dark brownish ochreous: costa of fore wings pale ochreous, with black spots, some large ochreous patches in the cell and below it and one outside the end: hind wings more dull in colour and paler; both wings so much suffused with brown as to make the reticulations indistinct; a row of submarginal brown dots; cilia ochreous, with a brown base. Underside pale reddish ochreous, the reticulations reduced to dots and spots, but prominent; fore tibiæ blackish, fore tarsi with black bands.

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

Khasia Hills; four examples.

Differs from any known Indian form.

Striglina mediofascia, nov.

♂. Of a uniform reddish ochreous: costa of fore wings white, with some blackish-brown spots; both wings covered with uniformly disposed blackish-brown reticulations and minute lunular marks of the same colour on the outer margins; a more or less indistinct brown, medial, transverse fascia on the fore wings, nearly straight, rather broad, and incomplete. The underside paler, the fascia dark and prominent and composed of two patches, one at the end of the cell and the other below it; hind wings with a transverse blackish ante-medial band; abdominal tuft pale; fore tibiæ blackish brown.

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

Khasia Hills; five examples.

Allied to *S. decussata*, Moore, which has prominent dark spots at the end of each cell, no medial band either above or below, and the costa of fore wings reddish ochreous.

Rhodoneura canidentalis, nov.

♂ ♀. Pale pinkish grey; thorax and abdomen suffused with brown, the latter with blackish-brown segmental bands: wings thickly striated and irrorated with black, leaving the costal and marginal areas pale; the costa of fore wings with some black and white patches, the ground-colour showing in parts all over both wings, giving them a peculiar variegated appearance. Underside paler, the variegations prominent and caused by a number of black and a few white patches.

Expanse of wings $\frac{8}{10}$ inch.

Khasia Hills; many examples.

The outer margin of both wings slightly excavated below the apex.

Family Pyraustidæ.

Bocchoris fatualis.

Botys fatualis, Led. Wien. ent. Mon. vii. p. 475, pl. xi. fig. 15 (1863).

Sarawak; three males and one female.

Kuching; one pair.

Lederer's type came from Java. The species does not appear to be noticed by Sir George Hampson in his monograph of the Pyraustidæ in P. Z. S. 1898; I have gone through it twice and cannot find it: without a specific index the P. Z. S. is practically useless for reference to entomologists.

Sylepta marcidalis, nov.

♂. Palpi ochreous, with a brown band; antennæ and head ochreous, the latter suffused with grey: both wings above dull purplish grey; interior and exterior transverse lines and cell-markings as in *S. iopasalis*, Walker, the area between the two lines on the fore wings tinged with yellow, the area outside the outer line darker purplish grey: hind wings entirely suffused with purplish grey, paler towards base and generally paler than on the fore wings. Underside much as in *iopasalis*, but of a duller colour.

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

Padang, Sumatra; eight examples.

A form of *iopasalis*, but very distinct, showing no variation; there is an example in the B. M. from Sambawa, Pyraustid Drawer 10.

Genus TORQUEOLA, nov.

Palpi upturned, second joint broadly scaled in front, the third porrect; frons rounded; antennæ of male with four calciform teeth enclosing a hollow at base of shaft, which is much bent and contorted, and with a small angulation at end of contorted portion; hind tarsi with a large tuft of hairs on outer side of first joint; venation as in the genus *Margaronia*, Hübn., = *Glyphodes*, Guen.

Type, *T. ophiceratis*, Walker, xxxiv. 1440 (1865).

Corresponds with Section III. of Hampson's genus *Glyphodes*.

Cenocnemis amboinalis, nov.

♂. Of a uniform green colour, paler and much duller than is usual in this group; palpi green, last joint chocolate;

body beneath, legs, the large tuft of hair near abdominal angle of hind wings below white, anal tuft of abdomen black; costa of fore wings above pale chocolate, hairs on the abdominal margin of hind wings white; a blackish spot at the end of each cell of both wings, black dots on the outer margin; cilia pale chocolate, with whitish base and tips.

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

Amboina; one example.

The fore wings are longer and narrower than usual, almost as narrow as in *Euchnemidia melanuralis*, Walker, which I have from Amboina and Flores, and is somewhat of the same colour, but the hind legs are normal and do not possess the large black tufts of hair on the tibiæ as in that form.

Crocidophora bicoloralis, nov.

♂. Antennæ, palpi, head, and body dark chestnut-red: wings ochreous yellow, the upper half of the basal area of fore wings brownish yellow, the fans of leaden scales showing through to the upper side; an oblique, somewhat sinuous, antemedial dark line joining above the hinder margin a similar medial line which runs up to the costa above the end of the cell in the form of a triangle; two lines in the disk of the hind wings joined together in a V-shaped form: fore wings with a chestnut-red very broad marginal band, occupying nearly a third of the wing, with an erect inner margin; a narrower, similarly coloured band on the hind wings, attenuated downwards, ending at one third from the anal angle and not quite reaching the costa. Underside same as upper-side, but without the lines; body and legs yellow, without markings.

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

Sarawak; one example.

Allied to *C. ptyophora*, Hmps. n.

LI.—*A new Species of Orycteropus*. By A. S. HIRST.

Orycteropus leptodon, sp. n.

Almost as large as *O. Erikssoni*, Lönnberg*, but readily distinguishable from it and from all the other members of the genus by its small and very narrow teeth. Anterior portion of skull dilated, and as a result the edges of the palate are

* Arkiv Zool. iii. no. 3 (1906).

more parallel, not converging to the same extent as in other species.

Dimensions of the typical skull:—

	mm.
Basal length	(c.) 247
Zygomatic breadth.....	(c.) 91
Intertemporal breadth	50
Distance between tips of postorbital processes ..	65
Nasals, length.....	102
" breadth	46·5
Greatest breadth of muzzle on premaxillo-maxillary suture.....	45
Palatal length.....	167
Breadth of palate halfway between gnathion and palation	44·5
Second upper molar, length	11
" " greatest breadth	6·7
" " least breadth	4·5
First upper molar, length	10·5
" " greatest breadth.....	5·5
" " least breadth	3·6

Hab. Efulen, Cameroons.

Type. An incomplete skull, collected by Mr. G. L. Bates. British Museum no. 5. 11. 27. 20.

LII.—*Some undescribed Species of Cicadidæ.*

By W. L. DISTANT.

Subfamily *TIBICININÆ.*

Division *TETTIGADESARIA.*

Collina obesa, sp. n.

Body above dull dark ochraceous, finely, sparingly, palely pilose; body beneath with legs a little paler in hue; anterior femora irregularly spotted with castaneous, intermediate and posterior femora apically annulated, tibiæ biannulated, and bases and apices of the tarsi more or less castaneous; tegmina and wings hyaline and talc-like, the venation pale testaceous spotted with fuscous brown; the whole area of the tegmina is somewhat thickly and minutely spotted with pale fuscous, the wings (except on the veins) immaculate; the lateral margins of the pronotum are acutely medially produced and then concavely sinuate to base; tegmina a little more than two and a half times as long as broad; face with the central

carination very pronounced; head (including eyes) very little more than half the width of base of mesonotum; abdomen short and broad, only about one third longer than greatest breadth.

Long., excl. tegm., ♂ 21 mm.; exp. tegm. 52 mm.

Hab. —? (Paris Mus.).

Tettigades Lebruni, sp. n.

Body and legs black, very longly and strongly pilose; pronotum with the posterior margin and an anterior spot on lateral margins, mesonotum with the posterior margin and the anterior and posterior angles of the basal cruciform elevation testaceous; tegmina and wings hyaline, the venation black; tegmina with the costal membrane, terminal veins to radial area, claval sutural vein, anterior venation to upper apical area, and some suffusions on ulnar veins ochraceous; wings with the veins a little here and there ochraceous on basal half; tegmina about two and a half times as long as greatest breadth, first and second ulnar areas about equal in length but shorter than third, apical areas short but varying in length, fourth ulnar area extending beyond middle of lower apical area, its terminal transverse vein outwardly convex.

Long., excl. tegm., ♂ ♀ 20–22 mm.; exp. tegm. 50–56 mm.

Hab. Patagonia, Santa Cruz (*Lebrun*, Paris Mus.).

Allied to *T. parva*, Dist., from the Argentine, but much larger, body more robust and pilose, tegmina with the apex of fourth ulnar area much broader and its terminal vein outwardly convex.

Division TAPHURARIA.

Ueana maculata, sp. n.

Body testaceous brown, about basal third of abdomen ochraceous; head with the anterior angles of lateral margins to vertex and an angulate fascia at the area of the ocelli black; pronotum with two central longitudinal lines, strongly amplified anteriorly and posteriorly, and the fissures piceous, the anterior and posterior margins paler testaceous; mesonotum with two central anterior obconical spots, denoted by their darker margins; apical abdominal segment black at base; tegmina and wings hyaline, in some lights with a pale bluish lustre; tegmina with the veins and costal membrane testaceous, the veins to apical areas more or less piceous, and the

transverse veins at bases of second and third apical areas infuscated, sometimes very strongly so; wings with the margins and apex of anal area infuscated; face strongly centrally sulcate, the lateral transverse ridges very coarse; rostrum reaching the posterior coxæ; anterior femora with three strong spines, posterior tibiæ with three long slender spines on inner margin and two on outer margin.

Long., excl. tegm., ♂ 19, ♀ 21½ mm.; exp. tegm., ♂ 60, ♀ 65 mm.

Hab. New Caledonia, Bourail (*H. Méray*, Paris Mus.).

Division PARNISARIA.

Taipinga fuscata, sp. n.

♀. Head and pronotum dull ochraceous; head with a spot at base of front and nearly the whole of the vertex piceous; pronotum with a central longitudinal fascia and an irregular spot on each lateral area piceous; mesonotum and abdomen black; mesonotum with two bent central longitudinal fasciæ and the lateral margins, and abdomen with the posterior segmental margins (excluding basal segment) dull ochraceous; body beneath and legs brownish ochraceous, posterior tibiæ paler, tarsi and rostrum more or less testaceous; tegmina and wings semihyaline, suffused with a pale fuscous tint, venation dull ochraceous; tegmina with a broad oblique reddish-brown fascia crossing the transverse veins at bases of apical areas, and the outer margin broadly and irregularly of the same colour; head with the front strongly produced and about as long as vertex; posterior pronotal angles distinctly subtriangularly produced; tegmina less than three times as long as greatest breadth.

Long., excl. tegm., ♀ 13 mm.; exp. tegm. 28 mm.

Hab. Transvaal; Rustenburg.

Taipinga consobrina, sp. n.

Head, pronotum, and mesonotum black, sparingly greyishly pilose; anterior and posterior margins and sometimes a central longitudinal fascia to pronotum, two central longitudinal inwardly angulated fasciæ to mesonotum, margins of cruciform elevation, and posterior margins of mesonotum ochraceous; abdomen ochraceous, two central basal spots and a lateral spot behind tympana black; abdomen beneath with a central and a lateral segmental series of spots on each side piceous; body beneath and legs ochraceous; face, space between

face and eyes, coxæ, and anterior femora beneath piceous; margins of face ochraceous; tegmina and wings hyaline, the venation brownish ochraceous; tegmina with the costal membrane ochraceous and margin of clavus piceous; rostrum just passing the intermediate coxæ; opercula in male elongate but posteriorly dilated; wings with five apical areas.

Long., excl. tegm., ♂ 16 mm.; exp. tegm. 3½ mm.

Hab. Transvaal; Rustenburg (*Distant*); Lydenburg (*Zutrzenka*).

Division MELAMPSALTARIA.

Melampsalta Germaini, sp. n.

♂. Body black; eyes ochraceous; ocelli and a central spot at base of head, a central fascia (ampliated posteriorly) and lateral and posterior margins to pronotum, lateral margins to mesonotum and the cruciform elevation (excluding anterior angles), coxæ and legs sanguineous; a central spot at posterior margin of pronotum, suffusions to coxæ and femora, and rostrum piceous; tegmina and wings hyaline, their extreme bases sanguineous, venation fuscous.

♀. Posterior margin of apical abdominal segment and apex of anal segment testaceous red.

Vertex of head foveate at basal sanguineous spot and near each lateral angle; anterior femora with three spines; tegmina about two and a half times as long as greatest breadth.

Long., excl. tegm., ♂ 10, ♀ 12 mm.; exp. tegm., ♂ 26, ♀ 29 mm.

Hab. New Caledonia (*Germain*, Paris Mus.).

KOBONGA, gen. nov.

♀. Head (including eyes) distinctly a little narrower than pronotum, front broad, much shorter than vertex, the lateral margins of the latter convex, ocelli placed on disk of vertex; face broadly centrally longitudinally sulcate, but the sulcation becoming narrow and evanescent before clypeus, strongly transversely striate, the striations not reaching lateral margins; rostrum not extending beyond the intermediate coxæ; pronotum a little shorter than mesonotum, the lateral margins sinuate, and obsoletely centrally toothed; mesonotum (including cruciform elevation) almost as long as head and pronotum together, the cruciform elevation broadened anteriorly; tegmina in ♀ a little more than three times as long as

greatest breadth, the ulnar areas very long, either half as long again or twice as long as apical areas, the lower apical area placed longitudinally, basal cell about twice as long as broad; wings with six apical areas.

Allied to *Melampsalta*, but differing by the much greater length of the ulnar areas.

Type, *K. umbrimorgo*, Walk. (*Cicada*).

BIRRIMA, gen. nov.

♂. Head (including eyes) a little wider than pronotum, front flattened, shorter than vertex, margins of both almost continuous, ocelli on disk, front ocellus near anterior margin of vertex; face a little depressed at base, only moderately prominent, centrally sulcate and strongly transversely ridged, about as broad as space between it and eyes; rostrum about reaching the posterior coxæ; pronotum shorter than mesonotum, its lateral margins nearly straight, its posterior angles distinctly prominently produced; mesonotum convex, cruciform elevation with the area defined by its produced angles broader than long; abdomen longer than space between apex of head and base of cruciform elevation; tympana entirely exposed; opercula globose, elevated, laterally extending a little beyond margin of abdomen, at sides exposing the cavities, not extending beyond base of abdomen; tegmina about three times as long as greatest breadth, basal cell narrower at apex than at base, about twice as long as broad, bases of the upper vein to lower ulnar area and the lower vein to radial area fused, the first emitted at some distance from the base of the second, apical areas eight, a short transverse vein near apex of clavus; wings with six apical areas; anterior femora with three slender spines, the apical one shortest, posterior tibiæ with some long slender spinules.

By the shape of the opercula this genus has considerable affinity to *Gymnotympana*, Stål (*Chlorocystaria*), but in other characters, especially by the venation of the tegmina, it belongs to the division *Melampsaltaria*.

It is probable that other species, of which I have seen only female examples, now included in the genus *Melampsalta* may belong here.

Birrima Montrouzieri, sp. n.

♂. Body piceous; front of head and anterior lateral margins of vertex castaneous; ocelli shining testaceous; eyes pale olivaceous speckled with black; pronotum with two central

longitudinal black fasciæ much widened at base; mesonotum with two anterior obscure central obconical spots; tympanal cavities ochraceous; a spot at base of face, anterior margins between face and eyes, legs, opercula, segmental margins to abdomen beneath, and the anal segment ochraceous or pale testaceous; broad longitudinal streaks to femora and bases of tibiæ piceous; tegmina and wings hyaline, the venation and costal membrane, postcostal area, and lower basal streak to the first ochraceous, the upper vein to lower ulnar area emitted from radial vein at about length of basal cell.

Long., excl. tegm., ♂ 21 mm.; exp. tegm. 65 mm.

Hab. New South Wales (Coll. Dist.) · Sydney (Stockholm Mus.).

LIII.—*Natural History Notes from the R.I.M.S. Ship 'Investigator,' Capt. T. H. Heming, R.N., commanding.*—Series III., No. 12. *Preliminary Report on the Indian Stalked Barnacles.* By N. ANNANDALE, D.Sc., Deputy Superintendent of the Indian Museum.

THE Stalked Barnacles collected from time to time by the Surgeon-Naturalist on board the Survey Ship 'Investigator' were obtained between latitudes 5° and 27° north and longitudes 50° and 99° east, and with a few exceptions from a depth of over 100 fathoms. Though the collection is not very large as regards individual specimens, a considerable number of forms are represented, a large proportion of which fall within the genus *Scalpellum*. Several of these are new, but Høek's *acutum**, *velutinum**, *tenue**, and *novæ-zealandiæ** are each represented by at least one characteristic example. Over one half of the individuals, moreover, belong to Weltner's *Scalpellum squamuliferum*, which is abundant in the neighbourhood of the Andamans and occurs at a depth of from 112 to 1840 fathoms. Our large series of this species is very uniform.

In the present paper I propose merely to describe the hermaphrodites or females of those forms which are in my opinion new †, all but two of them belonging to the above-mentioned genus. My thanks are due to Lieut.-Col. A. W. Alcock, I.M.S., F.R.S., Superintendent of the Indian

* See my paper on "Malaysian Barnacles &c.," *Memoirs of the Asiatic Society of Bengal*, vol. i. (1905).

† Only those forms which are represented by at least two specimens have been described.

Museum, for many valuable suggestions. As regards taxonomic order, I have followed Gruvel's 'Monographie des Cirrhipèdes' (Paris, 1905) as far as possible. The forms here described will be figured in the next volume of the "Illustrations of the Zoology of the 'Investigator'" (1906). The specimens are, almost without exception, in an excellent state of preservation.

GENUS SCALPELLUM.

(a) *Forms with imperfectly calcified valves.*

Scalpellum Gruvelii, sp. n.

Capitulum irregularly ovoid, laterally compressed, with 13 plates, which are widely separated one from the other, deeply embedded in and partially concealed by a thick, feebly translucent, externally smooth and hairless membrane. *Carina* more or less distinctly bent at an angle, with umbo on a tooth which projects upwards through the membrane some distance from the distal extremity of the plate; the latter separated from the terga; the præumbinal portion expanded distally, flattened or feebly convex upwards, variable in extent; subumbinal portion nearly straight or bowed in a very wide arc, with its dorsal surface concave, with ill-defined borders, decreasing considerably from below upwards, its base overlapped by the carinal latera, its sides with a dorsal ridge. *Terga* \curvearrowright -shaped, the shorter limb overlapped at its distal extremity by the apex of the scuta, the larger directed towards the carina, the apex slightly retroverted towards and above the carina. *Scuta* subtriangular, with a sharp tooth near the upper extremity of the lateral margin; below this point the margin is boldly excavated. *Upper latus* with perfectly calcified portion pentagonal, subtriangular, sharply pointed at the apex, which is directed towards the notch below the scutal tooth; the base feebly angular. *Rostral latus* sausage-shaped, its main axis forming an angle with the basal margin of the scutum, its median extremity close to the latero-basal angle of that plate. *Infra-median latus* an isosceles triangle with its base parallel to the base of the capitulum; a club-shaped ridge with its expanded extremity uppermost projects outwards through the membrane almost to the external surface, the remainder of the plate being deeply buried. *Carinal latus* triangular, with apex at free extremity, which projects backwards for some distance behind the carina; upper margin slightly

concave; margin directed towards upper latus feebly excavated. Except this plate, all are widely separated from the carina.

Peduncle short, flexed, cylindrical, with the base expanded into a small flat disk, irregularly armed with large heterogeneous plates, which are compressed from above downwards and have a sharp edge directed outwards; normally these are covered with a thick smooth membrane.

Appendages &c.—Cirri normal, first widely separated from second, devoid of pigment. Anal appendages short, slender, reaching a short distance beyond the junction of the two rami of the sixth cirrhus, with six joints and a terminal row of about six stiff hairs. Penis absent.

Mouth.—Labrum large, feebly bullate. Maxilla small, with free edge straight, bristles few and feeble. Mandible very small, with only two main teeth, the outer notched near the extremity of its outer margin and with a subsidiary tooth at its base inwards, the inner small and simple. Altogether the mouth-parts of this species are feebly developed. There are no traces of pigment on them or on any other part of the surface of the animal.

Dimensions.—

	mm.
Length of capitulum	30
Breadth „	21
Length of peduncle	15

Localities.—Between Laccadives and mainland, 1022 fath.; Gulf of Manaar, 1006 fath. and 859–880 fath.; Andaman Sea, 930 fath. On dead Lamellibranch shell; on skeletons of Gorgoniids and of *Caryophyllia*; on glassy fibres of *Hyalonema*. Five specimens.

Var. quadratum.

Upper half of subumbinal carina bent into a semicircle. Peduncle with medium-sized plates arranged in ten longitudinal series, with about 8 plates in each series. Otherwise agreeing with typical form.

A single specimen was taken in the Gulf of Manaar at a depth of between 859 and 880 fathoms, side by side with one of the typical form.

This is evidently a variety in the true sense of the word. Possibly all intermediate stages exist, as some of the typical specimens are nearer that of the variety than others.

Scalpellum Alcockianum, sp. n.

Capitulum oval, with or without a notch above, with 13 plates, which are widely separated, embedded in and concealed by a thick, brownish, externally eorrugated and velvety membrane. *Carina* simply bowed, its upper extremity not very widely separated from or in contact with, but not entering between, the terga, not or barely reaching carinal latera below; dorsal surface convex, without borders, decreasing comparatively little from below upwards; sides straight; umbo terminal. *Terga* irregularly quadrilateral, of moderate size; the apex not or very little superior to that of carina; earinal margin angular, receding from carina both above and below, both portions feebly concave towards earina; scutal margin excavated, but not strongly; ocludent margin straight, forming a wide angle with the lateral margin of the scuta. *Scuta* large, completely calcified, triangular, the apex sometimes passing slightly in front of the lower extremity of the ocludent margin of the terga, but not overlapping it. Calcified portion of *upper latus* triangular, very small, widely separated from other plates, its base convex towards the carinal latus, its apex slightly retroverted towards the lateral margin of the scutum. *Rostral latus* long and narrow, its main axis parallel to the basal margin of the scutum, from which it is separated. *Inframedian latus* triangular, the margin directed towards the earinal shorter than that directed towards the rostral latus, the base deeply embedded in the membrane, the remainder of the plate eurling outwards. *Carinal latus* stout, irregularly triangular, not projecting far behind the earina; umbo subterminal, a small postumbinal portion directed upwards and slightly retroverted; the bases of the two latera meeting below the base of the carina.

Peduncle short, cylindrical, expanded into a large flat disk at base, armed with transversely elongated plates, which are larger above than below and are arranged above in alternating and below in simple series; their number is variable; a row of minute slanting plates surrounds the basal disk.

Appendages &c.—*Cirri* long, eurled at the tip, of a purplish-black colour; the first pair widely separated from the second, with the posterior rami shorter by six joints than the anterior. Anal appendages at least one third, sometimes more than one half, as long as the sixth cirri, slender and tapering, with about thirty joints, faintly suffused with purple. Penis slender and short, minutely annulated, covered with short hairs of a purplish colour.

Mouth.—Labrum moderate. Maxillæ large, with distal

extremity almost straight; bristles feebly differentiated. Mandibles with 4 main teeth: the innermost very blunt, fringed with short bristles, the others pointed; the outermost large, widely separated from the next; a small subsidiary tooth near the base of the inner margin of the former. The whole of the mouth-parts covered with minute star-shaped pigment-cells.

Dimensions.—

	mm.
Length of capitulum	55
Breadth "	40
Length of peduncle.....	22

Localities.—Gulf of Manaar, between 880 and 859 fath.; Andaman Sea, 960 fath. On glassy fibres of *Hyalonema* and on Gorgoniid skeleton, together with *S. Gruvelii*; three specimens.

This species, like the last, is somewhat variable as regards the capitulum and peduncle. On the whole, the structure of the body is constant; but the length of the anal appendages varies considerably.

Scalpellum laccadivicum, sp. n.

Capitulum regularly oval, laterally compressed, with 13 plates, which are completely covered by a fine, hairless, grey membrane; those of the lower whorl completely, the remainder imperfectly calcified. *Carina* simply bowed, with umbo sub-terminal, in contact with the terga above or just entering between them; the dorsal surface flat or concave, with well-defined borders, sides narrower below than above, concave outwards below, becoming convex above, with dorsal ridges. *Terga* almost triangular; the scutal margin excavated, but not very boldly; the occludent margin slightly, regularly convex outwards; the carinal margin feebly concave towards the carina, with less than a third of its length above the umbo of the latter; umbo terminal, hardly retroverted. *Scuta* sub-triangular; the lateral margin excavated, with the tooth above the excavation blunt, short, simple; the occludent margin regularly convex outwards, slightly overlapping that of the terga above. *Upper latus* large; the perfectly calcified part irregularly triangular, constricted above; the base almost straight, without a notch; the margin directed towards the scutal margin of the tergum parallel or almost parallel to and separated from it throughout. *Rostral latus* quadrangular, meeting its fellow below the aperture, deeper behind than at this point; no trace of a rostrum. *Infra-*

median latus triangular, narrow, with apex not retroverted in either direction, sometimes expanded into a small knob. *Carinal latus* subtriangular; the free extremity bent inwards behind the carina, but separated from its fellow; umbo subterminal.

Peduncle at least half as long as capitulum, stout, cylindrical, armed with a variable but always considerable number of regular transverse series of small transversely elongated plates covered and almost concealed by membrane.

Appendages &c.—First cirrus with the two rami narrow, subequal, widely separated from second cirrus; second to sixth cirri moderate, with the basal portion elongated, colourless. Anal appendages long and slender, with nine joints; the three distal joints much attenuated, the base of the third being slightly beyond the junction of the rami of the sixth cirrus. No penis.

Mouth.—Labrum small, feebly bullate. Maxilla well developed, free edge slightly convex outwards in a regular arc, with three large subequal spines (one terminal) alternating with the same number of smaller ones; two groups of short, stout bristles towards the inner extremity. Mandible with four teeth; the outermost very long, its extremity fringed with short spines, pointed; the three innermost with their bases close together, short, simple, pointed; the distal arm narrow and elongated.

Dimensions.—

	mm.
Length of capitulum	17
Breadth „	11
Length of peduncle.....	11

Locality.—Laccadive Sea, 1154 fathoms. On living shells of *Dentalium*, with var. *investigatoris* and an Actinian; three specimens.

Externally this form closely resembles Høek's *S. intermedium*, from which it may readily be distinguished by the length of its peduncle, the regular outline of its capitulum, and the shape of its upper latus. The spines of the maxilla are also shorter and stouter than in Høek's species and arranged differently, while the mandible is narrower. Apparently *S. laccadivicum* is diœcious in the strict sense of the word, whereas Høek talks of his specimens as "female and hermaphrodite." The 'Investigator' examples are fully adult, containing (like the types of *S. Alcockianum* and *S. Gruvelii*) both eggs and dwarf males. These I hope to describe later.

Var. *investigatoris*.

Differs from the typical form in the following characters only:—The capitulum is relatively narrower and the peduncle stouter; the scutal margin of the tergum is more nearly straight, the whole plate being triangular, with only a notch in the base; the inframedian latus is reduced to a rudiment or altogether suppressed. Only the upper latus, the tergum, and the lateral part of the scutum are imperfectly calcified. The proportions of peduncle and capitulum are more variable than in typical specimens.

This interesting form practically breaks down the separation between the sections of the genus with imperfectly and with perfectly developed valves; but I cannot regard it as more than a variety of *S. laccadivicum*, the structure of the appendages &c. of the two forms being identical and the general external similarities very close. We have six specimens of the variety, all taken in the Laccadive Sea at a depth of 1154 fathoms, on two living *Dentalium* shells, together with the types of the species. The capitulum of the largest is 14 mm. long and has several dwarf males attached to it.

(b) *Forms with fully calcified valves and a simply bowed carina.*

Scalpellum bengalense, sp. n.

Capitulum narrow and elongated, almost quadrangular, laterally compressed, with 15 slightly separated, fully calcified plates, which are conspicuously striated, covered by a very fine, transparent, yellowish, hairless membrane, and have the lines of growth well marked externally. *Carina* almost straight; umbo terminal, in contact with the carinal margin of the terga; dorsal surface convex, without borders; sides narrow, with dorsal ridges, in contact or almost in contact with other plates throughout. *Terga* large, rhomboidal; umbo terminal, not retroverted; occludent margin straight, vertical; carinal margin angular, the apex of the angle opposite the umbo of the carina, both parts straight or nearly straight. *Scuta* almost pentagonal, rather small; occludent margin straight, in a line with that of the terga, but with the extreme edge bent in slightly towards the aperture. *Upper latus* large, quadrilateral. *Rostral* and *carinal latera* small, subequal, triangular, not reaching the edge of the capitulum. *Inframedian latus* larger, regularly lozenge-shaped. *Rostral* large, subrhomboidal, with the

upper extremity protuberant and slightly introverted towards the base of the aperture. *Subcarinal latus* small, irregularly lozenge-shaped.

Peduncle about half as long as capitulum, stout, regularly cylindrical, armed on the sides with a variable number of slanting vertical rows of small plates, each plate separated from its neighbour horizontally. The rows on each side meet in the middle line of the occludent surface of the peduncle, the carinal surface being devoid of plates.

Appendages &c.—First cirrus elongate, slender, not very widely separated from the second, the two rami subequal. Remaining cirri elongate and slender. Anal appendages sausage-shaped, constricted at the base, short, consisting of a single apparent joint, with a bunch of long and rather stout bristles at the apex; the appendage, apart from the bristles, reaching slightly beyond the junction of the rami of the sixth cirrus. Penis long, slender, tapering, not distinctly ringed, covered with fine scattered hairs.

Mouth.—Labrum conical, rather large. Maxilla well developed, with biting-edge distinctly bilobed, armed with numerous stout bristles, of which those towards the outer extremity are slightly larger than the remainder. Mandible boldly arched, with 4 teeth; the outermost largest, widely separated from the others; the innermost not quite at the extremity of the margin, with a distinct notch at its base within; the base of the three smaller teeth densely covered with fine hairs, which also form a fringe on the inner edge of the mandible.

Dimensions.—

	mm.
Length of capitulum	10
Breadth "	5
Length of peduncle	5

Locality.—Bay of Bengal, off Ganjam coast, 98–102 fath. Eight specimens on a dead Gorgoniid.

Scalpellum Wood-Masoni, sp. n.

Capitulum irregularly quadrilateral, compressed, covered with a very fine, smooth, hairless, transparent membrane; the occludent edge straight, almost vertical. Fourteen thick, white, striated plates, with the lines of growth well marked upon their surface. *Carina* bowed in a moderate arc, not reaching the carinal margin of the terga; umbo subterminal; dorsal surface flat or feebly concave, with a V-shaped ridge across the base, without definite borders; lateral surface for

the most part flat, concave towards the umbo. *Terga* large, triangular, separated from the carina throughout, with the carinal margin nearly straight and extending far beyond the carina in a slanting direction; scutal and occludent margins straight, the former longer than the latter, both shorter than the carinal margin. *Scuta* irregularly quadrangular, with a well-developed ridge slanting vertically across the centre of their external surface; umbo terminal, overlapping the scutal margin of the terga very slightly, slightly retroverted. *Upper latus* large, subtriangular, divided into two subequal parts by a slanting ridge; umbo terminal; scutal margin concave, parallel to the adjacent margin of the scuta. *Rostral latus* rather large, almost rectangular, much longer than deep, overlapping the *rostrum*, which is lozenge-shaped, vertical, and very small. *Carinal latus* large, feebly protuberant behind, irregularly pentagonal, meeting its fellow in the middle line posteriorly. *Inframedian latus* very narrow, horn-shaped, pointed above, truncated below, slightly retroverted towards the occludent edge of the capitulum above.

Appendages &c.—First cirrus short, widely separated from second; the rami laterally flattened. Other cirri normal, not very long. Anal appendages slender, moderately short, with numerous joints, extending well beyond the junction of the rami of the sixth cirrus. Penis absent.

Mouth.—Labrum small, feebly bullate. Maxilla with distal arm rather narrow, with 4 teeth. External tooth large, pointed; two intermediate teeth moderate, subequal; internal tooth large, very blunt, with two minute projections at the tip. Maxilla moderate; the biting-surface distinctly bilobed, with a very large spine at the external extremity and with about twelve other large subequal spines.

Dimensions.—

	mm.
Length of capitulum	14
Breadth " 	11
Thickness " 	3
Length of peduncle	8

Locality.—Gulf of Oman, 890 fath. Two specimens on a glassy sponge-filament.

Scalpellum subflavum, sp. n.

Capitulum irregularly oval, truncated below, covered with a fine, hairless, transparent membrane, which varies in colour from pale yellow to greyish white. Thirteen delicate white plates with the lines of growth well marked upon them, but

otherwise smooth. *Carina* feebly arched ; umbo subterminal, almost in contact with the carinal margin of the terga ; dorsal surface flat, with well-defined borders ; lateral surfaces feebly concave. *Terga* large, irregularly triangular ; the carinal and scutal margins sinuous, the former extending far above the carina ; umbo terminal, retroverted ; occludent margin convex outwards. *Scuta* large, subtriangular, with a well-defined tooth above the apex of the upper latus ; lateral margin sinuous ; lower margin convex downwards ; umbo terminal, slightly over the scutal edge of the terga. *Upper latus* moderate, pentagonal, subtriangular. *Carinal latus* of almost the same size, triangular, not projecting behind the carina, but meeting its fellow in the middle line below the base of this plate. *Inframedian latus* moderate, triangular, pointed, and slightly retroverted towards the carina below, rather broad above. *Rostral latus* small, shallow, oblong, shallower below the opening than towards the inframedian latus.

Peduncle shorter than the capitulum, but somewhat variable in length ; slender, cylindrical, feebly or not at all expanded below, with about eight alternating series of smooth almost linear plates ; about six plates in each series.

Appendages &c.—*Cirri* delicate ; the rami of the first cirrus subequal, laterally flattened. Anal appendages long, slender, cylindrical, with about 8 joints and a very long bunch of fine hairs at the tip. No penis.

Mouth.—*Labrum* moderate. *Mandible* with three teeth ; the inner tooth boldly dichotomous, the outer edge of its inner branch armed with stout curved bristles. *Maxilla* large, its biting-surface bilobed, with outermost bristle large, the remainder stout and long, few in number.

Dimensions.—

	mm.
Length of capitulum	15
Breadth „	8
Length of peduncle	11

Localities.—Gulf of Oman ; off Cochin ; Gulf of Manaar ; Andaman Sea : 130–700 fath. On various objects, such as *Hyalonema*-filaments ; numerous specimens.

A common species in the India Seas ; variable as regards its proportions and colour. Several of the specimens bear complementary males.

There are two other species of *Scalpellum* in the collection which may be new, but one of them is possibly identical with Hœk's *truncatum*. It seems better to wait until more material is available before describing them.

GENUS MEGALASMA.

Megalasma striatum, subsp. *minus*, nov.

This form agrees in every respect with Hœk's *striatum* from the Philippines, except that the semicircular ridge on the lower part of the capitulum, which forms a conspicuous feature in the latter, is quite absent.

Localities.—Several stations in the Andaman Sea, 161–484 fath. Numerous specimens, most of which are attached to the spines of various Echinoids, but a few to Corallines.

I call this form a subspecies, not a variety, because it seems to represent a well-defined local race, differing only slightly from the typical form, but with a constant difference. Several very small specimens bear eggs, which are small and spindle-shaped; while other examples are at least as large as the types of the typical form.

GENUS ALEPAS.

Alepas xenophoræ, sp. n.

Capitulum subtriangular, convex both outwards and forwards below the aperture, laterally compressed above, distinct from peduncle. Aperture about $\frac{1}{3}$ as long as capitulum, slit-like, slanting outwards from above, with non-tubular, feebly protuberant lips. Integument white, feebly translucent, with shallow, more or less transverse striæ on the surface. No carinal ridge or crest; no plates.

Peduncle about $\frac{1}{2}$ as long as capitulum, irregularly annulated, cylindrical.

Appendages &c.—Cirri moderate, the first widely separated from the second; the two rami of the fifth and sixth equal. Anal appendages rather long, slender, with 12 joints. Penis short, stout, tapering to a point, not reaching further forwards than the mouth.

Mouth.—Labrum moderate. Maxilla with free edge almost straight; the outer spine much larger than the others; a number of subequal spines arranged all along the edge, a bunch of stout hairs near the inner extremity. Mandible with 4 teeth, the innermost with a short sharp projection on its inner margin near the tip; the bases of all the teeth near together and on a very wide arc; the tip of the innermost sharply pointed, the remainder rather blunt; slender spines arranged in a semicircle parallel to the excavation between the third and fourth tooth, in a dense mass at the base of the first and second and almost all over the

innermost, forming a fringe on the inner margin of the latter; a fringe of stout hairs occupying the middle third of the outer margin of the organ.

Dimensions.—

	mm.
Length of capitulum	12
Breadth „	10
Length of aperture	4
„ peduncle.....	7

Locality.—Off the S.W. coast of India, 185 fath. On shell of living *Xenophora*; four specimens.

A. xenophoræ resembles *A. quadrata*, Aur., in some respects, but may be distinguished externally by its feebly protuberant, non-tubular aperture and subtriangular capitulum. The appendages and mouth-parts differ considerably from those of the Californian species, the structure of the fifth and sixth cirri in particular being characteristic.

LIV.—*Diagnoses of Five new Species of Decapod Crustacea and of the hitherto unknown Male of Spirontocaris rectirostris (Stimps.) from the Inland Sea of Japan, as also of a new Species of Palæmon from Darjeeling, Bengal.* By Dr. J. G. DE MAN, of Ierseke, Holland.

ONCODOLAMBRUS, subgen. nov.*

A new subgenus of *Lambrus*, Leach. Carapace broadly triangular, once and a half as broad as long. Rostrum acute, projecting and strongly deflexed. No postocular constriction. *Branchial regions extraordinarily swollen, globular, rounded, much higher and broader than the narrow cardiac region, and devoid of tubercles and spines.* Pterygostomian regions traversed by a ridge that runs parallel with the antero-lateral border. Chelipedes of moderate length, their margins dentate, their surfaces smooth. Ambulatory legs also short.

Related to *Platylambrus*, but distinguished by the much inflated and swollen branchial regions, that are not tuberculate.

Lambrus (Oncodolambrus) prædator, sp. n.

Carapace of the single male specimen that was collected 7 mm. long, front included, but without the abdomen; the

* ὄγκώδης, swollen, inflated.

greatest breadth, at the angles between the antero- and postero-lateral borders, 10 mm. The breadth (1·8 mm.) of the front at its base almost one fifth of the greatest breadth of the carapace, lateral margins of the front smooth and entire. On the posterior end of the gastric region stands a low rounded tubercle in the middle line, in front of which a much smaller one is observed on either side. Cardiac region in the middle line with two obtuse tubercles behind one another, which are as large as that of the gastric region. Distance between the external orbital angles one third the greatest breadth of the carapace. Hepatic area, situated between the orbits and the branchial regions, deeply concave. Branchial regions considerably swollen and inflated, nearly globular, twice as broad as the gastric region. The cristiform antero-lateral margins run at first outward and then curve backward and upward, terminating, on the outer surface of the branchial globes, in a triangular compressed tooth, which is preceded by three or four smaller; postero-lateral margins also cristiform, running at first backward and upward, then turning suddenly downward and inward at a right angle, and carrying at this angle an obtuse tooth, which is smaller than that at the posterior end of the antero-lateral border. Right chelipede a little larger than the left, little more than twice as long as the carapace. Anterior border of the trigonal palm crenulate, the upper denticulate, the teeth small, little prominent; posterior margin sharp, cristiform, with four triangular teeth, on the left leg with six or seven. Sharply pointed fingers much turned inwards.

Ambulatory legs of moderate length, their joints laterally compressed.

A single male from Japan, probably from the Inland Sea.

Crangon consobrinus, sp. n.

Closely related to *Crangon alaskensis*, Lock.*, from Alaska, but perhaps different.

Carapace (rostrum included) one fourth of the whole length. Rostrum distinctly shorter than the eye-peduncles when they are directed forward; it is rather narrow, sides parallel for a portion of their length, edges upturned, tip rounded. Single median gastric spine at one fourth of the length of the carapace from the tip of the rostrum, situated with the two equally large hepatic spines in a transverse line.

* Rathbun, 'Decapod Crustaceans of the North-west Coast of North America' (New York, 1904), p. 114.

Abdomen resembling in general appearance that of *Cr. vulgaris*. The first to third segments rounded above, fourth segment presenting a trace of carination along a very short distance on the posterior half; *fifth segment distinctly carinate*: sixth resembling that of *Cr. vulgaris*, but its upper border has a shallow median groove; as in *Cr. vulgaris*, it is sulcate beneath. Telson almost once and a half as long as the sixth segment, just as long as the carapace, faintly grooved above, terminating in a sharp tooth, on each side of which three movable spinules are inserted.

Inner antennular flagellum exceeding somewhat the antennal scale, outer flagellum reaching to the end of the blade.

External antennæ as long as the body. The scale, measured along its straight outer margin, appears to be *four fifths* the length of the carapace exclusive of the rostrum; it resembles that of *Cr. alaskensis*, but it is only three times as long as broad; end of the blade rounded, not produced at the antero-internal angle and much broader than the spine at this level; spine extending as much beyond the blade as the tip of the latter is broad.

External maxillipedes reaching to the end of the blade. Chelæ of first pair almost four times as long as broad, *a little slenderer* than those of *Cr. alaskensis*; obliquity of the terminal margin in both species the same.

A single egg-laden female, 48 mm. long, from the Inland Sea of Japan, deep water.

Crangon cassiope, sp. n.

In its outer appearance much resembling *Crangon vulgaris*, Fabr., but distinguished by the sixth segment of the abdomen, which is convex, not sulcate beneath, so that this species is also related to *Cr. alba*, Holmes, and *Cr. Holmesi*, Rathb.*, from the north-west coast of North America.

Carapace of egg-bearing female, rostrum included, a little longer than one third of abdomen. Viewed from above this species *most closely* resembles *Cr. vulgaris*, but the numerous small dark spots on carapace and abdomen are almost wanting. All the segments of the abdomen are rounded above, but neither the sixth nor the seventh shows any tendency to become flattened or grooved, as sometimes takes place in the common shrimp. Ventral surface of sixth segment *rounded and convex in the middle*; at the posterior end a subacute conical tubercle instead of the sharp spine of *Cr. vulgaris*.

* Rathbun, *l. c.* pp. 117 & 118.

Both pairs of antennæ *closely resembling* those of *Cr. vulgaris*. Antennal scale measuring two thirds the length of the carapace without the rostrum and two and a half times as long as broad; end of the blade slightly rounded, making a distinct angle with the inner margin, and four times as broad as the contiguous part of the spine that reaches considerably beyond it. Stylocerite of inner antennæ a little shorter than the first joint of the peduncle.

External maxillipedes reaching to the end of the scales; the joints of the endopodite *broader* in proportion to their length than those of *Cr. vulgaris*.

First pair of feet nearly reaching to the end of the scales; they are *of a stouter shape* than those of *Cr. vulgaris*, the chelæ two and a third times as long as broad, in *Cr. vulgaris*, however, three times. Legs of the fourth and fifth pairs differing from those of *Cr. vulgaris* by comparatively shorter dactyli and slenderer propodites.

Length of egg-laden female 46·5 mm.

Inland Sea of Japan, deep water.

Male of Spirontocaris rectirostris (Stimps.).

Hippolyte rectirostris, Stimpson, Proc. Acad. Nat. Sciences Philadelphia, 1860, p. 33.

Same size as the female, but abdomen less deep and therefore slenderer. Carapace longer in proportion to the whole length than in the female. Rostrum arising more forward than in the female, viz. at one third of the length of the carapace from its anterior border; above with six teeth, of equal size and equidistant, *two* teeth only on the carapace; lower margin with two teeth as in the female; the rostrum reaches a little beyond the end of the antennular peduncles. Fifth segment of abdomen shorter in proportion to the fourth than in the female and the four pairs of spinules on the telson reaching farther backward.

Antennal scales more elongate than in the female, measuring one sixth the whole length, and a little more than three times as long as broad.

External maxillipedes *much* longer, *twice* as long as the carapace, rostrum included, and extending *with the last two joints* beyond the scales; terminal joint *just as long as the other joints together*, *much slenderer* than in the female. Legs of first pair resembling those of the female, but *much larger*.

Length 34·5 mm.

If this specimen is really the male of *Spiront. rectirostris* (Stimps.), the sexual differences are *considerable*.

Inland Sea of Japan.

Spirontocaris propugnatrix, sp. n.

Related to *Spiront. stylus* (Stimps.), *gracilis* (Stimps.), and *amabilis*, Lenz.*, and characterized by the *elongate* rostrum and its *toothing*.

Body *slender*. Carapace, rostrum included, little shorter than abdomen; exclusive of the rostrum the carapace measures only one seventh of the whole length. The rostrum *a little more than twice as long* as the remainder of the carapace, arising at one third of its length from its anterior border; it is *styliform, very little dilated*, gradually tapering, and the anterior half is *gently ascending*. Upper margin with seven teeth that reach *to the middle* of the free portion, *two* on the carapace; lower margin with ten teeth that reach to the tip. The rostrum extends two fifths of its length beyond the scales. Antennal spine small; supraorbital and pterygostomial spines wanting.

Third segment of the moderately geniculated abdomen slightly produced in an obtuse lobe posteriorly. Fourth and fifth segments of subequal length, postero-lateral angle of the fourth obtuse, that of the fifth ending in a sharp tooth. Sixth segment twice as long as broad; telson one fourth longer than sixth segment.

External maxillipedes very short, barely reaching to the end of the antennal peduncle.

Legs of first pair still shorter, reaching with their fingers beyond basal joint of antennal peduncle. Carpus of second legs 7-articulate, the second and the sixth joints the shortest, the third the longest. Following legs slender, *e. g.*, meropodites of antepenultimate pair eleven times as long as broad.

Length of single specimen 33.2 mm.; carapace, rostrum included, 15.2 mm. long.

Inland Sea of Japan, 6 fathoms.

Spirontocaris alcimede, sp. n.

Closely related to *Spiront. gracilis*, Stimps., and *Spiront. flexa*, Rathb., from the north-west coast of North America †.

Abdomen once and a half as long as carapace (rostrum

* Confer Rathbun, *l. c.* pp. 77, 79, & 84.

† Rathbun, *l. c.* pp. 77 & 78.

included), *strongly geniculated at a right angle at the third segment*. Rostrum slender, arising with obtuse crest at one third of the carapace from its anterior border, the free part once and a half as long as the remainder of the carapace; gently ascending from the anterior tooth of the upper margin, it just reaches beyond the scales. Upper margin with five, rarely four teeth, *two* on the carapace; *terminal half of upper margin devoid of teeth*. Lower limb *shallow, convex, as in Spiront. unalaskensis*, Rathb., and *Spiront. tridens*, Rathb., width of the rostrum at base of lower margin one eighth to one seventh of its whole length; lower limb gradually diminishing anteriorly, armed with six, seven, or eight, rarely nine teeth.

No supraorbital spine; antennal spine moderate, no pterygostomian spine.

Third segment of abdomen produced posteriorly *into a somewhat compressed hump, that is bent at a right though rounded angle*; fourth segment rounded at the postero-lateral angle, but the fifth terminating in a sharp tooth; sixth segment twice as long as broad. Telson little longer than sixth segment, upper surface carrying four, rarely five, pairs of spinules.

Stylocerite reaching to the distal end of first joint of antennular peduncle; thickened portion of outer flagellum reaching somewhat beyond the middle of antennal scale. Antennal scale a little longer than carapace, exclusive of the rostrum, *slender*, six times as long as broad, hardly narrowing distally; distal spine not nearly so advanced as the membranous portion.

External maxillipedes reaching to only one third of the scales and without exopodite.

Legs of first pair reaching with their fingers beyond basal joint of outer antennæ, those of second pair to the middle of the scales. Carpus 7-articulate, the sixth joint, just half as long as the last, the shortest, the third the longest.

Following legs slender, *e. g.*, the meropodites of the antepenultimate pair ten times as long as broad; dactyli one third the length of the propodites.

Length of the largest of twelve specimens 34 mm.

Inland Sea of Japan.

Palæmon (Parapalæmon?) Hendersoni, sp. n.

Related to *Pal. altifrons*, Hend., from Delhi and Lahore, to *Pal. scabriculus*, Heller, from Ceylon, and to *Pal. latimanus*, v. Mart., from the Indian Archipelago.

Carapace, rostrum included, two thirds the length of the abdomen. Carapace *scabriculate* on its anterior half. Rostrum *short*, reaching to the middle of penultimate joint of antennular peduncle, arising from the anterior third of the carapace; it is directed *obliquely downward*, the acute tip situated *at a much lower level* than the upper surface of the carapace. Upper border armed with seven or six teeth that reach to the tip; first tooth situated at one fifth of the carapace from the frontal border; *three* teeth on the carapace. Lower border nearly straight, with *one* or *two* teeth, situated near the anterior tooth of the upper margin. Upper limb of the rostrum, in the middle, little higher than lower. Antennal spine small; hepatic spine *extremely small, sometimes even wanting altogether*.

Carpus of legs of first pair as long as the merus and *one third longer than the chela*.

Leg of second pair, apparently the smallest, twice as long as carapace, rostrum included, extending with one fourth of the carpus beyond the scales. Carpus somewhat *shorter* than merus; chela *three times as long as the carpus, palm very little shorter than the fingers*, and *slightly compressed* in the proportion of 3:4. Palm barely broader than carpus. Fingers probably somewhat tomentose, shutting close together; the fixed finger carries a low denticulate prominence, the dactylus a somewhat compressed conical tooth between the articulation and the small tooth at the end of the cutting-edges. Leg covered with minute spinules.

Following legs *moderately slender*.

Length 61 mm.; carapace 25 mm. long.

Darjeeling, Bengal; fresh water, at a height of 2500 feet.

LV.—*Descriptions of some new Species of Heterocera from Peru.* By HERBERT DRUCE, F.L.S. &c.

Family Arctiidæ.

Thyraryctia friga, sp. n.

Male.—Head, antennæ, collar, tegulæ, and front of thorax dark brown; palpi yellow; the base of the thorax and first segment of the abdomen yellow; the upperside of the abdomen and anal tuft dark brown, the underside white; legs dark brown. Primaries dark brown, with a large yellowish

hyaline spot partly in the cell and partly beyond, the apex broadly yellowish hyaline; both the hyaline markings are thickly spotted with dark brown; a rather large bluish-black spot at the end of the cell, two minute black spots close to the base: secondaries, the costal half of the wing white, the inner half pale brown; the fringe brown.

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

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

Idalus marpessa, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, thorax, and base of the abdomen bright red; abdomen dark brown; the underside of the abdomen and the legs white. Primaries semihyaline pale yellow; the costal margin from the base to the apex and the basal half of the wing bright red: secondaries red, the apical third of the wing semihyaline pale yellow; the fringe pale yellow.

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

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

Idalus syrissa, sp. n.

Male.—Head, antennæ, collar, tegulæ, and thorax blackish brown; palpi red on the underside; abdomen black, with a white spot on the basal segment; underside of the abdomen yellow; the legs brown. Primaries very pale yellow, the basal third of the wing dark reddish brown; a small reddish-brown crescent-shaped spot close to the apex; the fringe pale yellow: secondaries semihyaline pale yellow, the inner margin broadly banded with brown; the fringe yellow.

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

Hab. Peru, Rio Huacamayo, 3100 feet (*Mus. Druce*).

Idalus rhyssa, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen dark brown, the two basal segments of the abdomen slightly reddish; the underside and the legs pure white. Primaries white, the costal margin from the base to the apex black slightly speckled with grey near the base; the basal half of the wing dark reddish brown, crossed from the costal to the inner margin by a fine pinkish-white line; a triangular hyaline white spot below the cell; the fringe white: secondaries semihyaline white, slightly shaded with red along the inner margin.

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

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

Idalus manora, sp. n.

Male.—Head, collar, tegulæ, and thorax bright yellow; antennæ brown, tegulæ lined with brown, abdomen chrome-yellow; the anus and underside white; legs yellow, spotted with black. Primaries bright citron-yellow, thickly spotted with greyish dots edged with black; the fringe yellow: secondaries bright yellow, the costal margin white.

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

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

Allied to *I. pandama*, Druce, and *I. laurentia*, Schaus.

Hemihyalea hades, sp. n.

Male.—Head, antennæ, palpi, collar, tegulæ, thorax, and abdomen all black; the anus bright yellow; legs black. Primaries and secondaries black on the upper and under sides.

Expanse $2\frac{1}{4}$ inches.

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

Family Limacodidæ.

Sciathos roseipuncta, sp. n.

Male.—Head red, antennæ black; collar white, edged with red; tegulæ white, tipped with red; thorax white; abdomen bright red, the underside of abdomen and anus white; legs black. Primaries white, the costal margin edged with red; the wing crossed beyond the middle from the costal to the inner margin by a band of small red spots; the fringe white: secondaries bright red, the fringe white. Underside of both wings bright pink, with a slightly yellowish shade along the costal margin.—*Female* the same as the male, but rather larger.

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

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

Family Notodontidæ.

Anodonta gigantea, sp. n.

Male.—Head and collar pale fawn-colour; tegulæ dark brown; thorax brown, with two large black spots at the base; abdomen black, the underside yellowish brown; the underside of the thorax black; legs black and yellowish brown. Primaries dark reddish brown, the costal margin from the base to the apex broadly bordered with cream-colour; a double, marginal, zigzag, reddish-brown line

extends from the apex to the inner margin: secondaries white, the costal margin, apex, and inner margin dusky white; two small black spots close to the anal angle and a marginal row of two fine yellow lines extending from the apex to the anal angle.

Expanse 4 inches.

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

Anodonta euribya, sp. n.

Male.—Head, collar, and front of tegulæ pale fawn-colour; tegulæ, antennæ, and thorax brown; abdomen black, the anal segment and anus fawn-colour; the underside of the abdomen and legs yellowish white. Primaries pale fawn-colour, palest at the apex and along the outer margin; a darker brown line down the middle of the wing from the base to the apex: secondaries blackish grey, darkest at the apex and on the inner margin. The underside of both wings pale cream-colour.

Expanse 3 inches.

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

Dasylophia riparia, sp. n.

Male.—Head, palpi, antennæ, collar, tegulæ, and thorax pale grey; abdomen dark brown, the underside pale grey; the legs brown. Primaries pale grey, streaked with brown to the end of the cell, from the end of the cell to the apex and outer margin dark blackish brown; a fine, submarginal, zigzag, pale grey line extends from the apex to the anal angle; the fringe greyish: secondaries white, the veins and inner margin pale brown.

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

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

Heterocampa multilineata, sp. n.

Male.—Head, antennæ, and palpi dark black-brown; collar and tegulæ black, edged with white; thorax and abdomen greyish black; underside of the abdomen and the legs brown. Primaries grey, crossed from the costal to the inner margin by a number of fine waved black lines, the marginal line black; the fringe alternately black and grey: secondaries greyish black, palest at the base; the fringe black.

Expanse 2 inches.

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

Heterocampa elongata, sp. n.

Male.—Head and collar grey; antennæ brown; thorax, abdomen, and legs dark grey; underside of the abdomen white. Primaries dark grey, the costal margin from the base to the middle white; a large reddish-brown marking near the apex and several black broken lines near the base of the wing on the inner margin; fringe dark grey: secondaries pure white.

Expanse 2 inches.

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

Heterocampa striata, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen dark brown, the collar and tegulæ edged with yellowish white; underside of thorax and abdomen dark brown; the legs yellowish brown. Primaries dark brown, the costal margin irrorated with yellowish-white scales; a yellowish-white streak from the base to about the middle of the cell; the veins and two fine submarginal lines yellowish white; a black line at the end of the cell and a series of black spots edged with yellow on the inner side extending from the apex to the anal angle: secondaries dark brown.

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

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

Dognina botis, sp. n.

Male.—Head, collar, tegulæ, and thorax pale fawn-colour; abdomen black; anus and underside yellowish white; antennæ, palpi, and legs brown. Primaries greenish black; a large white spot at the base, a very large reddish-brown round spot edged with white; an apical reddish-brown spot edged with white on the inner side, the outer margin fawn-colour: secondaries dusky white, darkest on the costal margin; the fringe white.

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

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

Dognina carastia, sp. n.

Male.—Head, antennæ, collar, tegulæ, thorax, and abdomen dark brown; underside of abdomen pale yellowish brown; legs pale brown. Primaries dark brown, crossed near the base by a wide black band irrorated with grey

scales; the inner margin and anal angle grey: secondaries dark brown; the fringe pale brown.

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

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

Family Saturniidæ.

Saturnia Ockendeni, sp. n.

Male.—Head, collar, tegulæ, and thorax brownish black, slightly speckled with yellowish hairs; antennæ black; abdomen black; anus brown; legs red, thickly clothed with black hairs. Primaries dark brown, irrorated with yellowish scales; a yellowish-white line broadly edged with black crosses the wing from the costal to the inner margin; a large hyaline spot at the end of the cell, surrounded broadly with black, then yellow, and then black again; a waved, pale brown, wide line edged on both sides with black extends from close to the apex to about the middle of the inner margin; a large black spot at the apex edged with red; the outer side of the black line is irrorated with greyish scales; the outer margin fawn-colour: secondaries dark brown; a rather wide black band edged with a few yellowish scales crosses the wing from the inner margin, but does not reach the costal margin; the ocellus at the end of the cell the same as on the primaries, and the marginal lines the same. Underside of both wings dark red-brown, thickly irrorated with black scales; the lines as above, but wider and all black; two red spots at the apex of the secondaries; the outer margins of both wings paler brown.

Expanse 5 inches.

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

Allied to *Saturnia medea*, Maas, from which it differs in having the markings in a different position and hardly any white on the upperside and none on the underside.

I have named this fine *Saturnia* after Mr. W. F. Rosenberg's collector Mr. G. Ockenden, who has collected many fine species in Peru.

Oxytenis nigropuncta, sp. n.

Male.—Head, collar, tegulæ, and thorax dark greyish brown, the collar irrorated with white scales; palpi reddish brown; antennæ brown; abdomen dark brown; anus yellow; underside of abdomen chrome-yellow. Primaries and secondaries dark brown, thickly irrorated with white scales, the

veins covered with white scales. Primaries: two narrow dark brown waved lines cross the wing from the costal to the inner margin before the end of the cell; a large black spot at the end of the cell, and a second spot above it nearer the costal margin considerably smaller; beyond the cell the wing is crossed by two fine dark brown lines, slightly curved from the costal to the inner margin; a broken white curved line along the outer margin from the apex to the middle of the outer margin. Secondaries crossed by two curved dark brown lines edged with white, the first near the base edged with white on the upper side, the second below the cell edged with white on the outer side; a rather wide indistinct dark band irrorated with yellowish scales and edged on the outer margin with a white waved line; the marginal line of both wings white; the fringes dark brown. Underside: both wings dark greyish brown; a dark brown line at the end of the cell of both wings; both wings with a submarginal double row of bright orange-coloured lunular-shaped markings extending from near the apex to the anal angle.

Expanse $3\frac{1}{2}$ inches.

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

Oxytenis næmia, sp. n.

Female.—Head and palpi dark brown; collar, tegulæ, thorax, and abdomen red-brown; underside of abdomen and anus yellow. Primaries red-brown, crossed from the apex to the middle of the inner margin by a yellowish-brown line edged with grey near the apex; a submarginal band of lunular-shaped grey markings, extending almost from the apex to the anal angle; two black spots edged with grey close to the anal angle; the fringe dark red-brown, the fringe at the apex of the wing black: secondaries red-brown, crossed above the middle by a yellowish-brown line; the outer half of the wing thickly irrorated with grey scales; a marginal row of very indistinct black dots extends from the apex to the anal angle; the fringe dark brown. Underside: both wings yellow, slightly irrorated with brown scales; both wings crossed from the apex to the inner margin with a brown submarginal line, that on the secondaries waved.

Expanse 4 inches.

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

Oxytenis leda, sp. n.

Female.—Head and palpi dark brown; collar pale yellowish brown; tegulæ, thorax, and abdomen dark brown; underside

of the abdomen dark yellow. Primaries dark brown, thickly irrorated with grey scales; an indistinct reddish line extending from the apex to the middle of the inner margin; three black spots close to the anal angle and series of grey blotches along the outer margin: secondaries dark brown, very thickly spotted and blotched with grey; the fringes of both wings dark brown. Underside yellowish brown: primaries crossed from the apex to near the middle of the inner margin by a rather wide brown line; a marginal row of brown spots extends from the apex to the inner margin: secondaries crossed by a submarginal waved brown and a marginal row of large brown spots.

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

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

Family Lasiocampidæ.

Lebeda peruviana, sp. n.

Male.—Head, collar, and tegulæ dark brown; antennæ pale brown; thorax pale brown, clothed with greyish hairs; abdomen dark brown; anal tuft pale brown, tipped with black; palpi, underside of thorax, abdomen, and legs black. Primaries: the base, costal half, and two thirds of the outer margin dark brown; an almost round patch at the anal angle pale brown, with three black spots at the anal angle; two faint brown lines cross the wing near the base, beyond which at the end of the cell is a small white dot; beyond the cell extending from the costal to the inner margin are two narrow pale brown lines, almost invisible, about the middle of the wing. Secondaries dark reddish brown, palest on the inner margin; the fringe pale greyish brown. Underside of both wings dark brown, thickly irrorated with pale brown scales; both wings crossed beyond the middle by two curved, narrow, pale reddish-brown bands.

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

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

Allied to *Lebeda Championi*, Druce, and *Lebeda lineola*, Maas, but very distinct from either. I have one specimen of this species from Bolivia, received some years ago from the late Dr. Staudinger.

Ormiscodes? nigrolinea, sp. n.

Female.—Head, palpi, antennæ, collar, tegulæ, thorax, and abdomen brick-red; legs dark brown. Primaries brick-red,

crossed from the costal to the inner margin by four waved black lines—the first close to the base, very faint, the second crosses about the middle of the cell, the third beyond the cell, and the fourth submarginal; a red line crosses the wing at the end of the cell; the fringe reddish brown: secondaries the same colour as the primaries, but slightly paler; two very indistinct blackish lines close to the anal angle. Underside of both wings reddish brown; both wings crossed by a submarginal brown band.

Expanse 3 inches.

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

Near *Ormiscodes choba*, Druce.

Megalopyge pedacia, sp. n.

Male.—Head, collar, abdomen, and legs black; antennæ yellowish brown; tegulæ grey; thorax clothed with long white hairs; anus and underside of the abdomen white. Primaries greyish black; the outer margin from the apex to the anal angle broadly white; a white spot in the cell, one at the end of the cell, and two below; a waved white line beyond the cell extending from the costal margin to about the middle of the inner margin; the outer margin spotted with black; the fringe white: secondaries pure white, with three minute black dots on the outer margin close to the apex.

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

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

Family Arbelidæ.

Arbela orima, sp. n.

Male.—Head, collar, tegulæ, thorax, and abdomen pale grey; antennæ yellowish brown; underside of abdomen white; legs dark brown. Primaries dark grey, striated with fine brown lines; a large patch of white beyond the cell; the apex broadly cream-colour, with two dark brown spots near the apex—the first round, the second elongated, reaching the outer margin; the fringe brown: secondaries dark grey.

Expanse 2 inches.

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

Resembles *Phalera bucephala*, Linn.

Family Zeuzeridæ.

Brachylia florita, sp. n.

Male.—Head, collar, tegulæ, and thorax pale grey; antennæ and legs yellowish brown; abdomen brown, clothed

with greyish hairs near the anus; the underside greyish white. Primaries brownish grey, crossed from the costal to the inner margin by eight reddish-brown bands edged with silvery white; some of the bands are almost broken into spots; the outer margin reddish brown: secondaries yellowish grey, mottled with darker grey near the apex.

Expanse 2 inches.

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

LVI.—*New Insectivores and Voles collected by Mr. A. Robert near Trebizond.* By OLDFIELD THOMAS.

DURING the last quarter of 1905 Mr. Alphonse Robert, already so well known for his South-American collections, made a trip to Trebizond, in order to obtain series of the small mammals of that region, hitherto almost unrepresented in the British Museum.

Along the northern coast of this part of Asia Minor there is a strip of forest, some 50 miles wide, sloping northwards to the Black Sea from an altitude of 1500 to 2000 metres at its southern edge. The forest then abruptly disappears and an open steppe country commences, inhabited by Hamsters and Spermophiles, and continuous with the more desert countries further south.

Compared with this more open and desert country the coast-forest has a very different fauna, of a distinctly northern character. Moles and black-toothed shrews reach their most southern recorded limit here, while the occurrence of an *Evotomys* is the most striking piece of evidence in the same direction.

Mr. Robert's work was done at two localities in the heart of the forest-strip—Sumela, about 30 miles south of Trebizond, where he stayed at the monastery of the same name, and collected from about 1000 to 1300 metres altitude; and Scalita (or Metosh de Sumela), a village in the same valley as Sumela but about 3000 m. lower.

Collecting in this region proved to be a work of very great difficulty, owing both to the character of the people and to the distance from Trebizond, whence all provisions had to be brought. In spite of these drawbacks, however, Mr. Robert has sent home a beautifully prepared collection of over 300 specimens, belonging to about 24 species.

In working these out I have received great assistance from

the writings of Dr. K. Satunin, of Tiflis, whose many papers on the mammals of the Caucasus and Transcaucasia have been of the greatest service to me.

The following are the forms which appear to need new names, the most notable being the remarkable vole I have named in honour of its discoverer.

Talpa caeca levantis, subsp. n.

Size of true *caeca*—the brain-case lower and flatter.

External characters as usual, the eye-openings apparently not perforate.

Skull of the size characteristic of *T. caeca*, therefore markedly smaller than in any form of *T. europæa*. But, as compared with Italian specimens, the brain-case is lower and flatter, so that the height of the brain-case, measured with sliding compasses, is less instead of more than 9 mm.; and, as the flattening is mainly on the upper surface, the greatest breadth appears to be above instead of below the halfway line of the skull as viewed from behind. Interorbital inflation more marked than in true *caeca*, forming a more strongly developed convexity on the frontal profile.

Teeth apparently as in *caeca*, though the second premolar appears to average rather shorter.

Dimensions of the type (measured in the flesh):—

Head and body 122 mm.; tail 27; hind foot 17.

Skull: greatest length 31·5; basal length 27·2; zygomatic breadth 11; greatest breadth across brain-case 15·2; palatal length 13·5.

Hab. Scalita, S. of Trebizond. One specimen from Sumela.

Type. Old male. B.M. no. 6.3.6.5. Original number 2196. Collected 28 November, 1905. Three specimens.

This mole is interesting as agreeing so nearly in size of skull with the Southern European *T. caeca*, while one from the northern side of the Caucasus, obtained in 1891 by Mr. Littledale, has a greater cranial length (33·5 mm.), more as in *T. europæa*.

Crocidura leucodon lasius, subsp. n.

A long-tailed form of the European *C. leucodon*.

Size fairly large. Fur of back about 5·5 mm. in length. General colour above "mouse-grey," not so black as well-marked examples of *leucodon*. Sides and belly about "grey no. 8"; the boundary-line between the upper and lower colours high up on the sides, not so sharply defined as in the most

strongly marked German examples. Tail bicolor, decidedly longer than in European *leucodon*.

Third upper unicuspid slightly shorter than second, just equalling anterior basal cusp of p^4 .

Dimensions of the type (measured in the flesh):—

Head and body 75 mm.; tail 40; hind foot 14; ear 8.

Tails of other specimens are recorded as 38, 39, 39, 40, 40.

Skull: greatest length 20·2; greatest breadth across brain-case 9·7; length of upper tooth-series from front face of i^1 9·7.

Hab. Scalita, S. of Trebizond. Alt. 700–1000 m.

Type. Female. B.M. no. 6. 3. 6. 10. Original number 2175. Collected 20 November, 1905. Six specimens.

C. leucodon has not been previously recorded from this region. The present specimens seem to differ constantly from German and Swiss examples by their longer tails and rather greyer colour.

Crocidura russula monacha, subsp. n.

A long-tailed representative of *C. russula*.

Size about as in European *russula*. Fur of back about 5 mm. in length. General colour rather more smoky and less brown than in true *russula*, but the difference not strongly marked. Under surface light greyish, passing gradually, low down on the sides, into the dorsal colour. Tail comparatively long, markedly longer than in any known members of the *russula* group.

Dimensions of the type (measured in the flesh):—

Head and body 75 mm.; tail 44; hind foot 14; ear 7.

Skull: greatest length 19; greatest breadth across brain-case 9; length of upper tooth-series from front face of i^1 8·6.

Hab. Scalita, S. of Trebizond. Alt. 700–1000 m.

Type. Adult female. B.M. no. 6. 3. 6. 13. Original number 2209. Collected 3 December, 1905. One specimen.

It is noticeable that both the white-toothed shrews of Scalita are distinguished from their allies elsewhere by their longer tails.

Evotomys ponticus, sp. n.

A large species allied to *E. Nageri*.

Size about as in *E. Nageri*, or rather larger. General colour of the same dark rufous as in that species, with greyer rump and sides and buffy-washed belly. Tail heavily haired, black above and at the end, dull creamy below. Upper surface of hands and feet darker than in *Nageri* even in the oldest specimen, more or less brown in younger ones.

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Skull large, smooth, and rounded, the brain-case more oblong than in the allied species, with less ridges and angles, and without any median frontal concavity, the upper profile being evenly and smoothly convex. Zygomatics less boldly expanded anteriorly. Palatal foramina well open behind.

Teeth as usual in this group. Last upper molar with a long posterior lobe, curved round at its extreme hinder end to form a well-marked fourth internal angle to the tooth.

Dimensions of the type (measured in the flesh):—

Head and body 102 mm.; tail 54; hind foot 19; ear 13.

Skull: greatest length 25.3; basilar length 21.4; zygomatic breadth 13.2; length of upper molar series 5.

Hab. Forest-region south of Trebizond. Type from Sumela.

Type. Male. B.M. no. 6. 3. 6. 173. Original number 2087. Collected 29 October, 1905.

This, the first recorded *Evotomys* from anywhere near this region, belongs to the well-marked group of large species containing *E. Nageri*, *norvegicus*, and *skomerensis*. From any of these it is distinguished by its smoother and less ridged skull, without frontal concavity. In a specimen of *E. skomerensis* of similar age to the type, the crests, ridges, and median concavity are already well developed, so that although the type is not an old specimen it would presumably not have developed them.

Microtus Roberti, sp. n.

A large vole with a very long tail. Not a member of the subgenus *Arvicola*.

Size perhaps larger than in any known vole not an *Arvicola*. Fur of medium texture; hairs of back about 11 mm. in length. General colour above brown (nearest to mummy-brown). Below greyish (near smoke-grey) with a slight drabby suffusion. Ears fairly large, projecting well out of the fur. Upper surface of hands and feet glossy whitish, pollex with a very small and rudimentary nail, soles with six large and distinct pads. Tail very long, longer than in any vole not of the water-vole group, giving the animal rather the appearance of a rat than a vole; blackish above, grey below; the tip with a tuft of hairs 3-4 mm. in length. Mammæ 2—2=8.

Skull oval, smooth, and little ridged, the brain-case rounded above, not strongly angular; supraorbital ridges only approaching within 1 mm. of each other in the oldest examples. Palatal foramina evenly opened, the broadest point just in front of the centre. Posterior palate normally Microtine, the lateral pits deep. Bullæ large.

Upper incisors vertical as in *Microtus*, not thrown forwards as in *Arvicola*; first upper molar with five, second with four closed cement spaces, as usual. Third with four closed spaces, fifth and sixth spaces sometimes closed and sometimes opening into each other, or the sixth into the posterior C which follows; the tooth has therefore five well-marked angles on the inner side, and five, or four and a curve, on the outer. First lower molar with five angles on each side, five posterior closed spaces, and a complicated anterior one; this has two angles on each side of it, the intermediate re-entrant angle very deep on the inner, shallow on the outer side.

Dimensions of the type (measured in skin):—

Head and body 142 mm.; tail 100; hind foot 24; ear 16.

Other specimens have head and body 130, 130, 140, 141, and 148 mm., with tails respectively 84, 90, 92, 97, and 96 mm.

Skull: median length 30·5; basilar length 27; zygomatic breadth 17·3; nasals 8·7; interorbital breadth 4·3; palatilar length 15·4; diastema 9·5; palatal foramina 5·4; length of upper molar series (crowns) 7.

Hab. Sumela (type) and Scalita, south of Trebizond. Alt. 700–1300 m.

Type. Adult female. B.M. no. 6. 3. 6. 132. Original number 2114. Collected 2 November, 1905. Many specimens.

This fine vole, distinguishable at the first glance by its large size and remarkably long tail, is evidently very common, for Mr. Robert obtained a large series of it at both Sumela and Scalita. No vole with these unusual proportions, apart from the *Arvicola* group, appears to have ever been described, so that I cannot say to which it is most nearly related.

From any species of *Arvicola* it is at once separable by its slender form, long oval skull, and purely Microtine teeth.

I have very great pleasure in naming this fine species in honour of its discoverer, whose labours in Asiatic Turkey have been carried on in circumstances of even greater hazard and difficulty than he has ever encountered in South America. The fine results of his collecting-trip are a tribute to his capacity for overcoming such difficulties, whether human or climatic.

Microtus (Pitymys) Majori, sp. n.

A long-tailed species, with extra open enamel spaces on m^3 and m_1 .

Size, character of fur, and colour quite as in *M. leponticus*, Major. Hairs of back 9–10 mm. in length. General colour above of the same mummy-brown colour as in *leponticus*; under surface mostly slaty grey, washed with a pale (in some

cases almost clay-coloured) edition of the same brown. Ears fairly long for a *Pitymys*, projecting beyond the fur. Upper surface of hands and feet dull whitish. Tail unusually long for a member of this group, its upper surface blackish brown, its lower side dull whitish, becoming rather darker terminally. Mammæ 1—2=6, the anterior pair level with the hinder end of the sternum; no trace of a pair further up on the breast.

Skull very similar to that of *M. leponticus*. Slightly lower and flatter, the nasals a little more projected in front, so that the incisors are less visible from above; the zygomata rather less boldly expanded; the palatal foramen with their broadest point further back, at about the level of the suture.

Teeth with the same number of angles and spaces as in *leponticus*, but there is an unusual tendency for the spaces to communicate with each other instead of being closed. Thus the second and third spaces of m^2 and the same spaces of m^3 are commonly connected. Then in m_1 , not only is there the usual characteristic connection between the fifth and sixth from the back, but the second and third from the back are also commonly open, as also are the two middle spaces of m_2 . Anterior angles of m_1 , outer and inner, more strongly developed than in *leponticus*, practically equalling the angles behind them, thus making 6 internal and 5 external equally projecting angles; the antero-external one peculiarly turned down and pressed close to the second.

In some specimens there is a tendency to an additional posterior angle on m^2 , attaining in No. 2237 almost to the size of the extra lobes of *M. agrestis*.

Dimensions of the type (measured in the flesh):—

Head and body 97 mm.; tail 42; hind foot 17; ear 10.

Other examples have head and body 94, 98, 100, 103, 105 mm., with tails respectively 37, 37, 44, 45, and 39 mm.

Skull: length in middle line 24; basilar length 21.2; zygomatic breadth 13.8; palatal foramina 4.1; length of upper tooth-row 5.7.

Hab. Scalita and Sumela, south of Trebizond. Altitude 700–1300 m. Type from Sumela.

Type. Male. B.M. no. 6. 3. 6. 148. Original number 2085. Collected 29 October, 1905. Many specimens.

No member of *Pitymys* has been described from this region, while those geographically nearest, such as *M. Thomasi*, Major, belong to the short-tailed group, and are widely different in the shape of the skull. The nearest allies of *M. Majori* appear to be the group of species to which the N.-Italian *M. leponticus* belong, and I have therefore drawn the description in contrast to that, of which the Museum

possesses the typical series. That species has been only recently described by Dr. Major, who has always taken a very special interest in the present group of voles, so that I have had great pleasure in naming after him this peculiar little species, discovered by his kinsman Mr. Robert.

The presence of a pectoral pair of mammæ is a very unusual character in *Pitymys*, which is usually said to have only the two inguinal pairs. The tendency to have extra molar enamel spaces connecting with each other is also an interesting point about this species, even though variable to a certain extent.

LVII.—A Third Genus of the *Ichthyomys* Group.

By OLDFIELD THOMAS.

IN a small collection of Costa Rican animals just received from Mr. C. F. Underwood there occur two specimens of a remarkable new Rodent, the subject of the following description:—

RHEOMYS, gen. nov.

General external characters as in *Ichthyomys*. Muzzle below nostrils complete, not cleft, and entirely hairy, without trace of a naked median groove. Ears present, but very small, buried in the fur. Feet apparently rather more broadly webbed, the webs as well as the toes fringed with bristles.

Skull smoothly rounded, little ridged, less modified in general outline than in either *Ichthyomys* or *Anotomys*; the profile normal and the nasals not bent upwards. Nasal opening high and narrow. Anterior zygoma-root as in *Ichthyomys*; the anteorbital foramen even more widely open. Pterygoids in normal proportion to each other—in *Ichthyomys* the entopterygoid is unusually developed and the ectopterygoid almost obsolete.

Incisors quite normal, narrow, slightly but evenly rounded in front, not unlike those of *Akodon* or *Peromyscus*, therefore strikingly different to the peculiar incisors of *Ichthyomys*, fully described in 1893*. Lower incisors narrow, slender, and pointed, though less so than in *Anotomys*. Molars as in *Ichthyomys*.

Type. *Rheomys Underwoodi*, described below. "*Ichthyomys*" *trichotis*, Thos., is also a member of *Rheomys*.

This genus, the third known of the group, is to the full as highly specialized for an aquatic life as *Ichthyomys* and

* P. Z. S. 1893, p. 337. *Anotomys* was described Ann. & Mag. Nat. Hist. (7) xvii. p. 86, January 1906.

Anotomys, so far as the external characters of glossy fur, reduced ears, and swimming-feet are concerned. But the skull is less modified in the directions usually found correlated with such a life, and the incisors are quite normal. In this latter respect it is like *Anotomys*, with which it also agrees in the complete hairiness of the muzzle between the nostrils and the upper lip. In *Ichthyomys* there is a strongly defined naked line connecting the two. On the whole, in spite of its possession of ears and its glossy fur, *Rheomys* would seem to be more nearly allied to *Anotomys* than to *Ichthyomys*, but it is unquestionably distinct generically from both.

In correlation with the unmodified incisors, the food of *Rheomys* is possibly not so much fish as mollusks, worms, or other water-animals, which, while rendering necessary great swimming-powers to dive after them in a swift-running stream, would not need for their capture and retention such a specialized doubly pointed fishing-gaff as is possessed by *Ichthyomys*.

The animal I described in 1897* as *Ichthyomys trichotis*, from the Magdalena River, Colombia, clearly belongs to *Rheomys*, having quite similar incisors, equally small ears, and no groove on the muzzle. Owing to the skull of the type having been completely crushed no comparison of it with that of *Ichthyomys* has hitherto been possible; nor had the interesting character of the rostral groove attracted attention.

Rheomys Underwoodi, sp. n.

Size and general appearance very much as in *Ichthyomys hydrobates*. Fur glossy; longer hairs of back about 15 mm. in length. General colour above mummy-brown, darkened by the black tips to the longer hairs. Rump nearly black, the tips of many of the longer hairs here glossy white, as commonly in *Ichthyomys*. Whole of under surface greyish white, the bases of the hairs slaty. Head slaty blackish. Sides of muzzle and upper lip as far back as the angle of the mouth white. Posterior part of lower cheek slaty blackish, connected across the chin by a darker band, so that the white of the upper lip is prominently bounded by dark behind. Ears very short, hairy, blackish, a white patch at the tips of the longer hairs round them. Front of forearm and top of metacarpus dark; digits white. Hind feet pale brown, the fringing bristles glossy white. Tail well haired throughout, dark brown above, slightly paler below.

Skull smoothly rounded, unridged. Interorbital region broad, its edges rounded, the supraorbital foramina on the

* Ann. & Mag. Nat. Hist. (6) xx. p. 220.

sides, not on the upper surface. Palatal foramina about the length of the molar series, not extending back to the level of the front of m^1 . Front of upper incisors pale whitish yellow, of lower ones white.

Dimensions of the type (measured in the flesh):—

Head and body 130 mm.; tail 150; hind foot 35; ear 5, length of conch 2.

Skull: greatest length 30·5; basilar length 24; zygomatic breadth 15·5; length of nasals 10·8; interorbital breadth 5·6; breadth of brain-case 14·4; palatilar length 13·5; diastema 7·8; palatal foramina $5 \times 2\cdot2$; length of upper molar series 4·8.

Hab. Tres Rios, Costa Rica.

Type. Male. Collected 5 May, 1905, by Mr. C. F. Underwood.

This beautiful animal forms a striking addition to the fauna of Central America, and it is with much pleasure that I name it in honour of Mr. Underwood, who had known of its occurrence for some time, but had hitherto been unable to obtain a specimen.

This makes the third mammalian genus discovered by Mr. Underwood, the other two being *Glyphonycteris* and *Hylonycteris*.

LVIII.—*New Asiatic Mammals of the Genera Kerivoula, Eliomys, and Lepus.* By OLDFIELD THOMAS.

Kerivoula picta bellissima, subsp. n.

Essential characters as in *picta*, but size larger and fur longer.

Size decidedly larger than in *picta*, the forearm about 3 mm. longer. Fur long, thick and woolly; hairs of back about 9 mm. in length. Interfemoral membrane and hind limbs more thickly and extensively covered above than in *picta*. Colour practically as in *picta*, except that the fur of the back is more strongly contrasted blackish slaty for about 2 mm. at its base, only a faint indication of a darker basal shade appearing in *picta*. Face more white than rest of body. Tail-vertebræ apparently only six in number instead of seven, the individual joints longer, especially the proximal ones.

Skull as in *picta*, except for its larger size.

Dimensions of the type (a skin):—

Forearm 39 mm.

Skull: greatest length 15; palate length in middle line 7; front of i^1 to back of m^3 7·5.

Hab. Pak-hoi, S. China.

Type. Skin. B.M. no. 6. 1. 13. 1. Collected by Dr. Hayley Bell. Presented by Miss M. A. Bell.

If the difference in the caudal vertebræ above noted proves to be constant, this bat will, of course, have to be regarded as a distinct species; but, owing to the distortion of the parts, due to the skinning, so that there is some difficulty in making sure of the facts, and to there being only one specimen, I think it wise for the moment to ignore this character. The difference in size and in length of fur may easily indicate merely subspecific distinction, corresponding to the difference in locality.

Eliomys (Dryomys) angelus, sp. n.

A large Central-Asian representative of *E. nitidula* (*E. dryas*, auct.).

General characters, structure of teeth, and other details as in *E. nitidula*, the type of the subgenus *Dryomys*. Size conspicuously larger than in that animal, exceeding it by as much as it in turn is surpassed by *E. quercinus*. Fur thick and firm; the ordinary hairs of the back about 10 mm. in length, a few longer and finer ones intermixed attaining 13–14 mm. General colour (specimen skinned out of spirit) dull clay-colour with a suffusion of rufous, but the latter is probably due to alteration in spirit. Under surface from nose to anus sharply defined creamy white, the hairs of this colour to their bases on the throat, centre of chest, and inguinal region, slaty at base elsewhere. Crown like back; muzzle whitish, even on the sides, the black eye-mark commencing about 3 mm. in front of the eye, passing across the eye to the base of the ear, a marked tuft of black hairs on the forwardly turned base of the outer margin. Hands and feet pure white. Tail imperfect in the type, apparently from an accident during life, the hairs of the basal two inches about twice as long as in *E. nitidula*, above mixed brown and buffy, below dull whitish.

Skull conspicuously larger in every dimension than in *E. dryas*; its form very similar. Palatal foramina short, little open, their dividing septum broad behind. Bullæ proportionally large.

Teeth small in proportion to the skull, not larger than in *E. nitidula*, their structure apparently, so far as can be seen on a rather worn example, very much as in that animal.

Dimensions of the type (measured as a spirit-specimen):—

Head and body 110 mm.; tail damaged in life; hind foot 21; ear 15.

Skull: greatest length 30; basilar length 23.2; greatest

breadth 17; length of nasals 10; interorbital breadth 44; brain-case, breadth 13·5; palatilar length 10·2; diastema 7·3; palatal foramina 3·2 × 2; length of bulla 7·9; length of upper tooth-series 3·7.

Hab. Thian Shan.

Type. Male (skinned from spirit). Collected by Mr. A. A. Kutsenko. One specimen.

This species is readily distinguished by its much greater size from its only near ally, the European and Persian *Eliomys* (*Dryomys*) *nitidula*. It is chiefly interesting by the immense reduction which its discovery in Central Asia effects in the great geographical gap between the Japanese dormouse (*Glirulus japonicus*) and all the other members of the sub-family Glirinæ.

The type specimen had had its tail broken during life, and had then produced a bony continuation to the vertebral column, supporting the thickened tail-end, as described elsewhere*.

Lepus Vassali, sp. n.

A small species allied to *L. hainanus*, but much paler in colour.

Size about as in *L. hainanus*, conspicuously smaller than in *L. peguensis* and *siamensis*. Fur rather short, the longer hairs of the back about 25 mm. in length. General colour above heavily lined drab, the light rings on the hairs near "cream-buff," the resulting colour very different to the cinnamon of *L. hainanus*. The wool-hair whitish slaty at base, darkening to black terminally, without an intermediate buffy or fulvous ring. Sides inconspicuously washed with pale cinnamon; chin and belly white; chest-band coarsely grizzled buffy drab. Top of muzzle cinnamon, sides white, a whitish-grey line running through the eye to the base of the ear; crown like back. Ears of medium length; proectote grizzled drabby, the long fringe-hairs nearly white; metectote mostly naked, inconspicuously black terminally; metentote thinly haired, dull whitish, with a darker band along the middle of the outer edge, its extreme edge white. Nuchal patch dull rufous. Fore limbs cinnamon, hind limbs similar but paler; palmar and plantar hairs dirty whitish. Tail black above, white on sides and below.

Skull short and stout, its upper profile strongly curved. Postorbital wings decidedly larger than in *L. hainanus*.

Incisors with their enamel foldings as in *L. hainanus* †.

* P. Z. S., 12th December, 1905.

† See Major, Trans. Linn. Soc., 2nd ser. Zool. vii. p. 468 (1899).

Dimensions of the type:—

Head and body 353 mm.; tail 65; hind foot 74; ear 70.

Skull: greatest length 73·5; basilar length 55; greatest breadth 36; nasals, length diagonally 33, breadth 17; inter-temporal breadth 13·7; breadth of palatal bridge 5·5; diastema 19·5; palatal foramina 18 × 8·5.

Hab. Nha-tiang, Annam. Sea-level.

Type. Adult female. Original number 16. Collected 25th December, 1905, and presented by Dr. J. Vassal.

This very interesting little hare, which I have much pleasure in naming after its discoverer, is widely different from any of the Burmese and Siamese species, and is only related to that of Hainan, from which it differs by its conspicuously paler colour.

LIX.—*Spinning Slugs and Snails.* By L. LINDINGER*.

In observing land- and water-mollusks I was struck by a faculty apparently widely spread among these animals, which appears to be known to but few malacologists, namely the power of drawing out threads of mucus which harden, and by means of which the creatures are able to let themselves down from firm objects.

I could find but few statements in literature. Almost all notices mention slugs of the genus *Limax* (and *Agriolimax*). Thus Schilling ('Grundriss der Naturgeschichte') states with regard to *Agriolimax agrestis*:—"From the slime on the surface of the body it forms threads, by which it is able to let itself down from the branches to the ground." Geyer ('Unsere Land- und Süßwasser-Mollusken,' 1896, p. 13) is acquainted with the same fact in the case of *Limax arborum*. Precise statements as to the nature of the spinning and as to experimental observations on the length of the thread in the case of *Agriolimax agrestis* are given by M. Ballerstedt in the 'Naturwissenschaftliche Wochenschrift' (Neue Folge, i. pp. 463-465). This author isolated the subjects of his experiment upon a leaf, which was attached to a thread. The leaf was then exposed to the sun, which caused the animals to change their temporary sojourning place; they did not, however, crawl up the thread supporting the leaf, but descended from the latter by means of their mucus which

* Translated by E. E. Austen from the 'Zoologischer Anzeiger,' xxix. Bd., No. 19 (29th December, 1905), pp. 605-610.

hardened into a thread. One thread measured 147 cm., and for the attainment of this length over half an hour was required. In connexion with the phenomenon in question allusion is made to yet another habit of the animals, namely that of, when passing from one elevation to another, as, for instance, from leaf to leaf, securing themselves by means of a bridge of mucus, which binds the foot to the support just left until firm hold has been taken of the new one.

In one case the same observer saw the slug crawl back on the thread that had been formed, during which procedure the thread was, as Ballerstedt expresses it, sucked up again by the slug's mucous membrane. Further contributions on the subject are to be found in the 'Gartenwelt' (vol. vii. 1903, p. 346) *, where the phenomenon of the slug crawling back on the thread is likewise noticed. The thread-drawing in the case of *Limax* is also referred to by Leydig ('Horæ Zoologicae,' 1902, p. 90), who at the same time mentions the names of two earlier observers, Lister and Latham.

Yet it is not only among the land-gastropods that this singular faculty has been shown to exist; there are also statements concerning water-mollusks. In the 'Naturwissenschaftliche Wochenschrift' (Neue Folge, i. 1902, pp. 509 et seq.) W. Brenner writes that in the case of water-snails, especially *Limnæa vulgaris* [= *Limnæa stagnalis*, var. *vulgaris*], he has observed how the animals regulated their ascent and descent through open water by means of a thread of mucus attached to a point of support. An interesting note was published by E. Pohl in 'Nerthus' (2. Jahrg. 1900, pp. 738 et seq.). It has long been known that *Aplexa hypnorum* suddenly bobs up on the surface of the water and disappears again equally quickly. Since Pohl appears to have found out the explanation of this peculiar behaviour, I should like to give his statement in his own words. He writes:—

“The snails (*Physa* [*Aplexa*] *hypnorum*) had so greatly increased in number, that they often hung in regular clusters on the grated meat which had been thrown in. I then noticed how individual snails separated from a cluster and glided to the surface, in some cases straight upwards, in others in an oblique direction, but always in a straight line, as if upon some firm object although in the middle of the water. The animals also return by the same route, meet, and pass close by one another. It was only after long and close observation that I discovered a number of extremely fine threads, that, starting from the lump of meat, led to the

* For this reference I am indebted to Dr. C. Brick, of Hamburg.

surface of the water and so rendered the tight-rope-walking performance possible. The snails remained at the surface only long enough to thrust the respiratory orifice for a few seconds out of the water, and then sailed back to their meal again as quickly as possible. The small specimens of *Planorbis* in the same vessel never make use of the tight-rope, but crawl up the glass or let themselves float up in the water without any attachment. Since I have never read that *Physa* possesses the power of spinning threads, I thought it advisable to mention the fact here. It is not possible for the threads to be due to other creatures, such as perhaps the water-spider, since there have never been any in the vessel."

In 1904 I myself mentioned the names of a number of slugs and snails that possess the power of drawing threads*. Apart from *Agriolimax agrestis* and *Limax arborum*, which are mentioned elsewhere in literature, these are among land-mollusks *Agriolimax lævis*, and among water-snails *Ancylus fluviatilis*, *Aplexa hypnorum*, *Bythinia tentaculata*, *Physa fontinalis*, and a species determined by me as *Physa acuta* †.

To-day I am able to add to the list *Limax variegatus*, *Amphipeplea glutinosa*, *Planorbis carinatus*, *P. complanatus*, *P. nitidus*, and *P. umbilicatus*.

As regards the thread-spinning in the case of the species of *Agriolimax* and *Limax*, I cannot add much that is new to Ballerstedt's description. While it is but seldom that this kind of locomotion, which at first sight seems somewhat strange as exhibited by slugs, can be witnessed in the open—for which the observer rather than the slugs is responsible—it can be produced experimentally at any time. In order to obtain a successful result it is necessary that too great a distance should not at first be interposed between the animal and the point that it has to reach. An interval of about 15 cm. is sufficient. Once it has formed a piece of thread, the distance is generally immaterial. For the actual experiment the animal is placed upon a portion of a leaf suspended by a fine thread.

Crawling back on the thread already drawn out is also not uncommon, with the reservation, however, that well-

* "Verzeichnis der in und um Erlangen beobachteten Mollusken," Abh. Naturhist. Ges. Nürnberg, Bd. xv. 2. Heft, p. 68.

† As Herr D. Geyer, of Stuttgart, informed me, this is probably not *Physa acuta*, but a similar species introduced from North America. The same remark very likely also applies to the species recorded as *Physa acuta* by O. Goldfuss ('Die Binnenmollusken Mitteldeutschlands,' 1900, p. 28) for Leipzig, and by H. Sell (Nachrichtsbl. deutsch. mal. Ges. Bd. xxxvii. 1905, p. 40) for Copenhagen.

nourished individuals containing much moisture only adopt this course when one has made the distance from the ground too great, or when light is thrown on them from below, while animals less favourably equipped in these respects make the return journey relatively often.

The way in which the animals behave upon an isolated leaf, which is brilliantly lighted or warmed from above, or upon which a strong current of air is suddenly directed, shows us that they are not very unaccustomed to the route through the air; if the expression "deliberation" be employed with the necessary limitation, it is here apropos. At least it may be said that letting themselves down upon a thread of mucus is to be numbered among the normal faculties of the animals.

The circumstance that the animals do not try to escape upwards on the thread by which the leaf which serves as an experimental table is supported, is simply due to the fact that the influence which disturbs the animals makes itself felt from above. When I applied the source of light and warmth (in the form of an electric incandescent bulb) to the under side of the leaf, I succeeded in several instances in causing the slugs to take to flight in an upward direction. It is true that, when they come too near to the lamp, the animals for the most part simply let themselves drop.

Under normal conditions also the land-snails seek their hiding-place in a downward direction, when light or warmth becomes too troublesome to them.

The hardened thread of mucus that has become useless on the crawling back of the animal is not, as Ballerstedt supposes, sucked up again by the slug's mucous membrane, but is thrust to the hinder end of the foot owing to the movements of the latter; here it is stuck together by the freshly excreted slime, and is subsequently left behind when the animal has again reached a firm support.

In the case of the water-snails two forms of thread-drawing can be distinguished, since the water enables the animals to ascend as well as to let themselves down. While the animals when descending in jerks twist hither and thither like the slugs and turn round on their axis, in consequence of which the thread (under the microscope) appears spirally twisted, climbing up almost always takes place quietly. In descending the animal has the sole of the foot turned downwards longitudinally so as to form a kind of groove, and slightly arched from front to rear, so that the head occupies an almost horizontal position. Climbing up takes place more continuously and somewhat slowly. The thread may attain

a passable length even in climbing up; in the case of *Amphipeplea* I measured one that was 20 cm. long.

Apart from the crawling back that occasionally takes place, the same thread is never used more than once; whether, as might be supposed from Pohl's description, *Aplexa hypnorum* behaves differently has yet to be ascertained. The rapidity of its progress is at any rate remarkable. It is true that *Aplexa*, like its near relation *Physa*, is distinguished by its very active movements.

Let us now turn to the fact of the thread-spinning itself. This cannot excite surprise when we reflect that all mollusks secrete a viscid mucus, which always adheres to the support and is continuously replaced. Anyone who thoughtfully observes a snail crawling away on sandy or dusty ground must notice how clean the animal keeps, although the sticky surface leads us to suppose the opposite (it is not always easy to remove snail slime from the fingers). Every collector knows the tracks, that cover depressions with a glistening pellicle; every possessor of an aquarium, who keeps specimens of *Limnæa*, must have been vexed at finding that the animals, in so far as they do not eat them, regularly glue up some plants (such as *Myriophyllum*), so that their shoots look like the brush out of the gum-pot when it has become dry. Upon this cleansing process of snails and slugs depends the well-known method of killing the animals by means of a repeated distribution of salts or ashes. In consequence of the copious excretion of mucus which is necessary again and again in order to remove the unwelcome and probably also corrosive covering, the animals become so much weakened that they perish*.

It follows that even the bridge of mucus, alluded to by Ballerstedt, does not occasion surprise. As regards Ballerstedt's assumption that thereby the animals guard themselves from slipping off, before the foot has taken firm hold of the new support, we may entertain two opinions. When the snail passes over a gap in the substratum, the slimy track is bound to form a bridge. It is self-evident that the latter also safeguards the animal in a manner that is not to be underrated; its formation is, however, in all likelihood not effected by the animal for this special case, but is the result of the viscid character of the mucus.

In the progression, too, of mollusks the mucus at all events

* Further details as to slugs' slime will be found in Künkel's paper, "Die Wasseraufnahme bei Nacktschnecken" (Zool. Anzeiger, Bd. xxii. 1899, pp. 388-396 and 401-404).

plays such a part that it might be asserted that the animals crawl upon their slime. Let us imagine a *Limax* or an *Arion* that possessed no mucus. Every grain of sand, every pine-needle, every dry fragment of a plant upon the ground would to a certain extent give way, and progression, though not exactly impossible, would be greatly impeded. The mucus in the first place cements everything together into a relatively firm whole. In the case of the mussels also it serves a similar purpose.

If we imagine the bridge of mucus extended, we have the rope of slime that young Helicidæ and the species of the genera *Hyalina* and *Vitrina* are capable of forming. In the case of these creatures, if their weight is not too great, the mucus is tough enough to be drawn out into short threads which support the animal, though they are certainly considerably thicker than in the case of *Limax*. In the case of *Vitrina pellucida* I measured threads of from 15 to 20 mm. in length; in that of young specimens of *Arion* the thread gave way on reaching a length of 5 mm., and older individuals fell before the foot had completely left the support.

It follows that from *Vitrina* to *Limax* we see an advance in the process of thread-formation. In order to be capable of being drawn out into durable threads, the mucus must be extremely tough and harden quickly. In the case of *Agriolimax* and *Limax* it possesses these properties in a high degree. Now since various authors (Leydig, Simroth, Clessin, and Goldfuss) state with regard to *Amalia* that the mucus is excessively tough, and that byssus-like threads occur in it, it may be expected that the animals of the genus in question possess the capacity of thread-drawing in a much higher degree than those of other genera. Simroth (*apud* Clessin, 'Mollusken-Fauna von Oesterreich-Ungarn und der Schweiz,' 1887, p. 54) writes as follows concerning the mucus of *Amalia robici*:—"If it is proved by Leydig that the mucus of the species of *Amalia* owes its varnish-like viscosity to byssus-like threads, we here have actual byssus. Widely scattered on the body, closer together on the sole of the foot, but especially in the groove which bounds the locomotor median area, there projects a series of whitish pointed threads, which are approximately equal to this median area in length."

In conclusion, I would point out that gardeners should take a special, although certainly not a benevolent, interest in the spinning slugs. Undeniably the best method of protecting valuable plants from being eaten by slugs and snails is to render it impossible for the animals to obtain access to them by placing the plants in saucers filled with water. But this

otherwise excellent plan, which in the case of orchids, *Sarracenia*, *Nepenthes*, *Drosera*, &c., is moreover beneficial to the growth of the plants, is almost valueless as against the species of *Limax* and *Agriolimax*, which are also to be met with in glass-houses, since these slugs can also reach the plants through the air. In this case the best defence will still be found in diligently searching for and collecting the animals, which must be done principally in the evening and early in the morning.

BIBLIOGRAPHICAL NOTICE.

Catalogue of the Collection of Birds' Eggs in the British Museum (Natural History). Vol. IV. London: Printed by Order of the Trustees of the British Museum. 1905.

THIS volume, by Mr. Eugene W. Oates and Capt. Savile G. Reid, deals with the eggs of the Families from the Timeliidæ to the Certhiidæ, and includes descriptions of some 620 species.

A feature of the book, as in the preceding volumes, is the great beauty of the plates. The selection of specimens illustrating the great range of variation which some species exhibit is a step in the right direction, but we venture to think the usefulness of the Catalogue would be immensely increased if a summary of the characteristic features of the eggs of each family were given, as well as a short account of the structural characters of the shell.

Again, it would have been helpful had special reference been made to the eggs of such species as are supposed to be peculiar to Great Britain, but represented on the Continent by scarcely distinguishable forms. In the case of the Long-tailed Tit (*Aegithalus roseus*), for example, we find on comparison of the descriptions of the eggs of this bird and those of the Continental *Æ. caudatus* that they are distinguishable, while this is not the case with the eggs of our Coal-Titmouse (*Periparus britannicus*) and the Continental *P. ater*. Finally, whenever possible, the number of eggs in a clutch should be definitely stated, yet this appears in no single instance to have been done.

MISCELLANEOUS.

The Echinoderm Name Calveria hystrix.

To the Editors of the 'Annals and Magazine of Natural History.'

GENTLEMEN,—In laboriously proving the identity of *Korethraster hispidus* with *Calveria hystrix* (Ann. & Mag. Nat. Hist., Feb. 1906, p. 251) I was unconsciously treading in the footprints of a master. This identity was, without comment, assumed by Lovén in a footnote on p. 31 of his 'Études sur les Échinoïdées' (1875).

Yours, with apologies,

F. A. BATHER.

British Museum (Nat. Hist.),
24th Feb., 1906.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 101. MAY 1906.

LX.—*Descriptions of new Fishes discovered by Mr. E. Degen in Lake Victoria.* By G. A. BOULENGER, F.R.S.

MR. E. DEGEN, who has rendered such signal service to African ichthyology as a collector of the fishes of Abyssinia, has utilized his leisure, when recently in Uganda as assistant to Prof. E. A. Minchin, by making a very fine collection of the fishes of Lake Victoria, our previous knowledge of which was very unsatisfactory. This collection is by far the most extensive that has ever been made in that lake, consisting of about 800 specimens. It contains not only examples of nearly all the species which had been previously described by Hilgendorf, Pfeffer, Pellegrin, and myself, but representatives of as many as 26 which are here described as new. Fuller descriptions and figures of all of them will appear later in the work on the Fishes of the Nile, on which I have been engaged for some years, and the publication of which is necessarily postponed by the constant accession of fresh material.

Until quite lately the fish-fauna of Lake Victoria was believed to be, comparatively to the other great lakes of Africa, a rather poor one, only about 25 species being known. From the available data, I concluded, when recently discussing the distribution of African freshwater fishes, that Lake Victoria has long been isolated, showing so little in common with the fauna of the Nile. This conclusion is further emphasized by the collection brought home by

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Mr. Degen, the Cichlids especially showing so many modifications, apparently derived from some original stock consisting of a small number of forms. These modifications are not comparable in importance to those with which the exploration of Lake Tanganyika has made us acquainted, but they tend to show that this lake has a quite peculiar fauna, bearing no special affinity to either the Nile or the Congo, so far as specific forms are concerned.

Mormyridæ.

Petrocephalus Degeni.

Depth of body $3\frac{1}{2}$ times in total length, length of head $3\frac{3}{4}$ times. Snout very short, about $\frac{1}{6}$ length of head, rounded, projecting beyond the mouth; width of mouth $\frac{1}{4}$ length of head; teeth bicuspid, 10 in upper jaw, 22 in lower jaw; eye longer than snout, $4\frac{1}{2}$ times in length of head, once and $\frac{1}{2}$ in interorbital width. Dorsal 19, originating above first ray of anal, its length twice and $\frac{1}{3}$ in its distance from head. Anal 27. Pectoral pointed, about $\frac{2}{3}$ length of head. Caudal peduncle twice and $\frac{1}{2}$ as long as deep, $\frac{3}{4}$ length of head. 41 scales in lateral line, $\frac{10}{12}$ in a transverse series on the body, $\frac{9}{9}$ between dorsal and anal, 12 round caudal peduncle. Silvery, back dark grey; fins grey.

Total length 88 mm.

A single specimen from the mouth of the Katonga River.

Easily distinguished from its congeners in the short dorsal fin originating above the first ray of the anal.

Marcusenius nigricans.

Depth of body 3 to $3\frac{1}{2}$ times in total length, length of head 4 to $4\frac{1}{3}$ times. Snout about $\frac{1}{5}$ length of head, rounded, projecting beyond the mouth; mouth below the nostrils, its width 4 times in length of head; teeth small, bicuspid, 7 in upper jaw, 8 in lower jaw; eye as long as snout, $\frac{1}{2}$ to $\frac{2}{5}$ interocular width. Dorsal 15-18, originating above 5th or 6th ray of anal. Anal 24-25. Pectoral pointed, subfalcate, as long as or a little shorter than head. Caudal peduncle twice and $\frac{1}{2}$ to twice and $\frac{2}{3}$ as long as deep, $\frac{2}{3}$ to $\frac{4}{5}$ length of head. 46 to 53 scales in lateral line, $\frac{10-11}{14-15}$ in a transverse series on the body, $\frac{10-12}{10-11}$ between dorsal and anal, 16-20 round caudal peduncle. Uniform blackish brown.

Total length 93 mm.

Numerous specimens from the mouth of the Katonga River.

Distinguished from *M. Isidori*, C. & V., by the shorter dorsal fin, the shorter caudal peduncle, the larger mouth, and generally fewer scales in the lateral line.

Characinidæ.

Alestes Sadleri.

Depth of body $3\frac{1}{2}$ to $3\frac{1}{2}$ times in total length, length of head 4 times. Snout rounded, not projecting beyond the lower lip, a little shorter than the eye, the diameter of which is $\frac{1}{3}$ length of head; interorbital width $\frac{2}{3}$ length of head. Gill-rakers long and slender, 18 on lower part of anterior arch. Dorsal II 8, just behind vertical of ventrals, equally distant from occiput and from root of caudal; first branched ray as long as head. Anal III 16-17. Pectoral as long as head. Caudal peduncle barely once and $\frac{1}{2}$ as long as deep. Scales $33\frac{6\frac{1}{2}}{2\frac{1}{2}}$, 2 between lateral line and ventral. Steel-blue above, silvery white below; fins orange-red; a black (in life brilliant orange) blotch on the caudal peduncle, extending on the middle rays of the caudal fin.

Total length 94 mm.

Two specimens from Entebbe.

This new species is named after Lieut.-Col. Hayes Sadler, H.M. Commissioner, Uganda Protectorate, at the time of Mr. Degen's visit. It is easily distinguished from *A. nurse*, Rüpp., which is common in the lake, by the more posterior position of the dorsal fin, by the greater number of rays in the anal fin, and by one series more of scales between the origin of the dorsal fin and the lateral line.

Cyprinidæ.

Barbus lobogenys.

Depth of body equal to or a little greater than length of head, $3\frac{1}{2}$ to $4\frac{1}{6}$ times in total length. Snout rounded, distinctly projecting beyond the mouth, longer than the eye, the diameter of which is $3\frac{2}{3}$ (young) to $5\frac{1}{2}$ times in length of head; interorbital width $2\frac{1}{2}$ to 3 times in length of head; width of mouth $\frac{1}{4}$ to $\frac{1}{3}$ length of head; lips strongly developed, the upper more or less produced into a point, the lower continuous across the chin and often produced into a long rounded mental lobe; barbels two on each side, anterior $\frac{2}{3}$

to $\frac{1}{2}$ diameter of eye, posterior as long as eye or a little shorter. Dorsal III 8 (rarely 9), free edge feebly emarginate; last simple ray strong, bony, not serrated, straight, $\frac{1}{2}$ to $\frac{3}{4}$ length of head. Anal III 5, longest ray $\frac{2}{5}$ to $\frac{3}{4}$ length of head. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, not reaching ventral; latter below anterior rays of dorsal. Caudal peduncle once and $\frac{1}{3}$ to once and $\frac{2}{3}$ as long as deep. Scales 32-36 $\frac{5\frac{1}{2}}{6\frac{1}{2}}$, 3 or $3\frac{1}{2}$ between lateral line and ventral, 12 or 14 round caudal peduncle. Coppery brown above, pinkish or brassy yellow on the sides, the scales dark brown at the base; silvery white below; pectoral and ventral fins orange, dorsal, anal, and caudal lemon-yellow at the base, greyish or blackish towards the border; iris yellow.

Nine specimens, measuring from 155 to 600 mm., from Bunjako and Buganga.

Differs from *B. Radcliffii*, Blgr., in the more prominent snout, and in the presence of one series more of scales between the lateral line and the ventral fin; from *B. nedgia*, Rüpp., in the broader interorbital space.

Barbus Minchini.

Depth of body $3\frac{1}{3}$ times in total length, length of head 4 times. Snout rounded, not prominent, shorter than the eye, the diameter of which is $3\frac{1}{2}$ times in length of head; interorbital width twice and $\frac{1}{2}$ in length of head; lips moderate, not extending across the chin; barbels two on each side, anterior $\frac{2}{3}$ diameter of eye, posterior as long as eye. Dorsal III 7, last simple ray strong, bony, serrated behind, a little shorter than head; border of fin nearly straight. Anal III 5, longest ray $\frac{3}{5}$ length of head. Pectoral $\frac{3}{4}$ length of head, not quite reaching ventral; latter entirely in advance of vertical of origin of dorsal. Caudal peduncle twice as long as deep. Scales 25-26 $\frac{5\frac{1}{2}}{6\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 or 14 round caudal peduncle. Olive above, silvery white beneath, the scales blackish at the base; a bright yellow or scarlet spot on the gill-cover; pectoral and ventral fins yellow, dorsal, anal, and caudal scarlet, yellow at the base; iris greyish white.

Total length 88 mm.

Two specimens from Entebbe.

Named after Prof. E. A. Minchin, in recognition of his service to African ichthyology in enabling Mr. Degen to form the valuable collection which it is my privilege to describe.

The nearest ally of this species is *B. Kerstenii*, Peters.

Barbus Magdalene.

Depth of body $3\frac{1}{3}$ to $3\frac{3}{4}$ times in total length, length of head $4\frac{1}{3}$ to 5 times. Snout rounded, not prominent, shorter than the eye, the diameter of which is $2\frac{2}{3}$ to 3 times in length of head; interorbital width twice and $\frac{1}{2}$ in length of head; mouth narrow, with very thin lips; no barbels. Dorsal III 8, last simple ray not ossified and as long as head; border of fin slightly notched. Anal III 5, longest ray $\frac{2}{3}$ length of head. Pectoral $\frac{3}{4}$ length of head, not reaching ventral; latter below origin of dorsal. Caudal peduncle twice as long as deep. Scales 29–32 $\frac{5\frac{1}{2}}{2\frac{2}{3}}$, 1 or $1\frac{1}{2}$ between lateral line and ventral, 10 round caudal peduncle; lateral line descending very abruptly towards ventral fin. Silvery, yellowish olive on the back, with a more or less distinct darker lateral stripe; fins yellow.

Total length 71 mm.

Twelve specimens from Bunjako.

This species, dedicated to Mrs. Minchin, differs from *B. anema*, Blgr., and its allies, in the more numerous scales in the lateral line and in the longer caudal peduncle.

Siluridæ.

Clarias Alluaudi.

Depth of body 6 to $6\frac{1}{2}$ times in total length, length of head $4\frac{1}{4}$ to $4\frac{1}{2}$ times. Head once and $\frac{1}{3}$ to once and $\frac{1}{2}$ as long as broad, smooth above; occipital process acutely pointed, longer than broad; occipital fontanelle extending on occipital process; eye very small, twice or twice and $\frac{1}{2}$ in length of snout, 4 or 5 times in interorbital width, 9 or 10 times in length of head; vomerine teeth villiform, forming a crescentic band which is longer and broader than the band of præmaxillary teeth; nasal barbel as long as or a little longer than head; maxillary barbel once and $\frac{1}{2}$ to once and $\frac{2}{3}$ as long as head, 14 or 15 gill-rakers on anterior arch. Dorsal 67–78, its distance from the occipital process about $\frac{1}{4}$ length of head. Anal 55–62. Dorsal and anal extending to the root of the caudal. Pectoral $\frac{1}{2}$ length of head, the spine about $\frac{2}{3}$ the length of the fin and serrated on both sides. Ventrals nearly twice as far from the end of the caudal as from the end of the snout. Dark olive-brown above, lighter beneath.

Total length 143 mm.

One specimen from Entebbe and three from Bunjako; also one from Kavirondo Bay (Alluaud Collection) received from the Paris Museum as *C. microphthalmus*, Pfeff.

The fish described by Pfeffer is probably a young *C. Robecchii*, Vincig., and is at any rate very different from the one here described, as the vomerine teeth are granular, the dorsal fin is widely separated from the caudal, and there are 40 gill-rakers on the anterior arch.

Bagrus Degeni.

Depth of body $4\frac{1}{2}$ to $5\frac{1}{2}$ times in total length, length of head $3\frac{1}{5}$ to $3\frac{2}{3}$ times. Head once and $\frac{2}{5}$ to once and $\frac{1}{2}$ as long as broad; occipital process long and narrow; diameter of eye 5 (young) to 11 times in length of head, once and $\frac{2}{3}$ to twice and $\frac{3}{4}$ in length of snout, once and $\frac{1}{2}$ to once and $\frac{2}{3}$ in interorbital width; nasal barbel $\frac{1}{3}$ (young) to $\frac{1}{8}$ length of head, maxillary barbel once and $\frac{1}{5}$ (adult) to twice and $\frac{1}{3}$ (young) length of head, extending barely to end of pectoral fin in the adult, to end of ventral fin in the young. Dorsal I 9, last ray in advance of vertical of inner ray of ventral; longest ray $\frac{1}{2}$ (adult) to $\frac{3}{4}$ (young) length of head. Adipose dorsal 4 to $5\frac{1}{2}$ times as long as deep, once and $\frac{1}{2}$ to once and $\frac{2}{3}$ as long as the rayed dorsal; the space between the two dorsals equals $\frac{1}{2}$ to $\frac{2}{3}$ the length of the first. Anal III 8-9. Pectoral $\frac{1}{2}$ to $\frac{3}{5}$ length of head, its spine moderately strong, not serrated in the adult. Upper lobe of caudal produced into a long filament. Caudal peduncle not or but little longer than deep. Blackish brown or dark steel-blue above, whitish or brassy yellow beneath; fins grey to blackish; iris dark, with a vivid yellow ring.

Seven specimens, measuring from 130 to 490 mm., from Entebbe.

Intermediate between *B. docmac*, Forsk., which occurs also in Lake Victoria, and *B. orientalis*, Blgr., from the Pangani River.

Synodontis victoriæ.

Depth of body 4 to $4\frac{1}{2}$ times in total length, length of head $3\frac{1}{2}$ to 4 times. Head once and $\frac{1}{4}$ as long as broad, granulate above, the snout smooth; frontal fontanelle moderate; snout rounded, as long as postocular part of head; interorbital region slightly convex, $\frac{2}{5}$ length of head; eye supero-lateral, its diameter 5 to $5\frac{1}{2}$ times in length of head; occipital region convex; lips moderate; maxillary barbel simple, with a narrow fringe at the base, a little shorter than head, extending to base of pectoral spine; mandibular barbels with slender simple branches, outer about $\frac{1}{2}$ length of head, inner $\frac{2}{7}$ or $\frac{1}{3}$; præmaxillary teeth forming a broad band; anterior mandibular teeth curved, $\frac{1}{3}$ diameter of eye, 19-21 in number.

Gill-cleft not extending inferiorly beyond base of pectoral fin. Nuchal shield convex, not keeled, rugose and pitted, once and $\frac{1}{4}$ to once and $\frac{1}{3}$ as long as broad, ending in two blunt points, which extend a little beyond the base of the spine of the dorsal. Humeral process covered with granular asperities, once and $\frac{1}{2}$ as long as broad, pointed, not extending so far back as the occipito-nuchal shield. Skin smooth. Dorsal I 6-7; spine strong, $\frac{2}{3}$ length of head, smooth in front, with 8 very small serræ behind. Adipose dorsal 4 or 5 times as long as deep, as long as head, once and $\frac{2}{3}$ or twice its distance from rayed dorsal. Anal III 8. Pectoral spine a little shorter than head, feebly serrated on the outer side, strongly on the inner. Ventral not reaching anal. Caudal very deeply notched, crescentic, upper lobe longest. Brown above, white beneath, the brown parts with rather large round darker spots, which may be very indistinct; iris pure white.

Total length 250 mm.

One specimen from Entebbe and one from Buganga.

Allied to *S. afro-Fischeri*, Hilgendorf, and *S. punctulatus*, Gthr. Distinguished from the first by fewer mandibular teeth and the absence of villosities on the body, from the second by fewer mandibular teeth and shorter mandibular barbels.

Cichlidæ.

Paratilapia cinerea.

Teeth small, in 4 series in each jaw, outer largest and feebly curved. Depth of body equal to length of head, 3 times in total length; body deepest at the nape. Snout much deeper than long, with steep oblique upper profile, a little shorter than the eye, which is 3 times in length of head and equals interorbital width; maxillary extending to below anterior border of eye; 3 series of scales on the check. Gill-rakers short, 9 on lower part of anterior arch. Dorsal XVI 8; spines increasing in length to the last, which measures $\frac{2}{3}$ length of head. Anal III 8; third spine a little shorter than last dorsal. Pectoral as long as head, extending a little beyond origin of anal. Ventral extending beyond origin of anal. Caudal truncate. Caudal peduncle once and $\frac{2}{3}$ as long as deep. Scales with very feeble denticulation, $33\frac{5}{13}$; lat. l. $\frac{21}{11}$. Grey above and beneath, darker on the back; a blackish opercular spot; fins dark grey, ventrals blackish; two large orange round spots, encircled with red, on the posterior part of the anal.

Total length 105 mm.

A single specimen from Buganga.

Allied to *P. victoriana*, Pellegr.*; distinguished by the larger eye.

Pelmatochromis Spekii.

Teeth in 3 to 6 series in both jaws, outer large, distant, and curved in the adult. Lower jaw more or less projecting in the adult. Depth of body $2\frac{2}{3}$ to $3\frac{1}{4}$ times in total length, length of head $2\frac{2}{3}$ to $2\frac{4}{5}$ times. Head large, with straight or slightly concave upper profile; snout once and $\frac{1}{4}$ (young) to twice and $\frac{1}{2}$ diameter of eye, which is $3\frac{1}{2}$ to 6 times in length of head and $\frac{4}{5}$ to once and $\frac{1}{2}$ in interorbital width; mouth oblique; maxillary extending to below anterior border of eye, or not quite so far; 3 to 5 series of scales on the cheek. Gill-rakers short, 8 or 9 on lower part of anterior arch. Dorsal XV-XVI 9-10; spines increasing in length to the last, which measures $\frac{1}{3}$ to $\frac{2}{5}$ length of head; longest soft rays $\frac{1}{2}$ to $\frac{2}{3}$ length of head. Anal III 8-10; third spine longest, stronger than dorsals, $\frac{1}{4}$ to $\frac{1}{3}$ length of head. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, reaching origin of anal or a little beyond. Ventral reaching origin of anal or a little beyond. Caudal rounded. Caudal peduncle once and $\frac{1}{4}$ to once and $\frac{1}{2}$ as long as deep. Scales ctenoid, 30-33 $\frac{5-6}{12-13}$; lat. l. $\frac{19-22}{11-14}$. Olive-brown to emerald-green above, silvery below; sometimes an ill-defined dark lateral stripe, cross-bars on the back, and a vertical dark bar below the eye; a dark opercular spot; dorsal and caudal fins greyish or bluish purple, the latter and the soft part of the dorsal with small round dark spots; anal yellow or greyish, sometimes bordered with vermilion-red, often with large orange ocellar spots encircled with red, on the posterior part; ventrals yellow or black; iris greyish white to dark brown, or upper half brown and lower half yellowish white.

Fifteen specimens, measuring from 95 to 235 mm., obtained at Entebbe, Munyongo, Bunjako, and Buganga.

In the smaller specimens a few of the inner teeth in both jaws are tricuspid, whilst in the larger ones they are all unicuspid; the dentition of the young is that of a *Tilapia*.

* The very young of all the *Paratilapia* and *Pelmatochromis* of Lake Victoria have more or less distinctly bi- or tricuspid teeth, thus rendering the distinction between these genera and *Haplochromis* or *Astatotilapia* as difficult and unsatisfactory as is that between the latter and *Tilapia*.

Pelmatochromis flavipinnis.

Teeth in 4 series in the upper jaw, in 3 in the lower, outer largest. Lower jaw projecting. Depth of body equal to length of head, 3 times in total length; body deepest at the nape. Head large, with concave upper profile; snout once and $\frac{2}{3}$ diameter of eye, which is 5 times in length of head and once and $\frac{1}{4}$ in interorbital width; mouth obliquely directed upwards; maxillary not extending quite to below anterior border of eye; 6 series of scales on the cheek. Gill-rakers short, 9 on lower part of anterior arch. Dorsal XV 9; spines increasing in length to the last, which measures $\frac{1}{3}$ length of head; longest soft rays a little more than $\frac{1}{2}$ length of head. Anal III 8; third spine longest, a little shorter than last dorsal. Pectoral $\frac{3}{4}$ length of head, not reaching origin of anal. Ventral reaching vent. Caudal rounded. Caudal peduncle once and $\frac{1}{2}$ as long as deep. Scales ctenoid, $31\frac{7}{12}$; lat. l. $\frac{22}{13}$. Yellowish, tinged with orange on the sides, with 4 broad olive-brown cross-bands on the upper half of the body; an interrupted dark streak on each side from above the gill-cover to the base of the tail; head speckled with brown; an angular olive-brown band, pointing backwards, from eye to eye on the occiput; a broad blackish band from below the anterior half of the eye to the mouth; a blackish vertical bar on the præoperculum; an oblique blackish bar, involving the opercular spot, behind the gill-cover; fins bright yellow, the ventral black on the outer side; two large round orange spots encircled with red on the posterior part of the anal.

Total length 145 mm.

A single specimen from Buganga.

Closely allied to the preceding.

Pelmatochromis microdon.

Teeth very small and few, in 3 series in both jaws. Lower jaw slightly projecting. Depth of body equal to length of head, 3 times in total length. Head large, with slightly concave upper profile; snout as long as broad, once and $\frac{1}{3}$ diameter of eye, which is 4 times in length of head and once and $\frac{1}{4}$ in interorbital width; præorbital a little narrower than the eye; mouth obliquely directed upwards; maxillary extending to below anterior border of eye; 3 series of scales on the cheek. Gill-rakers very short; the posterior strongly expanded, much broader than long, 9 on lower part of anterior arch. Dorsal XV 9; spines increasing in length to

the last, which measures $\frac{2}{5}$ length of head; longest soft rays $\frac{3}{5}$ length of head. Anal III 8; third spine longest, as long as and stouter than last dorsal. Pectoral as long as head, extending to above base of third anal spine. Ventral reaching origin of anal. Caudal obliquely truncate, upper rays longest. Caudal peduncle once and $\frac{1}{3}$ as long as deep. Scaled etenoid, $32 \frac{4-5}{11}$; lat. l. $\frac{21}{11}$. Olive above, grey beneath, with six ill-defined darker vertical bars on the sides; a blackish opercular spot; fins grey, posterior part of dorsal and caudal with small round darker spots, forming regular series between the rays; posterior part of anal with a few small orange ocellar spots.

Total length 175 mm.

A single specimen from Bunjako.

A small specimen, 90 mm. long, from Entebbe, which I regard as probably a young of the same species, has stronger outer teeth, the maxillary extends to below anterior third of eye, and the caudal fin is regularly rounded. Snout as long as the eye, which is $3\frac{1}{3}$ times in length of head. D. XV 9; A. III 8; Sc. $32 \frac{4}{11}$; lat. l. $\frac{21}{11}$.

Allied to the two preceding. Agrees with *P. Jentinki*, Sldr., in the very feeble dentition.

Pelmatochromis obesus.

Teeth in 2 or 3 series in both jaws, outer small, inner minute. Depth of body twice to twice and $\frac{1}{2}$ in total length, length of head 3 times. Head broad, with slightly concave upper profile; snout twice as broad as long in the adult, as long as diameter of eye, which is $3\frac{1}{2}$ times in length of head and once and $\frac{1}{4}$ to once and $\frac{1}{2}$ in interorbital width; præ-orbital much narrower than the eye; mouth obliquely directed upwards; maxillary extending to below anterior border of eye; 3 or 4 series of scales on the cheek. Gill-rakers short, some T-shaped, 8 to 10 on lower part of anterior arch. Dorsal XV 9; spines increasing in length to the last, which measures $\frac{2}{5}$ to $\frac{1}{2}$ length of head; longest soft rays $\frac{3}{5}$ length of head. Anal III 8-9; third spine stronger but a little shorter than last dorsal. Pectoral as long as head, extending to above base of third anal spine. Ventral extending to soft anal rays. Caudal obliquely truncate, upper rays longest. Caudal peduncle once and $\frac{1}{4}$ as long as deep. Scales etenoid, $32 \frac{4-5}{13}$; lat. l. $\frac{20-21}{11-13}$. Olive above, with very indistinct dark cross-bands, yellowish white beneath; a rather indistinct dark vertical bar below the eye; a dark

opercular spot; dorsal fin greyish, blackish towards the border, the soft portion with round dark spots; anal yellow, with two or three large round orange spots on its posterior half; inner rays of ventrals yellow, outer blackish; caudal greyish.

Total length 155 mm.

A single adult specimen from Bunjako; a smaller one from Entebbe.

Very closely related to the preceding, in spite of the great difference in form.

Haplochromis * *percoides*.

Teeth in 3 series in both jaws, outer largest, some with a faint trace of a lateral cusp. Lower jaw projecting. Depth of body $3\frac{1}{4}$ to $3\frac{1}{2}$ times in total length, length of head $2\frac{3}{4}$ to 3 times; body deepest at the nape. Snout with convex upper profile, a little longer than the eye, which is 4 times in length of head and once to once and $\frac{1}{4}$ in interorbital width; maxillary extending to below anterior border of eye; 4 series of scales on the cheek. Gill-rakers moderate and stout, 8 or 9 on lower part of anterior arch. Dorsal XIV–XV 10; spines increasing in length to the last, which measures nearly $\frac{1}{3}$ length of head; longest soft rays nearly $\frac{1}{2}$ length of head. Anal III 9; third spine longest, as long as and stronger than longest dorsal. Pectoral $\frac{2}{3}$ length of head, not reaching origin of anal. Ventral reaching vent. Caudal truncate. Caudal peduncle once and $\frac{1}{2}$ as long as deep. Scales strongly ctenoid, $32\frac{5}{13}$; lat. l. $\frac{20-21}{11-15}$. Dark olive above, ochre-yellow below; four dark brown transverse bands on the body and a dark brown blotch at the base of the tail; a dark brown bar across the forehead, and another, vertical, below the eye; dorsal light olive-brown, with a darker longitudinal streak on its posterior portion; pectorals, ventrals, and anal ochre-yellow, the latter with an orange spot with dark centre; iris white, with a reddish circle round the pupil.

Total length 98 mm.

Two specimens from Entebbe.

* *Haplochromis*, Hilgendorf, 1888, and *Ctenochromis*, Pfeffer, 1893, have priority over *Astatotilapia*, Pellegrin, 1904. *H. nuchisquamulatus*, which may be taken as the type of *Haplochromis* and *Ctenochromis*, is closely allied to *H. Desfontainesi*, which represents Pellegrin's genus; in addition to the character of the dentition, intermediate between *Paratilapia* and *Tilapia*, the fishes of this genus differ from the latter in usually having a considerable portion of the maxillary bone exposed when the mouth is fully closed.

Haplochromis Stanleyi.

Teeth in 3 or 4 series in both jaws, outer largest, conical or bicuspid, the others minute and tricuspid. Lower jaw slightly projecting. Depth of body equal to length of head, 3 times in total length. Upper profile of head slightly concave; snout as long as the eye, the diameter of which is $3\frac{1}{3}$ or $3\frac{2}{5}$ times in length of head and equals interorbital width; maxillary extending to below anterior border of eye; 3 series of scales on the cheek. Gill-rakers rather long, some T-shaped, 12 or 13 on lower part of anterior arch. Dorsal XIV-XV 9-10; spines equal from the sixth or seventh, $\frac{1}{3}$ to $\frac{2}{3}$ length of head; longest soft rays $\frac{2}{3}$ length of head. Anal III 9; third spine as long as or a little longer than longest dorsal. Pectoral as long as head, reaching origin of anal. Ventral extending beyond origin of anal. Caudal truncate, slightly emarginate. Caudal peduncle twice as long as deep. Scales ctenoid, 30-32 $\frac{4}{11}$; lat. l. $\frac{19-21}{10-11}$. Reddish brown above, greyish beneath; throat and opercle blackish; a V-shaped blackish band, pointing forwards, on the nape; a blackish vertical bar below the anterior border of the eye; ill-defined blackish spots on the side of the body, partly confluent into one or two longitudinal bands; dorsal grey, anal yellow, both blackish at the base, the latter with two or three large orange ocellar spots encircled with red; caudal greyish, blackish in the middle; ventrals black.

Total length 110 mm.

Two specimens from Bunjako and one from Buganga.

This species, called after the great African explorer whose name stands next to those of Speke and Grant in the history of Lake Victoria, is allied to *H. Bloyeti* and *H. nuchisquamulatus*, but well distinguished by the larger eye, the longer caudal peduncle, the truncate caudal fin, and the more numerous gill-rakers.

Haplochromis bicolor.

Teeth in 3 to 5 series in both jaws, the outer larger and mostly bicuspid in the young, obtusely conical in the adult, the others minute and partly conical, partly tricuspid. Depth of body $2\frac{2}{3}$ to 3 times in total length, length of head $2\frac{1}{3}$ or 3 times. Snout broad, rounded, with curved upper profile, as long as or slightly longer than the eye, which is $3\frac{1}{3}$ to $4\frac{1}{2}$ times in length of head and once to once and $\frac{1}{2}$ in interorbital width; lips very thick; maxillary reaching or hardly reaching to below anterior border of eye; 3 or 4 series of

scales on the cheek. Gill-rakers short, the larger T-shaped, 7 to 9 on lower part of anterior arch. Dorsal XV-XVI 8-10; spines subequal from the seventh or eighth, about $\frac{2}{3}$ length of head; longest soft rays $\frac{1}{2}$ to $\frac{2}{3}$ length of head. Anal III 8-9; third spine as long as longest dorsal. Pectoral as long as or a little shorter than head, reaching vertical of origin of anal. Ventral reaching vent or origin of anal. Caudal truncate, the upper rays usually longer than the lower. Caudal peduncle once and $\frac{1}{3}$ to once and $\frac{1}{2}$ as long as deep. Scales ctenoid, 31-35 $\frac{5-6}{11-13}$; lat. l. $\frac{18-25}{10-14}$. Bright yellow, irregularly blotched or marbled with black, the black sometimes forming irregular cross-bands on the body; one or two pale yellow ocellar spots may be present on the posterior part of the anal fin; iris yellow or bronzy brown, with a red circle round the pupil.

Numerous specimens, measuring from 70 to 155 mm., from Bunjako and Buganga.

Allied to *Tilapia Johnstoni*, Gthr. (also a *Haplochromis*).

Haplochromis crassilabris.

Teeth few, in 3 or 4 series in both jaws, of outer row large and conical or indistinctly bicuspid in the adult, bicuspid in the young, others minute and tricuspid. Depth of body equal to length of head, $2\frac{1}{5}$ or 3 times in total length. Snout with convex upper profile, as long as (young) or a little longer than the diameter of the eye, which is $3\frac{1}{2}$ to 4 times in length of head and equals interorbital width; mouth not very oblique, with very thick lips; maxillary not extending to below anterior border of eye; 3 series of scales on the cheek. Gill-rakers short, 7 or 8 on lower part of anterior arch. Dorsal XV-XVI 8-9; spines increasing in length to the last, which measures $\frac{2}{3}$ to $\frac{1}{2}$ length of head; longest soft rays $\frac{1}{2}$ length of head. Anal III 8-9; third spine stronger and a little shorter than last dorsal. Pectoral $\frac{3}{4}$ to $\frac{4}{5}$ length of head, extending to vertical of origin of anal. Ventral extending a little beyond origin of anal. Caudal rounded, subtruncate. Caudal peduncle once and $\frac{1}{4}$ as long as deep. Scales ctenoid, 31-33 $\frac{4}{13}$; lat. l. $\frac{17-22}{10-12}$. Brownish above, silvery white beneath; a rather indistinct dark bar across the nape, in front of the dorsal fin, and more or less distinct traces of two dark longitudinal stripes on the body in the adult; back with ill-defined dark cross-bands; fins greyish, caudal with small round darker spots, anal with or without small orange ocellar spots.

Ten specimens from Entebbe, measuring from 60 to 105 mm.

Closely allied to *H. retrodens*, Hilg.*. Distinguished by fewer and larger outer teeth, fewer rows of inner teeth, and thicker lips.

Haplochromis Granti.

Teeth in 5 or 6 series in both jaws, all conical in the adult, some of the outer flattened and more or less distinctly bicuspid in the young. Depth of body equal to or a little greater than length of head, 3 to $3\frac{1}{4}$ times in total length; body deepest at the nape. Upper profile of head forming a strong curve; snout much deeper than long, as long as the eye, which is $3\frac{1}{2}$ to $3\frac{2}{3}$ times in length of head, and equals interorbital width; mouth nearly horizontal or slightly oblique, extending to below anterior border of eye or not quite so far; 3 or 4 series of scales on the cheek. Gill-rakers short, 8 or 9 on lower part of anterior arch. Dorsal XV-XVII 8-9; spines equal from the seventh or eighth, $\frac{2}{5}$ to $\frac{1}{2}$ length of head; longest soft rays $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Anal III 8-9; third spine stronger than dorsals, $\frac{1}{3}$ to $\frac{2}{5}$ length of head. Pectoral as long as head or a little shorter, extending to origin of anal, or not quite so far. Ventral reaching origin of anal or a little beyond. Caudal truncate. Caudal peduncle once and $\frac{1}{3}$ to once and $\frac{2}{3}$ as long as deep. Scales ctenoid, 30-35 $\frac{4-5}{12-13}$; lat. l. $\frac{20-23}{9-13}$. Pale olive-brown above, silvery white beneath; chin and throat bright yellow; a blackish opercular spot; a more or less distinct dark streak from the latter to the base of the caudal; sometimes a second dark streak higher up on the back; dorsal and caudal fins greyish, sometimes with small light spots between the rays; anal yellow, usually with one or two orange ocelli edged with red; ventrals yellow, uniform or outer rays black or blackish.

Six specimens from Bunjako, two from Entebbe, and one from Buganga, measuring from 80 to 145 mm.

Distinguished from *H. retrodens* and the preceding species by the shorter snout and the larger eye.

Haplochromis Ishmaeli.

Teeth very small, in 3 to 5 series in both jaws, outer largest and mostly bicuspid, the others tricuspid. Depth of body $2\frac{3}{5}$ to 3 times in total length, length of head $2\frac{2}{3}$ to 3 times. Snout with straight or slightly convex upper profile,

* I am indebted to Dr. Pappenheim for photographs of the type specimens of the Victorian Cichlids described by the late Prof. Hilgendorf

once to once and $\frac{1}{3}$ as long as the eye, the diameter of which is $3\frac{1}{2}$ to 4 times in length of head; interorbital width once to once and $\frac{1}{4}$ diameter of eye; mouth not very oblique, extending to below anterior border of eye; 3 or 4 series of scales on the cheek. Gill-rakers short, 8 or 9 on lower part of anterior arch. Dorsal XV-XVI 9-10; spines equal from the eighth or ninth, or slightly increasing in length to the last, which measures $\frac{1}{3}$ to $\frac{1}{2}$ length of head. Anal III 8-9; third spine stronger than dorsals, $\frac{1}{3}$ to $\frac{2}{5}$ length of head. Pectoral as long as head or a little shorter, reaching vertical of origin of anal or a little beyond. Ventral reaching origin of anal or a little beyond. Caudal truncate. Caudal peduncle once and $\frac{1}{3}$ to once and $\frac{1}{2}$ as long as deep. Scales etenoid, $31-34$ $\frac{5-6}{11-13}$; lat. l. $\frac{19-22}{10-15}$. Females pale olive-brown above, silvery white below; a brown or black opercular spot; a brown vertical bar below the anterior third of the eye sometimes present; ill-defined dark cross-bars on the back, barely distinguishable; dorsal and caudal fins greyish, with or without round darker spots; ventrals and anal bright yellow, the former sometimes blackish on the outer border, the latter sometimes with two large orange ocellar spots; lower half of caudal sometimes bright yellow. Males darker, grey or blackish on the belly; dorsal fin grey, the soft portion with round light spots; ventrals black.

Thirteen specimens, measuring from 110 to 130 mm., from Bunjako. One of them, a female, has the mouth and pharynx full of eggs, measuring 3 mm. in diameter.

This species appears to be very near *Ctenochromis pectoralis*, Pfeff.

Named after Mr. George Ishmaël, Interpreter to the Police Court at Entebbe, to whom Mr. Degen is indebted for valuable assistance during his stay in Uganda.

Tilapia variabilis.

Teeth very small, in 4 to 8 series in both jaws, outer bicuspid, inner tricuspid. Depth of body $2\frac{1}{4}$ to $2\frac{1}{2}$ times in total length, length of head $2\frac{4}{5}$ to 3 times. Upper profile of head curved; snout broader than long, as long as the eye in the young, twice as long as the eye in the adult; diameter of eye $3\frac{1}{3}$ (young) to $6\frac{1}{2}$ times in length of head, once and $\frac{1}{2}$ to 3 times in interorbital width; mouth small, scarcely oblique, $\frac{1}{2}$ to $\frac{2}{3}$ width of head, extending to between nostril and eye; 2 series of scales on the cheek. Gill-rakers moderately long, 17 to 19 on lower part of anterior arch. Dorsal XVI-XVII 11-12; spines strong, last longest, $\frac{1}{2}$ or a little

less than $\frac{1}{2}$ length of head; longest soft rays $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Anal III 10-11; third spine $\frac{2}{5}$ to $\frac{1}{2}$ length of head. Pectoral once and $\frac{1}{6}$ to once and $\frac{1}{4}$ length of head, extending to vertical of origin of anal or beyond. Ventral reaching vent or not quite so far, rarely origin of anal. Caudal truncate, more or less obliquely in the adult, with the lower angle rounded. Caudal peduncle as long as deep or a little longer than deep. Scales cycloid, 31-35 $\frac{4-5}{14-15}$; lat. l.

$\frac{20-22}{11-15}$. Coloration very variable, some specimens olive-brown, others brilliant vermilion on the sides, others bright yellow with black markings and the dorsal and caudal fins edged with red, &c. The very young not distinguishable from those of *T. galilæa* and likewise with a blackish ocellar spot on the anterior part of the soft dorsal. Iris grey or dark hazel, with a red circle round the pupil.

Numerous specimens, measuring from 20 to 320 mm., from Entebbe, Bunjako, and Buganga.

Very closely allied to *T. nilotica* and *T. galilæa*, with which species it has probably been confounded by other ichthyologists. Differs only in the smaller eye and the longer caudal peduncle.

Tilapia nigricans.

Teeth small, in 6 series in both jaws, outer largest and bicuspid, the others tricuspid. Depth of body $2\frac{1}{2}$ to $2\frac{2}{3}$ times in total length, length of head 3 times. Upper profile of head strongly curved; snout broader than long, a little shorter than the diameter of the eye, which is $3\frac{1}{4}$ times in length of head and equals interorbital width; mouth small, with thick lips, not extending to below anterior border of eye; 3 series of scales on the cheek. Gill-rakers moderately long, 10 on lower part of anterior arch. Dorsal XV-XVI 9-10; spines equal from the eighth or ninth, nearly $\frac{1}{2}$ length of head; longest soft rays $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Anal III 9; third spine as long as longest dorsals. Pectoral nearly as long as head, extending nearly to above origin of anal. Ventral extending beyond origin of anal. Caudal truncate. Caudal peduncle slightly longer than deep. Scales ctenoid, 31-32 $\frac{5}{14}$; lat. l. $\frac{21-22}{11}$. Blackish or steel-grey above, somewhat lighter beneath; seven ill-defined black bars on the body and a vertical black bar below the anterior third of the eye; a black opercular spot; dorsal and ventral fins dark brown or black; other fins dark greyish brown, the anal in

one of the specimens with two orange ocellar spots; iris white.

Total length 100 mm.

Two specimens, the larger caught with rod and line from the pier at Entebbe, the smaller also from Entebbe.

Allied to *T. Kirkii*, Gthr.

Tilapia Martini.

Teeth small, in 3 or 4 series in both jaws, outer largest and bicuspid, the others tricuspid. Depth of body $2\frac{2}{3}$ to 3 times in total length, length of head $2\frac{2}{3}$ to 3 times; body deepest at the nape. Upper profile of snout descending in a steep oblique line; diameter of eye greater than length of snout, twice and $\frac{2}{3}$ to 3 times in length of head; interorbital width equal to length of snout; mouth not very oblique; maxillary extending to below anterior third of eye; 4 or 5 series of scales on the cheek. Gill-rakers short, some T-shaped, 8 or 9 on lower part of anterior arch. Dorsal XV-XVI 8-10; spines equal from the eighth or ninth, $\frac{1}{3}$ to $\frac{2}{3}$ length of head; longest soft rays $\frac{1}{2}$ to $\frac{2}{3}$ length of head. Anal III 8-9; third spine as long as and stronger than longest dorsal. Pectoral nearly as long as head, reaching beyond vertical of origin of anal. Ventral reaching origin of anal or a little beyond. Caudal truncate. Caudal peduncle once and $\frac{2}{3}$ as long as deep. Scales ctenoid, 32-33 $\frac{4-5}{13-15}$; lat. l. $\frac{19-22}{11-13}$. Yellowish olive above, white beneath; a dark vertical bar below the eye and a cross-bar on the forehead; a blackish opercular spot; a blackish stripe from the latter to the root of the tail; a second, more or less distinct dark stripe higher up on the side of the back; one specimen uniform dark grey; dorsal and anal fins greyish, with more or less distinct round darker spots; pectoral and anal fins yellow, the latter sometimes with one or two orange ocellar spots in the posterior part, ventrals yellow in the female, black in the male.

Seven specimens from Bunjako, measuring from 75 to 110 mm. One of these, a female with large eggs in the ovaries, has the mouth filled with embryos measuring 8 or 9 mm. and provided with a large yolk-sae.

This species is named after Mr. James Martin, Transport Officer in the Uganda Protectorate, in recognition of much assistance rendered to Mr. Degen. *Tilapia Martini* bears a great resemblance to the *Paratilapia* described above as *P. cinerea*, but the dentition is quite different.

Tilapia lacrimosa.

Teeth small, in 3 to 5 series in both jaws, outer largest and bicuspid, the others tricuspid. Depth of body $2\frac{1}{2}$ to 3 times in total length, length of head 3 or $3\frac{1}{3}$ times. Upper profile of snout straight or slightly convex; diameter of eye equal to length of snout and to interorbital width, $3\frac{1}{3}$ to $3\frac{1}{2}$ times in length of head; mouth moderately oblique, maxillary extending to below anterior border of eye or a little beyond; 3 or 4 series of scales on the cheek. Gill-rakers short, 7 to 9 on lower part of anterior arch. Dorsal XV-XVI 8-9; spines increasing in length to the last, which measures $\frac{2}{5}$ to $\frac{1}{2}$ length of head; longest soft rays $\frac{3}{5}$ to $\frac{2}{3}$ length of head. Anal III 8-9; third spine as long as and stronger than longest dorsal. Pectoral as long as head, extending to vertical of origin of anal or a little beyond. Ventral reaching origin of anal or beyond. Caudal truncate. Caudal peduncle once and $\frac{1}{3}$ to once and $\frac{2}{3}$ as long as deep. Scales ctenoid, 30-34 $\frac{4-5}{12-13}$; lat. l. $\frac{19-24}{10-13}$. Pale olive or reddish brown above, white or grey beneath; belly sometimes blackish; usually two blackish cross-bars on the upper surface of the snout and a broader one on the occiput; a black vertical bar below anterior third of eye, rarely indistinct or absent; a black opercular spot; more or less distinct dark bars on the body, and a lateral series of blackish blotches sometimes confluent into a longitudinal band; dorsal fin greyish, usually with small darker or lighter spots; anal and lower half of caudal bright yellow, the former usually with one, two, or three large orange ocellar spots encircled with red; ventrals black or blackish; iris white.

Numerous specimens, measuring from 75 to 100 mm., from Entebbe, Bunjako, and Buganga.

Very similar to *Haplochromis nuchisquamulatus*, Hilg., but eye larger, caudal fin truncate, and maxillary entirely or nearly entirely concealed when the mouth is closed.

Tilapia nubila.

Teeth small, in 3 or 4 series in both jaws, outer largest and bicuspid, the others tricuspid. Depth of body equal to length of head, $2\frac{3}{5}$ to 3 times in total length. Upper profile of snout slightly convex; diameter of eye equal to length of snout (a little less in the young) and to interorbital width, 3 to $3\frac{1}{2}$ times in length of head; mouth not very oblique, with thick lips; maxillary extending to below anterior border of eye or not quite so far; 3 or 4 series of scales on the cheek.

Gill-rakers short, 8 or 9 on lower part of anterior arch. Dorsal XV–XVI 8–10; spines increasing in length to the last or last few, $\frac{2}{5}$ to $\frac{1}{2}$ length of head; longest soft rays $\frac{1}{2}$ to $\frac{4}{5}$ length of head. Anal III 8–10; third spine as long as longest dorsal. Pectoral $\frac{3}{4}$ to once length of head, extending to vertical of origin of anal or a little beyond. Ventral extending to origin of anal or beyond. Caudal rounded. Caudal peduncle once and $\frac{1}{4}$ to twice as long as deep. Scales ctenoid, 29–33 $\frac{3-4}{11-12}$; lat. l. $\frac{18-21}{9-14}$. Adult males black, the anal fin and the border of the caudal fin often bright vermilion; orange ocellar spots sometimes present on the anal. Females and young dark grey or brown to blackish, with or without black bars on the body; usually a black vertical bar below the anterior third of the eye; a black opercular spot; dorsal and anal fins dark grey or brown, edged with black; caudal grey or brown, and, like the soft dorsal, with more or less distinct small darker spots; some yellow spots may be present on the anal; ventrals greyish or yellow.

Numerous specimens, measuring from 50 to 120 mm., from Entebbe.

Very closely allied to the preceding; distinguished by the shape of the caudal fin.

PLATYTÆNIODUS, gen. nov.

Jaws with very broad bands of small conical teeth, the alveolar surface of the præmaxillaries widening towards the pharynx, the band of teeth in the upper jaw horseshoe-shaped, that in each ramus of the lower jaw not much longer than broad; a very small part of the maxillary exposed when the mouth is closed. Scales very feebly denticulate. Dorsal with 15 spines, anal with 3.

Platytaeniodus Degeni, sp. n.

Depth of body twice and $\frac{2}{3}$ in total length, length of head 3 times. Snout with convex upper profile, as long as inter-orbital width, once and $\frac{1}{3}$ diameter of eye, which is 4 times in length of head; mouth not extending quite to below anterior border of eye, its width half that of the head; lips thick; 4 series of scales on the cheek; gill-rakers short, 9 on lower part of anterior arch. Dorsal XV 10; spines increasing in length to the last, which measures $\frac{1}{2}$ length of head; longest soft rays $\frac{3}{4}$ length of head. Anal III 9; third spine longest, not quite half length of head. Pectoral acutely pointed, as long as head, extending to above origin of anal.

Ventral reaching a little beyond origin of anal. Caudal rounded. Caudal peduncle once and $\frac{1}{2}$ as long as deep. Scales $33 \frac{5}{12}$; lat. l. $\frac{22}{13}$. Pale olive above, silvery white beneath; a blackish opercular spot; a dark grey band from the latter to the root of the caudal; a rather indistinct dark vertical bar below the eye; dorsal and caudal fins greyish; ventrals yellow, the outer rays blackish; anal yellow, with three orange ocellar spots, encircled with red, on the posterior part.

Total length 140 mm.

A single specimen from Bunjako.

LXI.—*Preliminary Descriptions of new Species of Amphipoda from the 'Discovery' Antarctic Expedition, 1902-1904.*
By ALFRED O. WALKER, F.L.S., F.Z.S.

Fam. **Hyperiidæ.**

Hyperia macronyx *, sp. n.

S.E. of Coulman I., 22/2/04; six specimens, immature: length of largest 10 mm. W.Q.† 16/4/03, 5 f.; one specimen. W.Q. 18/5/03, 10 f. W.Q. 1/8/03, 10 f.; eight specimens.

Head shorter than the first two segments. *Eyes* occupying the entire head. *Segments all free*; the three pleon-segments with a tooth on the hind epimeral angle. *Carpal process of the first gnathopods reaching the middle of the hind margin of the hand, which is ovate, less than twice as long as wide, the hind margin convex and finely serrate.* Carpal process of the second pair reaching considerably beyond the middle of the hand; the limb otherwise as in the first; branchiæ of first pair oblong, wider below; of second pair pyriform.

First and second peræopods longer than the gnathopods; first joint a little wider than the fourth, which is twice as wide and about two thirds as long as the fifth, with *five long equidistant spines on the hind margin*; the fourth and fifth joints have their hind margins finely serrate. *Dactyli* slightly curved, slender, *about half as long as the fifth joint.*

Third peræopods: first joint subequal to the fifth, about twice as long as wide, widening near the middle; fifth joint

* From the long dactyli of the peræopods.

† W.Q. = winter-quarters.

half as long again and half as wide as the fourth, its front margin finely serrate. Dactyli as in preceding pairs.

Fourth and fifth peræopods: first joint narrower than in the third pair, and the front margin of the fourth smooth. *The fourth pair are subequal to the third and about one fifth longer than the fifth.* Dactyli as in preceding pairs.

First uropods reaching to the end of the third, second a little shorter.

Third uropods: peduncles broad, one third longer than the rami, which are subequal, wide at the base, and acutely pointed; the outer edge of the outer ramus smooth, the rest unequally serrate.

Telson equilaterally triangular, barely reaching the middle of the peduncle of the third uropods.

This species in the length of the peræopods and the relative proportions of the last three pairs approaches *Parathemisto*, with which it also agrees in the mouth-organs; but the widely expanded and produced wrist of the first gnathopods does not agree with either G. O. Sars's or Bovallius's definition of that genus.

Length 10 mm.

Hyperoche Lütkenides, sp. n.

Lat. $57^{\circ} 25' 30''$ S., long. $151^{\circ} 43'$ E.; one male: length 12 mm.

Like *Hyperoche Lütkeni*, Bovallius, except in the following respects:—In the second pair of peræopods (fourth pair of Bovallius) the hind margins of the fourth and fifth joints are *not serrate*. In the third pair the fifth joint *is curved*.

The telson is *triangular, with rounded apex, rather longer than the width at the base and reaching to the middle of the peduncles of the third uropods.*

The mandibular palp has the third joint almost as long as the first and second united, as figured by Bovallius for *H. Lütkeni*. In this respect both species differ from G. O. Sars's figure of *H. Krøyeri*, Bov. [*H. tauriformis* (Sp. Bate and Westwood)], in which the third joint is shorter than the second.

In the first pair of peræopods the hind margin of the fourth joint is prolonged in the form of a strong serrate tooth; in the second pair the tooth is smaller and not serrate, but the curved portion of the end of the joint between the tooth and the base of the fifth joint is so.

Fam. **Hyperlopsidæ**, Bovallius.*Hyperlopsis australis*, sp. n.

W.Q. 16/6/03, 15 f. ; one specimen.

Differs from *H. Vöringii*, G. O. Sars (Norweg. N. Atlantic Exp. p. 231), in the following points:—

The lower margin of the head is *oblique*.

The first segment of the urosome has a deep dorsal depression ; the second segment is the longest of the three.

The third joint of the first and second peræopods is not quite twice as long as the next two united and is about the same width (*i. e.* the margins are parallel) for the distal three fourths of its length.

In the last peræopods the jointing is indistinct ; the very long third (or fourth) joint is finely serrate and spinulose.

The first and second uropods are biramous. In his definition of the genus Sars says that they are "simple, two-jointed," but as the rami cling closely together this might easily be an oversight.

The single specimen was not dissected (nor, probably, was Sars's), but the maxillipeds are evidently of the Gammarid type. Bovallius has placed the genus in his tribe Synopidea, under the family Hyperlopsidæ.

Fam. **Lysianassidæ**.

Charcotia obesa, Chevreux, Bull. Soc. Zool. de France, Jan. 1906.

I had written the description of the above under the genus *Socarnes*, Boeck, from which genus it appears to differ only in the structure of the branchiæ, before M. Chevreux's paper was published.

Aristias antarcticus, sp. n.

W.Q. ; two specimens : length of largest 15 mm.

Body without carinæ or teeth. Head shorter than the first segment, *ocular lobe produced to the end of the first joint of the upper antennæ*, the angular apex rounded. *Eyes* large, dark, expanded below. *Body-segments* increasing in length backwards. First four side-plates (except the first pair) about as deep as the segments, the first concealed by the second. *Posterior angle of the third pleon-segment produced and acute.* *First urus-segment* depressed in front, almost

covering the second and third, which are very small, perhaps coalesced.

Antennæ subequal, scarcely reaching the end of the third segment; first joint of the upper rather longer than the second, which is twice as long as the third. First joint of the 10-jointed flagellum as long as the next three, setose. Appendage 5-jointed, the first joint the longest. Flagellum of the lower antennæ 10-jointed. *Mouth-parts* normal.

First gnathopods: side-plates small, rather wider than deep. Wrist longer and wider than the hand. Hand simple, tapering to the dactylus, the hind margin slightly concave, spinulose, with four spines at unequal distances.

Second gnathopods: side-plates ovate below. Wrist longer and wider than the hand, which has subparallel margins. Dactylus well developed. Last three pairs of *peræopods* subequal; hind margins of the first joints of the third and fourth pairs obscurely crenate in the lower part; these two pairs are turned up over the back; the whole hind margin in the fifth pair is serrate. The *third uropods* have the inner rami lanceolate, as long as the peduncle, and reaching to the end of the first joint of the outer.

Telson about as wide at the base as long, cleft about two thirds of its length, dehiscent, divisions rounded.

Orchomene goniops *, sp. n.

W.Q. 21/8/03; two specimens, probably immature: length 5 mm.

Body-segments increasing in length backwards. *First four side-plates* deeper than the segments, narrow. *Third pleon-segment* with a small postero-dorsal carina and hind and lower margins straight, the former crenate, the posterior angle rather less than 90° .

Head shorter than the first segment; *ocular lobe* broadly triangular, produced beyond the end of the peduncle of the upper antennæ. *Eye* moderately large, oval, dark.

Upper antennæ: first joint three times as long as the next two united, naked. Flagellum 13-14-jointed, the first joint as long as the next three, sparsely setose on the upper side. Appendage 5-jointed, the first joint the longest, the third the shortest. *Lower antennæ* rather longer than the upper; peduncle reaching the end of the third joint of the flagellum of the upper, first joint the longest, second the shortest. *First gnathopods*: side-plates narrowed and rounded below; wrist

* γωνία, angle; ὠψ, face.

two thirds of the length of the hand, which is about twice as long as wide with parallel margins, setose; palm rather oblique, convex, crenulate, defined by a spine. *Second gnathopods* as in *Orchomene humilis* (Costa) [= *O. Batei*, Sars]. *Third peræopods*: side-plates wider than the depth in front, with the usual posterior lobe; first joint about half as large as the side-plate, deeper than wide; hind margin convex, serrate, produced down to the middle of the third joint; this is much produced behind and downwards. *The fifth peræopods have the first joint nearly twice as deep as wide and longer than the rest of the joints, including the dactylus, together*, otherwise like the third pair: the dactyli of all the peræopods are very short.

The first uropods are subequal in extent to the second, exceeding the third: the peduncle is one fourth longer than the subequal rami, all the parts very spinous on the upper margins. *Second pair* less spinous. Peduncle in the *third pair* rather longer than the outer ramus: inner ramus not nearly reaching the end of the first joint of the outer, its inner margin minutely serrate. *Telson entire*, deeply concave above, *the end truncate with two setules*: it extends beyond the end of the inner rami of the third uropods.

The difference between the telson of this species and that of the female *O. humilis* is only one of degree, as the truncate margin is slightly concave.

Orchomenella chelipes, sp. n.

W.Q. 28/2/02, 10 f.; eight specimens: length of female with ova 5 mm.

Head subequal to the first segment; ocular lobe reaching the end of the first joint of the lower antennæ. Eye large, broadly oval, dark red. *Body*: first two segments subequal, shorter than any of the remaining segments. Posterior angle of the third pleon-segment a rounded right angle, hind margin smooth, lower margin straight. First urus-segment as long as the remaining two, carinate.

Upper antennæ: first joint three times as long as the next two united, naked. Flagellum 11-jointed, the first as long as the next two; appendage 4-jointed, the first twice as long as the second, which is subequal to the third, the fourth minute. *Lower antennæ* slightly longer than the upper; flagellum 12-jointed, subequal to the peduncle. *Mouth-organs* as in *O. nana* (Kr.); second joint of mandibular palp twice as long as the first.

First gnathopods: side-plates widened below, rounded in

front; wrist subequal to but wider than the hand; the latter slightly curved, *the hind margin produced, forming a chelate junction with the dactylus*; hind margins of third, fourth, and fifth joints densely setose. *Second gnathopods*: side-plates oblong, widened below: first joint about twice as long as the second, which is longer than the third; wrist much longer and wider than the hand, hind margin very convex and scabrous. Dactylus distinct. *Last three pairs of peræopods* similar in structure, the first joints wide and obscurely crenate behind; the side-plates of the third pair wider than deep. *Third uropods*: inner ramus not reaching the last joint of the outer. *Telson* barely reaching the end of the peduncle of the third uropods, deeply notched.

PODOPRIONIDES, gen. nov.

Resembles *Podoprionella*, G. O. Sars, in the chelate first gnathopods and the deeply serrate first joints of the last three peræopods, but differs in the less compact body, the structure of the mandibular palp and of the outer ramus of the third uropods. From *Podoprion*, Chevreux, it differs in having the first joint of the fourth and fifth peræopods serrate like the third.

Podoprionides incerta, sp. n.

W.Q. 29/8/02. Hole 12, D net. One specimen: length 2 mm.

Body not very compact: the anterior side-plates small.

Upper antennæ reaching a little beyond the peduncle of the lower: appendage 2-jointed, the first twice as long as the second, which has a tuft of very long setæ at the extremity.

Lower antennæ: peduncle stout, margins of third joint produced. *Mandibular palp with the third joint more than half as long as the second, narrow, pectinate.*

First gnathopods: side-plates less than half the length of the first joint, rounded in front, straight behind, with a notch and a spine above the angle. First joint rather longer than the remaining five, widening distally; second and third joints subequal; wrist subequal to the hand; *the hind margin of the hand is short, convex and prolonged in a spine-like process, which is slightly curved inwards to meet the point of the curved dactylus, forming a completely chelate joint; palm very oblique, smooth.*

Second gnathopods: side-plates oblong, about twice as deep as wide, angles rounded. First joint hardly as long as the next

three; second longer and wider than the third; wrist about twice as long as the hand, which is oblong, setose on both margins, palm transverse. The last three pairs of *peræopods* have the first joints broadly ovate, the hind margins deeply serrate as in *Podoprion*, Chevreux, and *Podoprionella*, Sars. *Uropods*: first and second subequal in extent and scarcely exceeding the third pair; *the outer ramus in this pair has two subequal joints* and is but little longer than the inner. The telson could not be made out.

The single specimen was not dissected; the mouth-parts therefore could not be described.

LXII.—*Notes on British Copepoda: Change of Names.*
By THOMAS SCOTT, LL.D., F.L.S.

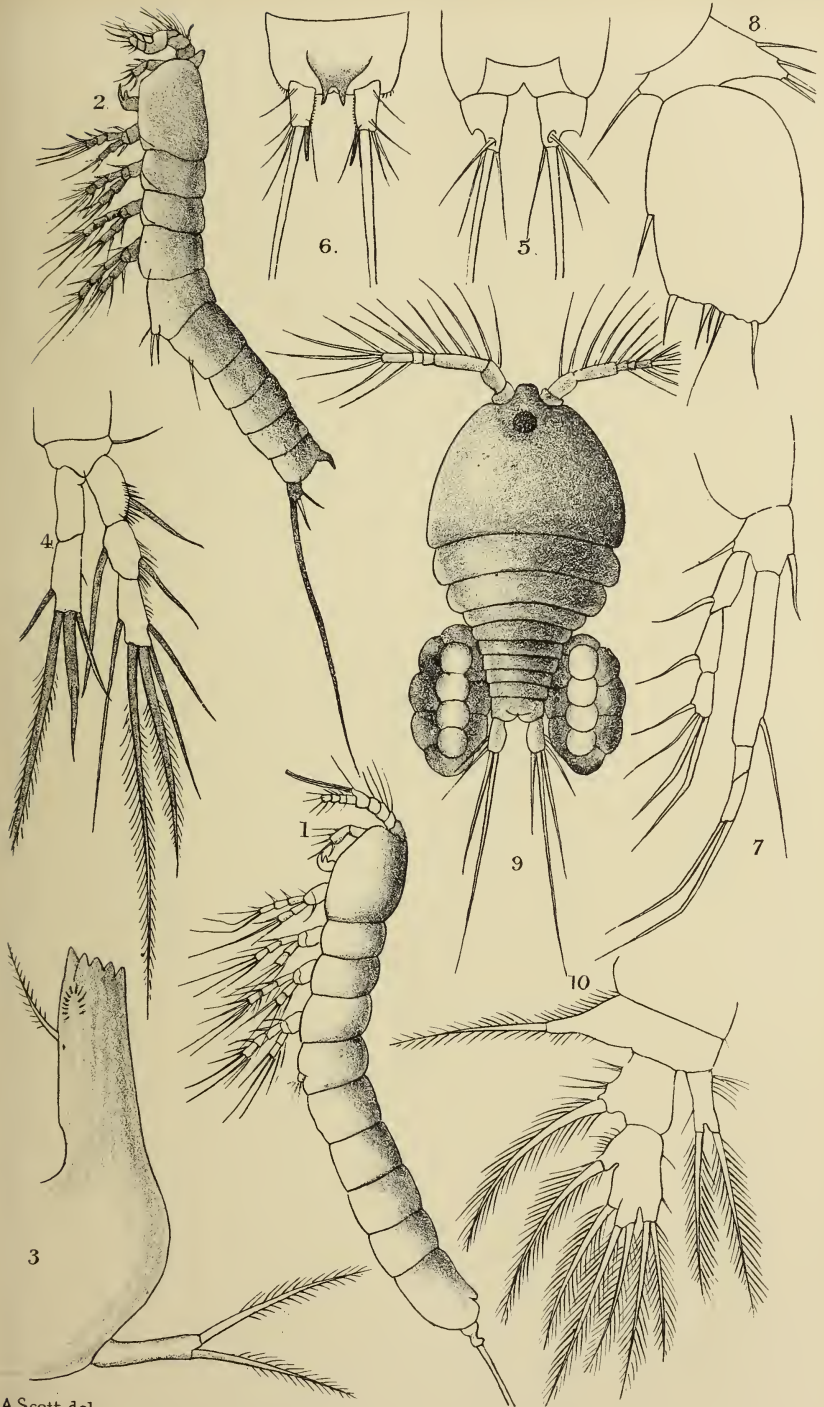
[Plate XI.]

Genus PHYLLOPODOPSYLLUS *, T. Scott, nov.

Syn. *Tetragoniceps*, T. Scott, in part. (not *Tetragoniceps*, G. S. Brady).

Description.—Resembling *Tetragoniceps*, G. S. Brady, in form. Anterior antennæ about as long as the cephalothoracic segment and composed of nine joints, the second joint bearing a more or less prominent hook-like spine, and the fourth a tolerably elongated sensory filament. Posterior antennæ three-jointed; outer ramus small, uniaarticulate. Mandibles small, biting-edge truncate and armed with several small teeth; palp tolerably large, basal joint with two, apparently uniaarticulate, branches, the distal branch being the longer. First maxillipeds five-jointed; first joint large and furnished with a few marginal processes, other joints small. Inner branches of the first four pairs of thoracic legs two-jointed, and the outer three-jointed. In the first pair the inner branch is elongated, and the first joint longer than the entire outer branch, the second joint is short. In the other three pairs the outer branch is elongated, while the inner is very short. The fifth pair are each composed of a large leaf-like plate, and they together completely enclose the ovisac; each plate is provided with a few setæ on the outer and distal margins. The abdomen consists of five segments and has the middle one produced distally on the underside into a

* φύλλον, a leaf; πούς, a foot; ψύλλος, a flea: from the leaf-like fifth pair of feet.



A. Scott del.

Fig 1 - 6 *D. Arcythompsonia furhensis* T. Scott
.. 7 - 8 *Pteropsyllus consimilis* T. Scott
.. 9 - 10 *Harrietella simulans* T. Scott.

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distinct tooth-like process. Furcal joints moderately short, inner margin lobate near the base.

No males observed.

Type species *Phyllopodopsyllus Bradyi*, T. Scott. Described in 1892 under the name of "*Tetragoniceps Bradyi*, T. Scott," in the 'Tenth Annual Report of the Fishery Board for Scotland,' pt. iii. p. 253, pl. ix. figs. 19-32.

Remarks.—This species, which appears to be scarce, but with a fairly wide distribution, has a close resemblance to *Tetragoniceps*, G. S. Brady. The anterior antennæ, however, are composed of nine joints and it is the second (not the first) joint that is strongly toothed. There is a difference in the structure of the maxillæ and first maxillipeds, but the most obvious difference is in the structure of the fifth pair of thoracic feet, which are so large and leaf-like that they enclose the entire ovisac. The species is described and figured in the Fishery Board Report referred to above.

Genus *PTEROPSYLLUS* *, T. Scott, nov. (Pl. XI. figs. 7, 8.)

Syn. *Tetragoniceps*, T. Scott, in part. (not *Tetragoniceps*, G. S. Brady).

Description.—This genus resembles in some respects the one last described, as well as *Tetragoniceps*, G. S. Brady, and seems to hold a somewhat intermediate position between them. The anterior antennæ are composed of eight joints; the first is elongated, the second is shorter and has the upper distal angle produced forwards into a tooth-like process, and the fourth is provided with a sensory filament. Posterior antennæ apparently three-jointed; outer ramus rudimentary, consisting of a minute uniaarticulate joint. Mandible and palp as in *Tetragoniceps*. The maxillæ and maxillipeds are also somewhat similar to those of the same genus. Both branches of the first pair of thoracic feet three-jointed; the first joint of the inner branch is as long as the entire length of the outer branch, but the second and third joints are small. The next three pairs have the inner branches two-jointed as in *Phyllopodopsyllus*. In the fifth pair the basal joint is small, but the secondary joint is large and foliaceous—large enough to enclose the ovisac. Abdomen composed of four segments. Furcal joints tolerably elongated.

No male observed.

Type species *Pteropsyllus consimilis*, T. Scott. Described in 1894 under the name of "(?) *Tetragoniceps consimilis*," in

* πτερὸν, a wing; ψύλλος, a flea: the fifth pair of thoracic legs being wing-like.

the 'Twelfth Annual Report of the Fishery Board for Scotland,' pt. iii. p. 244, pl. vii. figs. 4-12.

Remarks.—*Pteropsyllus consimilis* differs from the more typical forms of *Tetragoniceps* in the structure of the anterior antennæ and more particularly in that of the first and fifth pairs of thoracic feet, and these differences are so obvious that the species ought, I think, to be removed from the genus to which it was at first doubtfully ascribed. The species appears to be moderately rare. I have no record of its occurrence from any place outside the Forth Estuary.

Genus EVANSIA, T. Scott, nov.

In 1892 I described under the name of *Tetragoniceps incertus* a Copepod which, a short time before, had been observed in the Forth Estuary. In its general form the species was very like *Tetragoniceps*, but it differed so greatly in the structure of some of its appendages that its place in that genus could only be regarded as temporary.

Further research has shown that the species has a tolerably wide distribution, and the examination of additional specimens proves that its position in *Tetragoniceps* is untenable. I therefore propose to remove it to a new genus—*Evansia*, which is named in compliment to Mr. William Evans, F.R.S.E., Edinburgh, whose successful researches in various branches of natural history have added greatly to our knowledge of the fauna of Scotland.

The following is a description of the more important characters by which the genus may be distinguished.

Female.—Body narrow and elongated. Antennules (anterior antennæ) seven- or eight-jointed and about as long as the cephalothoracic segment. Posterior antennæ three-jointed; outer ramus small or nearly obsolete. Mandibles small, basal part usually dilated, distal part narrow, and with the truncated apex obscurely toothed; palp elongated and slender, composed of a single biarticulate branch. Other mouth-organs nearly as in *Tetragoniceps*. First pair of thoracic legs nearly as in *Tetragoniceps*. In the next three pairs the outer branches are three-jointed, slender and elongated as in those of the genus named, but the inner branches are very small and consist of only one joint. Fifth pair small, uniaarticulate, and narrowly triangular in form, and terminate in a stout apical spine. Abdomen composed of four segments.

Male.—The male is similar to the female, except, 1st, that the antennules are modified and hinged for grasping; 2nd, that the second pair of thoracic feet are provided with an

additional terminal seta on the outer branch; 3rd, the inner branch of the third pair is provided with an elongated slender spine, which springs from the base of the branch and extends to beyond the apex; 4th, the abdomen is five-jointed; and, 5th, the smaller size of the fifth pair of feet. The female carries only one ovisac.

Though *Evansia* has a close resemblance to *Tetragoniceps*, it is at once distinguished by the small uniarticulate inner branches of the second, third, and fourth thoracic feet.

Type species *Evansia incerta*, T. Scott. Described under the name of "*Tetragoniceps incertus*, T. Scott," in the 'Tenth Annual Report of the Fishery Board for Scotland,' pt. iii. p. 254, pl. xii. figs. 1-17 (1892).

A second species was described under the name of "*Tetragoniceps pygmæus*, T. Scott," in the 'Twenty-first Annual Report of the Fishery Board for Scotland,' pt. iii. pl. iv. figs. 11-19 (1903). This species, as pointed out in the description, agrees with *E. incerta* in all its more important characters, as, for example, in the structure of the thoracic legs in the female, and only shows some minor differences sufficient for the separation of the two species. This species will now be known as *Evansia pygmæa*, T. Scott.

Genus LEPTASTACUS, T. Scott, nov.

Description.—Body elongated, slender. Anterior antennæ in the female eight-jointed and wanting the hook-like spine observed in the same appendages in *Tetragoniceps* and *Evansia*. Posterior antennæ three-jointed; outer ramus rudimentary. Mandible and mandible-palp as in *Evansia*. First maxillipeds small, provided with two bilobed setiferous processes and a moderately stout terminal spine. Second maxillipeds slender and armed with an elongated and slender terminal claw. Inner branches of all four pairs of thoracic legs two-jointed and the outer three-jointed. In the first pair the inner branches are considerably longer than the outer, and the two joints are of nearly equal length. In the next three pairs the inner branches, which, like those of the first pair, are composed of two nearly equal joints, are much shorter than the outer. Fifth pair very small and uniarticulate, they have each a narrow triangular outline and taper gradually to the pointed apex. The abdomen is composed of four segments. One ovisac containing a few tolerably large ova.

The male does not differ greatly from the female, but the anterior antennæ are nine-jointed and modified for grasping.

Type species *Leptastacus macronyx*, T. Scott. Described under the name of "*Tetragoniceps macronyx*" in the 'Tenth Annual Report of the Fishery Board for Scotland,' pt. iii. p. 253, pl. x. figs. 19-28 (1892). *Leptastacus macronyx* was provisionally ascribed to the genus *Tetragoniceps*, G. S. Brady, because of its slender form and because in some structural details it had a resemblance to that genus. The occurrence of specimens from other localities has enabled me to study more carefully the peculiarities of this form, and I now think that though it is closely allied to *Tetragoniceps*, G. S. Brady, its position in that genus can scarcely be maintained. The structure of the anterior antennæ, the rudimentary character of the outer ramus of the posterior antennæ, the structure of the mandible-palp, of the first maxillipeds, and of the fifth pair of thoracic feet all differ more or less from the typical *Tetragoniceps*.

This species seems to have a fairly wide distribution, as I have observed it in the estuary both of the Forth and Clyde.

Genus D'ARCYTHOMPSONIA, T. Scott, nov.

Animal closely resembling *Cylindropsyllus*, G. S. Brady, in its general form. Body elongated, narrow, cylindrical, with no distinct separation between the thorax and abdomen.

Anterior antennæ in the female short, eight-jointed, the four proximal joints being tolerably robust, while the last four are distinctly more slender than the others. Posterior antennæ three-jointed; outer ramus uniaarticulated and rudimentary. Mandibles small, narrow towards the distal end, armed with a few blunt-pointed apical teeth; the mandible-palp small and uniaarticulate. Maxillæ broadly lamelliform and with the truncated apex furnished with several tooth-like spines; palp small and two-jointed. Second maxillipeds robust, two-jointed, and terminating in a strong bifid claw. The first four pairs of thoracic legs have the outer branches three- and the inner two-jointed. In the first pair the inner branches are nearly as long as the outer and the joints are subequal in length, but in the other three pairs the inner branches are considerably shorter than the outer branches. The fifth pair are very small, one-jointed, and lamelliform. The abdomen is composed of five segments.

The male is similar to the female in its general form, but the anterior antennæ appear to be only six-jointed, the structure of the last four joints being considerably modified. The second pair of thoracic legs differ from those of the female in the presence of a tolerably long, stout, spine-like

appendage, which takes the place of one of the two long, plumose, terminal setæ (see Pl. XI. fig. 4), but otherwise the second pair closely resemble the second pair in the female. The fifth pair are smaller than those of the female, but do not appear to differ much otherwise. The abdomen consists of five segments, as in the female, the first being furnished with a pair of minute rudimentary appendages. The operculum on the median dorsal aspect of the last abdominal segment and the furcal joints differ distinctly from the same parts in the female, as shown by the drawings (figs. 5, ♀, and 6, ♂). I have not yet ascertained if one or two ovisacs are carried by the female.

Type species *D'Arcythompsonia fairliensis*, T. Scott.
(Pl. XI. figs. 1-6.)

1899. *Cylindropsyllus fairliensis*, T. Scott, Seventeenth Annual Report of the Fishery Board for Scotland, pt. iii. p. 258, pl. x. figs. 11-14, pl. xi. figs. 1-4.

This Copepod, as already stated, is somewhat similar in its form and structure to *Cylindropsyllus*, G. S. Brady, and for that reason and because no males had been yet observed it was provisionally ascribed to that genus, even though one or two structural peculiarities were noticed and referred to at the end of the specific description.

The specimens from which the species was described were collected in pools of brackish water near Fairlie, Firth of Clyde. No others appear to have been discovered till quite recently, when two males and a few females were obtained in a small sample of dredged material collected in Lerwick Harbour, Shetland. An examination of these male specimens has enabled me to confirm the opinion I had previously arrived at from an examination of the females, viz., that the differences then observed might "yet render it necessary to remove this Copepod to another genus."

These males are found to differ from those of the two species of *Cylindropsyllus* already described in the entire absence of the peculiar terminal appendages with which the outer branches of the second pair of thoracic legs are furnished, and which appear to be characteristic of the males of that genus. These male specimens from Lerwick also want the appendages which characterize the inner branches of the third pair in the males of the same genus. In the species under consideration the third pair in the male is practically similar to that of the female.

The occurrence of these differences in the male, together

with those previously noticed in the female, render the removal of this species from the genus *Cylindropsyllus* necessary, and the new genus I propose for its reception is named *D'Arcythompsonia* in compliment to Professor D'Arcy Wentworth Thompson, C.B., of University College, Dundee.

Genus HARRIETELLA *, T. Scott, nov.
(Pl. XI. figs. 9, 10.)

An apparently new species of Copepod is described in part iii. of the 'Twelfth Annual Report of the Fishery Board for Scotland.' This Copepod was provisionally ascribed to the genus *Laophonte*, Philippi, with which it partly agrees. It was mentioned, however, in some general remarks on the species that there were certain important differences that could hardly be reconciled with the definition of that genus; but as only one or two specimens had been obtained, I preferred to leave it in that genus till additional examples should be procured. The first specimens were obtained within the valves of a dead Lamellibranch (*Cyprina*) shell dredged in the Firth of Forth, but others were afterwards found in considerable numbers in the Firth of Clyde in the crevices of partly decayed wood brought up in the trawl-net, and it is in pieces of submerged and partly decayed wood I now most frequently find the species. An examination of these additional specimens showed that the differences referred to were not accidental, but characteristic of the species, and that the species could not be retained in the genus *Laophonte*. I now therefore propose to remove it from that genus to the one described below.

Description of the genus Harrietella.—Female. Body tolerably robust, cephalothorax depressed, greatest width fully half the entire length of the animal; abdomen narrow. Anterior antennæ short, six-jointed. Posterior antennæ short, two-jointed; outer ramus small and unarticulate. Mandibles small and narrow, apex truncated and provided with a few small teeth. The other mouth-organs similar to those in *Laophonte*. The first three pairs of thoracic legs, which are tolerably robust, have the inner branches two- and the outer three-jointed. In the first pair the inner branch is elongated, the first joint being considerably longer than the entire outer branch; the second is short and armed with a stout terminal claw, as in *Laophonte*. In the second and third pairs the

* This genus is named in compliment to Miss Harriet Richardson, author of 'A Monograph on the Isopods of North America.'

inner branch is very short, but the outer is of moderate length. The fourth pair differs from the others in having the outer branch, which is short and stout, composed of only two joints, while the inner consists of a small uniarticulate and somewhat rudimentary joint. Fifth pair small, primary joint very short and broad; secondary joint triangular in form, very narrow at the proximal end, but becoming gradually wider towards the distal extremity. Female with two ovisacs.

Male unknown.

Type species *Harrietella simulans*, T. Scott. Described in 1894 as “(?) *Laophonte simulans*” in the ‘Twelfth Report of the Fishery Board for Scotland,’ part iii. p. 243, pl. vii. figs. 24–32, pl. viii. fig. 1.

Habitat.—In crevices of submerged and partly decayed wood; frequent.

Remarks.—This Copepod, though closely allied to *Laophonte*, Philippi, may be easily distinguished by its peculiar form, by the structure of the fourth pair of thoracic legs, and by the female bearing two ovisacs, instead of one as in *Laophonte*.

Genus PSEUDODIOSACCUS, T. Scott, nov.

Body tolerably robust and somewhat similar in form to *Diosaccus*, Boeck. Anterior antennæ composed of eight joints; posterior antennæ two-jointed, the outer ramus being also composed of two joints. Mandibles stout, with the biting-edge strongly but irregularly denticulated; mandible-palp similar to the same appendage in *Diosaccus*, having the basal part furnished with a single uniarticulate branch. Maxillæ compact in structure, the masticatory lobe broad and with the obliquely truncated apex provided with tolerably long spine-like teeth. The other mouth-organs and the first three pairs of thoracic legs similar to those of *Diosaccus*. In the fourth pair the inner branch, which is considerably shorter than the outer, is slender and composed of only two joints. The fifth pair are normal in structure.

Female with two ovisacs as in *Diosaccus*.

Type species *Pseudodiosaccus propinquus*, T. Scott.

1893. *Diosaccus propinquus*, T. Scott, Ann. & Mag. Nat. Hist. ser. 6, vol. xii. p. 237, pl. xi. figs. 1–6.

This species, which was described from specimens dredged in the Moray Firth at a depth of 130 fathoms, certainly belongs to the family Diosaccidæ. Its structure exhibits a

relationship somewhere between *Diosaccus*, Boeck, and *Amphiascus*, G. O. Sars, but it appears to be more nearly allied to the first; it differs, however, generically I think from both. The outer ramus of the posterior antennæ is two-jointed. The mandibles have the biting-edge armed with distinct though somewhat irregular teeth. The maxillæ differ from the same appendages in *Diosaccus* in being compact in structure (in this respect they more nearly resemble those of *Amphiascus*), and the inner branch of the fourth pair of thoracic legs is composed of only two joints.

The species appears to be rare.

EXPLANATION OF PLATE XI.

D'Arcythompsonia fairliensis, T. Scott.

- Fig.* 1. Female, seen from the side.
Fig. 2. Male, seen from the side.
Fig. 3. Mandible and mandible-palp.
Fig. 4. Foot of second pair, male.
Fig. 5. Last abdominal segment and furcal joints, female, dorsal view.
Fig. 6. Last abdominal segment and furcal joints, male, dorsal view.

Pteropsyllus consimilis, T. Scott.

- Fig.* 7. Foot of first pair.
Fig. 8. Foot of fifth pair, female.

Harrietella simulans, T. Scott.

- Fig.* 9. Female, dorsal view.
Fig. 10. Foot of fourth pair, female.

LXIII.—*The Morphology of the Madreporaria*.—VII. *Intrapolypal Tentacles* *. By J. E. DUERDEN, Ph.D., A.R.C.S. (Lond.), Professor of Zoology, Rhodes University College, Grahamstown, Cape Colony.

CORAL polyps present remarkably few structural departures from the ordinary Zoantharian type of polyp. Their few characteristic organs are simple, and scarcely any variations

* The first two parts of this series of papers appeared in the 'Johns Hopkins University Circulars,' vol. xxi. nos. 155 & 157, and were reprinted in the Ann. & Mag. Nat. Hist. ser. 7, vols. ix. & x., May and August 1902; the third and fourth parts appeared in the Ann. & Mag. Nat. Hist. vol. x., November 1902, and vol. xi., February 1903; the fifth and sixth parts in the 'Biological Bulletin,' vol. vii., July 1904, and vol. ix., June 1905. The work is being carried out with the assistance of an appropriation from the Carnegie Institution, Washington.

of much morphological significance have been found, notwithstanding that the external and anatomical details of a large number of genera and species are now known. It would rather seem that structural complexity within the Madreporaria is largely confined to the skeleton, where much diversity of form is recognized, the details of which are employed for taxonomic purposes. Though all this skeletal variability must necessarily be correlated with structural differences in the soft polypal tissues, yet these are modifications of but insignificant morphological value, according to accepted standards. In view of this general conformity to type a peculiarity associated with the tentacles of certain polyps in three Madreporarian genera seems worthy of notice.

M. Arm. Krempf *, when studying in 1903 representatives of the genera *Seriatopora*, *Stylophora*, and *Pocillopora*, obtained from the Red Sea, found in certain polyps of each colony a peculiar cellular formation, situated between the mesenteries, and evidently associated with the tentacles. In *Seriatopora* the peculiarity consists of a single long cord-like organ inserted in the disk over the ventral directive entocœle and hanging down into the polypal cavity; a continuation of the discal mesogloea accompanies the downgrowth throughout its length and constitutes a kind of skeletal axis. The organ first makes its appearance as a simple papilla of the endoderm, and afterwards increases in length. In *Stylophora* a similar downgrowth occurs, but a short axial canal is present, lined internally with ectoderm; inwardly the canal terminates blindly, but externally it opens on to the disk. In *Pocillopora* the structure is like that of *Seriatopora*, but the number of cords is increased to three, the middle one of which occupies the ventral directive entocœle, and the others the exocœles one on each side of the directive entocœle.

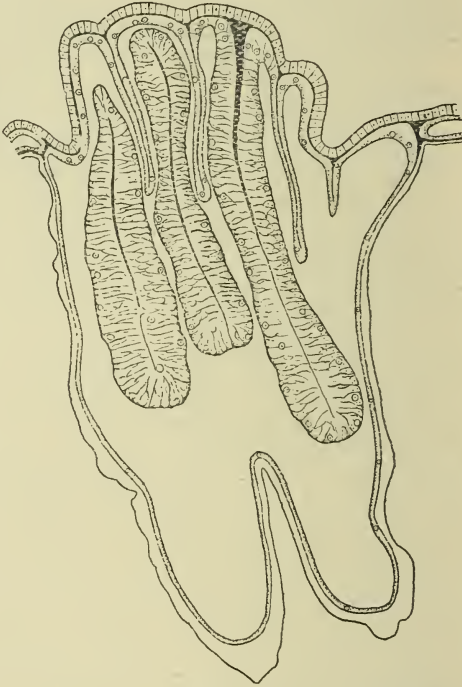
Krempf comes to the conclusion that the organs are invaginated tentacles which have become considerably modified in size and structure as a result of their unusual position, the modification extending much further in *Seriatopora* and *Pocillopora* than in *Stylophora*.

While investigating the polyps of various species of *Pocillopora* obtained from the Hawaiian Islands a few individuals presented structures which at once recalled the brief account given by Krempf. The appearance of these in vertical sections is given in figs. 1 and 2, and in transverse sections in figs. 3 to 5. Fig. 1 represents a vertical section

* Krempf, A., "Sur un Point de l'Anatomie de quelques Hexacoralliaires," Comptes Rendus, 1903.

through an entire polyp, and reveals three thickened downgrowths extending into the polypal cavity for about two thirds the length of the polyp, a distance much beyond the mesenteries which separate one downgrowth from the other. They vary somewhat in length, as indicated in the figure. The downgrowth to the right is shown attached to the disk

Fig. 1.

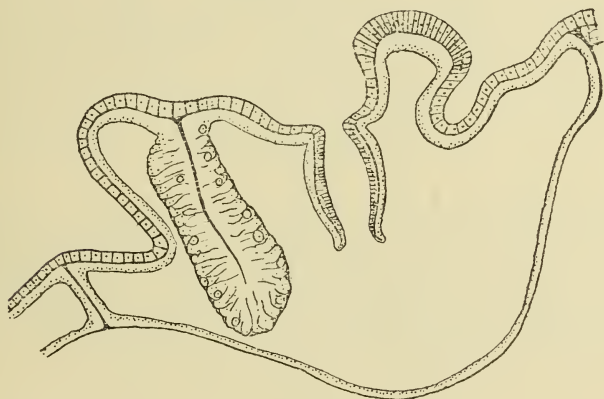


Vertical section through a decalcified polyp, passing through three intrapolypal tentacles and four mesenteries. The latter extend downwards for only a short distance, the modified tentacles far exceeding them in length. The section passes to one side of the stomodæum.

above, and the mesogloea of the latter is continued down the centre as a kind of supporting axis; the other two are here shown free from the disk, though in other sections the continuity is shown. Fig. 2 represents a section through the stomodæum of another polyp; here the single downgrowth to the left clearly corresponds in position with the normal tentacular upgrowth to the right and is much longer.

The transverse section depicted in fig. 3 proves that the three organs occur at what is known as the dorsal border of the polyp, one being within the dorsal directive entocœle and one within the exocœle on each side of the directive entocœle, exactly as described by Krempf for the Red Sea *Pocillopora* *. In sections of some polyps they occupy nearly the entire mesenterial chamber, while in others they are so enlarged as to result in disturbances of the mesenteries by pressing upon them.

Fig. 2.



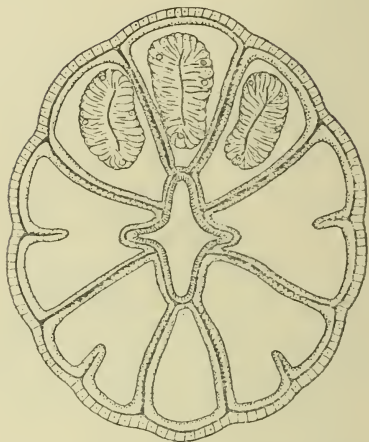
Vertical section through a polyp. The section passes through the stomodæum, and includes a retracted normal tentacle on the right and a modified invaginated tentacle on the left.

An examination of a large number of polyps reveals that the downgrowths are not always three in number; sometimes there are only two, and in other instances only one, but never more than three occur. In the polyp represented in section by fig. 4 only one downgrowth is present, situated in the exocœle to the right of the dorsal directive entocœle. The polyp is more retracted than that from which fig. 3 was taken, and the intrusion disturbs the regularity of form of the mesenteries and stomodæum.

As noticed by Krempf, the modification occurs in only a limited number of the many polyps making up a colony; the

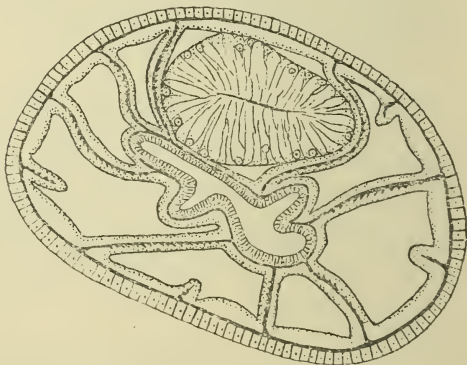
* There is possibly some confusion as regards the terms dorsal and ventral. Krempf states that the median organ in *Pocillopora* occurs within the ventral directive chamber, whereas in the Hawaiian specimens it is dorsal.

Fig. 3.



Transverse section through the stomodæal region of a polyp. An intrapolyal tentacle is seen in section within the dorsal directive entocœle and one within the exocœle on each side of it. The mesenteries in the genus *Pocillopora* are only in the *Edwardsia*-stage of development, *i. e.* four pairs complete, two pairs incomplete. The stomodæal wall of retracted polyps frequently presents, as here represented, a cruciform appearance in transverse sections.

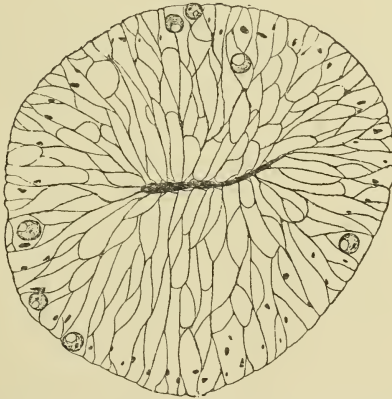
Fig. 4.



Transverse section through the stomodæal region of a retracted polyp with only one intrapolyal tentacle, which is situated within the exocœle to the right of the dorsal directive entocœle. The presence of the intrapolyal tentacle has disturbed the regularity of the mesenteries and stomodæum in the retracted condition.

remaining polyps are quite normal, having twelve tentacles—six inner slightly larger than six outer. In the Hawaiian *Pocillopores* the proportion of modified to normal polyps is about one in twelve, and the former are distributed irregularly over any region of the colony. From an examination of serial transverse sections there is no question that at their origin in the disk the protrusions correspond in position with the tentacles, only the direction of growth is inwards instead of outwards. Where three downgrowths occur there are only nine ordinary tentacles, where two downgrowths are present there are ten external tentacles, and where one downgrowth there are eleven tentacles; the missing tentacles are replaced by the modification. Unfortunately the diminution in the number of tentacles was not noticed on the living expanded polyps, indeed such an observation would be very difficult to make considering the smallness of the polyps of *Pocillopora* and the closeness of the two circles of tentacles.

Fig. 5.



Transverse section, much enlarged, through an intrapolyal tentacle, showing the vacuolated character of the endoderm and the axis of mesogloea. The nuclei are few in number, small and irregularly shaped; a few symbiotic zooxanthellæ are represented.

Histologically the downgrowths present certain marked peculiarities. The relationships to the polypal layers indicate that the cellular constituents are wholly endodermal, but the cells differ much from those of the ordinary endoderm. As shown in the various figures they are much longer, while fig. 5 gives their appearance when highly magnified. The cells are much vacuolated, and the various stains employed

indicate very meagre protoplasmic contents. The nuclei are small, irregular in shape, and comparatively few in number, and are aggregated towards the margin, where a few zooxanthellæ also occur similar to others distributed throughout the inner layer. The tissue, as a whole, bears the closest resemblance to the endoderm found in the deeper, more internal regions of most coral species. I have elsewhere described this gradual hypertrophy which the endoderm of coral polyps undergoes in passing from the upper to the lower parts of the polypal cavity*. In the deeper regions of the polyp the layer is nearly always greatly thickened and vacuolated, with few protoplasmic contents and small nuclei. The combination of characters indicates a tissue in a non-active condition, not one concerned in the growth or digestive processes of the polyp; moreover, the modification is never found over regions of the polyp where the skeleton is in process of active formation, these being in the upper growing parts of the polyp and corallum †.

Enquiry may now be made as to the origin and function of the downgrowths. As regards the former there can be no question of the direct relationship of the downgrowths with the tentacles, from the fact that they occupy the discal position of these organs and replace them. In *Stylophora* they present altogether the characters of introverted tentacles, having endoderm on the outside, ectoderm on the inside, and a narrow lumen communicating with the exterior. The phenomenon of tentacular introversion is of very general occurrence in living Madreporarian polyps; moreover, it is the usual condition of retracted preserved polyps. I have observed it in numerous West Indian and Pacific corals, but no satisfactory explanation of the process has yet been forthcoming. Introversion and extrusion of single tentacles have been observed to be repeated several times in close succession, and may even take place while the rest of the tentacles and the polyp as a whole remain fully expanded. From the manner in which it proceeds it is evidently connected with the internal circulation of the polypal fluid, a diminished pressure in any mesenterial chamber leading to an introversion of the tentacle communicating with it, and an increase in the pressure

* "West Indian Madreporarian Polyps," Nat. Acad. Sciences, Mem. 7, vol. viii. 1902, p. 480.

† *Pocillopora* is exceptional among corals in that the internal endoderm is no thicker than that over the rest of the polyp. On the other hand, the skeletogenic ectoderm, even where apparently non-active, is much broader than in most corals, though cellular distinctions are not marked (figs. 1 and 2).

leading to its extrusion again *; there seems to be no special musculature involved. It is but a step to consider that some of the tentacles may be permanently introverted or even develop in this position, as seems to be the case in *Stylophora*. Though from Krempf's description the ingrowths in this genus differ in no respect from ordinary introverted tentacles, yet in *Pocillopora* and *Seriatopora* the structural modification has gone much further than could possibly result from mere introversion. Certain of the tentacles in individual polyps of these two genera were probably never formed as outgrowths, but in their place we have a solid downgrowth of endoderm and mesogloea, not accompanied by the ectoderm, unless, indeed, the latter has disappeared as a result of its unusual position.

In a long series of valuable papers appearing in the 'Biological Bulletin,' from Oct. 1903 onwards, Dr. C. M. Child has shown the great influence which internal pressure exerts upon the growth of Actinian polyps (*Cerianthus*), and I am inclined to think that some such considerations may assist in the solution of the present problem.

The dorsal directive entocœle and the exocœle on each side of it being smaller than the other mesenterial chambers, their walls may be subject to less pressure than the others; hence during growth there may not be the same tension on the disk which closes the chambers above and from which the tentacles normally arise. Given a diminution of pressure in any chamber, or a negative pressure such as probably occurs during introversion, we may then have a hollow or solid downgrowth of the tissue which otherwise would form the hollow protruding tentacles. In *Seriatopora* and *Stylophora* Krempf finds the modified polyps disposed with much regularity in the coral stock, and it may be that the regions where they occur are more subject to diminished pressures. Whatever may be the ultimate explanation, it must be confessed that the haphazard character of the downgrowths, both as regards their number in any one polyp and the number of polyps concerned, suggests that their formation is not a

* It may be that the variations in the pressure of the internal polypal fluid influencing the introversion of individual tentacles are brought about by changes in the dominant beat of the internal cilia. However, we have as yet no experimental proof that the internal cilia can change the direction of their beat, though reversal has been fully demonstrated for the stomodæal cilia (see Parker, "The Reversal of Ciliary Movements in Metazoans," Amer. Journ. Physiol. vol. xiii. 1905). In colonial corals the internal fluid-pressure may vary in different regions, and thus parts of individual polyps may vary in pressure under the influence of neighbouring polyps.

constitutional feature of the species, but rather one dependent upon some peculiarity of position or structure of the individual polyp.

In his preliminary notice Krempf is unable to assign to the organs any definite function in the physiology of the polyps. He shows the close histological resemblance which they bear to the greatly thickened endoderm occurring in the deeper regions of the polyp, a resemblance to which allusion has already been made. To my mind the histological characters are such as to point to the tissue being mainly inactive. The small nuclei, meagre amount of protoplasm, and great vacuolization do not suggest a physiologically active tissue. This is the conclusion to which I have come with regard to the hypertrophied endoderm in the deeper regions of coral polyps generally, and I do not see that any other conclusion is to be reached with regard to the greatly thickened endoderm of the tentacular downgrowths. In the deeper regions of the polyps little or no growth is going on, mesenteries are absent, and the thickened tissue there probably serves to diminish the polypal cavity, so that the circulation of the internal nutritive fluid is more restricted to the upper regions, where growth is in actual progress. If we consider that the formation of the downgrowths is dependent upon mechanical influences, it is manifest that we need not necessarily assign to them any particular rôle in the economy of the polyp.

In correspondence with M. Krempf he informs me that he hopes to show later that the invaginations contain reserve food material and that they serve to nourish the young embryos. In this connexion it may be mentioned that none of the polyps of *Pocillopora* examined by me contained any sexual cells or embryos, and none of the staining reagents employed indicated the presence of reserve food material.

LXIV.—*Notes on the Genus Tatera, with Descriptions of new Species.* By R. C. WROUGHTON.

IN studying a small collection of mammals from West Africa my attention was called to the genus *Tatera*, which I found to be represented in the British Museum Collection by a considerable number of specimens. On collating and comparing these I discovered that, though there were apparently a great number of quite easily distinguishable forms, the

literature provided a very limited number of specific names; and I was thus tempted to undertake a more careful and detailed study of the genus.

The general plan of coloration in the genus proved to be monotonously uniform so far as the body was concerned. The general features are, on the upperside, a ground-colour ranging from a buffy grey to bright fawn (the basal halves of the hairs invariably dark slate-colour), more or less mottled or grizzled with black (due to the dorsal hairs being tipped to a greater or less extent, numerically and quantitatively, with black); the underside and the hands and feet are white (the hairs being white to their bases). In the tail, however, I was able to find characters of coloration and proportion which have served me in making a first classification into groups. These groups, on the whole, can be allotted satisfactorily to definite geographical areas, thus:—

- A. Tail dark above, pale below Africa.
 - a. Tail untufted or only slightly tufted.
 - a¹. Tail untufted, appreciably longer than head and body.
 - South of the Zambesi.
 - b¹. Tail untufted, about equal in length to head and body.
 - Between Zambesi and Equator.
 - c¹. Tail slightly tufted, appreciably longer than head and body North of Equator (except Nile Valley).
 - b. Tail tufted Nile Valley.
- B. Tail dark above and below, with pale bands along the sides; tufted Asia.

NOTE.—I have used the word “tufted” for want of a better, but it does not connote a “tassel,” as in *Jaculus* for instance, but only that (a) the hairs of the terminal part of the tail are markedly lengthened, and (b) whatever the colour-plan of the rest of the tail, this terminal portion is completely black or dark brown.

Unfortunately *c*¹ in the above key is unsatisfactory. In the more northern forms the short dark tip of very slightly lengthened hairs is quite recognizable, but in forms such as *Kempi* from Nigeria and *mombasæ* the “slight tuft” is by no means strikingly apparent. In drawing up the detailed keys, therefore, having failed to find any other distinguishing character which would be satisfactory, I have been obliged to fall back entirely upon geographical distribution, and to arrange my key to the species as follows:—

Section I.—AFRICA SOUTH OF THE ZAMBESI.

- A. Tail much ($\frac{1}{3}$) longer than head and body. (Umvolosi, Zululand.) (1) *Ruddi*, sp. n.
- B. Tail less markedly longer than head and body.
 - a. Size larger; head and body 150 mm. or more.

- a*¹. Tail tipped with white.
- a*². Skull larger; basilar length 34 mm., breadth 23, upper molar series 6·5, bullæ 11. (Wakkerstroom.) . . . (2) *draco*, sp. n.
- b*². Skull smaller; basilar length 30 mm., breadth 21, upper molar series 6, bullæ 10·5. (Orange Colony &c.) . . . (3) *Brantsi*, Smith.
- b*¹. No white tip to tail. (Cape Town.) (4) *afra*, Gray.
- b*. Size smaller; head and body less than 150 mm.
- a*¹. Head and body 135 mm. or more.
- a*². Upper surface of tail very dark. (Matabili.) . . . (5) *Lobengulæ*, de Wint.
- b*². Upper surface of tail less dark; ground-colour of body very pale. (Molopo.) . . . (6) *L. bechuanæ*, subsp. n.
- c*². Upper surface of tail scarcely darker than lower. (Kuruman.) (7) *L. griquæ*, subsp. n.
- d*². Ground-colour of body very dark, from chestnut to almost black. (Mazoe.) . . . (8) *L. m̄ashonæ*, subsp. n.
- b*¹. Head and body less than 135 mm.
- a*². Marked rufous tinge on chest; dark upper surface of tail narrowing distally (rarely disappearing and leaving a white tip). (Deelfontein, C. C.) . . . (9) *miliaria*, sp. n.
- b*². No rufous tinge on chest; dark upper surface of tail broad and well marked to the tip. (Kuruman.) . . . (10) *m. stellæ*, subsp. n.
- c*². No rufous tinge on chest; dark upper surface of tail narrowing, but also darkening. (Zoutpansberg.) . . . (11) *m. salsa*, subsp. n.
- C*. Tail equal in length to head and body. (Salisbury.) . . . (12) *panja*, sp. n.

Section II.—AFRICA NORTH OF THE ZAMBESI.

- A*. Tail not appreciably longer than head and body.
- a*. Large; length of head and body 160 mm. or more.
- a*¹. Rather larger; tail proportionately shorter; skull larger; upper molar series 6·8 mm. (Mweru, B. C. A.) (13) *liodon*, Thos.
- b*¹. Rather smaller; tail about equal in length to head and body; skull smaller; upper molar series 6·5 mm. (Angola &c.) . . . (14) *valida*, Boc.
- b*. Medium; length of head and body 140 mm. or more.
- a*¹. Upper molar series 5·3 mm. (Angola.) (15) *angolæ*, sp. n.
- b*¹. Upper molar series 6 mm.
- a*². Hind foot 30 mm., bullæ 10·5. (Gold Coast.) . . . (16) *Giffurdi*, sp. n.

- b*². Hind foot 32 mm., bullæ less than 10 mm.
- a*³. Brightly coloured. (Lake Nyasa, B. C. A.) (17) *nyasæ*, sp. n.
- b*³. Soberly coloured, nigrescent. (Upper Shire, B. C. A.) (18) *n. shirensis*, subsp. n.
- c*. Small; head and body less than 140 mm.; colour almost black. (Uganda.) (19) *nigrita*, sp. n.
- B. Tail appreciably longer than head and body.
- a*. Tail not or only slightly tufted.
- a*¹. Large; head and body 160 mm. (Uganda.) (20) *fullax*, Thos. & Schw.
- b*¹. Medium; head and body 140 mm. or more.
- a*². Teeth 6·3 mm., bullæ 11·5. (Galla Country.) (21) *shoana*, sp. n.
- b*². Teeth 6 mm., bullæ 11. (Nigeria) (22) *Kempi*, Wr.
- c*¹. Small; head and body 100 mm or more.
- a*². Hind foot 32 mm. (Somali.) (23) *Phillipsi*, de Wint.
- b*². Hind foot 36 mm. (B. E. A.) (24) *mombasæ*, sp. n.
- d*¹. Very small; head and body less than 100 mm. (Gambia.) (25) *gracilis*, Thos.
- b*. Tail tufted. (Nile Valley, &c.)
- a*¹. Sole of hind foot naked. (Nile Valley.) (26) *robusta*, Cretz.
- b*¹. Band of hair across sole of foot. (Wadelai.) (27) *Emini*, Thos.

Section III.—ASIA.

- A. Size large (175 mm.).
- a*. Mottled with black; hind foot 42 mm., upper molar series 7. (Syria.) (28) *tæniura*, Wagn.
- b*. Uniform colour; hind foot 41 mm., upper molar series 6·3. (E. Persia.) (29) *persica*, sp. n.
- c*. Mottled black; hind foot 39 mm., upper molars 6. (C. Persia.) (30) *p. scansa*, subsp. n.
- d*. Uniform colour; hind foot 38 mm., upper molars 5·5. (U. P. India.) (31) *indica*, Hardw.
- B. Size smaller.
- a*. Tail (200 mm.) and hind foot (45 mm.) very long. (S. India.) (32) *Cuvieri*, Waterh.
- b*. Tail normal.
- a*². Hind foot 41 mm., skull breadth 23, molars 6·5. (S.W. Persia.) (33) *Bailwardi*, sp. n.
- b*². Hind foot 39 mm., skull breadth 25, molars 6·5. (S.W. Persia.) (34) *B. monticola*, subsp. n.
- c*². Hind foot 41 mm., skull breadth 22, molars 6. (Ceylon.) (35) *ceylonica*, sp. n.

Section I.—AFRICA SOUTH OF THE ZAMBESI.

The fauna of this area is specially well represented in the Museum Collection, thanks to the numerous series from

various localities collected by C. H. B. Grant and presented to the Museum by Mr Rudd. With the exception of *panja* all the forms present a proportion in which the tail is appreciably longer than the head and body. Nevertheless all the old descriptions of species (by Gray, Smith, Smuts, Wagner, Sundevall, &c.) state the exact reverse. This, no doubt, is due to the fact that all these descriptions were based on mounted specimens, and measurements were taken following the curves of the body, thus greatly exaggerating them.

Tatera panja is obviously a "stray" from the mid-African fauna, but as my "Sections" are wholly geographical, I have included it among the South-African species.

(1) *Tatera Ruddi*, sp. n.

4. 12. 3. 55-59. Umvolosi, Zululand. Alt. 211'. (Rudd Exploration.)

The same size as *fallax*, Thos., from E. Africa, with an almost equally long tail.

Colour above as in *fallax*, but with much less admixture of black. The pale areas at the bases of the ears as in *fallax*, but that over the eye and extending backward to the ear in *fallax* is wanting in this species. The hairs on the nose and forehead have a metallic lustre. Under surface white, but markedly tinged with rufous, especially the sides of the throat and armpits. Tail pale sandy and but slightly darker above near its base, with no appreciable line of demarcation between the upper and under surfaces; the tip for about 40 mm. whitish, the hairs on this whitish portion rather longer than on the rest of the tail, but in no way amounting to a tuft or pencil as in the species of the north.

Skull very markedly smaller than in *fallax*, especially the incisors.

Normal dimensions as follows:—

Head and body 160 mm.; tail 205; hind foot 40; ear 23.

Skull: greatest length 41; basilar length 33; zygomatic breadth 21; length of upper molar series 6.5; bullæ 10.5.

The following are measurements of some selected specimens:—

			Skull.								
			H. & b.	Tl.	H. f.	Ear.	G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
(Type)	4. 12. 3. 56.	♂. Old	164	203	40	25	..	..	21	6.5	..
	4. 12. 3. 57.	♀. Old	157	205	40	23	40	32.5	21	6.5	10.5
	4. 12. 3. 58.	♀. Old	157	208	40	23	41	33	21.5	6.5	10.5

Hab. Umvolosi, Zululand.

Type. B.M. no. 4.12.3.57. An old female. Collected by Mr. Grant on the 11th July, 1904 and presented to the Museum by Mr. Rudd.

Besides the differences noted above, strongly grooved upper incisors separate this species from *fallax*, Thos. & Schw.

I have much pleasure in naming this fine well-marked species after Mr. C. D. Rudd, to whose generosity we owe the fine collections made by Mr. Grant in S. Africa, which alone have made possible any useful investigation of this and other S.-African groups.

(2) *Tatera draco*, sp. n.

4. 9. 1. 39-42. Wakkerstroom, Transvaal. (Rudd Exploration.) Alt. 6000'.

A form very near *Brantsi*, but consistently larger all round. The dark upperside of the tail dies out distally and leaves a white tip, but not to the same extent as in *Brantsi*. There is a much greater admixture of black on the back and the white underside is strongly tinged with rufous on the median line, across the chest, and on the lower surface of the tail; in this last it resembles *Ruddi*. The normal measurements are:—

Head and body 160 mm. ; tail 175 ; hind foot 36 ; ear 22.

Skull : greatest length 42 ; basilar length 34 ; zygomatic breadth 23 ; length of upper molar series 6.5 ; length of bullæ 11.

Its greater size and the rufous tinge of the under surface distinguish this species from *Brantsi*, while its shorter hind foot and tail differentiate it from *Ruddi*, its near neighbour on the other side.

I have named it *draco* from its habitat on the Drakensberg.

The following are actual measurements of selected specimens:—

		Skull.								
		H. & b.	Tl.	H. f.	Ear.	G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
4. 9. 1. 39.	♂. Young	95	113	31	19	31	24	18	6.1	9
4. 9. 1. 41.	♂. Adult	146	157	35	22	40	31	21	6.5	11
(Type) 4. 9. 1. 42.	♀. Old	162	176	36	22	42	34	23	6.5	11

Hab. Wakkerstroom, Transvaal.

Type. B.M. no. 4. 9. 1. 42. An old female. Collected by Mr. Grant on the 14th March, 1904, and presented to the Museum by Mr. Rudd.

(3) *Tatera Brantsi*.

Gerbillus Brantsi, Smith, Rep. Exp. Int. S. Afr. p. 43 (1836).

Gerbillus montanus, Smith, Ill. Zool. S. Afr., Mamm. pl. xxxvi. fig. 1 (1842).

Meriones (Rhombomys) maccalinus, Sundevall, Öfv. Vet.-Ak. Stockh. p. 120 (1846).

43. 2. 28. 14 (skull 59. 5. 7. 5). "Bashartoo" Country (? Basutoland). Type of *montanus*.

2. 4. 3. 3. Bethlehem, O. R. C. Alt. 5000'.

98. 4. 4. 14-19. Krugersdorp.

4. 1. 6. 2-3. Abraham's Kraal, O. R. C.

4. 4. 2. 6-8 (skull 4. 3. 1. 75). Vredefort Road, O. R. C. (*Barrett-Hamilton*). Alt. 4893'.

1171, 1196. Klein Letaba. Alt. 1100'. } Zoutpansberg.
1305. Woodbush. Alt. 4700'. } (Rudd Expedition.)

The type of *Brantsi* is lost, but that of *montanus* is still available. It is much faded and the tail is shrivelled out of all recognition, but the skull, though broken and wanting the bullæ, is quite good for comparison. It is a shorter, stouter skull than that of *afra*, with broader, stouter molars and wider incisors, as pointed out by Smith in his description. Smith's earlier description of *Brantsi* is very meagre, but as the locality is the crest of the Drakensberg, though slightly further north than the home of *montanus*, they may, in view of Smith's well-known habit of changing the names of his species at will, be legitimately accepted as the same species.

The specimen from Bethlehem corresponds well in skull-characters, as does the skull from Vredefort. The skulls of the skins from Vredefort are missing, but the skins themselves agree well with the Bethlehem specimen in coloration. Sundevall's *maccalinus* puzzled me a good deal; but by the courtesy of Dr. Lönnberg, Curator of the Stockholm Museum, I have been able to examine the specimen which undoubtedly served as Sundevall's type, for it is the only one in the museum from the Magaliesberg. It is labelled *montanus*, Smith, though close examination shows that this name has been written over "n. sp.," and the skull is still labelled "n. sp." This skull agrees excellently with the type skull of *montanus*. The exact coloration of the specimen, as in the case of the *montanus* type, is not recognizable owing to age and grime.

This species, then, which I accept as *Brantsi*, Sm., may be described as about the same size as *afra*, with a rather

warmer ground-colour; the dark colour of the upper surface of the tail dies away rapidly, leaving the distal half pure white, or, at most, persists as a very narrow dark line to near the tip. The skull, as stated above, is shorter and stouter, the upper molar series broader and the incisors wider than in *afra*. The following may be taken as the normal measurements of *Brantsi*:—

Head and body 150 mm.; tail 165; hind foot 36; ear 20.

Skull: greatest length 38; basilar length 30; zygomatic breadth 21; length of upper molar series 6; bullæ 10·5.

I place the three specimens from Zoutpansberg here with great hesitation. In coloration they closely resemble *miliaria salsa* from the same locality, except that there are indications of a white tip to the tail. In size and skull-characters, however, there is no resemblance. 1196 is slightly older than the other two and is consistently larger in all details of body and skull. Except in having a narrower upper molar series, 1171 and 1305 approach closely in skull-characters to *Brantsi*, but they all have much longer tails than any other S.-African species except *Ruddi*; there is also an indication of white towards the end of the tail, which also recalls that species. With so little and such conflicting material I cannot venture to give this form a new specific name, and have decided to rank these specimens as *Brantsi* until more material is available.

(4) *Tatera afra*.

Gerbillus afra, Gray, Spicil. Zool. p. 10 (1828).

Meriones Schlegeli, Smuts, Enum. Mamm. Cap. p. 41 (1832).

3 7. 2. 15-17. D'Urban Road, near Cape Town. (Rudd Exploration.)

Gray's type is not available and his description is very short and vague. That his type was a specimen of the *Tatera* found about Cape Town is certain, and the Museum specimens quoted above may therefore be confidently accepted as *afra*. The following may be taken as normal dimensions of *afra*:—

Head and body 160 mm.; tail 175; hind foot 34; ear 24.

Skull: greatest length 41; basilar length 32; zygomatic breadth 21; length of upper molar series 6·3; bullæ 10·5.

This is a dull-coloured species compared with the more northern forms, and the skull is more slender in all details than that of other forms of its own size, having narrower teeth (both incisors and molars) and smaller bullæ.

Smuts's *Schlegeli* has been unanimously accepted as a synonym of *afra* since Cuvier ranked it as such in 1836;

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but I confess the question has given me much trouble. Smuts's figure shows an animal coloured like *afra*, with the terminal half of the tail white, as in *Brantsi*, Smith; but though the description is very long and minutely detailed, there is no mention of this striking character. The skull-figures seem to me to indicate on the whole *Brantsi*, though in very many ways they agree with *afra*. It is scarcely to be thought that a coast form at Port Elizabeth would correspond with a high mountain form such as *Brantsi* rather than with *afra*, the coast form of the Cape. It must also be remembered that *Ruddi* from Umvolosi, Zululand, another coast form, has also a partially white tail, though the proportion of white is much less than in *Brantsi*. In my opinion it is practically certain that the characters of several specimens from different localities went to the formation of *Schlegeli*. I have no specimens from the Port Elizabeth region to refer to, but it is quite probable that a form with white tail and stout teeth may be found there, in which case the name *Schlegelii* will be available for it; but meanwhile I do not venture on the evidence available to move the name from its accepted position of a synonym to *afra*.

(5) *Tatera Lobengulæ*.

Gerbillus (Tatera) Lobengulæ, de Winton, Ann. & Mag. Nat. Hist. vol. ii. p. 4 (1898).

97. 1. 4. 11-16. Essex Vale, Matabililand (*Selous*).

The average dimensions of this species may be taken as:—

Head and body 135 mm.; tail 160; hind foot 34; ear 23 (de Winton's "45" was a slip of the pen).

Skull: greatest length 49; basilar length 30; zygomatic breadth 20; length of upper molar series 6; bullæ 10.5.

(6) *Tatera Lobengulæ bechuanæ*, subsp. n.

4. 10. 1. 64-71. Molopo, Bechuanaland (*Woosnam*).

The size is much as in typical *Lobengulæ*, the ground-colour is paler, and there is less grizzling, with the general result of a much paler animal; the very dark upper surface of the tail found in *Lobengulæ* is much less noticeable in this form. The skull is stouter than in typical *Lobengulæ*, with larger bullæ. The following are dimensions of some specimens:—

	H & b.	Tl.	H. f.	Ear.	Skull.				
					G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
4. 10. 1. 64	136	151	31.75	23.5	39.5	30	20	5.8	11
(Type) 4. 10. 1. 69	137	163	34	22.5	40	31	20	6	11
4. 10. 1. 70	145	160	34	23	40	31	20	6	11

Hab. Molopo, Bechuanaland.

Type. B.M. no. 4. 10. 1. 69. An old female. Collected by Mr. Woosnam on the 12th July, 1904.

(7) *Tatera Lobengulæ griquæ*, subsp. n.

4. 4. 8. 7-9. Kuruman (*Dent*). Alt. 4000'.

4. 10. 1. 22. Kuruman (*Woosnam*).

A still stouter form than *bechuanæ*, more approaching to typical *Lobengulæ* in colour, but with the dark grizzling on the upper surface of the tail completely absent, the tail rather longer in proportion to head and body than in the other forms, bullæ markedly larger.

The following are measurements of four specimens (the body-measurements as recorded by collector) :—

	H. & b.	Tl.	H. f.	Ear.	Skull.				
					G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
4. 4. 8. 7	139	153	33.5	25.75	40	31	21	6	11.5
4. 4. 8. 8	131	139.25	32	22	40	30	21	6	11.5
4. 4. 8. 9	136	174	36	24.75	40	?	21	6	11.5
(Type) 4. 10. 1. 22 ..	143	166	34	23	40	31	21	6	11.5

Hab. Kuruman, Bechuanaland.

Type. B.M. no. 4. 10. 1. 22. A very old female. Collected by Mr. Woosnam on 23rd April, 1904.

(8) *Tatera Lobengulæ mashonæ*, subsp. n.

95. 11. 3. 6-10 ; 4. 12. 1. 11-13 ; 95. 11. 3. 11. Mazoe, Mashonaland (*Darling*). Alt. 4000'.

This northern race is very much darker than any of the others, the ground-colour being deeper and the grizzling with black very much greater, and there is much more individual variation. The size is much the same as in typical *Lobengulæ*. The skull-characters show considerable individual variation, but on the whole are as in *Lobengulæ*.

By the courtesy and kindness of Dr. Lönnberg I have been able to examine a specimen from Mopani, *i. e.* the hilly country near the Limpopo about halfway between Molopo and Matabili. In skull-characters this specimen agrees closely with typical *Lobengulæ*, but in coloration it approaches the *mashonæ* form by its richer fulvous ground-colour; it is not, however, grizzled with black as in that form.

The following are measurements of some selected specimens (the body-measurements are as recorded by the collector,

but do not seem to have been taken quite as usual; the true length of head and body is about 140–145 mm.) :—

	H. & b.	Tl.	H. f.	Ear.	Skull.					
					G. l.	B. l.	Zyg. b.	Mol.	Bullæ.	
(Type) 95.11.3.10	.... 156	160	32	23	39	31	21	5.8	10.5
4.12.1.13	.... 133	169	33	22	39	30	21	6	10
95.11.3.11	.... 148	158	33	22	41	31	21	5.8	10.5

Hab. Mazoe, Mashonaland.

Type. B.M. no. 95.11.3.10. An old female. Collected by Mr. Darling on the 13th August, 1895, and presented to the Museum.

(9) *Tatera miliaria*, sp. n.

1.7.9.27; 3.1.4.29–37. Deelfontein, C. C. (*Sloggett*).

There is a small form of *Tatera* found in the centre and west of the O. R. C. and Transvaal from Deelfontein to Zoutpansberg which is clearly distinct from the larger forms, such as *afra*, *Brantsi*, and even *Lobengulæ*, side by side with which it is found living. The specimens we have from Deelfontein, on the south border of the O. R. C., are very uniform in coloration and skull-characters. The ground-colour above is the usual sandy buff, more or less clouded with buff, while the underparts and the inner sides of the limbs are pure white; the underside of the tail, however, is not pure white as in *Brantsi*, but rather a pale buff. In *miliaria* there is but little darkening of the upperside of the tail, and there is a patch distinctly tinged with rufous on the chest. The normal dimensions may be taken as :—

Head and body 125 mm.; tail 145; hind foot 30; ear 22.

Skull: greatest length 38; basilar length 28; zygomatic breadth 20; molars 5.5; bullæ 10.

The following are actual dimensions of some selected specimens (the body-measurements are quoted from the labels) :—

	H. & b.	Tl.	H. f.	Ear.	Skull.				
					G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
(Type) 3.1.4.29. V. old	..... 127	135	30	22	38	30	20	5.5	10
3.1.4.35. Adult	..... 124	163	31	21	36	28	18	5.5	10
3.1.4.36. Adult	..... 124	140	28	22	37	28	20	5.5	10

Hab. Deelfontein, Cape Colony.

Type. 3.1.4.29. A very old male. Collected by Mr. Grant on the 2nd September, 1902, and presented to the Museum by Col. Sloggett.

(10) *Tatera miliaria stellæ*, subsp. n.

4. 10. 1. 18, 19, 20, 23. Kuruman, Bechuanaland (*Dent*).
Alt. 4000'.

Slightly smaller than typical *miliaria*, with a shorter skull. There is no sign of rufous on the chest, and the upper surface of tail is very dark to the tip.

The following are measurements of some selected specimens :—

Type)			H. & b.	Tl.	H. f.	Ear.	Skull.				
							G. l.	B. l.	Zyg. b.	Mol. Bullæ.	
4. 10. 1. 19.	Adult	....	123	140	32	21	36	27	19	5.5	10
4. 10. 1. 20.	Adult	....	115	130	30	22	35	27	18	5.5	10
4. 10. 1. 23.	Adult	....	115	127	30	19	34	26	19	5.5	10

Hab. Kuruman, Bechuanaland.

Type. B.M. no. 4. 10. 1. 19. An adult male. Collected by Mr. Dent on the 30th April, 1904.

(11) *Tatera miliaria salsa*, subsp. n.

1164, 1172, 1175, 1176, 1188, 1211. Woodbush, Zoutpansberg. (Rudd Exploration.) Alt. 4700'.

5. 12. 9. 74-76. Klein Letaba, Zoutpansberg. (Rudd Exploration.) Alt. 1100'.

This form is about as much larger as the last is smaller than typical *miliaria*. The upper surface of the tail, though not so dark as in *stellæ*, is markedly darker than in typical *miliaria*, and is especially dark at the extreme tip, where even the underside is darkened.

The following are measurements of some selected specimens :—

			H. & b.	Tl.	H. f.	Ear.	Skull.				
							G. l.	B. l.	Zyg. b.	Mol. Bullæ.	
1175	.....		122	146	30	19	37	28	19	5.5	10
1211	.....		124	139	29	19	38	28	20	5.5	9.8
(Type)	5. 12. 9. 76	....	130	153	30	21	38	29	19	5.5	10

Hab. Klein Letaba, Zoutpansberg.

Type. B.M. no. 5. 12. 9 76. Female. Collected by Mr. Grant on the 6th September, 1905, and presented to the Museum by Mr. Rudd.

We have three skins and seven skulls collected by Major Barrett-Hamilton at Vredefort Road, O. R. C. The three skins and one of the skulls are undoubtedly *Brantsi*. Four of the remaining skulls belong to a small form of

Tatera, and are very like skulls of the Kuruman form ; but whether that form extends to Vredefort or whether there is a distinct form found there it is impossible in the absence of skins to decide. As there is no geographical break in the distribution of *miliaria* and its closely allied forms, I have ranked them as subspecifically allied ; but amongst these Vredefort skulls one has narrow slight molars resembling those of the Kuruman form, while three more have broad coarse molars, resembling those of typical *miliaria* from Deelfontein ; so that it is possible that with more material two or more distinct species will have to be formed.

(12) *Tatera panja*.

Meriones tenuis, Peters (nec Smith), Reis. Mossamb. p. 149 (1852).

99.8.3.7-10. Chicosta, 60 miles above Tete, Zambesi River.

The ground-colour above is a bright sandy with but little black shading, which is chiefly confined to the back, at the base of the tail. The under surface is, as usual in the genus, a bright white. The under surface of the tail, however, is scarcely paler than the upper, except at the extreme point, where the upper surface is very dark.

The following may be accepted as normal measurements of this species:—

Head and body 130 mm. ; tail 135 ; hind foot 32 ; ear 20.

Skull : greatest length 35 ; basilar length 28 ; zygomatic breadth 19 ; length of upper molar series 5.5 ; bullæ 10.

Hab. Chicosta, south bank of Zambesi above Tete.

Type. B.M. no. 99.8.3.9. An adult male. Taken by Capt. Boyd Alexander and presented to the Museum. Four specimens.

This form was taken on the right bank of the Zambesi, but I think the proportionally short tail at once clearly marks its affinity to the Nyasan forms, and I have little doubt that it is conspecific with the specimens brought by Peters from the neighbourhood of Tete, and identified by him as *G. tenuis*, Sm. I have borrowed the vernacular name of this Tete form, as recorded by Peters, for this species.

Section II.—AFRICA NORTH OF THE ZAMBESI.

This section includes all the remaining *Tateras* with bicoloured tails, viz. (a) those, from the area between the Zambesi and the Equator, constantly characterized by the

equal length of the head and body and the tail, which latter is not or only "slightly tufted"; (b) those, from Africa north of the Equator (except the Nile Valley), characterized by long slightly tufted tails, the slight tuft, however, being often not very obvious; and, finally, (c) those, from the Nile Valley, remarkable for their tufted tails.

Noack (Zool. Jahrb. vol. ii. p. 241) in 1888 described a *Tatera* from the west shore of Tanganyika remarkable for having two shallow grooves on the upper incisors in place of the normal one. In 1897 the Museum received specimens from the Tanganyika Plateau exactly corresponding with Noack's description, and showing that his *Boehmi* was a constant form, and Mr. Thomas (P. Z. S. p. 433, 1897) created for it the genus *Gerbilliscus*. Later a *Tatera* was received also from mid-Africa in which even these two shallow grooves were wanting, and was provisionally placed in the same genus under the name of *fraterculus*.

The material at present is too meagre for any profitable discussion as to the validity of the position given to these two forms, and I have therefore excluded them from my key. I would call attention, however, to the fact that *Boehmi* has a markedly long tail, whereas that of *fraterculus* is about equal to the head and body; so that while *Boehmi* shows apparent affinity to *fallax* and the northern forms, though living in mid-Africa, *fraterculus* is in close agreement with the forms of *Tatera* which surround it.

(13) *Tatera liodon*.

Tatera liodon, Thos. Ann. & Mag. Nat. Hist. ix. p. 441 (1902).

I quote dimensions from Mr. Thomas's description:—

Head and body 177 mm.; tail 142; hind foot 35; ear 20.

Skull: (greatest length 45; basilar length 35;) zygomatic breadth 22; length of upper molar series 6·8; bullæ 11.

The body-measurements were not recorded by the collector, and I cannot think that in life the proportion of head and body to tail, as recorded by Mr. Thomas from skin-specimens, really exists; *liodon* is but little larger than *valida* (e. g. head and body 160 mm.), but the tail, though undoubtedly unusually short, is almost certainly more than 140 mm., and I suspect is about the same length as the head and body.

Noteworthy characters are large size, short tail, and indistinct grooving of incisors.

(14) *Tatera valida*.

Gerbillus validus, Boc. J. Sc. Math. Phys. Nat. Lisb. pt. v. p. 6 (1890).

92. 1. 9. 10. Caconda, Angola. Cotype in al. (Lisb. Mus.).

4. 4. 9. 46-47. Duque de Bragança, Angola (*Ansorge*).

87. 12. 1. 48-49. Monbuttu (*Emin Pasha*).

Bocage based his species *valida* not on one but on several specimens from different localities. His description gives the body-measurements of an individual from the Rio Cuando and the skull-dimensions of one from Caconda. He states that the tail is always shorter than the head and body, but this must be due to his method of measurement. The cotype and Dr. Ansorge's specimens show that, as the dimensions are now taken, the head and body and the tail are practically equal in length. These Bragança specimens, while agreeing in all main characters with the cotype and Bocage's description, differ a little in being much less "rembrunies" and having the skull somewhat longer and narrower and the bullæ somewhat smaller; but the coarse broad molars and the stout, scarcely grooved upper incisors prove them to belong undoubtedly to this species. I venture to record the normal dimensions of this species as:—

Head and body 160 mm.; tail 160; hind foot 36; ear 20.

Skull: greatest length 41; basilar length 34; zygomatic breadth 22; length of upper molar series 6.5; bullæ 11.

Emin Pasha's specimens from Monbuttu I have placed here provisionally. In coloration they agree with *valida* even better than the Angola specimens, but seem to be smaller, and the skull is even shorter and broader than in the "cotype" of *valida*.

(15) *Tatera angolæ*, sp. n.

5. 5. 9. 34-39. Fort Quilenges, Angola (*Ansorge*). Alt. 3100'.

4. 4. 9. 48. Pungo Adongo, Angola (*Ansorge*). Alt. 1200'.

92. 1. 9. 11. Rio Coroca, Angola (Lisbon Museum, in al.).

A much smaller species than its compatriot *valida*. Ground-colour above a sandy buff, grizzled with black; under surface pure white; tail above same colour as back, below dirty white. Normal dimensions:—

Head and body 145 mm.; tail 150; hind foot 31; ear 20.

Skull: greatest length 36; basilar length 27; zygomatic breadth 20; length of upper molar series 5.3; bullæ 10.

The following are some actual measurements (those of the body from the labels) :—

	H. & b.	Tl.	H. f.	Ear.	Skull.				
					G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
92.9.1.11	111	153	31	17	36	27	20	5.3	10
(Type) 5.5.9.34. Y. adult	144	137	30	19	35	27	19	5.3	10
5.5.9.36. V. old	145	156	32	21	38	30	20	5.5	10
4.4.9.48. Old	144	144	33	24	39	30	20	5.3	10.3

It is possible that the last two specimens (with no. 5. 5. 9. 35) represent a distinct form ; but since two of them were taken at the same time and place as the type, from which they differ in no way externally, and that all three are very much older than the type of *angolæ*, I have not ventured to separate them. *Tatera angolæ* most likely represents the form referred to by Bocage in his memoir on “Mammifères d’Angola et du Congo,” published in 1890 in *Jorn. Sc. Math. Phys. Nat. Lisb.* (pp. 3 *et seq.*). It seems to me probable that he too had before him specimens of two forms differing in nothing but size, and even that only slightly, for while the specimen presented to the British Museum agrees closely with typical *angolæ*, his published description seems to apply better to the Pungo Adongo specimen above (and nos. 35 and 36 from Quilenges).

Hab. Fort Quilenges, Angola.

Type. B.M. no. 5.5.9.34. A young adult male. Collected by Dr. A. S. Orge on the 11th January, 1905.

(16) *Tatera Giffardi*, sp. n.

99.6.15.17. Gambaga, Gold Coast (*W. Giffard*). Alt. 1300’.

A rather small *Tatera* with very sombre colouring. The ground-colour is a buff rather than the usual “fawn.”

The dimensions (those of the body recorded by collector) are :—

Head and body 140 mm. ; tail 155 ; hind foot 30 ; ear 22.

Skull : greatest length 37 ; basilar length 28 ; zygomatic breadth 19 ; length of upper molar series 6 ; bullæ 10.5.

Hab. Gambaga, Gold Coast.

Type. B.M. no. 99.6.15.17. An adult male. Collected by Capt. Giffard on 4th January, 1899, and presented to the Museum.

Its smaller size and markedly smaller skull distinguish this species at once from *Kempi* ; while from *angolæ*, which it closely approaches in size, it is separated by its longer tail, much larger, broader molars, and larger bullæ.

(17) *Tatera nyasæ*, sp. n.

5. 2. 2. 10-13. Deep Bay, Lake Nyasa, B. C. A. (*Sir H. Johnston*).

97. 10. 1. 87-92. Fort Hill, Nyasa, B. C. A. (*Sir H. Johnston*).

97. 10. 1. 96-99. Karonga, Nyasa, B. C. A. (*Sir H. Johnston*).

3. 4. 2. 7-8. Luangwa, Nyasa, B. C. A. (*Sir H. Johnston*).

There would seem to be two forms among these specimens—the one I have chosen to represent the type, with a lighter narrower skull and small bullæ, and the other (including the Fort Hill (?) and Luangwa specimens) with a coarser broader skull and large bullæ. I have only fragments of skulls of the Fort Hill specimens and only a broken one of a very old individual from Luangwa, and under the circumstances do not venture to differentiate them.

Tatera nyasæ in body-measurements differs but little from *shirensis*, but the black shading of this latter species is almost absent in *nyasæ*, which also has a much brighter tone of "sandy" as a ground-colour.

The dimensions are (body-measurements are given approximately):—

Head and body 150 mm.; tail 150; hind foot 32; ear 20.

Skull: greatest length 37; basilar length 29; zygomatic breadth 18; length of upper molar series 6; bullæ 9.5.

Hab. Deep Bay, Nyasa, B. C. A. Alt. 7500'.

Type. B.M. no. 5. 2. 2. 10. An adult male. Collected by Mr. Whyte in April 1903, and presented to the Museum by Sir H. Johnston.

(18) *Tatera nyasæ shirensis*, subsp. n.

97. 10. 1. 100-103. Mt. Malosa (*Sir H. Johnston*). Alt. 5300-6300'.

93. 5. 2. 13-14. Fort Johnston, Upper Shire (*Sir H. Johnston*).

The whole of the material from Nyasaland is unfortunately in poor condition; dimensions were not recorded by the collector, and the skulls are much broken. The two specimens from Upper Shire are indistinguishable from the series from Mt. Malosa externally, but the skulls of the former are markedly broader, stouter, and have larger bullæ. With the material available I do not venture to separate them even as subspecies. There are, however, from Nyasa two well-marked

colour-forms, which, so far as the material available is concerned, are perfectly constant geographically. The present form, representing the fauna south of Lake Nyasa, is a medium-sized animal, in which the ground-colour is rather of a brown-sandy colour and in which the black shading is so copious as to give it a very markedly dark and sober appearance.

The dimensions are (approximately for body-measurements):—

Head and body 150 mm.; tail 150; hind foot 32; ear 19.

Skull: greatest length 37; basilar length 29; zygomatic breadth 18; length of upper molar series 6; bullæ 10.

Hab. Mount Malosa, Upper Shire, B. C. A.

Type. B.M. no. 97.10.1.100. An adult male. Collected by Mr. Whyte 27th November, 1896, and presented to the Museum by Sir H. Johnston.

(19) *Tatera nigrita*, sp. n.

2.11.1.12. Masindi, Unyoro, Uganda (*Ansorge*).

2.7.5.7-9. R. Kafu, Uganda (*Cunningham*).

96.5.29.5. Mumia, Kavirondo (*Ansorge*).

A small species about the size of *angolæ*.

Ground-colour a dark rufous buff, very much washed with black, especially along the centre of the back and upper surface of the tail. In some specimens this darkening is so complete as to make them look almost black. Under surface white as usual, but lower surface of the tail buff and not clear white. The molars are stout and broad and the bullæ large for the size of the skull, and the grooves of the incisors but slightly marked in old specimens.

The dimensions are as follows:—

Head and body 135 mm.; tail 140; hind foot 32; ear 20.

Skull: greatest length 38; basilar length 30; zygomatic breadth 20; length of upper molar series 6; bullæ 11.

Hab. Masindi, Unyoro, B. E. A.

Type. B.M. no. 2.11.1.12. An adult female. Collected by Dr. Ansorge on the 4th August, 1897.

Its dark colour, smaller size, and large bullæ distinguish it at once from the Nyasan forms.

(20) *Tatera fallax*.

Tatera fallax, Thos. & Schw. P. Z. S. i. p. 461 (1904).

4.2.6.11-13. Burumba, Uganda (*Radcliffe*). Alt. 5000'.

I quote the dimensions from the published description:—

Head and body 160 mm.; tail 219; hind foot 43; ear 24.

Skull : greatest length 45 ; (basilar length 35 ;) zygomatic breadth 24 ; length of upper molar series 7 ; bullæ 12.

Noteworthy characters in this species are large size, very long tail, and indistinct grooving of incisors.

(21) *Tatera shoana*, sp. n.

98.6.9.8-9. Jefir Medir and Ujawaji, Somaliland (*Hawker and Chetham*). Alt. 5000'.

2.9.9.18. Lake Zuai, Abyssinia (*Degen*).

79.11.11.4-5. Galla Country (*Gerrard*).

Much larger than *Phillipsi*, ground-colour duller than in that species. Mr. de Winton records "no ear- or eye-patches" in *Phillipsi*: this is not quite correct; though not strongly marked, there are distinct pale areas between the eye and ear and behind the ears at their bases, and this is equally true of this species. The terminal third of the tail is clothed above with long black hairs, recalling the tufted tails of the forms of the Nile Valley; but it is not so marked, nor does the black coloration extend to the lower surface as in those forms.

The following are dimensions:—

Head and body 140 mm.; tail 180; hind foot 36; ear 20.

Skull : greatest length 41 ; basilar length 32 ; zygomatic breadth 21 ; length of upper molar series 6.3 ; bullæ 11.5.

Hab. Jefir Medir, Somaliland.

Type. B.M. no. 98.6.9.8. An old female. Collected by Messrs. Hawker and Chetham, 31st December, 1897 (two specimens), and presented to the Museum.

The long black hairs at the tip of the tail almost forming a tuft distinguish this from all other forms yet known except those from the Nile Valley.

(22) *Tatera Kempfi*.

Tatera Kempfi, Wroughton, Ann. & Mag. Nat. Hist., April 1906, p. 375.

5.12.1.8. Anambra Creek, S. Nigeria (*R. Kempf*).

A medium-sized *Tatera* with an extraordinarily long tail. The colouring is rather dull, the ground-colour being a very brown shade of the usual "fawn" or "sandy"; otherwise there is no noteworthy external character. The skull is large for so small an animal, and in shape is markedly long and narrow; the groove of the incisors is well marked and is more than ordinarily outside the median line.

The dimensions are (those of the body recorded by the collector):—

Head and body 145 mm.; tail 174; hind foot 35; ear 20.

Skull : greatest length 42 ; basilar length 33 ; zygomatic breadth 20 ; length of upper molar series 6 ; bullæ 11.

I have quoted "tail 174" from the label, but there is some mistake ; I think 160 or 164 is more likely to be correct.

(23) *Tatera Phillipsi*.

Gerbillus (Tatera) Phillipsi, de Winton, Ann. & Mag. Nat. Hist. i. p. 253 (1898).

97. 12. 3. 7. Hanka Dadi, Somali (*Lort Phillips*).

I quote dimensions from Mr. de Winton's description :—
Head and body 120 mm. ; tail 163 ; hind foot 32 ; ear 20.

Skull : greatest length 38.5 ; (basilar length 30 ;) greatest zygomatic breadth 20.1 ; length of upper molar series 6 ; (bullæ 11).

The small size, bright colouring, and long tail are noticeable in this form as compared with its neighbours.

(24) *Tatera mombasæ*, sp. n.

1. 5. 1. 23-24. Takangu, B. E. A. (*Percival*). Alt. 70'.

1. 5. 1. 27. Kilifi, B. E. A. (*Percival*). Alt. 70'.

1. 2. 5. 6. Kitui, B. E. A. (*Hinde*). Alt. 3500'.

About the same size as *shoana*, differing from that species but little in coloration. The underside of the tail, however, which in *shoana* is white, is in this species at most a pale drab or buff. The skull is slightly smaller, more finely made, and flatter than in *shoana*, with markedly smaller bullæ.

The following are dimensions :—

Head and body 130 mm. ; tail 175 ; hind foot 36 ; ear 20.

Skull : greatest length 40 ; basilar length 31 ; zygomatic breadth 20 ; length of upper molar series 6.1 ; bullæ 11.

Hab. Mombasa, B. E. A.

Type. B.M. no. 1. 5. 1. 23. A young adult female. Collected by Mr. Percival on the 6th December, 1900.

Notwithstanding the difference of altitude of the localities from which they came, I can find nothing by which to distinguish the Kitui specimen from those from the coast.

Peters has described a species *leucogaster* from Mozambique. Unfortunately his description, though long and detailed, is throughout based on a comparison with "*Meriones Schlegeli*, Smith (*M. afer*, Gray)." The Museum possesses a specimen in alcohol from Peters's collection ; it is labelled *leucogaster*, but it has no character in common with *leucogaster* as described, and is most likely a specimen of the form identified by Peters as *tenuis*, Smith. The type-locality of *leucogaster* is along the sea-coast from Mozambique to the Shire River.

The hind foot is given as 36–40 mm., which differentiates it at once from the Upper Shire and Nyasa forms, which have a very short hind foot; it is quite possible that *mombasæ*, which also is a coast form, may be allied to *leucogaster*, but as, in any case, it would be worthy of subspecific rank, I have not hesitated to give it a distinctive name.

(25) *Tatera gracilis*.

Gerbillus gracilis, Thos. Ann. & Mag. Nat. Hist. ix. p. 77 (1892).

85.2.2.1. Gambia (*Sir C. A. Moloney*). (Type in al.)

I quote the dimensions recorded by Mr. Thomas:—

Head and body 92 mm.; tail 134; hind foot 29; ear 15.5.

Skull: greatest length 32; (basilar length 23); zygomatic breadth 15.7; length of upper molar series 5.1; bullæ 10.

This is the smallest species of the genus known so far.

(26) *Tatera robusta*.

Meriones robustus, Cretzsch. Atlas Reis. N. Afr. (1826).

Meriones murinus, Sundevall, Vet.-Ak. Handl. (1842).

1.5.5.34–39. Shendy, Nile Valley (*Rothschild*).

4.11.3.59–63. Naikhala, Upper Egypt (*Rothschild*).

5.5.8.24–30. Khartoum, Upper Egypt (*Butler*).

3.2.7.18–20. El Kowa, Soudan (*Mrs. Anderson*).

0.3.3.23. Roseires, Blue Nile (*Lord Lovat*).

Cretzschmar's description is very vague, and there is little beyond the locality to guide to an identification; this is given as "Kordofan." The type was collected by Rüppell, who, in his Catalogue of the Mammalia, gives its habitat as "Nubien"; finally, Mr. Thomas, who has seen the specimen, informs me that it is labelled "Ambukol, Nubien." Sundevall's description of *murinus*, though long and detailed, furnishes practically little on which to distinguish his species from *robusta*. He himself says:—"A. robusto, Rüpp., differt auriculis non acutis et rostro multo productiore sed mensuræ fere eadem videntur." The differences, it will be noted, are such that they may be due as much to the taxidermist as to natural selection. With the exception of the single specimen from Roseires all the Museum specimens are practically from the Nile banks between 13° and 17°. Unfortunately the specimens from Shendy, the nearest point to the type-locality from which we have specimens, are all young. Amongst them is one skull (1.5.5.37) markedly larger in every way than the rest, and, indeed, than almost any other skull in the collection from the Nile Valley, but

externally, except in size, the specimen does not seem to differ from the rest of the series. From a most careful study of all these skulls I am of opinion that there are almost certainly two species, differing chiefly in size, but closely resembling each other, in any locality—the bulk of the Shendy specimens representing the smaller, which is probably *robusta*, and the El Kowa specimens the larger, which may be *murina*, the type-locality of which is Bahr-el-Abiad. With two doubtful types and such restricted material I have not dared to do other than lump all these specimens as *robusta*.

(27) *Tatera Emini*.

Gerbillus Emini, Thos. Ann. & Mag. Nat. Hist. ix. p. 78 (1892).

87. 12. 1. 50–51. Wadelai (*Emin Pasha*).

I quote the dimensions recorded by Mr. Thomas:—

Head and body 140 mm.; tail 155; hind foot 29.

Skull: greatest length 35; (basilar length 27;) zygomatic breadth 16; length of upper molar series 5·2; bullæ 10·4.

Noteworthy characters are small size and band of hairs across sole of hind foot, which latter is unique in the genus.

Section III.—ASIA.

The colour-pattern of the tail makes this a very compact group. Unfortunately it is very badly represented in the collection. A small collection made by Mr. Woosnam quite recently, and presented to the Museum by Col. Bailward, has enabled me to recognize somewhat confidently the *tæniura* of Wagner, and thus to discriminate other Persian forms; but although we have the type of *indica*, the material from India is so very poor both in quantity and quality that, beyond identifying Waterhouse's *Cuvieri*, a strongly marked species, I have not ventured to base any conclusions on the specimens available for study.

(28) *Tatera tæniura*.

Meriones tæniurus, Wagner, Schreb. Säug., Suppl. iii. p. 471 (1842).

5. 10. 4. 28–29. Bund-i-Khel, Karun River, S.W. Persia (*Col. Bailward*). Alt. 250'.

Wagner described *Meriones tæniurus* from Syria. We have no specimens unfortunately from this locality, but experience in other genera seems to show that there is little change in the forms westward from the Euphrates until the Jordan basin is reached. Wagner's description is too vague by itself to indicate more than a large *Tatera*. He, however,

gives the following dimensions, viz.:—Head and body (measured along curves on a stuffed specimen) 8" 9" (=230 mm.); tail 7" 3" (=190 mm.); hind foot 1" 8" (=42 mm.).

The average dimensions of the above-named two specimens are:—

Head and body 187 mm.; tail 190; hind foot 42; ear 29.

Skull: greatest length 47; basilar length 37; zygomatic breadth 26; length of upper molar series 7; bullæ 12.5.

These specimens may, I think, be confidently accepted as representing typical *taniura*.

(29) *Tatera persica*, sp. n.

6. 1. 2. 5–6. Seistan. (Seistan Arbitration Commission.)

A large *Tatera*, as large as or even larger than either *taniura* or *indica*.

The whole upper surface of a uniform pale sandy colour, with no apparent black grizzling, though a certain proportion of the hairs on the back are black-tipped; an area above the eyes and the cheeks paler, giving the impression of a darker band from the snout over the crown between the ears; the dark band above and below the tail showing more admixture of black than the dorsal area, the terminal black "tuft" about one fourth of the total length of the tail. The skull strong and broad, and the upper incisors very stout and broad. Unfortunately the dimensions were not recorded by the collectors, but I give the following as probably correct:—

		Skull.								
		H. & b.	Tl.	H. f.	Ear.	G. l.	B. l.	Zyg. b.	Mol.	Bullæ.
(Type)	6. 1. 2. 5. Adult	190	200	41	24	45	?	25	6.1	?
	6. 1. 2. 6. Yg. adult	190	190	40	25	45	?	25	6.3	?

Hab. Seistan.

Type. B.M. no. 6. 1. 2. 5. An adult. Collected in September 1905.

(30) *Tatera persica scansa*, subsp. n.

4. 6. 1. 3. Kerman, Persia (*Sykes*). Alt. 5700'.

Rather smaller than typical *persica*. Ground-colour much as in that species, but a very marked black grizzling on the posterior dorsal area above the root of the tail; the dark bands of the tail are also much darker than in *persica*, and the terminal "tuft" occupies about one third of tail-length. The skull is broad as in *persica*, but neither it nor the molars are so stout. The emargination of the anterior border of

the infraorbital plate, which in *persica* is represented by at most a shallow arc, is in this specimen so deep that the emargination becomes distinctly "C"-shaped. That this character is constant I am not, however, in a position to affirm.

The following are the dimensions :—

Head and body 180 mm. ; tail 193 ; hind foot 39 ; ear 26.

Skull : greatest length 45 ; basilar length 35 ; zygomatic breadth 25 ; upper molar series 6 ; bullæ 12·5.

Hab. Kerman, Persia.

Type. B.M. no. 4. 6. 1. 3. An adult male. Collected by Mr. Sykes on the 1st February, 1903, and presented to the Museum.

(31) *Tatera indica*.

Dipus indicus, Hardw. Linn. Trans. viii. p. 279 (1807).

11. *g.* "India." (*Type.*)

Hardwicke describes the colour as "bright bay mixed with pencil-like strokes of dark brown longitudinally disposed," and gives the size as :—Head and body 6 5'' ; tail 7'' , tuft for last 2'' dark brown. I put the normal dimensions as follows :—

Head and body 180 mm. ; tail 190 ; hind foot 38.

Skull : greatest length 46 ; zygomatic breadth 23 ; length of upper molar series 5·5.

The skull is much broken, but suffices to show that it is more delicately made and long and narrow as compared with those of the Central Asian forms ; the upper molars, however, are fairly stout for their size.

(32) *Tatera Cuvieri*.

Gerbillus Cuvieri, Waterh. P. Z. S. p. 56 (1838).

99. 12. 21-2. Moli Jeri, Tinniveli (*Barber*).

5. 11. 25. 2. Ramnad, Madura (*Annandale*).

These specimens I refer quite confidently to *Cuvieri*, Waterhouse. They closely agree with his description both in colour and proportions. The following may therefore be taken as normal dimensions for this species :—

Head and body 165 ; tail 200 ; hind foot 45 ; ear 22.

Skull : greatest length 44 ; basilar length 34 ; zygomatic breadth 23 ; length of upper molar series 6 ; bullæ 12.

The extraordinary length of the hind foot, considering the size of the animal, was relied on by Waterhouse to distinguish this species from *indica*, and to this may be added the

proportionally very long tail. The upper molars are fairly stout, but the incisors are much narrower than in any Asian form that I have seen except *ceylonica*.

(33) *Tatera Bailwardi*, sp. n.

5.10.4.30. Bund-i-Khel, Karun River, S.W. Persia (*Col. Bailward*). Alt. 250'.

5.10.4.31. Shus, near Dizful, S.W. Persia (*Col. Bailward*). Alt. 500'.

5.10.4.32. Ram Hormaz, near Awaz, S.W. Persia (*Col. Bailward*). Alt. 500'.

53.1.6.83. Mound of Susa, Khuzistan, S.W. Persia (*Loftus*).

50.10.21.5. Euphrates Expedition.

This species differs from *tæniura* in hardly anything but size; in detail of colouring I can detect but the very smallest differences; the white patches on the face are rather more marked in this species, forming an indistinct but continuous line of pale colouring from the sides of the muzzle, over the eyes, to the base of the ears. Its consistently smaller size in all details, however, and the fact that the type specimen was taken at the same time and place as the specimens which I have identified as *tæniura*, from which it is clearly distinct, has determined me to give it a specific name.

The following are some measurements:—

				Skull.								
				H. & b.	Tl.	H. f.	Ear.	G. l. B. l.		Zyg. b.	Mol.	Bullæ.
(Type)	5.10.4.30.	♂.	Adult ..	166	182	41	28	44	34	23	6.5	11.5
	5.10.4.31.	♀.	Old	161	176	41	28	44	34	23	6.5	11.5
	5.10.4.32.	♂.	Adult ..	166	167	40	28	45	35	23	6.5	11.5

Hab. Bund-i-Khel, S.W. Persia.

Type. B.M. no. 5.10.4.30. An adult male. Collected by Mr. Woosnam on the 6th March, 1905, and presented to the Museum by Col. Bailward.

(34) *Tatera Bailwardi monticola*, subsp. n.

5.10.4.33. Mala Mir, S.W. Persia (*Col. Bailward*). Alt. 3300'.

The same size as *Bailwardi*, of which it is apparently a high-level form. Ground-colour much less rufous than in that species, giving it a soberer general coloration. The skull very broad and much stouter and the bullæ markedly larger. The following are the dimensions:—

Head and body 164 mm.; tail 177; hind foot 39; ear 28.

Skull: greatest length 46; basilar length 35; zygomatic breadth 25; length of upper molar series 6.5; bullæ 12.5.

Hab. Mala Mir, S.W. Persia.

Type. B.M. no. 5. 10. 4. 33. An old female. Collected by Mr. Woosnam on the 12th April, 1905, and presented to the Museum by Col. Bailward.

(35) *Tatera ceylonica*, sp. n.

52. 5. 9. 31. ♂. Ceylon (*Kelaart*).

In coloration *ceylonica* differs but little or not at all from *Cuvieri*—*i. e.*, from the specimens which I have identified as that species. It is dark cinnamon-brown along the centre of the back (probably due to the black tips of the hairs in that area), pallid along the sides. Above the eyes, and behind them to the ears and the cheeks, dull white. The following are dimensions:—

Head and body 160 mm.; tail 150; hind foot 41; ear 20.

Skull: greatest length 44; basilar length 33; zygomatic breadth 22; length of upper molar series 6; bullæ 11.

Hab. Ceylon.

Type. B.M. no. 52. 5. 9. 31. An adult male. Presented to the Museum by Dr. Kelaart.

Notwithstanding its colour-resemblance it is easily distinguishable from *Cuvieri* by its extremely short tail and much shorter hind feet. The skull is about as in *Cuvieri*, but the upper molars are finer and narrower than in that or any other Asiatic form.

LXV.—*A new Genus of Free-tail Bat from N.E. Africa.*
By OLDFIELD THOMAS.

PLATYMOPS, gen. nov. (*Molossidæ*).

Ears widely separated, as in *Mormopterus*. Lips without wrinkles, covered with short stout bristles. Forearms shagreened. Wings short. Metacarpal of third finger only one third longer than that of fifth; first phalanx of fifth finger much shortened, one third the length of the metacarpal and not longer than the second phalanx. A small untufted gular sac present in both sexes.

Skull of the general outline in upper view of that of *Mormopterus*, but extraordinarily flattened vertically. Crests much reduced, the sagittal absent and the lambdoid not

meeting in the middle line. Premaxillary notch narrow, not expanded behind. Mesopterygoid fossa without median bony ridge. Ramus of lower jaw very low vertically.

Incisors $\frac{1-1}{4}$; the upper pair long, nearly parallel, bicuspid, the lower ones subequal, all bicuspid. No trace of a small upper premolar, though the large p^4 does not touch the canine.

Type *Platymops Macmillani*.

This most remarkable bat is readily distinguishable from any member of the *Nyctinomus* group by its extraordinarily flattened head, unusual digital proportions, shortened wings, and dental formula. In this group it has a curious analogy with the Vespertilionine genus *Mimetillus*, being modified in its proportions and the shape of its head almost exactly in the same way, and having a strong superficial resemblance to it.

Platymops Macmillani, sp. n.

Size about as in *Mormopterus acetabulosus*, the abnormally short forearms giving a deceptive idea of the general bulk. Fur short; hairs of back about 3 mm. in length. General colour above smoky blackish, below dull whitish along the middle area, blackish along the sides. Limbs dark above, whitish below; membranes dark throughout, except that the surface near the body below is lighter, as is the extreme edge of the plagiopatagium. Ears widely separated, triangular, their anterior edge evenly convex, their tip rounded; anti-tragal notch scarcely perceptible. Tragus fairly large, quadrate, its inner edge about equal to its breadth at tip. Upper side of forearm, wrist, and basal half of third metacarpal thickly and coarsely shagreened with small round warts, very much as is the case in *Vespertilio Floweri*, de Wint. Wing-membrane attached to the distal third of the tibia. Upper side of the short lower leg flattened, finely granulated. Proximal plantar pad very prominent. Penis short, without special modifications.

Skull and teeth as described above.

Dimensions of the type (measured on the spirit-specimen):—

Forearm 32 mm.

Head and body 51; tail 27; tail free from membrane 15; ear 15; tragus on inner edge 2; third finger, metacarpus 31, first phalanx 12.5, second phalanx 11; fifth finger, metacarpus 23, first phalanx 6.5, second phalanx 6.7; lower leg 11; calcar 16.

Skull: condylo-basal length 16; basal length in middle

line 13; zygomatic breadth 11·2; breadth between preorbital processes 7·4; interorbital constriction 3·8; greatest mastoid breadth 10·2; height from basion to top of brain-case 4; palatal length in middle line 5·9; front of canine to back of m^3 6; front of lower canine to back of m_3 6·6.

Hab. N.E. Africa, between Adis Ababa and Lake Rudolf.

Type. Adult male. Presented by W. N. McMillan, Esq. Collected by Ph. C. Zaphiro. Seven specimens examined.

The peculiar flattening of the head of this bat—even to the abolition of the sagittal crest and the reduction in the vertical thickness of the lower jaw—probably indicates that it either lives in small cracks in trees or rocks, into which it may creep beyond reach of enemies, or else that it frequents some large-leaved plant (such as banana or cactus), between whose leaves the other bat with a similarly shagreened forearm (*Vespertilio Floweri*) was found by Mr. N. C. Rothschild.

I have named this most interesting bat in honour of Mr. W. N. McMillan, to whose liberality science is indebted for the exploration of which it is part of the outcome.

LXVI.—*A Dwarf Form of the African Elephant.*

By Prof. TH. NOACK, of Brunswick*.

IN the summer of 1905 Herr C. Hagenbeck, of Stellingen, received a small elephant from the French Congo which differs not merely from the varieties of *Elephas africanus* described by Prof. Matschie, but from all living elephants in that it represents a dwarf form.

I propose for it the name *Elephas africanus pumilio*.

The animal was 120 cm. high at the shoulder (in the lumbar region naturally higher), and was consequently about as large as the two young African elephants figured by Heck in 'Lebende Tiere,' pp. 116 and 117, which are the types of Matschie's *Elephas cyclotis* and *E. oxyotis*. The height of the young elephant from the Cameroons in particular is stated by Dr. Heck to be also 120 cm.

In my opinion these elephants were about a year and a half old. Since they were both, as also *Elephas pumilio*, of which, through the kindness of Herr Hagenbeck, I possess two beautiful photographs, photographed together with a keeper, it is possible to form a very good estimate of their

* Translated by E. E. Austen from the 'Zoologischer Anzeiger,' Ed. xxix. No. 20 (Jan. 8, 1906), pp. 631-633.

dimensions. A new-born Indian elephant is about 90 cm. high; in the case of the African elephant trustworthy statements are wanting.

The age of *E. pumilio* was estimated by Herr Hagenbeck, who is an authority upon elephants, at about six years. It was consequently only as large as young of *E. africanus* about one year and a half old. The dorsal ridge of a six-year old Indian elephant already reaches to the chin of a full-grown man, and the young African elephant stands much higher on its legs than the Asiatic animal of equal age.

The estimate of its age depends upon the fact that this dwarf elephant already possessed tusks protruding to a length of about 12 cm., relatively strong, sharply pointed, and directed entirely outwards and obliquely downwards, not forwards; the tusks are consequently very remarkable in their direction also. In the photograph of the *E. cyclotis* of the same size there is to be seen merely a small and scarcely visible stump of a tusk, while in that of *E. oxyotis* there is no trace of one whatever.

Moreover, the development of the front leg was that of an older elephant, not of a yearling.

In the quite young African elephant the forearm is relatively shorter and the upper arm relatively longer than in the adult state, as appears from the two illustrations referred to, which have been compared with adult specimens, as also from the development of an elephant from the Cameroons in the Hamburg Zoological Gardens, which I have been able to follow for a period of about ten years, and of which I possess original drawings.

The shape of the front limb in the specimen of *E. pumilio*, however, was that of an older and not that of a quite young animal.

The shape of the rest of the body—apart from the long and remarkably thin tail, on which the double row of hairs forming the small end-tuft consisted of some longer ones in front and only a few shorter ones behind—was as far as the shoulder similar to that of the elephant from the Cameroons figured by Heck, but differed considerably from the neck onwards.

Elephas pumilio carries its head decidedly lower than *E. cyclotis*; on both sides of the head, nearer the base of the ear than the eye, there is situated a prominent protuberance, similar to what is found in the case of the Asiatic elephant; the zygomatic arch is remarkably feebly marked, and the shape of the ear differs from that of all known African elephants.

The ear is remarkably small and its transverse diameter is more than a quarter less than that of a specimen from the Cameroons of equal size. The shape is also entirely different. In the case of the young Cameroons elephant the anterior margin projects in a flat curve behind the base of the ear, the posterior half of the ear forms almost a semicircle, the lower margin is straight, and the anterior lower lobe is rectangular. This is the type of *Elephas cyclotis*. In the case of *E. oxyotis* the upper margin of the ear is perfectly straight, while the anterior lobe is produced forwards into a point.

In *E. pumilio*, on the other hand, the anterior upper part of the ear is sharply marked off from the ear-base in a decided curve, and the upper margin runs in a flat curve obliquely backwards and downwards, so that the posterior half of the ear amounts to much less than a semicircle, and the posterior margin is rounded off below in a much shallower curve than in the case of *E. cyclotis*.

The lower margin of the ear is not straight, but before the middle curves inwards somewhat sharply, so that the anterior lobe has a decided downward direction. The lobe is not rectangular in shape, as in the case of the elephant from the Cameroons, but ends in a rounded point; consequently the anterior contour of the ear is not straight and short, as in *E. cyclotis*, but decidedly rounded and much longer than in the case of the latter.

The skin of *E. pumilio* is much smoother and less wrinkled than that of *E. cyclotis*, or, indeed, of any other African elephant. The trunk in particular is almost entirely without the transverse wrinkles characteristic of *E. africanus*, so that it resembles that of the Asiatic elephant. It diminishes but little towards the orifice; on the other hand, for about 10 cm. at the end it is very thin, and this portion is rather sharply marked off from the rest of the trunk. The orifice has thin edges.

Herr Hagenbeck and I were agreed that the animal in no way presented the appearance of being possibly stunted and backward, but that the impression that it gave us was that of a well-developed elephant, not very old, but at the same time not absolutely young. This first specimen of *Elephas pumilio*, which is undoubtedly of the greatest scientific interest, soon found a purchaser in North America.

LXVII.—On the Morphological Significance of the Joints of the Mandibles in the Acari. By Dr. A. C. OUDEMANS*.

IN the legs of the Acari the following joints are generally distinctly recognizable:—coxa, trochanter, femur, genu (patella), tibia, and tarsus. Sometimes two or more of these joints are fused together; thus in the case of certain species we meet with a trochanterofemur or a femorogenu. It may also happen that a joint is divided into two or more small joints. Thus, for instance, the femur may be divided into a basifemur and a telofemur, or in a tarsus a basitarsus, a mesotarsus, and a telotarsus may clearly be distinguished.

If we now compare the maxillæ of the Parasitidæ (Gamasidæ) with the legs in the same family, we arrive at the conclusion that the coxæ of the two maxillæ have become fused into a hypostoma, and that the rest of the joints have remained freely movable and form the palpi, in which we can recognize distinctly trochanter, femur, genu, tibia, and tarsus. The tarsus is, however, not attached to the tibia exactly at its distal extremity, but obliquely on its under and inner side. The tarsus itself bears beneath on the inner side and proximally a much deformed hair, which is capable of being moved by muscles (a three-pronged fork without a handle).

On examining a mandible we find that it is generally composed of three joints, namely, (1) a cylindrical joint, (2) a likewise cylindrical joint, which is movably united to the first joint by means of two lateral condyles and narrows abruptly at its distal extremity. At the proximal end of this narrowed portion there lies on the ventral side a slit or pit, in which the third joint is movably wedged, almost in the same way as that in which one of the rami of our lower jaw is attached to the temporal bone, that is by means of a posterior and upper condyle. The third joint and the attenuated distal portion of the second together form the *chela*, with a *digitus fixus* above and a *digitus mobilis* below.

In many families or orders the mandible consists, however, of only two joints—namely, of those described above, the first and second are fused together, and then constitute a somewhat differently shaped, more powerful, and more or less pyriform structure, the head of which is situated proximally, while the stalk represents distally the *digitus fixus*.

* Translated by E. E. Austen from the 'Zoologischer Anzeiger,' Bd. xxix. No. 20 (Jan. 8, 1906), pp. 638-639.

It is self-evident that it will be a difficult task to compare with a leg an appendage so entirely transformed. The attempts in this direction which have been undertaken in various ways by myself and other investigators must be regarded as having failed, yet I think that I am now able to compare and name the joints of the mandibles correctly.

I made a preparation of a mandible of an *Uropoda africana*, Oudms. This was composed of all known joints. It exhibited a trapezoidal coxa, a short trochanter, and a longer femur, which is united by means of two lateral condyles with a still longer genu; the latter, again, is connected by a dorsal condyle with the tibia, which carries the tarsus proximally in a pit on its ventral surface!

In the Parasitidæ, therefore, the proximal cylindrical joint is formed of the united coxa, trochanter, and femur, and the second joint of the united genu and tibia, while the last joint, the digitus mobilis of the chela, represents the tarsus. I go still further, and see in the ventral, proximal, and internal copulatory organ of the male Parasitidæ an analogue of the above-described furcate hair of the tarsus palparum.

In cases in which the mandible consists of only two joints (*e. g.* in the Labidostomidæ, Bdellidæ, Oribatidæ, and Acaridæ) the first joint is consequently to be regarded as a fusion of the coxa, trochanter, femur, genu, and tibia, while the digitus mobilis represents merely the tarsus.

BIBLIOGRAPHICAL NOTICE.

Darwinism and the Problems of Life. By CONRAD GUENTHER, Ph.D., Professor at the University of Freiburg in Baden. Translated from the Third Edition by JOSEPH McCABE. London: A. Owen & Co., 1906.

THE author tells us that "the present work had its origin in an attempt to appreciate the range, the foundation, and the value of evolutionary theories." This attempt accomplished, to his own satisfaction, he expresses a desire so to present the facts that he has garnered as to enable "nature herself . . . [to] teach the reader the truth of evolution."

But we venture to think that the author has by no means attained his ambition. His presentation of Darwinism is laboured, amateurish, and occasionally grotesque!

The translator is obviously not a zoologist, and to him probably

must be attributed many of the strange and misapplied names of animals and organs which occur throughout the pages of this book, which, indeed, does not seem to us to have been worthy even of this indifferent translation.

W. P. P.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

February 7th, 1906.—J. E. Marr, Sc.D., F.R.S.,
President, in the Chair.

The following communication was read:—

‘The Carboniferous Limestone (Avonian) of the Mendip Area (Somerset), with especial reference to the Palæontological Sequence.’
By Thomas Franklin Sibly, B.Sc., F.G.S.

The Avonian rocks are exposed in four main anticlinal forms or periclinal lines—those of Black Down, North Hill, Pen Hill, and Beacon Hill; each of which has an approximately east-and-west trend and has Old Red Sandstone exposed in its core. The following is the zonal succession:—

	Zones.	Subzones & Horizons.	Feet.
KIDWELLIAN.	{ <i>Dibunophyllum</i>	{ D ₂ . <i>Lonsdalia floriformis</i> . D ₁ . <i>Dibunophyllum</i> θ. }	500
	{ <i>Seminula</i>	{ S ₂ . <i>Productus</i> aff. <i>Cora</i> mut. S ₂ . S ₁ . <i>P. cf. semireticulatus</i> mut. S ₁ . }	720
CLEVEDONIAN.	{ <i>Syringothyris</i>	C. <i>S. cuspidata</i> .	550
	{ <i>Zaphrentis</i>	{ Z ₂ . <i>Z. aff. cornucopiæ</i> . Z ₁ . <i>Spirifer</i> aff. <i>clathratus</i> . }	800
	{ <i>Cleistopora</i>	{ K ₂ . <i>Spiriferina</i> cf. <i>octoplicata</i> . K ₁ . <i>Productus bassus</i> . M. (<i>Modiola</i> -phase.) }	450

In the present paper, the faunal sequence is discussed in detail, attention being confined almost entirely to the corals and brachiopods, which predominate throughout the series. The lithological character of each zone and subzone is treated briefly. The general

stratigraphy of the area is briefly discussed, reference being made to the more important forms. Following this, the exposures examined are classified in zonal order, and tabulated under the zonal headings. The best exposures of each zone receive special attention.

A correlation with the Bristol area brings out the following more important points. The faunal succession is essentially similar in the two areas; and in both there is good ground for a twofold division into Clevedonian and Kidwellian stages, the line of separation being drawn at the top of the *Syringothyris*-Zone. The Mendip area exhibits, however: (1) a great expansion in the thickness of the *Zaphrentis*- and *Syringothyris*-Zones; (2) a continuously-fossiliferous sequence from the top of the *Zaphrentis*-Zone to the base of the *Seminula*-Zone, possessing a characteristic coral- and brachiopod-fauna; and (3) a relative acceleration of the coral-fauna on the brachiopod-fauna, exhibited in the *Zaphrentis*-Zone.

The paper contains a detailed account of the Ebbor-Rocks District, near Wells, and concludes with notes on certain corals and brachiopods included in the faunal lists, together with descriptions of some new species and mutations.

March 7th, 1906.—Sir Archibald Geikie, D.C.L., Sc.D., Sec.R.S.,
President, in the Chair.

The following communication was read:—

‘Liassic Dentaliidae.’ By Linsdall Richardson, F.G.S.

Among the fossils collected in the cuttings on the new Honeybourne & Cheltenham Railway were many belonging to the family Dentaliidae; and as the majority are new, the Author has investigated the Liassic members of the family contained in his own collections and in those of numerous museums. The growth of the scaphopod-shell is effected by additions at the anterior end, while the posterior end suffers by wear and absorption. The members of this class are essentially marine, inhabiting deep water, and feeding principally on foraminifera. The word *Dentalium* is used in the broad sense, and not in the restricted sense of a shell with strong longitudinal costæ. Eight new species are described, and eight species already known are discussed.

March 21st, 1906.—Aubrey Strahan, M.A., F.R.S., Vice-President,
in the Chair.

The following communication was read:—

‘Brachiopod Homœomorphy: *Pygope*, *Antinomia*, *Pygites*.’

By S. S. Buckman, F.G.S.

This paper deals with the diphyoid Terebratulæ, of which so many species have borne the name *Terebratula diphyæ* (Colonna).

It is pointed out that this name is pre-Linnean, and can only date from the time when it was revived by L. von Buch in 1834. Prior to that several names had been given to these shells. The first were *Terebratula cor* and *T. pileus* given by Bruguière in 1792 in the 'Journal d'Histoire Naturelle,' his paper in which has been entirely overlooked by workers on these shells. Bruguière's names indicate a perforate and an imperforate species respectively. Consideration is then given to the synonymy of certain diphyoid species:—*T. triangulus*, Valenciennes, in Lamarck, which was actually founded on Bruguière's own figures of his *T. pileus*; *T. triquetra*, Parkinson, which includes two species, a perforate and an imperforate; and *T. antinomia*, Catullo, which covers various species. These and others all antedate *T. diphya*, L. von Buch.

It is pointed out that *Terebratula diphya* is not the type of the genus *Pygope*, as all text-books say; for Link, the author of the generic name, referred only to *T. antinomia*, Catullo. Reasons are given for taking as the type of *Pygope* one of the forms of *T. antinomia* which is considered to be the same species as *T. deltoidea*, Val. Then the later generic name *Antinomia*, Catullo, is discussed. The genus was founded on five species; and one of them is now selected as the type—the genolectotype. This is *A. dilatata*, Catullo, supposed to be equivalent to *Terebratula antinomia*, Catullo, that is, to what is now selected to be the type of that species. In that case the species would bear the name *Antinomia antinomia* (Cat.). The two generic names *Pygope* and *Antinomia* are employed, because they are supposed to indicate two independent parallel genetic series, whose members differ in size and position of the perforation, and in characters of the lateral margin. But there is yet another series of diphyoids, typified by *Terebratula diphyoides*, d'Orb. It is pointed out that, although the species covered by the name *diphyoides* are very like *Pygope* as now used, yet they all differ in having particular characters in the preperforate stage—a dorsal ridge and a ventral sulcus. For this series de Haan's MS. name *Pygites* is used; and it is supposed that there are three genetic series of diphyoids which have developed independently, and that the remarkable perforate form, with its two lobes joined, has been evolved three times over. A genetic plate is given, figuring for comparison many of the species in the three series, showing their development from the glossothyridoid, to the bifidate, to the perforate (ordinary *T. diphya*) stage; and that then they finish by losing all trace of the perforation, the lobes completely coalescing (the imperforate stage), represented by *Terebratula pileus*, Brug. = *T. triangulus*, Val. in Lamarck.

Synonymies and short notices of the species in the three genera have been given. In compiling them there have been found two papers overlooked by Brachiopod bibliographers—one by E. Newman in the 'Zoologist' naming *T. Duvali*, and one by Catullo.

April 4th, 1906.—R. S. Herries, M.A., Vice-President,
in the Chair.

The following communication was read:—

‘The Carboniferous Succession below the Coal-Measures in North Shropshire, Denbighshire, and Flintshire.’ By Wheelton Hind, M.D., B.S., F.R.C.S., F.G.S., and John T. Stobbs, F.G.S.

This paper opens with a critical account of previous research among the Carboniferous rocks of North Wales, chiefly the work of the late G. H. Morton, Mr. R. Kidston, and Mr. A. Strahan. There follows a detailed account of the various beds, exposed in numerous quarries worked for road-metal, iron-manufacture, lime, cement, chert, or building-stone. Fossil-lists are given from each exposure of importance. The lower series of the Carboniferous Limestone, as developed in the Bristol area, was never deposited in this district, where the lowest beds contain fossils characteristic of a comparatively-late phase of the Carboniferous-Limestone Period. Whether this was due to irregular configuration of the ocean-floor of that age, or to contemporaneous earth-movement of a regional character, cannot as yet be determined. The base of the Limestone is characterized by *Daviesiella (Productus) llangollensis*, and appears to correspond with the junction of the Upper *Seminula*- and Lower *Dibunophyllum*-Beds of the Bristol area. The next limestones in ascending succession are characterized by the presence of *Dibunophyllum* ϕ and *Cyathophyllum Murchisoni*, fossils which indicate, in the Bristol area, the life-zone which immediately underlies the *Lonsdalia*-Beds. These two life-zones have been named by Dr. Vaughan the Lower and Upper *Dibunophyllum*-Zones respectively. The *Cyathaxonia*-Beds and the cherts are equivalent to a zone higher than the Upper *Dibunophyllum*-Zone of Bristol, and not represented there. The black limestones (containing *Posidonomya Becheri*) with shales, at Teilia, Holywell, and near Bagillt, which occur above the cherts, are the homotaxial equivalents of the Pendleside Series. These beds are followed by the Gwespyr Sandstone, which is correlated with the Millstone Grit. A range-table is given of the chief brachiopods and corals, and the palæontological sequence is compared with that occurring at Bristol and in the North of England. A few notes on the palæontology conclude the paper, and Dr. R. H. Traquair appends a short description of a new species of *Elonichthys*, occurring in the Holywell Shales.

MISCELLANEOUS.

On the Anatomy and Histology of the Ixodidæ.

By A. BONNET.

THIS note is concerned with the study of the eye and of the poison-glands of the Ixodidæ, as well as with that of certain

peculiar organs of these Acarina, the nature of which has not up to the present been established.

I. *Porous area*.—We know that in the females of the Ixodidæ there are found on the dorsal surface towards the base of the rostrum two finely punctured depressions called porous areas. Authors have been content to point them out without indicating their exact nature; I think that it may be inferred from my observations that these two pits represent a sensory organ.

In sections the porous area is seen to be composed of a series of apertures or pores which pass right through the chitin, and, when regarded as a whole, exactly recall the appearance of a sieve. Beneath each aperture there lies an ovoid nerve-cell with a central nucleus. The nerve-cells terminate on the dorsal side in short prolongations in the shape of little rods, which penetrate into the apertures of the porous area. By their other extremity they are attached to a bundle of nerve-fibrils, which spreads itself out widely in the form of a fan on the under side of the organ. In a series of sections the nerve can be traced fairly easily as far as the latero-anterior region of the brain, where it originates.

By reason of its structure there seems no doubt that the porous area represents a sense-organ that may be compared with the lyriform organs and their analogues of the Arachnids. Nevertheless, there is in this case a more marked specialization, since this organ exists only in the females.

II. *Eye*.—The eyes of the Ixodidæ are of the simple type, that is to say, they are composed of a crystalline lens, a vitreous body, and retinal cells. The lens set in the chitin of the cephalothorax, of which it is but a simple differentiation, is white, hyaline, and strongly convex; in *Hyalomma affine*, Neumann, it is $150\ \mu$ thick and has a diameter of $100\ \mu$. It is not composed of concentric lamellæ, but exhibits striæ perpendicular to its surface; these striæ are numerous and accentuated by a black pigment contained in the crystalline substance. Beneath the crystalline lens the hypodermis is prolonged to form the vitreous body, which is composed of low compressed cells. This body is bounded by a circular zone of tall cells, corresponding to the irisated zone or tapete of the Arachnids. The retinal portion comprises a small number of ovoid nerve-cells of large size ($30\ \mu$ by $20\ \mu$), with posterior nuclei, as in the nocturnal eyes of the spiders and in those of the Opilionidæ. I have not found coloured pigment either between the retinal cells or upon the margin of the vitreous body, as we see it regularly in the other Tracheata.

We find, then, that the eyes of the Ixodidæ diverge in certain respects from those of the Arachnids, and are characterized: (1) by the great thickness of the lens and the strong curvature of the crystalline body; (2) by the presence of black pigment in the crystalline body; (3) by the absence of pigment between the retinal cells and in the irisated zone; (4) by the great size of the nerve cells.

III. *Poison-glands*.—Among the pluricellular alveoli of the salivary glands we find a certain number of bulky pyriform cells, which are distinguished from the other gland-cells by their affinity for the acid stains. Studying these cells at different stages, I perceived that they form unicellular glands, which open into the salivary ducts by a short canal. These glands are situated exclusively upon the three great trunks of the excretory canals. I consider these histological elements to be poison-glands; they are, moreover, much more numerous in the species of *Argas* than in those of *Ixodes*, a fact which explains easily enough the greater degree of irritation caused by the bite of the former when compared with that inflicted by the latter.

In the resting condition (that is to say, in individuals which have been detached from their host for a certain time) the nucleus of these cells is regular in shape, rounded, and sharply defined. At the moment of secretory activity the nuclear membrane disappears, and the nucleus sends out irregular prolongations, especially on the side of the aperture of the gland. These prolongations become detached from the central mass, and break up into nuclear granulations which are entirely identical with the venogenous granules observed in the poison-glands of Arthropods and snakes.

The cytoplasm stains readily with eosin, and is finely granular. Nevertheless, around the nucleus and the nuclear granulations it exhibits a hyaline zone of slight plasmic density; this zone is more or less extensive, according to the bulk of the mass of chromatin contained in it. The chromatic granulations appear to dissolve in the cytoplasm, and modify it in order to produce the toxic substances.

It seemed to me interesting to notice these nuclear emissions, which here undoubtedly play a highly important part in the phenomena of secretion, and probably participate in the formation of poison in the gland, as Launoy, in his researches upon poison-glands, has shown to be the case.—*Comptes Rendus*, t. cxlii. no. 5 (Jan. 29, 1906), pp. 296–298.

The Large Dermal Glands of the Species of Echinaster.

By Dr. PHILIPP BARTHELS.

In his work "Die Seesterne des Mittelmeeres" ('Fauna und Flora des Golfes von Neapel,' Bd. 24, 1897) Ludwig speaks on page 320 of the large dermal glands of the species of *Echinaster*; he describes their occurrence especially in *Echinaster sepositus*, Gray, and says that in their longest diameter the glands measured from 0.6 to 0.8 mm. After the removal of the epithelium covering the body he was already able to recognize the glands with the help of a lens, by means of the white coloration in the large meshes of the cutis, by which each one is surrounded. They had sometimes a rounded and sometimes a more elongate outline, or one in which

the angles were rounded off. Ludwig found the glands in very large numbers, upon the disk as well as upon the arms, extending close up to the ambulacral grooves, and in general situate upon the area of the body supported by the skeletal plates; he failed to find them in the central portion of the pore-fields, between the papulae. Ludwig adds that the same glands also occur in other species of *Echinaster* (e. g. in *Echinaster callosus* and *Cribrella oculata*). With reference to the finer structure of the glands, Ludwig refers to Cuénot's paper, "Contribution à l'étude anatomique des Astérides" (Arch. Zool. expér. [2] t. 5 bis, 1888, pp. 11-13, pl. i. figs. 15-17).

In the sections that he made of *Echinaster sepositus* Cuénot found that the glands were of irregular shape, 0.5 mm. in length, more or less spherical, enveloped by the fibrillar layer beneath the epithelium of the body; the aperture appeared as a shallow depression. Cuénot further states that in the gland there are meshes of connective tissue, surrounding oval spaces, and that in each mesh there lies a large cell, which forms the vesicles that are found in the cell and in the ejected mucus.

I studied the glands in very small specimens of *Echinaster sepositus* which Herr Geheimrath Ludwig most kindly gave me and in larger animals which I had preserved at Naples; besides these I also made use of *Cribrella oculata* (= *sanguinolenta*) from the Plymouth Biological Laboratory.

In young animals the origin of the glands at the tips of the arms can be clearly seen. They are formed by means of the invagination of the epithelium of the body; the primitive gland is a wide open invagination; the neck gradually becomes narrower and the gland assumes the typical form. The cells of the external epithelium which have thus sunk inwards multiply greatly and lose their regular arrangement; the new cells become detached and are pressed into the lumen of the gland; in the case of *Echinaster sepositus* they are some 11 to 15 μ in size, and in that of *Cribrella oculata* about 13 to 19 μ , generally not quite round, but somewhat elongate; the roundish nuclei of these cells measure approximately 2 μ . Between the parietal cells and those that are free only a slight difference in shape is perceptible; here and there among the fixed cells are to be found some that are in process of division. By the bursting of the free cells the mucus is poured into the gland; the small nuclei are mingled with it. The glands are surrounded by strong fibres of connective tissue, but nowhere is any connective tissue to be found in the interior of the gland.

If a starfish of this kind is irritated and the skin contracts, the mucus exudes from the affected spot in small droplets, and investigators are unanimously of the opinion that these glands of the species of *Echinaster* serve as organs of defence.—*Zoologischer Anzeiger*, Bd. xxix. No. 20 (Jan. 8, 1906), pp. 639-640.

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LXVIII.— *Some new and little-known Trematodes.* By
WILLIAM NICOLL, M.A., B.Sc., Gatty Marine Laboratory,
St. Andrews.

[Plates XII. & XIII.]

THE endoparasitic Trematode fauna of this country is a subject which has of late received but scant attention from zoologists. Since Cobbold's time practically no systematic work of note has been done. Jameson's attempt* to solve the much-disputed question of pearl-formation in mussels and other Lamellibranchs is possibly the most important work on the group.

This contrasts unfavourably with affairs in other countries, where helminthology in general, and particularly that branch of it relating to Trematoda, has within recent years been receiving very considerable attention. Von Linstow, Braun, Brandes, Lühe, and Mühling in Germany, Stossich and Monticelli in Italy, and Looss in Egypt have devoted the greater part of their time and energy to this department of zoology. Zschokke and Hausmann in Switzerland and Jägerskiöld and Odhner in Scandinavia have helped much to increase our knowledge of the bird and fish Trematode parasites of these countries, while in America many workers are engaged in the study of the freshwater-fish parasitic fauna.

While it is true that, owing to the migratory habits of

* Proc. Zool. Soc. 1902, i. p. 140.

birds and fishes, the Entozoan parasites of each species tend to be alike in every country, there is no doubt that by reason of unique local circumstances the parasites of a particular host, or in some cases a particular parasite itself, are more easy of study in one country than in another. The same, of course, applies to different localities in the same country. The presence of a rich invertebrate fauna, harbouring sporocysts and cercariæ, and at the same time easy of access, is beyond question a most important aid in the study of the adult parasites occurring in the vertebrate hosts. Besides ensuring that in these hosts infection will be frequent, it affords the means of studying the parasites throughout the various stages of their development. Many places in this country, and amongst them St. Andrews (where, owing to the labours of Professor M'Intosh, the marine invertebrate fauna is comparatively thoroughly known*), satisfy these conditions, so that it is surprising that more labour has not been expended on this subject. From the following notes, which are in many cases the result of casual observation, it will be evident that much research might, with a considerable prospect of success, be devoted to the elucidation of the British Trematode fauna.

The hosts which I have had an opportunity of examining are only such as occur with considerable frequency and are commonly brought down by "caddies" or others out for a day's shooting. The few fish noticed are some which have died while in confinement in the tanks at the Laboratory. I hope to be able to undertake a more extended study during the ensuing months.

The hosts with their respective parasites are as follows:—

Larus ridibundus.

Echinostomum secundum, sp. n.

Larus argentatus.

Zeugorchis acanthus, gen. et sp. n.

Echinostomum secundum.

Levinsenia similis, *Jügerskiöld.*

Tocotrema lingua, *Creplin.*

Hematopus ostralegus.

Echinostomum secundum.

Levinsenia similis.

Distomum brevicolle, *Creplin.*

— minutum, *Cobbold.*

Monostomum ignotum, sp. inq.

* Cf. e. g. 'Marine Invertebrate Fauna and Fishes of St. Andrews,' together with many papers of note.

Harelda glacialis.

Monostomum attenuatum, Rud.

Colymbus septentrionalis.

Distomum sp.

Gasterosteus aculeatus.

Psilostomum redactum, sp. n.

The following contained no Trematode parasites:—

Larus marinus (one specimen).

Totanus calidris „

Corvus cornix „

Uria troile „

Edemia nigra (two specimens).

Phasianus colchicus (two specimens).

Blennius pholis (one specimen).

Echinostomum secundum, sp. n. (Pl. XII. figs. 1-3.)

In the intestine of a black-headed gull (*Larus ridibundus*) three specimens were found. The smallest was 5.4 mm. long, the largest 7.3 mm. The body is long and narrow, flattened dorso-ventrally. The breadth varies considerably in different parts of the body. Across the head in the largest specimen it is .33 mm., at the neck (constriction just behind head) .27 mm., at the ventral sucker .52 mm., and at the widest part of the body (on a level with the anterior testis) .70 mm., from which it tapers gradually to the extremity.

The oral sucker is terminal, but set at an angle of 45° with the longitudinal axis of the body. Its diameter is .11 mm. The ventral sucker, situated at a distance of .7 mm. from the anterior end, measures .33 mm. in diameter. Both suckers are globular and have a circular aperture.

The cuticle is thrown into transverse folds, which give the surface a rugose appearance. These folds increase in size from the anterior end; posteriorly they broaden out and become indistinct. The summit of each fold is studded with numerous little spines, which also increase in size in passing backwards. They are almost entirely absent from the posterior third of the body. Around the oral sucker appears the well-defined row of cephalic spines (Pl. XII. figs. 2, 3, *Sp.*) distinctive of the genus. The spines are twenty-nine in number and are set on a sort of ridge, which encircles the anterior end except in the mid-ventral line, and forms the "head." With the exception of two at each end they are arranged in a single uninterrupted row. The exceptions are

on a different level from the rest and are smaller in size. They measure $\cdot 026$ mm., while the others have a length of $\cdot 050$ – $\cdot 053$ mm.

The mouth opens in the oral sucker and is followed by a narrow œsophagus $\cdot 50$ mm. long. At a distance of $\cdot 03$ mm. from the oral sucker there is a small muscular œsophageal bulb (pharynx) measuring $\cdot 10 \times \cdot 05$ mm. The œsophagus divides into two intestinal diverticula just in front of the ventral sucker. The diverticula extend the whole length of the body.

The testes, a pair of egg-shaped bodies, are situated in the posterior third of the body, one behind the other, the posterior being at a distance of $\cdot 94$ mm. from the hinder end. They measure $\cdot 66 \times \cdot 40$ mm. and $\cdot 80 \times \cdot 42$ mm. respectively. Further forward is the ovary, measuring $\cdot 27 \times \cdot 20$ mm., the long axis being transverse. The shell-gland lies behind the ovary, two folds of the uterus intervening. The uterus is much convoluted and the ova are numerous. The latter vary in size and colour. Those nearest the ovary are largest. They are colourless and measure $\cdot 093 \times \cdot 062$ mm. Further forward they assume a yellowish tint and their size is $\cdot 087 \times \cdot 056$ mm. The most anterior ova are brown in colour and measure only $\cdot 082 \times \cdot 053$ mm.

The genital aperture is closely apposed to the anterior border of the ventral sucker and lies slightly to the left of the middle line. It is elliptical in outline. The vitelline glands are lateral in position and extend from a distance of $\cdot 52$ mm. behind the ventral sucker to the posterior extremity of the body. They are dark in colour.

The excretory system consists of a pair of narrow tubes, one on each side, running the whole length of the body. These give off numerous branches. At the posterior end there is a large, distinct, excretory aperture, having the appearance of being surrounded by a series of longitudinal muscular fibres.

A species of *Echinostomum* (*E. spinulosum*) has already been observed in *Larus ridibundus*. This is noted by Diesing* and Bellingham†. *Echinostomum spinulosum* is one of the commonest species of the genus and occurs in *Colymbus septentrionalis*, *Podiceps cristatus*, *Carbo graculus*, *Numenius arquatus*, *Larus argentatus*, *capistratus*, *glaucus*, and some others. It has been described and figured by

* Syst. Helm. i. p. 392.

† Ann. & Mag. Nat. Hist. 1844, xiii. p. 426.

Dujardin *, Diesing, Molin †, Von Linstow ‡, Cobbold §, and Müller ||, so that its specific characters are well known. The features which distinguish it from *E. secundum* are: (1) the shape of the head, (2) the number of cephalic spines being only twenty-two, (3) the forward position of the testes, (4) the curtailed extent of the vitelline glands, (5) the relative sizes of the suckers. That these features are of diagnostic importance in the determination of species is recognized by most observers. According to Müller ¶, "several forms appear to be described under *E. spinulosum*, which, on more exact knowledge of the number of cephalic spines, extent of vitelline glands, and size of ova, will be distinguished from each other." Looss** discusses the affinities of several species of *Echinostomum*, each possessing twenty-two cephalic spines. They differ from each other in very slight detail, such as the size of the suckers and œsophageal bulb, the size and arrangement of the cephalic spines, and the sizes and positions of the ova, testes, and vitelline glands. It is possible, therefore, that *E. secundum* may have been already observed and, on cursory examination, mistaken for *E. spinulosum*.

In the number and arrangement of the cephalic spines *Echinostomum secundum* probably stands nearest *E. leptosomum*, Creplin, described by Villot †† from *Tringa variabilis (alpina)* and *Calidris arenaria*. This species possesses 28–30 cephalic spines of length .04 mm. Two spines at each end are on a different level from the others, but according to Villot they do not differ from them in size. The head is not marked off from the rest of the body by a constriction. The suckers also differ in size, while the ventral sucker is distinguished by the possession of a crenated margin. The œsophageal bulb, testes, and ova are all much smaller, although the animal itself is nearly half as long again as *E. secundum*.

Villot describes as the larval form of *E. leptosomum*, *Cercaria leptosoma*, occurring in cysts in the foot of *Scrobicularia tenuis*. There is much reason to believe that the corresponding larval form of *E. secundum* is identical with that

* Hist. d. Helm. p. 430.

† Wien. Denkschr. xix. p. 220.

‡ Arch. f. Naturg. 1877, p. 183.

§ Trans. Linn. Soc. xxii.

|| Arch. f. Naturg. lxiii. p. 20 (1897).

¶ Loc. cit.

** Zool. Jahrbücher, 1899, xii. p. 689.

†† Ann. d. Sc. nat. 1879, viii. p. 24.

which I have already described* from *Cardium edule*, *Mytilus edulis*, and *Macra stultorum*. I have not been able to prove this as Villot did, in the case of *Cercaria leptosoma*, by observing the development of the cercaria into the adult within the intestine of the host; but comparison of the adult with the encysted cercariæ in the cockle brings out several points of resemblance. The most marked is the close agreement in the number and disposition of the cephalic spines. In both the number is 29, and they are arranged round the oral sucker in a single row, uninterrupted, save in the mid-ventral line. The peculiar arrangement of the spines at each end, where two are on a different level from the rest and much smaller in size, is the same in both. The shape and position of the suckers also correspond, allowance being made for the great backward elongation of the body in the adult. The initial stages of this transformation I have observed within the intestine of *Hæmatopus ostralegus*, in which several cercariæ which had only recently emerged from the cyst were found. They differed from the encysted cercariæ in the cockle in no respect save the increased length of the body. Comparison of the measurements of these with corresponding measurements in the encysted cercaria and in the adult found in *Larus ridibundus* demonstrates the fact that the growth of the suckers compared with that of the length of the body takes place in the same proportion from the first to the second stage as from the second to the third. This will be best seen from the following table:—

	Encysted cercaria in cockle.	From <i>Hæmatopus</i> .	From <i>L.</i> <i>ridibundus</i> .
Length	·77 mm.	1·21 mm.	7·29 mm.
Oral sucker (diameter)	·065 "	·068 "	·11 "
Ventral sucker "	·095 "	·112 "	·33 "
Increase in length .....	..	·44 "	6·08 "
" oral sucker.....	..	·003 "	·042 "
" ventral sucker ....	..	·017 "	·218 "
Ratio of increase in oral sucker to increase in length ....	..	1 : 147	1 : 145
Ditto, ventral sucker .....	..	1 : 26	1 : 28

From these considerations it seems probable that *Echino-stomum secundum* is the adult form of the encysted cercariæ of the cockle and the mussel †.

* Ann. & Mag. Nat. Hist. ser. 7, xvii. p. 148, pl. iv. fig. 5.

† Later I found *E. secundum* occurring very numerously in *Larus argentatus*. The examples in this case were in an earlier stage of development, being smaller than those in *L. ridibundus* and containing few or

Zeugorchiis acanthus, gen. et sp. n.
(Pl. XII. figs. 4, 5; Pl. XIII. figs. 6, 7.)

From the bursa fabricii and cloaca of the herring-gull (*Larus argentatus*).

The body is of a somewhat oval outline; flattened ventrally, convex dorsally. It is divided into three portions. The anterior, corresponding to the head, bears the oral sucker, surrounded by a collar carrying a row of spines. It is separated from the rest of the body by a distinct though not deep constriction. The breadth at the collar is .87 mm. The middle portion of the body is flattened and expanded, with a breadth of 1.60 mm. In the posterior portion the breadth reaches a maximum of 2.11 mm., from which point it diminishes rapidly to the end. The posterior end is blunt. The length of the whole animal is 3.91 mm., of which the posterior part comprises 2.43 mm., or nearly two thirds.

The cuticle is beset with numerous rows of stout spines (Pl. XII. fig. 5). These cover the whole of the middle portion of the body and part of the posterior. They are almost entirely absent from the posterior half. The spines vary considerably in size, those in front measuring .019 mm., while those further back attain a length of .031 mm. The rows are about .025 mm. apart anteriorly, but become more widely separated on passing backwards.

The ridge bearing the cephalic spines is somewhat peculiar. It bears a distinct resemblance to the collar of a coat, and differs greatly from the corresponding structure found in the genus *Echinostomum*. It is flat, with very definite outline, and its edges are carried right up to the oral sucker, so that the terminal spines are contiguous with the rim of the sucker. About 12 spines can be seen on each side in a ventral view, while dorsally there are about 30, the total number being about 60. They are all nearly equal in size (about .037 mm.), but ventrally they appear to diminish somewhat as they approach the end of the ridge, so that the spines nearest the sucker are the smallest. The surface of the collar is slightly furrowed by muscular bands running down to meet the spines.

no ova. Ovary comparatively small and vitelline glands scanty. Cephalic spines 29 in number, reaching a length of .065 mm. in some cases. The herring-gull from which the specimens were obtained was much infected with parasites, *Tocotrema lingua* and *Levinsenia similis* occurring in great numbers. Each parasite was confined to a particular part of the gut, the order being *Echinostomum*, *Tocotrema*, *Levinsenia*.

The suckers are large and muscular. Both are globular. The oral sucker has a diameter of $\cdot 50$ mm., with a circular aperture of $\cdot 26$ mm. The ventral sucker is situated at the level of the junction of the middle and posterior parts of the body. Its diameter is $1\cdot 08$ mm. The mouth opens in the oral sucker and is continuous with a large pharynx, there being no pre-pharynx. The pharynx is $\cdot 24$ mm. long. From this the intestine almost immediately divides into two wide branches, which pass down the whole length of the body nearly to the posterior end.

The genital organs are not distinct, being obscured by the numerous ova which occupy the greater part of the posterior portion of the body. Not far from the ends of the intestinal diverticula and contiguous with them are two large somewhat circular testes, about $\cdot 55$ mm. in diameter, placed closely together side by side. The ovary is slightly in front, but hidden by the ova. The vitelline glands are of small extent, being confined to the posterior part of the body, behind the ventral sucker. They are in two rows, one on each side of the body, at some distance from the margin. The genital aperture is situated on a small prominence just in front of the ventral sucker. The aperture is elliptical and very distinct. There is apparently no penis-sac.

The ova are numerous and rather peculiar. They are of two kinds: the younger are in the rear and vary in length from $\cdot 081$ to $\cdot 095$ mm., the breadth being $\cdot 040$ to $\cdot 044$ mm.; the older ova (Pl. XIII. fig. 7) are larger, measuring $\cdot 106$ to $\cdot 113$ mm. \times $\cdot 056$ to $\cdot 062$ mm.; they are distinguished from the younger by being lighter in colour and by the presence of a dense, dark, variably shaped spot about $\cdot 014$ to $\cdot 016$ mm. in diameter. In many cases this has the form of a cross. It is not difficult to perceive in this the "eye-spots" of the *Miracidium* larva developing within the egg-capsule. In this species the "eye-spots" are particularly large and distinct, so that they form the most striking feature of the ova at first sight.

In one specimen several ova were observed lying in the cavity of the ventral sucker. From many of these the capsule had been ruptured, the rupture having taken place in the direction of the long axis, so that two equal halves remained, united at one extremity. From this it is probable that the ovum develops completely into the *Miracidium* within the uterus, and there is a suggestion that the ventral sucker acts as a sort of receptacle for the ova until the capsule is ruptured and the *Miracidia* are set free. In the absence of fuller information this can only remain a supposition, and

the occurrence is more likely to be the result of chance. There is no doubt, however, that the *Miracidia* are set free before the ova leave the host, as occurs in some other forms, e. g. *Distomum macrostomum* and *D. lanceolatum* *.

The systematic position of this species is difficult to decide. It certainly cannot be classed in the genus *Echinostomum*, for, although it has a circum-oral collar, bearing spines, the shape of the collar and the arrangement of the spines on it are quite unlike any found in that genus. Moreover, it differs widely in internal structure. The most important features of difference are: (1) the apposition of the pharynx to the oral sucker and the absence of œsophagus, (2) the position of the testes, (3) the situation and extent of the vitelline glands, (4) the advanced development of the ova. These features are of generic importance. For the same reasons it cannot be included with any of the allied genera *Stephanostomum*, *Acanthostomum*, *Centrocestus*, and *Ascocotyle*, each of which possesses a crown of spines round the mouth. In its internal anatomy it approximates more closely to the genus *Pygorchis*, Looss †, but in spite of certain similarities the points in which it differs are of sufficient importance to prevent its inclusion in that genus. It bears the closest resemblance of all to an as yet unique species, *Distomum pittacium*, Braun ‡. Together they agree with *Pygorchis* in having the intestinal diverticula extending almost to the posterior extremity of the body, the vitelline glands of small extent and entirely behind the ventral sucker, and in the presence of well-developed eye-spots within the ova. *Pygorchis*, however, differs in having the testes placed obliquely behind each other, in having the vitelline glands stretching obliquely across the body, in the forward position of the genital aperture, and in the possession of a penis-sac. In addition, *Pygorchis* is destitute of spines of any description. *Distomum pittacium* also entirely lacks spines, and in Braun's figure there is not the slightest vestige of a collar round the oral sucker. The otherwise remarkable resemblance between this species and *Zeugorchis acanthus* inclines one to doubt whether Braun's species was really provided with spines or not. Judging from the tenacious manner in which the spines remain fixed to the body in my examples, it seems very unlikely that they can have been completely stripped off; besides, in any case, the collar would remain.

The question now is whether *Distomum pittacium* is to be

* Bronn's 'Thierreich,' Vermes, I. i. p. 778.

† Zool. Jahrbücher, Syst. xii. p. 587.

‡ *Op. cit.* xvi. p. 146.

included along with *Zeugorchis acanthus* in the same genus or not. This will be done with more or less readiness according to the importance attached to the presence of the collar and spines. As regards internal anatomy the two are well-nigh identical.

In choosing a generic name I have studiously avoided reference to the spines or the circum-oral collar, so that in the event of the inclusion of *Distomum pittacium* the name may not be inappropriate. The close apposition of the testes seemed to me a sufficiently diagnostic point on which to found the generic name.

Levinsenia similis (*Spelotrema simile*), Jägerskiöld.
(Pl. XIII. fig. 8.)

From the intestine and cæca of a herring-gull (*Larus argentatus*) considerably over a hundred examples of this parasite were obtained. While they correspond closely in their structure to Jägerskiöld's exhaustive description* of the species (as *Levinsenia pygmæa*, var. *similis*), yet they differ slightly in one or two particulars and very much in size.

Levinsenia pygmæa was first described as *Distomum pygmæum* by Levinsen† from *Somateria mollissima*. According to him it was of very small size, its length rarely exceeding .5 mm., usually much smaller. The oral sucker, too, was always slightly larger than the ventral. Jägerskiöld later found a similar form occurring in *Larus argentatus* and *L. fuscus*. The size, however, was considerably greater and the oral sucker was smaller than the ventral. The most striking peculiarity of the species is the arrangement of the genital system. The situation of the testes and ovary is not unusual, but the occurrence of a large vesicula seminalis just in front of the ventral sucker and the position of the genital aperture to the left of the same sucker, together with the presence of a genital sinus, are diagnostic features.

Jägerskiöld compares the specimens which he found in *Larus* with those found both by Levinsen and himself in *Somateria mollissima*. The size of the former, as already mentioned, exceeds that of the latter considerably. The length of my specimens from *Larus*, however, shows a much greater divergence. Out of about 30 examples measured, none possessed a length of less than .85 mm., and many of them greatly exceeded this, attaining in some cases a length of 1.30 mm. The breadth of the body and the sizes of the

* Centralbl. f. Bakt. &c. xxvii, p. 732.

† Bidrag til Kundskab om Grönl. Trematodfauna, p. 23, pl. iii. fig. 2.

various structures are proportionately large. Comparison with Jägerskiöld's specimens will best be seen by the following list of measurements:—

	Jägerskiöld.	
	mm.	mm.
Length	·42 -·60	·85 -1·30
Maximum breadth.....	·20 -·22	·35 - ·44
Oral sucker (diameter)	·048-·060	·07 - ·08
Ventral sucker (diameter)	·052-·064	·07 - ·095
Pharynx (length)	·032-·036	·043- ·049
" (breadth)	·020-·022	·030- ·037
Undivided intestine	·16 -·20	·37 - ·61
Intestinal diverticula.....	·1 -·13	·23 - ·37
Ovary	·050	·09 - ·11
Testes		·13 × ·09
Ova	·023 × ·011	} ·022- ·025 × } 009- ·011

From this it is evident that the only point of correspondence is in the size of the ova. In this connexion some of my specimens show a number of ova towards the end of the uterus, which are much larger than the others, measuring $\cdot028 \times \cdot019$ mm. A feature which Jägerskiöld does not mention is that the uterus starting on the right side contains almost colourless ova on that side, while on the left the ova have a brownish-yellow colour and are very slightly larger.

As regards the general contour, Levinsen figures *Distomum pygmæum* somewhat after the fashion of an isosceles triangle. Jägerskiöld, however, never found specimens of that shape either in *Larus* or in *Somateria*. To his mind the form is biscuit-shaped ("biscuit-förmig") and sometimes, but rarely, club-shaped ("keulen-förmig"). He depicts * a young specimen from *Hæmatopus ostralegus* which shows this latter shape. He adds that in life the animal is probably pear-shaped, with a greater or less concavity on the ventral side of the anterior part of the body. Now the majority of the examples which have come under my observation have, or tend to have, this pear-shaped or club-shaped form, although at the same time they are considerably flattened dorso-ventrally; many of them are, certainly, not so attenuated anteriorly, but there is always a marked distinction, often, indeed, a constriction between anterior and posterior parts, and the latter is always well rounded.

Jägerskiöld makes no mention of having found *Levinsenia similis* in the intestinal cæca of *Larus argentatus*. I found

* *Op. cit.* p. 734.

specimens occurring there in considerable numbers and of much larger size than those in the intestine. One exceptionally large specimen reached a length of 1.56 mm. and the others all exceeded 1 mm. It was noticeable that, in passing down the intestine, the specimens tended to increase in size.

The advisability of making a new species for the *Levinsenia* from the gulls has been discussed by Jägerskiöld. While inclined at first to regard it merely as a variety of *L. pygmæa*, he later * raised it to the position of a distinct species. Further he makes it the type of a new genus, *Spelotrema*, including *Distomum pygmæum*, *macrophallos*, and *claviforme*, distinct from the genus *Levinsenia*, of which *D. brachysomum* was the type. Looss †, however, does not entirely agree with this, maintaining that as *D. brachysomum* was a species inquirenda it could not be employed as a genus type, and that therefore the name *Levinsenia* ought rightly to remain for the species included under Jägerskiöld's *Spelotrema*, with *L. similis* as the type.

That my specimens are identical with those of Jägerskiöld there can be little doubt, despite the disparity in size. The relative size of the suckers, which enabled Jägerskiöld to differentiate *L. similis* from *L. pygmæa*, is usually a point of diagnostic importance. In this respect my experience agrees with that of Jägerskiöld; although it is certainly a matter of some difficulty to decide in this case, for in many examples the ventral sucker, by reason of compression, acquires an elliptical form, the long axis being as often longitudinal as transverse. In a large series of measurements it was found that the ventral sucker was in most cases, if not all, slightly larger than the oral. The inclusion of *Distomum claviforme*, Brandes ‡, within the genus *Levinsenia* is open to question. As Jägerskiöld says, it is a species impossible to identify. Brandes's figure certainly leaves much to be desired and his description is by no means full. Jägerskiöld's interpretation § of Brandes's figure is plausible and seems necessary if *D. claviforme* is to take its place alongside the other species in the genus *Levinsenia*. On this assumption it would bear a very strong resemblance to my specimens of *L. similis* both in shape and structure, for it has the typical club shape, although of much smaller size (.3-4 mm.).

Brandes sees in *Distomum claviforme* the adult of the

* Centralbl. Bakt. xxx. p. 982 (1901).

† Zool. Jahrbücher, xvi. p. 705.

‡ Arch. f. Naturg. liv. p. 247.

§ Centralbl. Bakt. xxvii. p. 739.

encysted cercaria described by Professor M'Intosh* from *Carcinus mænas* and *Cancer pagurus*. He bases his assumption on the close resemblance between the cercaria and the adult, and endeavours to correlate the various structures in them. He is possibly correct, but there is just as much ground for assuming that *Levinsenia* from *Larus* is the adult of the cercaria from *Carcinus*. The shape and the structure show just as much resemblance. The occurrence of the adult in such great numbers corresponds, too, with the exceptional frequency and abundance of the cysts in the crab. Until proper feeding experiments have been conducted or more accurate information is forthcoming the point must remain in abeyance, though it is known that gulls and other birds readily devour *Carcinus* and *Cancer*, e. g. after storms on the West Sands at St. Andrews.

Psilostomum redactum, sp. n. (Pl. XIII. fig. 9.)

From the intestine of the 3-spined stickleback (*Gasterosteus aculeatus*).

The stickleback has been examined by several observers, yet, although quite a number of parasites are described from it, only two Distomidæ, viz. *Distomum ventricosum* and *D. appendiculatum*, have so far been recorded.

Psilostomum redactum is a small species of length 1.40 mm. The breadth is variable. Both anterior and posterior ends are somewhat bluntly pointed. The widest parts of the body occur at distances of about $\frac{2}{7}$ of the whole length from each end. The body narrows again in the middle. At the broadest parts the breadth is .45 mm.; in the middle it is .31 mm.; towards the end of the tail .18 mm. The surface of the body is not armed with spines, but the cuticle has distinct longitudinal and transverse striations.

The oral sucker is subterminal and circular, with a diameter of .16 mm. The ventral sucker is elliptical, with the long axis transverse; it measures .38 × .23 mm. The cuticle of the ventral sucker presents a beautifully distinct reticular striation.

The mouth opens in the oral sucker and is continuous with a large muscular pharynx, .09 mm. broad. The gut branches into two diverticula immediately behind the pharynx. The diverticula widen as they pass down, so that they assume an almost sac-like shape, but towards the end they become

* Q. Jour. Micr. Sc., July 1865, p. 200, pl. viii.

constricted again. They very nearly reach the extreme tip of the tail.

The testes are large, irregularly-shaped bodies, situated one behind the other about $\cdot 45$ mm. from the posterior end of the body. Their long axis is transverse and is included between the gut-diverticula. The ovary lies just in front of the anterior testis, is smaller than the latter and of somewhat oval shape. The vitelline glands extend along each side of the body, ventral to the intestinal diverticula; they almost reach the ventral sucker anteriorly, and are only a short distance from the end of the tail posteriorly. The lobes are fairly large and are particularly voluminous in some parts.

The ova are not numerous (about 30), but are of considerable size, $\cdot 078$ to $\cdot 081$ mm. \times $\cdot 040$ to $\cdot 042$ mm. The genital aperture is in front of the ventral sucker, but somewhat to the left side of the middle line, a feature characteristic of the genus.

At the extreme tip of the tail is the excretory aperture, to which a long, narrow, straight tube runs down. At the top of this tube there was in the living specimen a distinct yellowish refractive body, oval in shape, measuring $\cdot 014 \times \cdot 012$ mm. After death this became less distinct and on keeping some time it almost entirely disappeared.

The only three species of this genus are all described by Mühling*. *P. redactum* agrees with them in their characteristic features, viz. (1) absence of œsophagus, (2) position of testes and ovary, (3) disposition of vitelline glands, (4) situation of genital aperture. It differs in habitat, however, for the others are described from the intestine of marine birds, *Harelda glacialis* and *Fuligula nyroca* (*Nyroca ferina*).

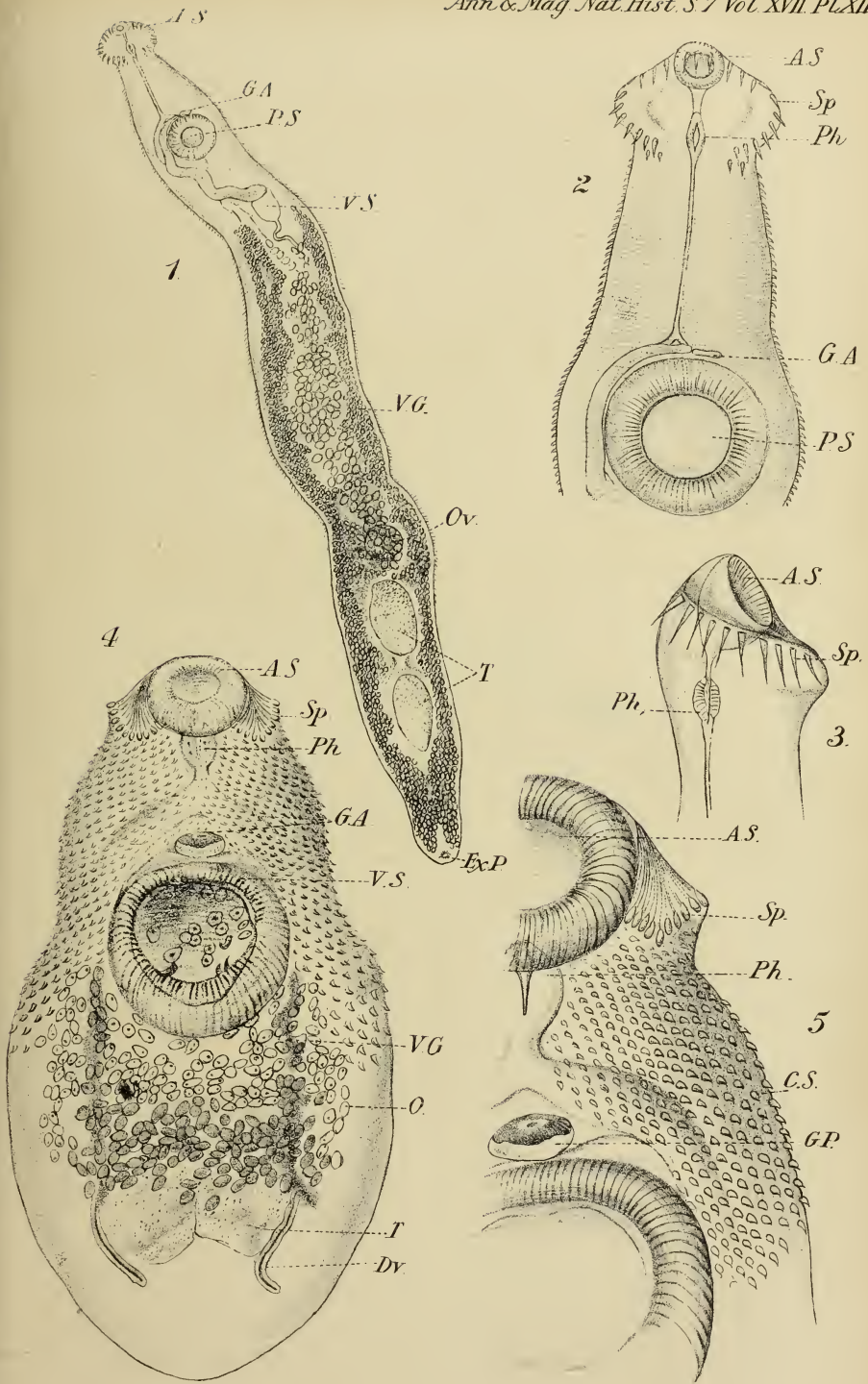
In another three-spined stickleback a specimen (Pl. XIII. fig. 10) differing in many respects from the foregoing was found. It presented the following features of difference:—

Length $2\cdot 54$ mm.; breadth, comparatively uniform, $\cdot 40$ – $\cdot 65$ mm. Pharynx proportionately small.

The testes are circular in outline and measure $\cdot 28$ mm. and $\cdot 35$ mm. in diameter respectively. The greatest difference occurs in the character and disposition of the vitelline glands, which in this specimen extend in front of the ventral sucker. The lobes also are smaller and much denser.

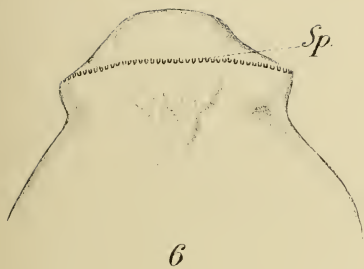
The ova are more numerous, but their size remains practically the same, viz. $\cdot 075$ to $\cdot 081$ mm. \times $\cdot 040$ to $\cdot 044$ mm. The

* Arch. f. Naturg. lxii, p. 243, and lxiv. p. 96.

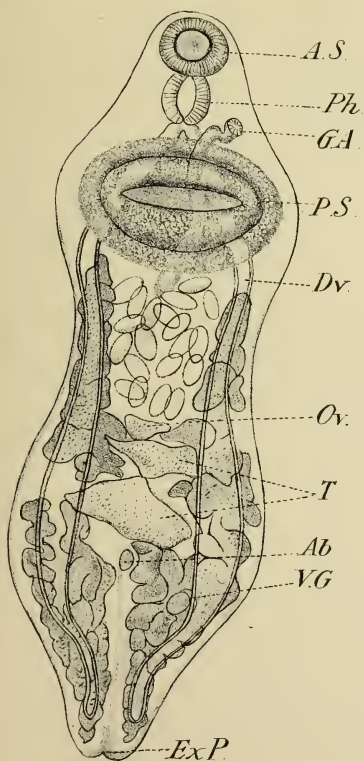
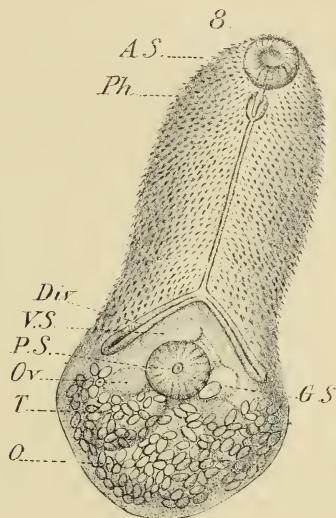


1 2 3 DFM. del.
4 5 ERB. del.

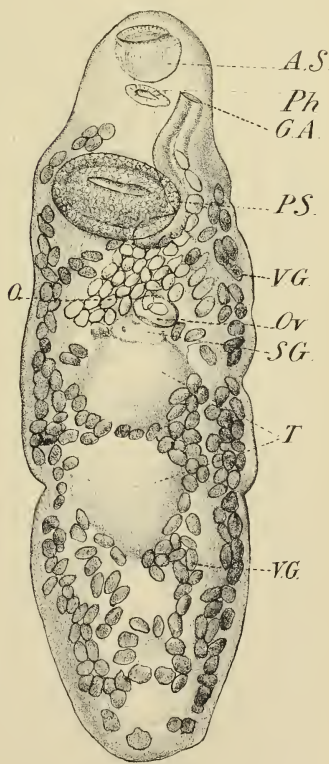
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genital aperture is well forward, on a level with the pharynx, but to the left of it.

This is probably an older example of *P. redactum*, and the differences are due to development.

EXPLANATION OF PLATES XII. & XIII.

The following letters apply to all the figures :—

<i>A.S.</i> Oral sucker.	}	<i>P.S.</i> Ventral sucker.
<i>Ph.</i> Pharynx (œsophageal bulb).		<i>G.A.</i> Genital aperture.
<i>V.S.</i> Vesicula seminalis.		<i>V.G.</i> Vitelline glands.
<i>Ov.</i> Ovary.		<i>T.</i> Testes.
<i>Ex.P.</i> Excretory pore.		<i>Sp.</i> Cephalic spines.
<i>O.</i> Ova.		<i>Dv.</i> Intestinal diverticula.
<i>S.G.</i> Shell-gland.		

- Fig.* 1. *Echinostomum secundum*. × 16.
Fig. 2. Ditto. Anterior end. × 60.
Fig. 3. Ditto. Lateral view of head.
Fig. 4. *Zeugorchis acanthus*. × 25.
Fig. 5. Ditto. Part of anterior end to show arrangement of spines (*c.s.*) on body. *G.P.* Genital papilla. × 60.
Fig. 6. Ditto. Posterior view of head. × 35.
Fig. 7. Ditto. Ovum. *E.S.* Eye-spots. × 100.
Fig. 8. *Levinsonia similis*. *G.S.* Genital sinus.
Fig. 9. *Psilostomum redactum*. *Ab.* Refractive body.
Fig. 10. Ditto. Older example.

LXIX.—*Descriptions and Records of Bees.*—XI.
 By T. D. A. COCKERELL, University of Colorado.

AUSTRALIA (including Tasmania) possesses thirty-five described species of *Megachile*, all first described by F. Smith with the exception of three, made known by Fabricius, Radoszkowski, and Froggatt respectively. In 1904 I had an opportunity to study Smith's types in the British Museum, and I have now been permitted to work up the material which has accumulated in that Museum since Smith's time, the present paper being the result. I include in my tables two species of *Lithurgus*, which are easily confused with *Megachile*.

The Australian species of *Megachile* do not appear, for the most part, to be closely related to those of the Austro-Malay islands. Thus, of all the Australian species known in the female, only two have the ventral scopa black, and three or four have it red or fulvous, all the rest having it white or nearly so. The Austro-Malay islands are richly endowed with fifty-five described species, most of which have the scopa

black or red, white being quite an uncommon colour. With these characters go others, not readily expressed in a few words.

Females.

- | | | |
|--|-----|--|
| Abdomen entirely bright red, or only part of first segment black | 1. | |
| Abdomen not red, or at most with the apex red | 2. | |
| 1. Small; the red not due to tomentum . . . | | <i>M. abdominalis</i> , Sm. |
| Larger; the red due to tomentum | | <i>M. mystacea</i> , Fabr. |
| 2. Ventral scopa entirely black; large black species, with deep fuliginous wings . . . | | <i>M. Doddiana</i> , Ckll. |
| Ventral scopa bright red; abdomen with purple or green tints | | <i>M. pictiventris</i> , Sm. |
| Ventral scopa white or nearly so, often with black at extreme apex | 3. | |
| 3. Apex of abdomen with the tegument red . | 4. | |
| Apex of abdomen with the tegument not red | 5. | [Sm.*] |
| 4. Larger; marginal cell sharply pointed . . | | <i>Lithurgus rubricatus</i> , |
| Smaller; marginal cell rounded at apex . . | | <i>M. modesta</i> , Sm. |
| 5. Wings fuliginous or smoky, with the base light; abdomen black, without bands, but the first segment with white hair . . | 6. | |
| Wings hyaline or dusky; when the latter, abdomen conspicuously banded | 7. | |
| 6. Length about 17 mm.; clypeus with a great process on each side | | <i>M. monstrosa</i> , Sm. |
| Length about 12 mm.; clypeus without such processes | | <i>M. suffusipennis</i> , Ckll. |
| 7. Ventral scopa entirely white; cutting-edge of mandibles covered by a fringe of fulvous hair | | <i>M. fulvomarginata</i> , Ckll. |
| Ventral scopa with some black hairs on apical segment, at least | 8. | |
| 8. Mandibles mainly red; size small, length about 10 mm.; sides of ventral scopa practically without black hairs | | <i>M. atrella</i> , Ckll. |
| Mandibles black; size larger, or, when as small, sides of ventral scopa with conspicuous black hairs | 9. | |
| 9. Hair of top of head ochreous, or, at least, nearly all so; sixth abdominal segment covered with ochreous tomentum; abdomen conspicuously banded | | [<i>maculata</i> , Sm.).
<i>M. macularis</i> , D. T. |
| Hair of top of head black or dark fuscous . | 10. | |
| 10. Abdomen parallel-sided, the hair-bands orange in the middle, and a patch of orange tomentum occupying part of fifth and sixth segments | | <i>M. Hampsoni</i> , Ckll. |

* The specimen of *Lithurgus rubricatus* (labelled simply "Australia") before me differs from the type in having distinct pulvilli. I do not think it is a different species, but rather that the pulvilli are sometimes evident and sometimes not, according to the condition of the specimen.

- Abdomen shovel-shaped, the hair-bands white 11.
11. Larger; length about 13 mm.; hind spurs black *M. Waterhousei*, Ckll.
- Smaller; length about 10 mm.; hind spurs red. *M. quinquelineata*, Ckll.

Males.

- Head and thorax black; abdomen bright red, the colour not due to tomentum: size small *M. abdominalis*, Sm.
- Head and thorax black; abdomen (except for the hair or tomentum) black or almost 1.
1. Abdomen bright red, from a covering of tomentum *M. mystacea*, Fabr.
- Abdomen not so. 2.
2. Anterior tarsi flattened and peculiarly coloured 3.
- Anterior tarsi ordinary 6.
3. Size small: upper surface of anterior tarsi white striped with black; last two abdominal segments with orange tomentum *M. nigrovittata*, Ckll.
- Larger, 10 or 11 mm. long 4.
4. Upper surface of anterior tarsi without black markings; anterior femora and tibiæ mainly red 5.
- Upper surface of anterior tarsi with a conspicuous black spot on second joint; anterior femora red. *M. darwiniana*, Ckll.
5. Fifth abdominal segment with conspicuous erect black bristles; outer edge of anterior tibiæ (except at ends) straight *M. cygnorum*, Ckll.
- Fifth abdominal segment without black bristles; outer edge of anterior tibiæ presenting an angle a little before the middle *M. Gahani*, Ckll.
6. Tibiæ and tarsi, and greater part of anterior femora, red *M. Kirbyana*, Ckll.
- Legs black 7.
7. Smaller: apex of abdomen showing more or less red. 8.
- Larger: apex of abdomen not showing red. 9.
8. The red almost confined to penultimate segment, and due entirely to tomentum *M. tomentella*, Ckll.
- The red including the last two segments, and apical margin of fourth, and not due to tomentum. *M. rhodura*, Ckll.
9. Apex of abdomen terminating in a point; antennæ short [Ckll.*
Lithurgus atratiformis,
- Apex of abdomen emarginate; antennæ long *M. Austeni*, Ckll.

* *Lithurgus atratiformis*, Ckll., has only been described in the female. The ♂ (Queensland, *Gilbert Turner*, 304) is like that of *L. atratus*, Sm., but differs by having the hair of the face all white, that of the pleuræ all

Megachile abdominalis, Smith.

Townsville, Queensland, 12. 2. 03 (*F. P. Dodd*); Queensland (*Gilbert Turner*, 322 Hy.).

Megachile mystacea, Fabricius.

Port Darwin (*J. J. Walker*, 747, 748); Queensland (*Gilbert Turner*, 232 Hy.).

Megachile pictiventris, Smith.

M. secunda, D. T. (*senex*, Smith), is the same insect. Queensland (*Gilbert Turner*, 296 Hy.).

Megachile Doddiana, sp. n.

♀.—Length $16\frac{1}{2}$ mm.; expanse of wings about 27 mm.; width of abdomen $5\frac{1}{2}$ mm.

Black, with very dark fuliginous wings, which are strongly purple-iridescent; pubescence short and black, not abundant; a patch of white hair on each side of the face, between the eye and the antenna; each side of first abdominal segment with a large patch of hair, the upper half of which is white; hair on inner side of tarsi (especially anterior ones) more or less reddened; a very little scattered light hair on coxæ and bases of femora beneath; rest of hair all black, including scopa; head and thorax coarsely and extremely densely punctured, the punctures of top of head larger than those of mesothorax; head large, with broad cheeks, which at the lowermost point bear a sharp tooth, directed downwards; clypeus confluent punctured, its anterior margin with a pair of widely separated shining broad triangular teeth, the interval bearing a small nodule in the median line; mandibles elongated, the outer margin bisulcate (or tricarinate), the apex curved inwards, the long cutting-edge (which is bordered by a line of shining reddish tomentum) bearing a short sharp tooth before the middle; labrum normal, with blunt corners; antennæ black; middle tibiæ with a conspicuous apical tooth directed outwards; last segment of abdomen vertical.

Hab. Townsville, Queensland, 10. 1. 03 (*F. P. Dodd*).

By the black colour and coarse sculpture it resembles

black (except a very little white hair in front), the black hair at sides of sixth abdominal segment scarcely half as long, and the marginal cell much more sharply pointed.

M. scabrosa, Sm., discovered by Wallace in the Aru Is. It appears to be the Australian representative of *M. lachesis*, Sm., which is widely distributed among the islands to the north. The only other Australian species with a black scopa is *M. fumipennis*, Sm., which is easily known from *M. Doddiana* by the white pubescence of face, &c.

Megachile modesta, Smith.

Queensland (*Gilbert Turner*, 756, Ridg. 4. 92).

This seems to agree with Smith's too brief description, but it may prove distinct upon comparison. It is also very near to *M. apicata*, Smith; possibly not specifically different. The anterior margin of the clypeus has a pair of short widely-separated teeth, the interval being convex, so as to suggest a rudimentary middle tooth.

Megachile monstrosa, Smith.

Townsville, Queensland, 7. 1. 03 (*F. P. Dodd*).

The ventral scopa is yellowish white, hardly fulvous as Smith describes.

Megachile suffusipennis, sp. n.

♀.—Length 12–13 mm.; expanse of wings about 18 mm.

Black, with a parallel-sided abdomen; wings fuscous, hyaline at base; upper half of marginal cell very dark; pubescence arranged nearly as in *M. Doddiana*, but white, including the scopa; the broad vertex has a few dark hairs; head and thorax very densely punctured; facial quadrangle about square; antennæ black; cheeks simple; anterior margin of clypeus straight; mandibles broad, bisulcate, the inner tooth subapical and rounded; tegulæ black; scutello-mesothoracic suture with two transverse marks of white tomentum; middle tibiæ without a conspicuous apical tooth; abdomen bandless, with large well-separated punctures; first segment with a conspicuous tuft of white hair on each side; fourth and fifth segments with hardly noticed short black hair; sixth with short dull white hair; hind spurs black.

Hab. Queensland (*Gilbert Turner*, 289 Hy.).

Very near to *M. lucidiventris*, Sm., which differs by the fuscous hair of clypeus, ferruginous spurs, &c.

Megachile fulvomarginata, sp. n.

♀.—Length about 12 mm.

Black, abdomen parallel-sided; wings hyaline, with the

nervures black ; pubescence, including the scopa, white ; head and thorax strongly and very densely punctured ; head very large, vertex very broad ; cheeks very broad, unarmed, with strong well-separated punctures on a shining ground ; flagellum dull reddish beneath, especially at apex ; sides of face with much snow-white hair ; clypeus low and broad, its anterior edge straight, with an obscure median nodule ; mandibles elongate, the cutting-edge covered by a very conspicuous band of golden-fulvous hair, which completely hides what rudiment there may be of the second tooth ; blade of maxilla light rufo-fulvous ; tegulæ black, a little tuft of white hair on thorax above and behind each ; a tuft of white hair at each extreme side of metathorax ; claws with a short basal denticle projecting at right angles ; hind spurs clear rufous ; hair on inner side of basal joint of hind tarsi very light yellowish ; abdomen above white-pruinose, with a spot of white hair on each side of first segment, and indications of marginal bands on second and third.

Hab. Queensland (*Gilbert Turner*).

Presented to the Museum by Mr. E. Saunders.

Megachile atrella, sp. n.

♀.—Length about 9 mm.

Abdomen parallel-sided, but short ; black, with dull white pubescence ; scopa white with a faint yellowish tint, black on last segment ; hair of vertex fuscous, but very scanty ; apical part of abdomen above with some dark hair ; sides of face with much white hair ; a white patch at each side of first abdominal segment ; the segments have obscure dull white or greyish narrow hair-bands. Head large, considerably wider than thorax ; cheeks unarmed ; flagellum obscurely brown beneath ; clypeus with large confluent punctures, the upper part with a central smooth shining area ; mandibles dark red, with the 4-dentate cutting-edge black ; mesothorax and scutellum with extremely dense small punctures ; tegulæ piceous with a rufous spot ; wings hyaline, nervures black ; legs quite hairy, the hairs on anterior and middle tarsi bent over or hooked at end ; hair on inner side of basal joint of hind tarsi pale fulvous ; claw-joints and claws ferruginous ; hind spurs dark reddish piceous ; hind tarsi much longer than the others, which are shortened, the joints 2 to 4 being short and broad, triangular.

Hab. W. Australia ; "68. 6."

Superficially it resembles the European *M. rotundata*, Fabr., but it is more robust.

Megachile macularis, Dalla Torre.

Queensland (*Gilbert Turner*, 295 Hy. and 622, Seaf. 3. 90).

The pubescence of the thorax and abdomen above varies from decided ochreous to yellowish white.

Megachile Hampsoni, sp. n.

♀.—Length about 14 mm.

Abdomen long and parallel-sided; black, with black, white, and orange pubescence, the latter only on the abdomen; head large, but cheeks and vertex rather narrow, the distance from a posterior ocellus to margin of occiput less than the distance to opposite posterior ocellus; head and thorax above densely and strongly punctured, but on scutellum, and especially on hind middle of mesothorax, the shining surface is very apparent between the punctures; clypeus and supra-clypeal area with very large punctures, the latter punctured all over; anterior edge of clypeus straight; flagellum dark reddish beneath; mandibles black, only the extreme tip dark reddish, cutting-edge notched near the tip, but otherwise the teeth obsolete; sides of face, and cheeks, with much white hair; hair of front dull pale ochreous, of vertex short and dark fuscous; a conspicuous tuft of white hair just below tegulæ, and sides of metathorax and lower part of pleura with much white hair; upper part of pleura, extreme sides of scutellum, and mesothorax just above tegulæ, with black hair; tegulæ rufo-piceous, with a large fulvous spot posteriorly. Wings dusky, nervures black, second recurrent nervure exactly meeting second transverso-cubital; upper part of marginal cell with a fuliginous streak. Legs black, with white pubescence; the claws ferruginous, with a slender oblique basal denticle; hind spurs black; basal joint of hind tarsi broad and flat, the hair on its inner surface reddish chocolate. First abdominal segment broadly concave, with a tuft of white hair on each side; segments 2 to 4 with short black hair (except basally, where they are nude), and with narrow, but very distinct marginal hair-bands, white at the extreme sides, but otherwise orange; fifth segment with the marginal band orange, but the orange also invades the disk, leaving the black only at the sides; sixth with the base broadly covered with orange tomentum; ventral scopa long and white, black on the last segment and at extreme sides of penultimate one.

Hab. Fremantle (*J. J. Walker*, 1938).

Named after Sir G. F. Hampson, of the British Museum.

In some of its characters it resembles *M. oblonga*, Sm., *chrysopyga*, Sm., and *heriadiformis*, Sm., but it is quite distinct. It has the form of the American *M. pugnata*, Say.

Megachile Waterhousei, sp. n.

♀.—Length about 13 mm.; width of abdomen 5 mm.

Black, with white pubescence, abundant and quite long on front, sides of face, cheeks, pleura, and metathorax, and forming a spot above each tegula; hair black or dark fuscous on vertex, and a little on the practically nude mesothorax, some black also on the ventral surface of thorax; head broad; flagellum dull reddish beneath; clypeus confluentely punctured, with a median impunctate line; anterior margin of clypeus irregular; mandibles with two well-formed teeth, the inner angle hardly forming a tooth; mesothorax dullish, extremely densely punctured; tegulæ ferruginous, with a fuscous spot, and the anterior margin broadly subhyaline. Wings only slightly dusky, upper half of marginal cell with a fuliginous streak; nervures piceous, second r. n. not meeting second t.-c. Basal joint of hind tarsi broad and flat, the hair on its inner side yellowish fuscous; apical projections of middle and anterior tibiæ tipped with red; hind spurs black; abdomen broad, with five white hair-bands; scopa white, black on last segment, and some black at extreme sides of third and following segments.

Hab. Queensland (*Gilbert Turner*, 295, Seaf. 3. 90).

Named after Mr. Chas. O. Waterhouse, of the British Museum. It has the general form of the American *M. latimanus*, Say.

Megachile quinquelineata, sp. n.

♀.—Length about 10 mm.

Similar to *M. Waterhousei*, but much smaller, and also differing as follows;—Snow-white abdominal bands narrower and more regular; apical dorsal segment with black bristles, and wholly without light hair or tomentum; mesothorax and scutellum with conspicuous long black hairs (as seen from the side), especially long on scutellum; anterior margin of mesothorax with white hair; hind spurs bright ferruginous; apical points of anterior and middle tibiæ not tipped with red; antennæ black, the flagellum pruinose; clypeus densely punctured all over; mandibles obsoletely 4-dentate, with a minute spot of glittering orange-fulvous tomentum

near the apex; tegulæ piceous; second r. n. meeting second (morphologically third) t.-c., or just falling short of it.

Hab. Queensland (*Gilbert Turner*, 374, and 326 Hy., Seaf. 3. 90).

Superficially like the European *M. apicalis*, Spinola.

Megachile nigrovittata, sp. n.

♂.—Length slightly over 8 mm.

A small narrow species, with the last three abdominal segments covered with orange tomentum, the apex briefly bituberculate; anterior coxæ with no distinct spines. This is superficially very like several other species, but may be readily known by the remarkable anterior legs, as follows:—Tibiæ shining black, with an apical creamy-white patch; tarsi white, broadly expanded, the first three joints forming a very large oblong structure, concave beneath, having on its upper surface a long black streak parallel with the anterior edge, tapering apically, and sending out two oblique branches anteriorly; there is also a dark red-brown band extending round the hind margin of the first joint only; beneath there are near the middle two oblong black spots, which show merely as bluish shades on the upper surface; fourth and fifth joints much smaller, but also broadened, the fifth with a lateral projection; the claws white and widely divergent; middle legs dark reddish, the tibia with a small light apical patch, the spur white, the basal joint of tarsus abruptly bent near the base; hind legs missing in type specimen; labrum long, anterior corners rounded. Face covered with yellowish-white hair; eyes light yellowish green; flagellum dull fulvous beneath. Wings hyaline; stigma pale, with a dark margin; recurrent nervures entering the extreme base and apex of second submarginal cell. Mesothorax very coarsely rugoso-punctate.

Hab. N.W. coast of Australia; 69. 50.

Nearest, perhaps, to *M. modesta*, Sm.

Megachile darwiniana, sp. n.

♂.—Length about 10 mm.

Black, with white and black hair. A species with much the form of the American *M. manifesta*, Cress. Thorax with a semicircle of white spots, one above each tegula and two (elongated) in the scutello-mesothoracic suture; abdomen with marginal white hair-bands. Head large; face densely

covered with yellowish-white hair; vertex with black hair and longer white ones intermixed; antennæ quite long, flagellum obscure ferruginous beneath; mandibles black, very shiny at apex; mesothorax dull, minutely rugoso-punctate; dorsum of thorax with much erect black hair, longest on scutellum; tegulæ rufo-piceous. Wings moderately dusky, stigma and nervures very dark reddish brown; recurrent nervures entering second submarginal cell quite (and equally) near base and apex; anterior coxæ with short broad spines; anterior femora bright ferruginous, sharply keeled below, and with some black and white hair at base; anterior tibiæ triangular in section, red, with the outer side (except the anterior apical corner broadly) black, the anterior corner having a pointed yellowish-white projection; anterior tarsi yellowish white, broadened and flattened, but not excessively so, and with a long posterior fringe, which is white at base and mainly golden-fulvous otherwise, some of the hairs tipped with fuscous; within, the second joint has a large black spot bordered with ferruginous, this also shows through on the upper side as a black spot; basal joint of middle tarsi densely covered with shining silver-white hair on the outer side and with an excessively long posterior fringe of white hairs, slightly mixed with fuscous; hind spurs black; hair on inner side of hind tarsi pale orange; dark parts of abdomen with black hair; sixth and broad apical margin of fifth segment covered with yellowish-white tomentum; sixth invisible from above and ending in two widely-separated teeth.

Hab. Port Darwin (*J. J. Walker*, 750).

Megachile cygnorum, sp. n.

♂.—Length 10 mm. or a little more.

Shape of *M. darwiniana*, but with the pubescence, especially of the abdomen, decidedly pale ochreous and the abdominal hair-bands broad. Eyes light green, with a little red suffusion in front; antennæ long, flagellum dull fulvous beneath; face densely covered with yellowish-white hair; hair of vertex long and light ochreous, but some admixture of black on mesothorax and scutellum; mandibles black, with a dark red spot near the apex; mesothorax densely rugoso-punctate; tegulæ dark brown. Wings rather dusky, nervures piceous. Anterior coxæ with rather short flattened spines; anterior femora light orange-fulvous, greatly flattened and keeled, with long yellowish-white hair beneath; anterior tibiæ triangular in section, short, orange-

red, with a large black patch on the basal half outside; anterior tarsi resembling those of *M. darwiniana*, but no black spots show on the outer side, and on the inner there are black spots on the first and second joints; middle tarsi with shining creamy-white hair on the outside and a long white fringe behind; hind spurs black; abdomen with two apical teeth, wide apart.

Closely allied to *M. darwiniana*, but certainly distinct.

Hab. Swan R., "69. 50."

Megachile Gahani, sp. n.

♂.—Length 11 mm.

At first sight just like *M. cygnorum*, but showing many differences in detail, as follows:—Hair of face yellower, it might be called pale golden; front not covered with hair; tegulæ ferruginous; dark parts of abdomen without black hair, but instead with a fine fulvous tomentum; the broad abdominal hair-bands and the fine tomentum covering sixth and nearly all of fifth segments quite orange; the apical teeth closer together and merely low-pyramidal in outline; the anterior femora strongly elbowed beneath at base, the base in front also having five or six obliquely-placed fine black lines (*cygnorum* has some greyish lines); anterior tibiæ with the lower outer margin angled, and the outer face with two black patches, basal and apical; anterior tarsi light yellow, the end of the fringe largely black; no spots visible on outer side, but the second segment is mainly black beneath, the first being without a spot; hair on middle tarsi (arranged as in *cygnorum* and *darwiniana*) light yellow; hind spurs dark reddish.

Hab. "New Holland, 44. 4."

Named after Mr. C. J. Gahan, of the British Museum.

Megachile Kirbyana, sp. n.

♂.—Length not quite 10 mm.

Superficially much like *M. darwiniana*, the pubescence being white, with black on vertex, but the anterior legs are simple. Hair of face perfectly white; a slight admixture of fuscous on front; clypeus extremely densely punctured; mandibles black, faintly reddish at apex; flagellum dull red beneath; cheeks and vertex rather broad, distance from hind ocellus to margin of occiput greater than distance to opposite hind ocellus; mesothorax dull, minutely rugoso-punctate, with a good deal of white pubescence; a little fuscous hair

at extreme sides of scutellum; a small spot of white hair behind tegulæ, but no spots in the scutello-mesothoracic suture; tegulæ dark rufous. Wings slightly dusky, nervures black; second r. n. joining second s.m. at extreme apex; all the tibiæ and tarsi, and anterior femora except at base, deep but bright chestnut-red, the tarsi with a good deal of white hair. Abdomen with a large patch of white hair at each side of first and second segments, third to fifth with hair-bands, that on second weak in middle; sixth covered with white hair, its apical margin red, and irregularly dentate, with about four prominent rounded teeth (in the type specimen there are two teeth on one side, but on the other one, the outer, tooth, and the place of the inner one minutely crenulate); the extreme antero-lateral corners of the sixth segment have a sharp thorn-like tooth; the subapical ventral region shows two long dark red divergent teeth or spines. Anterior coxæ with rather short spines.

Hab. Fremantle (*J. J. Walker*, 1937).

Very distinct by the armature of the abdomen &c. Named after Mr. W. F. Kirby, of the British Museum. The locality is in Western Australia.

Megachile tomentella, sp. n.

♂.—Length about 8 mm.

Black, with a parallel-sided abdomen; one of the small *Heriades*-like forms, superficially similar to *M. nigrovittata* and *M. rhodura*.

Face with perfectly white hair; mandibles black, bidentate; flagellum beneath pruinose and very faintly brownish; vertex broad and very densely punctured, distance from hind ocellus to edge of occiput much greater than distance to opposite hind ocellus; mesothorax and scutellum extremely densely punctured; tegulæ piceous. Wings hyaline, with black nervures. Legs black, with pale pubescence; anterior tarsi simple; spurs white; claw-joints mainly ferruginous; abdomen very strongly punctured, the bases of the second and third segments depressed; no hair-bands, but fifth segment and base of sixth covered with orange tomentum, a few orange hairs also on hind margin of fourth; apex of sixth broadly emarginate. Anterior coxæ without spines.

Hab. Swan River, "69. 50."

Allied to *M. erythropyga* (but hair of face quite a different colour) and to *M. canifrons* (but end of abdomen different).

Megachile rhodura, sp. n.

♂.—Length 9 mm.

Black, with parallel-sided abdomen; much like *M. tomentella*, but fifth and sixth segments, and hind margin of fourth, with the tegument light red, the fine tomentum (which also is scattered over fourth segment) cream-colour; a conspicuous spot of white pubescence above and behind the tegulæ; stigma and nervures very dark reddish, stigma comparatively large. Hair of face pure white; flagellum dark reddish beneath; mandibles black, the inner tooth rudimentary; anterior coxæ without spines; apex of abdomen emarginate.

Hab. Queensland (*Gilbert Turner*, 422, Ridg. 12. 93).

Megachile Austeni, sp. n.

♂.—Length about 10½ mm.; expanse of wings about 17 mm.

Pubescence mainly white, but it is long and black on scutellum, mesothorax, and vertex, and partly on front; face covered with white hair, with small black hairs mixed on clypeus; antennæ very long, black; mandibles black, 4-dentate; mesothorax very densely punctured, its anterior border with greyish-white pubescence and a tuft of the same above and behind the tegulæ; metathorax and pleura with much white hair, a little black just below the wings; tegulæ black or brown-black. Anterior wings with the apical half mostly dilute fuliginous; nervures black. Legs black, with mainly white hair; anterior tarsi simple; anterior coxæ with short spines, almost hidden by white hair; hind spurs light reddish brown; hind tibiæ with a conspicuous band of white hair on outer edge; hind tarsi slender; abdomen short and parallel-sided, with white marginal hair-bands only at the sides of the segments; some white tomentum at base of fifth segment and sides of sixth; apex of sixth emarginate; marginal bands of venter entire.

Hab. "Australia, 92. 16"; it is marked also 323 Hy., and is evidently one of Mr. Gilbert Turner's Queensland captures.

Named after Mr. E. E. Austen, of the British Museum. It is just possible that it is the male of *M. suffusipennis*. *M. Blackburnii*, Froggatt, seems to be allied, but it has clear wings, and there is no mention of any black hair.

LXX.—*Eastern and African Heterocera.*
By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family **Lithosiidæ.**

Barsine syntypica, nov.

♀. Pure white; thorax with two black spots in front, two in the centre, and two at the base: fore wings with a black spot near the base; two bands, each composed of three black transverse streaks, elbowed outwards and nearly touching; a medial, almost erect, transverse black line, also in three parts; a black spot at the end of the cell and a broad marginal band of black streaks on the veins, its inner margin without a line, but uniform and deeply curved towards the outer margin in its middle; hind wings with a narrow marginal band of short black streaks on the veins.

Expanse of wings 1 inch.

Padang, W. Sumatra; one example.

Pattern somewhat as in *B. radians*, Moore, from Sikkim, but the basal bands of streaks in that species are erect and not outwardly angled.

Family **Lymantriidæ.**

Genus **PENDRIA**, nov.

Palpi minute and porrect; antennæ bipectinate, the branches longer in male than in female; hind tibiæ with two pairs of minute spurs: fore wings with vein 2 from the cell at two thirds, 3 from before angle, 4 from the angle, 5 from middle of discocellulars, 6 from upper angle; 7, 8, 9, and 10 stalked; 11 from the cell at three fourths: hind wings with vein 2 from two thirds, 3 from before angle, 4 from the angle, 5 from a little above, all these arising rather close together; 6 and 7 from upper angle.

Type, *P. rinaria*, Moore.

Pendria rinaria.

Redoa rinaria, Moore, Cat. Lep. E. I. Co. ii. p. 336 (1859).

Caviria rinaria, Hmps. (part.), Moths India, i. p. 490 (1892).

Caragola rinaria, Swinhoe, Trans. Ent. Soc. 1903, p. 377.

Java, Sumatra.

Leucoma costalis, nov.

♂. Antennæ with shafts pinkish white, pectinations brown; palpi pale pinkish; body pinkish white; thorax with some ochreous hairs in front: wings pure white, very thinly clothed; costal area suffused with pale pinkish, the median vein somewhat tinged with the same colour; a very minute black dot at the end of the cell of the fore wings, otherwise there are no markings above or below. Underside: body and legs tinged with pale pinkish: wings narrower than usual in the genus.

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

Uganda (*Christy*); one example (type in B. M.).

Euproctis monophyes, nov.

♂. Antennæ, frons, and top of head ochreous red: wings short, broad, uniform white, with a very slight primrose tinge; costa ochreous red; wings without any markings: legs ochreous.

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

Bilhe, W. Africa; one example.

Euproctis cincta, nov.

♂ ♀. Palpi, antennæ, and thorax dull yellow; abdomen brown; anal tuft dull yellow: wings dull pale ochreous brown; outer margin of fore wings narrowly dull yellow, its inner edge dentated and terminating in a yellow spot at the hinder angle: hind wings with the margin yellowish white. Underside much paler; pectus yellow; legs and abdomen whitish; wings as above, with the addition of an indistinct whitish patch near anal angle running narrowly a short distance up the wing.

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

Kina Balu (♂ type); Kuching, Borneo (♀ type in B. M.).

Euproctis icelomorpha, nov.

♀. Frons white; palpi, antennæ, thorax, and fore wings dull pale ochreous: fore wings with the basal two thirds smeared with brown; a medial band, upper half pale brown, lower half white, almost filled up with two dark purplish-brown double spots, and two large, similarly coloured, single subapical spots: hind wings with the ground-colour dull pale ochreous, but almost entirely smeared with brown, leaving only the marginal area ochreous: abdomen blackish,

anal tuft ochreous. Underside dull pale brownish; the outer areas of both wings pale ochreous, without markings; legs whitish.

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

Padang, W. Sumatra; one example.

With the markings as in *E. perplexa*, Swinhoe, from Singapore, but that is an entirely brown insect, with only one apical spot.

Euproctis hemibathes, nov.

♂. Palpi, antennæ, head, and fore part of thorax bright ochreous; remainder of thorax, abdomen, and wings dark ochreous brown, the hind wings slightly paler than the fore wings: fore wings with the costal line, apex broadly, and outer margin narrowly bright ochreous: hind wings with an even costal and marginal band of pale straw-yellow colour. Underside as above, but very pale, nearly white; body and legs whitish; anal tuft with some ochreous hairs: wings narrow; fore wings with the apex much produced.

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

Padang, W. Sumatra; one example.

Euproctis nessa, nov.

♂. Pectinations of the antennæ black, shafts orange-ochreous; palpi, head, body, and wings of a uniform very bright orange-ochreous, without any markings whatever except that the margins of the fore wings are slightly darker in colour. On the underside the coloration is paler, the colour throughout very uniform and bright.

Expanse of wings 1 inch.

Uganda (*Minchin*) (type in B. M.).

Another example from the same locality has a little brown suffusion on the hind wings above and on apical portion of the fore wings below. It is allied to *E. chrysophæa*, Walker, from Abyssinia.

Euproctis Ridleyi, nov.

♂ ♀. Palpi brown, antennæ and frons greyish ochreous, thorax and fore wings olive-brown tinged with ochreous: fore wings irrorated with rather large black atoms; a prominent black spot at the end of the cell; outer marginal space and cilia paler, in one male example greyish ochreous: hind wings black, with a broad, greyish-ochreous, even, marginal band: abdomen black, with greyish-ochreous anal tuft. Underside whitish; fore wings with a black spot at the end

of the cell; hind wings with a prominent black lunule, the inner and basal portions of the wings suffused with blackish: the female has a broad, indistinct, outwardly elbowed, brown medial band on the fore wings; the coloration is duller and paler and the outer margins are very slightly ochreous.

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

Singapore (*Ridley*); two pairs (types in B. M.).

Euproctis humida, nov.

♂. Ochreous fawn-colour; abdomen blackish brown, anal tuft ochreous fawn: fore wings with an antemedial, nearly erect, ochreous-brown line, with an angle inwards at the middle and another below it; a spot at end of cell and a postmedial similar line, curving outwards above the middle, both lines slightly sinuous; two black spots just outside the middle of the outer line and another near the hinder angle in some examples, some of these spots are obsolescent; marginal line pale brown; cilia ochreous fawn, with pale brown patches: hind wings suffused with blackish brown except towards the outer margin. Underside much paler, uniform in colour, without any markings.

Expanse of wings $1\frac{3}{10}$ inch.

Singapore; six examples (type in B. M.).

Pantana droa, nov.

♂. Palpi and frons orange-ochreous; shaft of antennæ white, plumes black; head and body blackish brown: wings white; fore wings with a prominent black spot a little below the end of the cell; an indistinct spot at the end, hidden by the outer margin, which is broadly black, occupying one third of the wing at the costa, narrowing hindwards, its inner margin irregular; a space bent into the black a little above the hinder margin; the entire wing suffused with pale black, palest below the black spot: hind wings with some black suffusion at the base and a large black patch at the apex. Underside similar but paler, both wings evenly and slightly suffused with blackish; legs grey above, white beneath; body white.

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

Hong Kong (*Longstaff*); one example (type in B. M.).

Nearest to *P. terminata*, Walker, from Burma.

Lalia hemippa, nov.

♂. Palpi and frons orange-ochreous; head and body grey; shafts of antennæ white, pectinations black: fore wings

white, the veins thickly olive-brown, some pale ochreous-grey suffusion on the hinder margin: hind wings ochreous grey, marginal line brownish ochreous, cilia white. The underside has the fore wings more or less suffused with ochreous grey, the hind wings pure white.

Expanse of wings $1\frac{3}{10}$ inch.

Machakos (*Crawshay*); one example (type in B. M.).

The outer margins of the fore wings are oblique, making the wings narrower than usual, and the last joints of the palpi are shorter than is usual in this genus.

Aroa glebula, nov.

♂. Of a uniform dark brown-pink: fore wings with indistinct, whitish, very thin, transverse antemedial line close to the middle of the wing, and a similar, outwardly curved, discal line: hind wings without markings; cilia ochreous, with dark brown-pink patches. Underside pale dull brown, tinged with pinkish; costa of fore wings ochreous; wings without markings, cilia concolorous, with ochreous dots; legs brownish ochreous.

Expanse of wings 1 inch.

Padang, W. Sumatra; one example.

Dasychira pulchra, nov.

♂. Palpi and frons orange-ochreous; plumes of the antennæ greyish ochreous, shafts dark brownish ochreous, with black spots; head and thorax chocolate-brown; abdomen greyish, tinged with yellow: fore wings with the upper third whitish, tinged with pink, the apical portion nearly pure white, the two portions divided from each other by a club-shaped dark chestnut-brown band, with a dark spot in the club-head below the costa, contracted in the middle, then again near the hinder margin, and edged on both sides with ochreous white; the lower two thirds of wing is purplish brown, dark in the middle, paling towards the hinder margin; two brown subapical streaks connecting the club with the outer margin: hind wings white, tinged with yellow, without markings. Underside: wings white, tinged with yellow; fore wings with the upper and outer portions suffused with chestnut-brown, containing dark longitudinal streaks; body white; legs grey, fore tarsi pink.

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

Coomassie (*Whiteside*); one example (type in B. M.).

Abdomen without dorsal tufts.

Dasychira postalba, nov.

♂. Palpi and antennæ ochreous grey, shafts of the latter pure white towards the base; head and thorax ochreous red, with large white spots: fore wings white, primrose-tinged; a broad, medial, upright, ochreous-red band, inside of this is a band of two or three lines connected with the medial band in places, forming several white spots, several lines at the base connected with the other band on the costa and hinder margin, leaving an inner white space, beyond the medial band; all the veins are ochreous red, with two transverse irregular lines; cilia ochreous red: hind wings, abdomen, and all the underside pure white, without markings.

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

Coomassie (*Whiteside*); one example (type in B. M.).

Abdomen without dorsal tufts.

Dasychira glovera, nov.

♂. Palpi, antennæ, head, thorax, and fore wings pinkish cream-colour: fore wings with the basal third olive-brown, limited by a brown line having two short outward dentations on the subcostal and medial veins; the brown space includes a subbasal short brown line and a large cream-coloured spot or patch in its middle; a discal, sinuous, very fine, brown line, which bends inwards on vein 2 and then is outwardly oblique to the hinder margin; a brown streak crosses it on vein 5, and on vein 2 it bends inwards and circles upwards to the costa; there is also a costal subapical brown patch and some brownish patches on the cilia: hind wings and abdomen white, without markings. Underside white; legs with brown markings; both wings with short discal brown lines running down from the costa.

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

Uganda, Entebbe (*Minchin*); one example (type in B. M.).

Abdomen with dorsal tufts.

Dasychira rocana, nov.

♂. Palpi black, with white tips; antennæ pinkish grey, the shafts whitish; collar and fore part of thorax olive-brown, the remainder and the basal third of fore wings greenish grey smeared in parts with white and limited by an erect and straight black line; remainder of the wing olive-brown, finely irrorated with grey; a blackish, fine, sinuous line from the costa one fifth from apex curves inwards at vein 3 to the

middle of the wing, then outwards to the hinder margin near the angle; a short blackish subapical line attached on the costa to a submarginal sinuous line; marginal line grey; cilia ochreous grey, with grey patches: hind wings white, without markings: abdomen grey, dorsal tufts blackish. Underside white; legs with brownish markings; fore wings suffused with brown except towards hinder margin; all the wings with a brown spot at the end of the cell.

Expanse of wings $1\frac{8}{10}$ inch.

Coomassie (*Whiteside*); one example (type in B. M.).

Genus CADURCA, nov.

♂. Antennæ bipectinate, with long pectinations throughout, each branch covered with very fine but rather long setæ; palpi porrect, hairy, the last joint hidden by hair; frons hairy; thorax and abdomen slender, the latter not extending beyond the hind wings: fore wings short, much narrower in proportion than the hind wings; costa nearly straight, apex rounded, outer margin evenly curved, hinder margin nearly straight: hind wings broad, rather produced at the apex, which extends to a level with the outer margin of the fore wings; outer margin very slightly curved; anal angle slightly produced: fore wings with vein 2 from a little beyond middle of cell, 3 at an even distance between 2 and end of cell, 4 from the angle, 5 from a little above, 6 from upper angle; 7, 8, 9, and 10 stalked, 11 from close to upper end of cell, 12 free: hind wings with veins 2, 3, 4, and 5 as in fore wings, 6 from upper angle, 7 from before angle.

Cadurca venata, nov.

♂. Antennæ, palpi, frons, thorax below, and legs black, thorax above with longitudinal yellow and black stripes; abdomen pinkish yellow, with black segmental bands above: wings of a uniform pale pinkish grey, very thinly clothed, costal and marginal line and all the veins prominently black; cilia concolorous with the wings.

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

Bihé, W. Africa; ten examples.

Lymantria postfusca, nov.

♂. Palpi black, speckled with white, bright orange beneath; antennæ black; head, thorax, and fore wings white, thorax with a black spot in front and another in the middle; abdomen orange, with brown suffusion at the base

and black dorsal spots: fore wings with the markings black; a short basal line followed by some spots; an antemedial dentated line and duplicate outwardly curved deeply dentated lines, well separated from the inner line on the costa, but inclining close to it on the hinder margin, and not filled in with black as is usual in this group; submarginal and marginal indented but incomplete lines: hind wings blackish brown, some whitish suffusion in the disk, and a small white mark on the outer margin below the middle. Underside with both wings almost entirely suffused with blackish brown; legs blackish brown; abdomen orange, with black lateral spots.

♀. Similar to the male, though also suffused with brown and with a deep black marginal border, but the fore wings are purer white, the transverse lines thicker with large black patches; the ante- and postmedial lines joined together below the middle by two large almost square patches, the upper one having two white spots in it.

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

Kandy, Ceylon (*Mackwood*); one pair.

Belongs to the *beatrice* group, but that form has a male that is entirely brown and the female has white hind wings. I have both sexes from Java, where the type came from. The female is nearest to *L. fuliginosa*, Moore, from South India, but that form also has a brown male. I have four males and three females, bred by me in Bombay. This group has many local forms. I have in my collection good series of *beatrice*, Stoll, *ganaha*, Swinhoe, *marginata*, Walker, and *fuliginosa*, Moore, all constant in their differences from each other; *ganaha* has a blackish male, the others brown males.

Lymantria singapura, nov.

♂. Antennæ brown, the shafts with some white on the basal two thirds; apical third pure white; palpi black, white at the tips; frons, head, thorax, and fore wings white; middle of head with a black spot and a crimson line behind it; thorax with black spots: fore wings with spots and lines black; two basal spots, four elongated spots beyond them, an antemedial highly dentate line, a cell-spot, a medial similar line with longer teeth and double at the upper portion; a submarginal dentate line and marginal black spots which run across the white cilia: abdomen crimson, with white anal tuft and dorsal spots, two black at the base, four black at the end, the middle spots white: hind wings crimson, with a black border which does not quite reach the anal angle;

white cilia crossed by black streaks between the veins. Underside: wings pale ochreous white, shining; abdominal margin of hind wings crimson-tinged; two prominent medial black spots on costa of fore wings, indications of a central line and outer grey marginal borders: legs white, with black spots; abdomen crimson, with black bands.

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

Singapore (*Ridley*); one example (type in B. M.).

A beautiful insect, nearest *L. rosea*, Hmps. n.

Family Limacodidæ.

Miresa acallis, nov.

♂. Palpi chestnut-red; frons, head, and fore part of the thorax ochreous orange; antennæ, body, and fore wings pale pinkish grey, the margins of the fore wings darker, the median vein and its branches brown; a dark brown subbasal patch; no other markings: hind wings much paler, whitish towards the costa; cilia of both wings dark pinkish grey, with a white basal line. Underside whitish, tinged with pink; no markings.

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

Padang, W. Sumatra; one example.

There are three male examples from Singapore in the B. M. collection unnamed (Drawer 6).

Natada amicta, nov.

♂. Antennæ, palpi, head, body, and wings ochreous grey: fore wings with the costal line darker grey; a broad subcostal indistinct pink streak from base to outer margin; no other markings above. Underside similar in colour; costa of fore wings pink, broadly so towards the base; fore and middle legs bright pink.

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

Bihé, W. Africa; one example.

Family Hypsidæ.

Deilemera marcida, nov.

♀. Frons black, edged with white; palpi ochreous, last joint black; top of head ochreous, with a black centre; collar with two black spots edged with ochreous; thorax and fore wings greyish brown, with a pinkish tinge; abdomen blackish, with whitish segmental bands, whitish below, with

a double lateral row of black spots: fore wings with an even white discal band from costa at two thirds to near the hinder angle; a white streak running below the cell from the base to the lower end of the discal band, and attenuated at both ends: hind wings white, with the costa narrowly and the outer margin broadly banded with black, its inner margin with an inward curve in its middle. Underside of thorax with bright ochreous on each side; legs brown above, white beneath.

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

Angola; one example.

Family Gonopteridæ.

Savara amisa, nov.

♂. Palpi pinkish red, with white beneath; top of head and collar pinkish grey; body and fore wings olive-brown, the latter with a white dot in the cell; ante- and postmedial, indistinct, outwardly curved, sinuous, and dentated brown lines, the latter curved inwards below the cell; a submarginal dentated brown line, with an outer pale edging: hind wings pinkish red, without markings. Underside whitish, the fore wings inwardly suffused with pinkish; both wings crossed by a recurved medial brown line, with a black spot on the middle of the costa of the hind wings; fore tarsi with prominent white spots.

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

Padang, W. Sumatra; one example.

Fore wings with the outer margin highly angled above the middle, with a small angular projection between that and the hinder margin.

Family Catephidæ.

Gyrtona acuda, nov.

♀. Silvery grey, irrorated with dark pinkish brown; collar with a white line hindwards; abdomen with a black band on first segment and some dorsal and lateral black dots: fore wings smeared with whitish at the base; an outwardly oblique, triangular, black costal patch just before the middle extending to vein 2; some black dots in and beyond end of cell; an indistinct straight pale line across the disk, rather broadly suffused with blackish on its outer side; marginal black line interrupted by the veins; whitish cilia, with brown patches: hind wings with a broad blackish-brown marginal border, the veins blackish brown. Underside dull brown,

some pale marks on the costa of fore wings towards apex; body white; legs white, with black stripes; tarsi black, with white bands.

Expanse of wings 1 inch.

Padang, W. Sumatra; one example.

Family Focillidæ.

Egnasia mesotypa, nov.

♂ ♀. Of a uniform ochreous-brown colour; the tuft of hair on the inner side of the third joint of the palpi in the male black: fore wings with a vitreous white spot in the middle of the cell; a vitreous white mark like the figure of 3 at the end: hind wings with a white trident-shaped vitreous mark at the end of the cell, with a white spot close to its centre: fore wings with indications of an antemedial transverse black line, and both wings crossed by a black outwardly curved postmedial line and a discal dentated black line, but much curved inwards on to the costa of the fore wings; marginal line black; cilia yellow; both wings with the outer margin angled as in *E. ephyrodalis*, Walker.

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

Khasia Hills; one male and two females.

Capnodes brunnea, nov.

♀. Dark brown, uniform in coloration; palpi below whitish: fore wings with a dark shade in the cell; an indistinct postmedial, outwardly curved, interrupted, white line, curved slightly inwards below the cell; both wings with a row of submarginal brown dots, with pale outer sides; a pale marginal line; cilia pale, with a brown inner band. Under-side pale, with indications of a brown, postmedial, outwardly curved line across both wings and marginal brown spots with pale outer sides.

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

Padang, W. Sumatra; one example.

Allied to *C. ceylonica*, Walker, but browner, without any cell-spots or subapical markings, and with the outer line of fore wings not bent in on to costa, as in that species.

Family Deltoididæ.

Adrapsa chartalis, nov.

♂. Palpi dark brown-pink, ochreous beneath; antennæ and top of head ochreous chestnut; body and wings dark

brown, tinged with ochreous: fore wings with a pure white lunular mark, edged with dark brown, at the end of the cell; an indistinct white dot in the cell; both wings crossed by an antemedial, outwardly curved, uniform, thick, brown line near the middle; a postmedial, highly crenulate, and sinuous brown line, outwardly edged with ochreous; a diffuse discal brown band, with an ochreous, crenulate, and sinuous line running through its outer side, the space beyond variegated with brown and ochreous; marginal lunules black, with ochreous outer edges; cilia brown. Underside ochreous, irrorated with brown atoms; all spots as above; antemedial and postmedial sinuous brown lines; a broad blackish discal band, running into the margin in parts, leaving ochreous spaces at the apex and hinder margin on both wings; body and legs dull ochreous.

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

Padang, W. Sumatra; one example.

Bertula invenusta.

Bertula invenusta (♂), Swinhoe, Ann. & Mag. Nat. Hist.(7) ix. p. 177 (1902).

♀. Brown, with a pinkish tinge: fore wings with a brown dot in the cell, a nearly square brown spot at the end, a brown transverse fascia between them across the wing; an antemedial sinuous brown line; a postmedial dentated brown line, the space from the base to this line much paler than the space beyond; a submarginal pale dentated line: hind wings with no visible inner line, the outer lines and* colouring of the wing corresponding to that of the fore wings; a brown, diffused, indistinct patch in the disk. Underside paler, but shaded as above; fore wings with a brown dot in the cell; a brown spot at the end on all the wings; hind wings with an additional antemedial thin brown band which crosses the cell-spot.

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

Padang, W. Sumatra; one male and four females.

The male is much lighter in colour than the type specimen, but is otherwise identical.

Bertula similalis, nov.

♂ ♀. Palpi, head, body, and fore wings brown, the last with two white dots edged with black at the end of the cell; subbasal, antemedial, and postmedial black sinuous bands, not very distinct, the last much bent inwards below vein 2, the

first and last edged inwardly with a pale thin band, the antemedial band edged outwardly; a submarginal sinuous white line: hind wings pale brown, without markings. Underside brownish white and grey in parts; two discal crenulated brown lines; a brown spot at the end of each cell, very indistinct on the fore wings; a brown spot in the disk and another near anal angle.

Expanse of wings, ♂ $1\frac{4}{10}$, ♀ $1\frac{5}{10}$ inch.

Padang, Sumatra; two males and two females (types).

Sarawak, Borneo; one male and four females.

There are two examples from Borneo in the B. M. Drawer 36 with *Bleptina hadenalis*, Moore, and one also from Borneo in the same drawer with *Bertula impuralis*, Hmps. n.; the second joint of the palpi is long and thickly pilose, and the third is long, curves over the head, and is thickly tufted with long hair on the upperside.

Bleptina delosticha, nov.

♂ ♀. Of a uniform dark purplish-brown colour: fore wings with a white lunule edged with black at the end of the cell; two transverse thin and erect white bands edged with black on both sides, ante- and postmedial, some large blackish patches in and below the cell, and smaller ones in the disk, through which runs an indistinct, whitish, sinuous line: hind wings with a whitish, thin, discal band, most apparent near the anal angle, and two similar but more indistinct bands immediately following it; marginal lunules of both wings black; cilia pinkish grey. Underside pale brown; both wings with two pale, discal, sinuous, thin bands and a large and prominent black spot at the end of each cell; hind wings with an additional black spot in the cell.

Expanse of wings, ♂ $1\frac{1}{2}$, ♀ $1\frac{8}{10}$ inch.

Padang, W. Sumatra; one male and two females (types); Ternate, one male.

There is an example from Obi in the B. M. unnamed (Drawer 34).

Family Hypenidæ.

Hypena epigæa, nov.

♂. Palpi brown, hairs on the upperside and breast black; thorax and fore wings blackish brown; an antemedial, highly sinuous, indistinct, pale line; a postmedial sinuous black line, outwardly edged with white, most distinctly so on the costa, the space between this line and the base darker

than the rest of the wing ; a white and grey apical streak ; a row of pale discal dots, three dots on the costa near the apex ; black marginal lunules with pale inner edges ; cilia dull ochreous, with a central double brown line and brown terminal patches : hind wings dull pale brown, without markings ; cilia as on the fore wings. Underside dull pale brown ; a short angled line from the costa at two thirds and a white subapical spot ; hind wings with a brown cell-spot and a brown discal line.

Expanse of wings $1\frac{3}{10}$ inch.

Padang, W. Sumatra ; one example.

Superficially somewhat like *H. tuma*, Swinhoe, from the Jaintia Hills.

Family Epiplemidæ.

Epiplema subflavida, nov.

♂. Of a uniform ochreous brown, tips of palpi and head black : fore wings with an antemedial brown line, bent deeply outwards ; a postmedial similar line, angled outwards, the portion below the angle sinuous and ending on the hinder margin in a large blackish spot ; a submarginal, incomplete, and indistinct brown line rather close to the margin, some pale and black dots on the costa, and some pale shades near the outer margin : hind wings with subbasal and discal outwardly bent brown lines, corresponding to the lines on the fore wings ; a submarginal line very close to the margin, two tails above and below the middle, a black spot on the lower tail edged with whitish on its inner side ; all the wings with black dot at the end of the cell. Underside rather bright ochreous yellow, with indications of the outer lines ; body and legs yellow.

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

Malang, Java ; one example.

Of the shape of *E. quadricaudata*, Walker.

Family Monoctenidæ.

Genus DEBOS.

Debos, Swinh. P. Z. S. 1885, p. 291.

Debos iratus.

Debos iratus, Swinhoe, l. c. pl. xx. fig. 7.

Poona, Nilgiri Hills.

In vol. i. p. 298 of 'Moths of India' Sir George Hampson

says this insect is probably a *Tinea*; but both Lord Walsingham and Mr. Durrant refused to accept it as a micro. I sent one of my examples to Mr. Meyrick, and he says certainly not a micro, belongs to the Monoctenidæ. I have therefore put it after the Australian genus *Epidesma*.

Family Boarmiidæ.

Genus PHRUDURA, nov.

Antennæ of male bipectinated, the pectinations lessening towards the tips; hind tibiæ dilated: fore wings with veins 3 and 4 from angle of cell, 5 from the middle of discocellulars, 6 from upper angle; 7, 8, 9, and 10 stalked: hind wings with veins 3 and 4 from lower angle of cell, 5 and 6 from upper angle.

Type, *P. pura*, Swinhoe, Trans. Ent. Soc. 1902, p. 602.

I described *pura* from a female as a *Bapta*, but having now a male from the same locality (Sumatra), I must make a genus for it. *Bapta* has simple antennæ in both sexes: the bipectinated antennæ of *pura* male at once separates it; the male has the antennæ ochreous, the frons tinged with pink, a pink mark behind each eye, costa of fore wings pinkish, and general coloration of both wings white tinged with primrose.

Boarmia decisaria.

Boarmia decisaria, Walker, xxxv. 1589 (1866); Swinhoe, Cat. Het. Mus. Oxon. ii. p. 291 (1900).

Kandy, Ceylon; one male.

The type from Ceram is in Mus. Oxon.; it is a very variable insect and has had many names given it, as recorded in my book above quoted, but all the varieties come from the same localities. I have it from Java and Cape York; it is in Mus. Oxon. from Lifu and Port Moresby, and in Coll. Rothschild from Ke Island. Not previously recorded from the Indian Region.

Family Sterrhidæ.

Ptochophyle rectilineata, nov.

♀. Of a uniform bright greyish-ochreous colour, very minutely irrorated with grey atoms; vertex of head white: fore wings with the costa red-brown; lines on both wings straight, pale red-brown in colour, two on the fore wings—medial and postmedial, the latter from the costa at one fourth from the apex to the outer margin above the hinder angle; a

line on the hind wings, in continuation of the medial line of the fore wings, from the costa one third from apex to the middle of the outer margin; marginal points brown; cilia pale. Underside: fore wings and outer margin of hind wings diffused with pink; cilia nearly white; body and legs pale pinkish without markings.

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

Padang, W. Sumatra; one example.

Family Geometridæ.

Genus ACOLLESIS.

Acollesis, Warren, Nov. Zool. v. p. 11 (1898).

Acollesis semialba, nov.

♀. Palpi and antennæ greyish ochreous; frons white, with a greyish-ochreous line across the middle; top of head and body white: fore wings with the basal third white, the white running up the costa above the subcostal vein for one half the length, the remainder of the wing bright green; a transverse straight white line from the hinder margin beyond the middle towards the apex, bent inwards a little on to the costa just before reaching it: hind wings pure white, without markings. Underside white, with a greenish tinge, without markings; body and legs greyish ochreous.

Expanse of wings $1\frac{3}{10}$ inch.

Bilé, W. Africa; one example.

Family Crambidæ.

Eschata radiata, nov.

♀. White, top of head and a large patch on the fore part of the abdomen dull brownish ochreous: fore wings faintly suffused with grey; two silvery streaks from near the base to near the outer margin, one through the lower part of the cell and the other through the interno-median interspace; two transverse bands of short silvery streaks near the outer margin, and across these streaks two grey, interrupted, thick lines; some silvery spots on the margin; cilia and indistinct submarginal line blackish: hind wings pure white without markings: antennæ and sides of palpi orange-brown.

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

Gilolo; one example.

Family Epipaschiidæ.

Stericta basalis.

Orthaga basalis, Leech, Trans. Ent. Soc. 1891, p. 417.

Khasia Hills; one example.

The type from Japan is in the B. M. Not previously recorded from India.

Family Pyralidæ.

Bostra indicator.

Arippara indicator, Walker, Journ. Linn. Soc. vii. p. 74 (1864).

Bostra indicator, Swinhoe, Cat. Het. Mus. Oxon. ii. p. 435 (1900).

Poaphila marginata, Walker, xxxiii. 991 (1865).

Bostra marginata, Hmps. Trans. Ent. Soc. 1896, p. 534.

Khasia Hills.

The type from Sarawak is in Mus. Oxon.; I have it also from the same locality. The type of *marginata* from Moulmein is in the B. M. They are specifically identical. I have it also from Singapore, and Hampson records it from Japan and Sumatra.

Family Pyraustidæ.

Dichocrocis orissusalis.

Botys orissusalis, Walker, xviii. 701 (1859).

Dichocrocis orissusalis, Swinhoe, Cat. Het. Mus. Oxon. ii. p. 481 (1900).

Botys trigalis, Led. Wien. ent. Mon. vii. p. 375, pl. x. fig. 18 (1863).

Khasia Hills.

The type from Sarawak is in Mus. Oxon. Lederer himself sank his *trigalis* to *orissusalis*, and anyone comparing the type with his figure must agree with him. Not previously recorded from India.

Pleuroptya distinguenda.

Sylepta distinguenda, Hering, Stett. ent. Zeit. lxii. p. 77 (1901), lxiv. pl. i. fig. 16 (1903).

Khasia Hills; four examples.

The type came from Sumatra.

LXXI.—On a Collection of Fishes from Gallaland.

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

THANKS to the generosity of Mr. W. N. McMillan, the British Museum has recently received a large collection of fishes made by Mr. P. C. Zaphiro during a trip to Kaffa and Lake Rudolf. The great care bestowed by Mr. Zaphiro on the preservation and labelling of the specimens, about 400 in number, most of which are accompanied by notes on the coloration in the fresh state, and the great number of new or rare forms from comparatively little-known waters*, render this collection a very valuable one, by which our knowledge of African ichthyology is further advanced. The collection was made in five distinct hydrographic systems:—

1. The Blue Nile; 2. The Omo with Lake Rudolf; 3. Lakes Abaya and Ganjule with the Sagan River, which connects them with Lake Stephanie †; 4. Lakes Zwai and Suksuki; 5. The Hawash. According to Mr. Zaphiro, Lake Stephanie contains no fishes. The species represented in the collection are first enumerated in hydrographical order ‡.

The collection made by Mr. Zaphiro has added to the list of the species of *Barbus* of the *B. Bynni* group, the variety of which in Southern Ethiopia and East Africa constitutes so striking a feature. Undoubtedly fast-running mountain-streams are more favourable to the existence of Cyprinids than of fishes of a more strictly tropical character. But it, nevertheless, remains a puzzling fact that these *Barbus* should have split up into such a number of allied forms, whilst the *Labeo*, seemingly still better adapted for waters of a torrential nature, have remained unaltered, only four species, three of them of wide distribution in Africa, being known from the district.

* Cf. Günther, P. Z. S. 1896, p. 217; Vinciguerra, Ann. Mus. Genova, (2) xvii. 1897, p. 343, and xix. 1898, p. 240; Boulenger, Ann. & Mag. Nat. Hist. (7) x. 1902, p. 421, and P. Z. S. 1903, ii. p. 328; Pellegrin, Bull. Mus. Paris, 1905, p. 290.

† A communication between these lakes appears to exist only at certain seasons, according to Oscar Neumann (Geogr. Journ. xx. 1902, p. 384). "The sources of the Sagan lie east of the south end of Lake Abaya [Pagade]. But there is a broad channel connecting Lake Ganjule [Margherita] with the Sagan. The bed of this channel was dry at the time, but there were some large and small waterpools scattered over it. When the water rises in L. Ganjule for about 5 inches, which will probably take place every year at the beginning of the rainy season, a large river will run from Lake Ganjule to the Sagan."

‡ Cf. maps in Bottego's 'L' Omo' (Milan, 1899) and in O. Neumann's paper in Geogr. Journ. xx. (1902).

The additions to the fish-fauna of Lake Rudolf which this collection affords (*Gymnarchus niloticus*, *Heterotis niloticus*) only further emphasize the almost purely Nilotic character of this fauna, as remarkable a fact as is, on the other hand, the very insignificant proportion of Nile elements in the fish-fauna of Lake Victoria. Lakes Abaya-Margherita also possess some fishes particularly suggestive of the Nile, but here they are associated with a preponderating number of forms characteristic of the eastern parts of Africa.

It is worthy of note that nearly all the species of fishes which by their association impress a so strikingly Nilotic character on the fauna of Lake Rudolf belong to the set which extends westwards to Lake Chad and the Senegal and Niger.

I.—SYSTEM OF THE BLUE NILE.

1. GUDAR RIVER, a fast-running stream, about 25 yards wide, flowing from the Rogghe Mountains northwards to the Blue Nile. Altitude 3400 feet.
Barbus plagiostomus, *B. gudaricus*.
2. METTI RIVER, a fast-running stream, about 20 yards wide, flowing from Tului dimtu northwards to the Gudar River. Altitude 3500 feet.
Discognathus dembeensis, *Varicorhinus beso*, *Barbus gudaricus*.
3. DIDESSA RIVER, about 60 yards wide, flowing from Guma northwards to the Blue Nile. Altitude 1500 feet.
Labeo Forskalii, *Discognathus dembeensis*, *Varicorhinus beso*, *Barbus surkis*, *B. intermedius*, *B. Zaphiri*, *B. affinis*, *B. nedgia*.
4. JUJU RIVER, about 10 yards wide, flowing from the hills of Guma to the Didessa River. Altitude 2000 feet.
Labeo Forskalii, *Discognathus dembeensis*, *Varicorhinus beso*, *Barbus intermedius*, *B. leptosoma*, *B. eumystus*.
5. URGESSA RIVER, about 15 yards wide, flowing north-west to the Wama River, a tributary of the Didessa River. Altitude 2300 feet.
Varicorhinus beso, *Barbus intermedius*.

II.—SYSTEM OF THE OMO.

1. OMO RIVER at Kullo, width 150–200 yards. Altitude 2000 feet.
Labeo cylindricus, *Barbus Bottegi*.
2. COJEB RIVER, about 50 to 60 yards wide (in the rainy season), flowing from Guma and the Cialla hills to the Omo. Altitude 2500 feet.
Alestes macrolepidotus, *Heterobranchus longifilis*.

3. ERGINO RIVER, about 20 yards wide, flowing from the Basketo hills northward to the Omo. Altitude 3000 feet.
Labeo niloticus, *L. cylindricus*, *Barbus intermedius*, *B. Duchesnii*, *B. Gregorii*, *Heterobranchus longifilis*, *Bagrus docmac*, *Tilapia nilotica*.
4. GIBE RIVER, a fast-running stream about 20 yards wide, coming from the plains of Gorombi (Leka), supposed to be the source of the Omo, and flowing southwards. Altitude 2800 feet.
Discognathus dembeensis, *Barbus nedgia*.
5. WONDINAK RIVER, 3 yards wide, flowing north-west to the Gibe River. Altitude 3000 feet.
Barbus oreas.
6. ZENDO RIVER, about 15 yards wide, flowing from the hill Anko eastwards to the Maze River, an affluent of the Omo. Altitude 4300 feet.
Labeo cylindricus, *Barbus Gregorii*, *Barilius Loati*.
7. LAKE RUDOLF, north-east end. Altitude 1800 feet.
Polypterus senegalus, *Gymnarchus niloticus*, *Heterotis niloticus*, *Synodontis frontosus*, *Tilapia nilotica*.

III.—SAGAN RIVER AND LAKES ABAYA (PAGADE) AND GANJULE (MARGHERITA)*.

1. SAGAN RIVER at Wondo, a fast-running stream about 15 yards wide. Altitude 2800 feet.
Labeo niloticus, *L. cylindricus*, *Barbus Duchesnii*, *Schilbe mystus*, *Bagrus docmac*, *Synodontis schall*.
2. DELBENA RIVER, a fast-running stream about 10 yards wide, flowing from the hills of Gandulla westwards to the Sagan River. Altitude 3200 feet.
Labeo cylindricus.
3. GATO RIVER, a fast-running stream about 15 yards wide, flowing from the hills of Gandulla westwards to the Sagan River. Altitude 3700 feet.
Labeo cylindricus, *Barbus nedgia*.
4. ZEISSI RIVER, a very fast-running stream about 10 yards wide, flowing from the hills of Zeissi eastwards to Lake Abaya. Altitude 3000 feet.
Labeo cylindricus, *Barbus intermedius*, *B. affinis*.

* There is great confusion in the naming of these two lakes. The larger, northern lake appears on many maps, including Bottego's, as L. Margherita. Both are also known as Lakes Abaya.

5. ELGO RIVER, a very fast-running stream about 15 yards wide, flowing from the hills of Gamu eastwards to Lake Abaya. Altitude 3000 feet.
Barbus Duchesnii, *B. affinis*, *Clarias Robecchii*.
6. SIRE RIVER, a fast-running stream about 30 yards wide, flowing from the highlands of Gamu to Lake Abaya. Altitude 3000 feet.
Barbus intermedius, *B. affinis*, *Clarias lazera*.
7. GANDA RIVER, about 15 yards wide, flowing from the highlands of Gamu to Lake Ganjule (Margherita). Altitude 3000 feet.
Labeo cylindricus, *Barbus intermedius*, *B. Duchesnii*.
8. ALABA RIVER, a fast-running stream about 20 yards wide, flowing from the plains of Kambata to Lake Ganjule. Altitude 6000 feet.
Barbus Gregorii, *B. alticola*.
9. LAKE GANJULE OF MARGHERITA. Altitude 3000 feet.
Hydrocyon Forskalii, *Labeo cylindricus*, *Barbus Macmillani*, *B. Ruspolii*, *B. Gregorii*, *B. nedgia*, *B. Margaritæ*, *Synodontis schall*, *Tilapia nilotica*.
10. ZUJA RIVER, 30 yards wide, flowing from the hill Marta southwards to Lake Stephanie. Altitude 4200 feet.
Labeo cylindricus, *Barbus Gregorii*, *B. nedgia*.
11. BARJA RIVER, a fast-running stream about 10 yards wide, flowing from the hills of Sangana and Bako to the Zuja River. Altitude 4250 feet.
Labeo cylindricus, *Barbus Gregorii*.

IV.—LAKES ZWAI AND SUKSUKI.

1. LAKE ZWAI. Altitude 4000 feet.
Discognathus quadrimaculatus, *Barbus zuaicus*, *B. oreas*, *Tilapia nilotica*.
2. LAKE SUKSUKI. Altitude 3900 feet.
Tilapia nilotica.
3. SUKSUKI RIVER, connecting the two lakes.
Barbus oreas.
4. MAKI RIVER, flowing into Lake Zwai.
Barbus oreas, *B. Gregorii*.

V.—SYSTEM OF THE HAWASH.

1. HAWASH RIVER at Zekuala, about 20 yards wide. Altitude 4100 feet.
Varicorhinus beso, *Barbus oreas*, *B. Gregorii*.

2. AKAKI RIVER, a stream 10 to 12 yards wide, flowing from the hills of Legadadi southwards to the Hawash. Altitude 4500 feet.

Discognathus quadrimaculatus, *Barbus paludinosus*, *B. plagio-*
stomus, *B. oreus*.

SYSTEMATIC LIST.

Polypteridæ.

1. *Polypterus senegalus*, Cuv.—Lake Rudolf.

Mormyridæ.

2. *Gymnarchus niloticus*, Cuv.—Lake Rudolf.

Osteoglossidæ.

3. *Heterotis niloticus*, Cuv.—Lake Rudolf.

Characinidæ.

4. *Hydrocyon Forskalii*, Cuv.—Lake Ganjule (Margherita).
5. *Alestes macrolepidotus*, Cuv.—Cojeb River.

Cyprinidæ.

6. *Labeo niloticus*, Forsk.—Ergino River, Sagan River.
7. *Labeo Forskalii*, Rüpp.—Didessa River, Juju River.
8. *Labeo cylindricus*, Peters.—Omo River, Ergino River, Zendo River, Sagan River, Delbena River, Zeissi River, Ganda River, Lake Ganjule (Margherita), Zuja River, Barja River.
9. *Discognathus dembeensis*, Rüpp.—Metti River, Didessa River, Juju River, Gibe River.
10. *Discognathus quadrimaculatus*, Rüpp.—Lake Zwai, Akaki River.
11. *Varicorhinus beso*, Rüpp.—Metti River, Didessa River, Juju River, Urgessa River, Hawash River.
12. *Barbus paludinosus*, Peters.—Akaki River.
13. *Barbus surkis*, Rüpp.—Didessa River.
14. *Barbus intermedius*, Rüpp.—Didessa River, Juju River, Urgessa River, Ergino River, Zeissi River, Sire River, Ganda River.

15. *Barbus zuaicus*, sp. n.

Depth of body $3\frac{2}{5}$ times in total length, length of head 4 times. Snout rather pointed, $3\frac{1}{3}$ times in length of head; diameter of eye 4 times in length of head, interorbital width $3\frac{1}{3}$ times; mouth inferior, its width 5 times in length of head; lips moderately developed, interrupted on the chin; barbels two on each side, equal in length, twice diameter of eye. Dorsal IV 9; last simple ray very strong, bony, straight, $\frac{3}{4}$ length of head. Anal III 5. Pectoral a little shorter than head. Ventral below anterior rays of dorsal. Caudal peduncle nearly twice as long as deep. Scales $33\frac{5\frac{1}{2}}{5\frac{1}{2}}$, 3 between lateral line and ventral, 12 round caudal peduncle. Dark olive above, silvery white beneath.

Total length 190 mm.

A single specimen from Lake Zwai.

Well distinguished from the species with interrupted lower lip by the very long barbels.

16. *Barbus plagiostomus*, Blgr.—Gudar River, Akaki River.17. *Barbus Macmillani*, sp. n.

Depth of body equal to or a little less than length of head, $3\frac{1}{2}$ to 4 times in total length. Snout rounded, 3 times in length of head; diameter of eye $4\frac{1}{3}$ to $4\frac{1}{2}$ times in length of head, interorbital width $3\frac{1}{3}$ to $3\frac{1}{2}$ times; mouth inferior, forming a broken arch, a feebly curved transverse line in front, its width 4 times in length of head; lips very feebly developed, confined to the sides; a thin horny sheath, with a blunt keel, covers the jaws; barbels two on each side, anterior once to once and a half length of eye, posterior once and $\frac{1}{5}$ to once and $\frac{3}{5}$ length of eye. Dorsal IV 8-9, free edge emarginate; last simple ray very strong, bony, not serrated, straight, $\frac{3}{5}$ to $\frac{3}{4}$ length of head. Anal III 5. Pectoral a little shorter than head. Ventral below anterior rays of dorsal. Caudal peduncle once and $\frac{1}{2}$ to once and $\frac{3}{4}$ as long as deep. Scales 30-33 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, 2 or $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Dark olive above, the scales blackish at the base, silvery white beneath.

Total length 220 mm.

Five specimens from Lake Ganjule (Margherita).

Closely allied to *B. plagiostomus*, Blgr. Distinguished by the longer head and the longer barbels.

18. *Barbus Bottegi*, sp. n.

Depth of body 3 to $3\frac{1}{2}$ times in total length, length of head 4 to $4\frac{1}{3}$ times. Snout rounded, $3\frac{1}{4}$ to $3\frac{1}{2}$ times in length of head; diameter of eye 4 to 5 times in length of head, interorbital width $2\frac{2}{3}$ to 3 times; mouth inferior, forming a broken arch, a feebly curved transverse line in front, its width $3\frac{1}{2}$ to 4 times in length of head; lips very feebly developed, confined to the sides; a thin horny sheath, with a blunt keel, covers the jaws; barbels two on each side, anterior once and $\frac{1}{4}$ to once and $\frac{1}{3}$ length of eye, posterior once and $\frac{1}{3}$ to once and $\frac{1}{2}$. Dorsal IV 9, free edge emarginate; last simple ray very strong, bony, not serrated, feebly curved, $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Anal III 5. Pectoral as long as head or a little shorter. Ventral below anterior rays of dorsal. Caudal peduncle once and $\frac{1}{2}$ as long as deep. Scales 28-30 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, 2 or $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Silvery, the dorsal region darker, with the scales dark-edged, lower parts pure white; fins greyish, or pectorals, ventrals, and anal reddish; a yellow line round the pupil.

Total length 245 mm.

Three specimens from the Omo River at Kullo and one from the Gibe River.

Distinguished from *B. plagiostomus* by longer barbels and fewer scales in the lateral line, from *B. Macmillani* by the deeper body and the broader interorbital space.

19. *Barbus Zaphiri*, sp. n.

Depth of body $3\frac{2}{3}$ times in total length, length of head $3\frac{1}{4}$ times. Snout rounded, $3\frac{1}{2}$ times in length of head, eye 6 times, interorbital width 4 times; mouth terminal, lower jaw slightly projecting; width of mouth 4 times in length of head; lips well developed, interrupted on the chin; barbels two on each side, nearly equal, about once and $\frac{1}{2}$ diameter of eye. Dorsal IV 9, free edge emarginate; last simple ray very strong, bony, not serrated, feebly curved, about $\frac{2}{3}$ length of head. Anal III 5. Pectoral about $\frac{2}{3}$ length of head. Ventral slightly in advance of vertical of origin of dorsal. Caudal peduncle once and $\frac{2}{3}$ as long as deep. Scales 31 $\frac{5\frac{1}{2}}{5\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 14 round caudal peduncle. Dark olive above, silvery white beneath.

Total length 230 mm.

A single specimen from the Didessa River.

Near *B. gorguari*, Rüpp.; differing in the longer barbels.

20. *Barbus Ruspolti*, Vincig.*—Lake Ganjule (Margherita).
21. *Barbus oreas*, Blgr.—Wondinak River, Lake Zwai, Suksuki River, Maki River, Hawash River, Akaki River.
22. *Barbus leptosoma*, Blgr.—Juju River.

23. *Barbus gudaricus*, sp. n.

Depth of body $3\frac{2}{3}$ times in total length, length of head $3\frac{1}{2}$ to 4 times. Snout rounded, 3 to $3\frac{1}{2}$ times in length of head; eye 5 to $5\frac{1}{2}$ times in length of head, interorbital width 3 times; mouth inferior, its width $3\frac{2}{3}$ to 5 times in length of head; lips well developed, the lower continuous across the chin and forming a small rounded median lobe; barbels two on each side, anterior a little longer than eye, posterior once and $\frac{1}{3}$ to once and $\frac{1}{2}$ length of eye. Dorsal IV 9, free edge emarginate; last simple ray very strong, bony, not serrated, nearly straight, $\frac{2}{3}$ to $\frac{3}{4}$ length of head. Anal III 5. Pectoral a little shorter than head. Ventral below anterior rays of dorsal. Caudal peduncle once and $\frac{1}{2}$ to once and $\frac{2}{3}$ as long as deep. Scales 28–30 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Dark olive above, silvery white beneath.

Total length 265 mm.

Two specimens from the Gudar River and two from the Metti River, affluent of the Gudar River.

Near *B. oreas*, Blgr.; distinguished by the lower number of scales in the lateral line.

24. *Barbus Duchesni*, Blgr.—Ergino River, Sagan River, Elgo River, Ganda River.
25. *Barbus affinis*, Rüpp.—Didessa River, Zeissi River, Elgo River, Sire River.
26. *Barbus Gregorii*, Blgr.†—Ergino River, Zendo River, Alaba River, Lake Ganjule (Margherita), Zuja River, Barja River, Maki River, Hawash River.

* This species was founded on a badly preserved dry specimen from Lake Ganjule. It proves to be closely allied to *B. bynni*, differing in having only $2\frac{1}{2}$ series of scales between the lateral line and the ventrals. The spine of the dorsal fin is remarkably strong and much longer than the head.

† *B. Neuvillii*, Pellegr., is probably identical with this species.

27. *Barbus eumystus*, sp. n.

Depth of body equal to length of head, nearly 4 times in total length. Snout rounded, 3 times in length of head, eye 5 times, interorbital width 3 times; mouth inferior, its width $4\frac{1}{2}$ times in length of head; lips well developed, lower continuous across the chin and forming a small rounded median lobe; barbels two on each side, equal, twice and $\frac{1}{3}$ diameter of eye. Dorsal IV 9, free edge emarginate; last simple ray very strong, bony, not serrated, straight, $\frac{5}{6}$ length of head. Anal III 5. Pectoral a little shorter than head. Ventral below anterior rays of dorsal. Caudal peduncle once and $\frac{2}{3}$ as long as deep. Scales 31 $\frac{5\frac{1}{2}}{4\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Dark olive above, silvery white beneath.

Total length 225 mm.

A single specimen from the Juju River, affluent of the Didessa River.

Remarkable for its very long barbels.

28. *Barbus nedgia*, Rüpp.—Didessa River, Gibe River, Gato River, Lake Ganjule (Margherita), Zuja River.29. *Barbus Margaritæ*, sp. n.

Depth of body $3\frac{3}{4}$ to $4\frac{1}{3}$ times in total length, length of head $3\frac{1}{2}$ to $3\frac{3}{4}$ times. Snout rounded, 3 to $3\frac{1}{4}$ times in length of head, diameter of eye 4 (young) to 7 times, interorbital width 3 to $3\frac{1}{4}$ times; mouth inferior, its width 4 to 5 times in length of head; lips strongly developed, lower continuous across the chin and forming a short, rounded, median lobe; barbels two on each side, anterior 1 to $1\frac{1}{3}$, posterior $1\frac{1}{3}$ to $1\frac{2}{3}$ diameters of eye. Dorsal IV 8–9, free edge emarginate, last simple ray very strong, bony, not serrated, straight or slightly curved, $\frac{1}{2}$ to $\frac{3}{4}$ length of head. Anal III 5. Pectoral $\frac{2}{7}$ to $\frac{4}{5}$ length of head. Ventral below anterior rays of dorsal. Caudal peduncle once and $\frac{1}{2}$ to once and $\frac{3}{4}$ as long as deep. Scales 30–33 $\frac{5\frac{1}{2}}{4\frac{1}{2}-5\frac{1}{2}}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Dark olive above, the scales blackish at the base, white beneath.

Total length 285 mm.

Four specimens from Lake Ganjule (Margherita).

Very closely allied to *B. nedgia*, Rüpp.; distinguished by the absence of triangular rostral and mental lobes.

30. *Barbus alticola*, sp. n.

Depth of body $3\frac{1}{4}$ to $3\frac{1}{2}$ times in total length, length of head 4 times. Snout rounded, 3 to $3\frac{1}{2}$ times in length of head; diameter of eye 6 times in length of head, interorbital width 3 times; mouth inferior, its width 4 times in length of head; lips moderately developed, lower continuous across the chin; anterior barbel once and $\frac{1}{3}$ to once and $\frac{1}{2}$ diameter of eye, posterior barbel once and $\frac{2}{3}$ to once and $\frac{3}{4}$. Dorsal IV 9, free edge strongly emarginate; last simple ray very strong, bony, not serrated, feebly curved, $\frac{2}{3}$ length of head. Anal III 5. Pectoral a little shorter than head. Ventral below anterior rays of dorsal. Caudal peduncle once and $\frac{1}{2}$ to once and $\frac{2}{3}$ as long as deep. Scales 28-29 $\frac{4\frac{1}{2}}{4\frac{1}{2}}$, 2 between lateral line and ventral, 10 or 12 round caudal peduncle. Silvery grey above, the scales darker at the base, white beneath.

Total length 300 mm.

Three specimens from the Alaba River.

Agrees with *B. labiatus*, Blgr., in the large size of the scales; differs in the longer barbels and the absence of labial lobes.

31. *Barilius Loati*, Blgr.—Zendo River.

Siluridæ.

32. *Clarias lazera*, C. & V.—Sire River.

33. *Clarias Robecchii*, Vincig.—Elgo River.

34. *Heterobranchus longifilis*, C. & V.—Cojeb River, Ergino River.

35. *Schilbe mystus*, C. & V.—Sagan River.

36. *Bagrus docmac*, Forsk.—Ergino River, Sagan River.

37. *Synodontis schall*, Forsk. (*Smithii*, Gthr.).—Sagan River, Lake Ganjule (Margherita).

38. *Synodontis frontosus*, Vaill. (*Citernii*, Vincig.).—Lake Rudolf.

Cichlidæ.

39. *Tilapia nilotica*, L.—Ergino River, Lake Rudolf, Lake Ganjule (Margherita), Lakes Zwai and Suksuki.

LXXII.—*Descriptions of new Reptiles from Yunnan.*

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

Cyclemys yunnanensis.

Carapace much depressed, tricarinate, the median keel much stronger than the laterals, the posterior border slightly serrated in the young, entire in the adult. Vertebral shields as long as broad and much narrower than the costals in the adult; nuchal shield moderate, square or trapezoid. Plastron large, but not completely closing the shell, hind lobe openly emarginate and a little longer than the bridge; transverse hinge distinct but feeble; axillary and inguinal shields small; suture between the gulars 3 to 4 times as long as that between the humerals and as long as or a little shorter than that between the pectorals, the femorals, or the anals, which are nearly equal and longer than that between the abdominals. Snout prominent, pointed; upper jaw not hooked. Digits webbed to the claws, which are long, curved, and sharp. Front part of fore limb with band-like transverse shields. Carapace olive-brown or chestnut-brown, the edge and the keels sometimes yellowish; plastron brown or olive, yellowish on the border, the sutures blackish. Head olive, with a narrow yellow line on each side, passing through the eye; chin and throat marbled with orange; two narrow orange streaks on each side of the neck; limbs with orange spots and streaks.

Length of shell 140 mm.

Several specimens of this very distinct species from Yunnan fu, collected by Mr. John Graham, and one from Tongchuan fu, obtained by the Rev. F. J. Dymond.

Acanthosaura Dymondi.

Head once and a half as long as broad; snout longer than the diameter of the orbit; canthus rostralis and supraciliary edge angular; tympanum nearly as large as the eye-opening; upper head-scales unequal, strongly keeled, some raised and spine-like above the ear; 7 to 9 upper and as many lower labials; gular scales smaller than ventrals, strongly keeled and mucronate. A very indistinct oblique fold in front of the shoulder. Body not at all compressed; dorsal scales irregular, imbricate, strongly keeled; dorsal and nuchal crests continuous, very low, reduced to a series of very strongly keeled scales; one or two more or less regular series of

similar scales on each side of the back ; ventral scales strongly keeled, mucronate. Fourth finger slightly longer than third. The hind limb reaches the shoulder or the ear. Tail cylindrical, not crested. Greyish or brownish above, with a vertebral series of large triangular or cordiform dark brown or black spots pointing backwards.

	♂. mm.	♀. mm.
Total length	218	180
Head	22	19
Width of head	15	13
Body	56	51
Fore limb	35	31
Hind limb	57	42
Tail	140	110

Four specimens from Tongchuan fu, obtained by the Rev. F. J. Dymond.

Macropisthodon rudis.

Maxillary teeth 12 + 2. Rostral once and a half as long as deep, scarcely visible from above ; upper head-shields rugose ; internasals much broader than long, nearly as long as the præfrontals ; frontal once and one fourth as long as broad, slightly longer than its distance from the end of the snout, as long as the parietals ; loreal small, deeper than long ; three præoculars, four postoculars, and three suboculars separating the eye from the labials ; temporals scale-like, strongly keeled ; seven upper labials ; five lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales very strongly keeled, in 25 rows. Ventrals 139 ; anal divided ; subcaudals 50. Anterior part of back with large square, transversely elliptic or biscuit-shaped blackish-brown blotches separated by narrow brownish-white interspaces ; further back the ground-colour passes gradually to olive-brown, with a median series of round and a lateral series of longitudinally elliptic blackish spots ; head blackish brown above, cream-white on the upper lip and below ; belly greyish olive speckled with black anteriorly, blackish speckled with white posteriorly.

Total length 590 mm. ; tail 160.

A single male specimen was obtained at Tongchuan fu by the Rev. F. J. Dymond.

This species is well characterized by its very strongly keeled scales and temporal shields and by the presence of suboculars.

LXXIII.—*Description of a new Fish of the Genus Clarias from Uganda.* By G. A. BOULENGER, F.R.S.

Clarias Wernerii.

Depth of body $6\frac{1}{2}$ to 8 times in total length, length of head $4\frac{1}{2}$ to 5 times. Head about once and a half as long as broad, smooth or very feebly granulate above; occipital process angular; occipital fontanelle as large as or a little smaller than the frontal, and partly on the occipital process; eye very small, 2 to 3 times in length of snout, 5 to 6 times in inter-orbital width; vomerine teeth granular, forming a crescentic band which is as broad as or a little narrower than the band of præmaxillary teeth. Nasal barbel nearly once to once and a half length of head; maxillary barbel once and $\frac{1}{5}$ to twice length of head, reaching extremity of pectoral fin or beyond. 16 to 18 gill-rakers on anterior arch. Dorsal 82-91, its distance from the occipital process nearly $\frac{1}{3}$ length of head. Anal 68-72. Both dorsal and anal in contact with or very narrowly separated from the caudal. Pectoral nearly half length of head, the spine very feebly serrated on the outer border and $\frac{2}{3}$ the length of the fin. Ventral once and $\frac{2}{5}$ to once and $\frac{3}{4}$ as distant from root of caudal as from end of snout. Blackish brown above, lighter brown beneath.

Total length 230 mm.

Found in a pond two hours to the east of Gondokoro by Dr. F. Werner (one specimen presented by him to the British Museum in 1905) and in Lake Victoria (at Bunjako, Buganga, and Munyonyo) by Mr. E. Degen.

LXXIV.—*Note on a New Zealand Amphipod belonging to the Genus Seba.* By CHARLES CHILTON, M.A., D.Sc., F.L.S., Professor of Biology, Canterbury College, New Zealand.

[THE subjoined communication was sent to me by Prof. Chilton for publication. Since receiving it I have carefully compared my female specimens and Mons. Chevreux's descriptions and figures with those of *S. Saundersii* in the 'Challenger' Report. As regards the former, I can find no differences of any value, and I agree with Prof. Chilton that those given by Mons. Chevreux cannot be relied on*. I have therefore come to the following conclusions:—

* There is, however, a marked difference in the mandibular palps: in *S. Saundersii* (and in *S. antarctica*) the third joint is much longer than the first, while in *S. armata* it is said to be shorter. As the last-named species was taken in the Gulf of Gascony, it is probably distinct.

1. That the females of the known species as mentioned in Prof. Chilton's article cannot be differentiated.

2. That *S. Saundersii*, Stebbing, may be the female of *S. typica* (Chilton), *S. armata* (Chevreux), of the 'Discovery' species, or of a male, not yet discovered, distinct from all three, and that, consequently, we are not justified in referring any of them to it.

The 'Discovery' species, which I propose to call *Seba antarctica*, appears to offer an example of male dimorphism. The commonest form resembles the female so closely in size (4.25 mm.) and structure that they can only be distinguished by the absence of the incubatory lamellæ. But in one gathering two males, measuring respectively 5 mm. and 7 mm., occurred, remarkable for the great expansion of the meral joints of the last three pairs of peræopods, especially in the larger specimen. The hand of the first gnathopods is more perfectly chelate than in either *S. typica* or *S. armata*.

It is a question whether any of the above species ought to have been placed in the genus *Seba*! In the 'Catalogue of Amphipodous Crustacea (Brit. Mus.),' p. 159, pl. xxix. fig. 5, Sp. Bate defines *Seba*, which he attributes to A. Costa, as having *long antennæ*, *small coxæ*, and *uniform, subequal, and chelate gnathopoda*. None of the characters italicized fits the above three species, nor can the hand of the first gnathopods of the male *S. typica*, as figured by Prof. Chilton, be properly called chelate. To complete the confusion, Prof. A. Costa denied having ever established either the genus or species of "*S. innominata*, A. Costa, Pochi Crost. de Messina," as given by Sp. Bate, who further says, at the end of his description, that they are taken "from a figure given in a memoir in the possession of Prof. M.-Edwards, but I have some doubt of the correctness of my notes both as to the title of the work and the specific name"! *—ALFRED O. WALKER.]

IN 1884 † I described under the name *Teraticum typicum*, gen. et sp. n., a small Amphipod taken in Lyttelton Harbour. I had three specimens, in two of which the first gnathopod was large and subchelate, while in the third specimen it was smaller and chelate. Subsequently the Rev. T. R. R. Stebbing called my attention to the resemblance between my species and one described by him under the name *Seba*

* 'Challenger' Report, vol. xxix. p. 334; Della Valle, 'Fauna &c. Golf. Neap.,' Gammarini, p. 774.

† Trans. N. Z. Inst. xvi. p. 257, pl. xviii. figs. 1 a-1 f.

Saundersii supposed to come from South Africa; consequently in 1885* I transferred my species to the genus *Seba*, but left its identity or otherwise with *S. Saundersii* an open question, and the New Zealand species was given under the name *Seba typica* in the "Critical List of the New Zealand Crustacea" published in 1886 by Mr. G. M. Thomson and myself †.

In the collections made by the 'Challenger' Mr. Stebbing found a single female specimen from Station 313 off Cape Virgins, Patagonia, which he referred to *Seba Saundersii*, Stebbing, and he considered my New Zealand species to be identical with this, assuming the form I had described with rather large subchelate first gnathopods to be the male ‡. It will be noted that Mr. Stebbing had himself seen no males of his species. The only difference pointed out by Mr. Stebbing between his specimens and the New Zealand ones was in the first joint of the upper antenna, which I had described as being equal in length to the second, while in his original specimen the second joint was a little longer and in the 'Challenger' specimen decidedly longer. In 1892 § I published a short note accepting Mr. Stebbing's view as to the identity of the New Zealand specimens with his and as to the male sex of the forms with the larger gnathopods.

In 1889 ||, among the Amphipoda collected by the 'Hirondelle,' M. Chevreux described under the name *Grimaldia armata* a species from the Gulf of Gascony which he afterwards ¶ described very fully under the name *Seba armata* and compared at some length with *S. Saundersii*, pointing out various differences. As some of the differences were based upon the assumption that the New Zealand species belongs to the true *S. Saundersii*, Stebbing, and as it appears desirable, as shown below, to consider the New Zealand specimens as a distinct species, it follows that these differences may not serve to distinguish *S. armata* from the true *S. Saundersii*, Stebbing.

Mr. A. O. Walker, in working out the Amphipoda collected by the National Antarctic Expedition, has found several specimens of *Seba Saundersii*, Stebbing, and as he finds that in them the first gnathopods of the males do not differ appreciably from those of the female, and therefore differ

* N. Z. Journ. of Science, ii. p. 320.

† Trans. N. Z. Inst. xviii. p. 148.

‡ Rep. on 'Challenger' Amphipoda, p. 783, pl. xlix.

§ Trans. N. Z. Inst. xxiv. p. 260.

|| Bull. Soc. Zool. de France, xiv. p. 284.

¶ 'Résultats des Campagnes Scientifiques par Albert 1^{er} de Monaco, fasc. xvi. p. iii, pl. xiii. fig. 1.

considerably from the New Zealand specimens, he has written to me suggesting that after all these latter should be considered a distinct species. At the same time Mr. Walker has very kindly sent me three female specimens of *S. Saundersii*, Stebbing, so that I have been able to compare them with mine; and after doing so I am forced to agree with him that the New Zealand specimens, though very closely allied, must be considered distinct under the name *S. typica* (Chilton). Unfortunately the only female specimen I had is no longer extant, so that the following description is drawn up from the male only; this, however, is perhaps not of much consequence, since it is evident that in this genus, as in so many others of the Amphipoda, the males of the different species differ from one another much more than the females do.

Seba typica (Chilton).

1884. *Teraticum typicum*, Chilton, Trans. N. Z. Inst. xvi. p. 257, pl. xviii. figs. 1 a-1 f.
 1885. *Seba typica*, Chilton, N. Z. Journal of Science, ii. p. 320.
 1886. *Seba typica*, Thomson and Chilton, Trans. N. Z. Inst. xviii. p. 148.
 1888. *Seba Saundersii*, Stebbing, Report on the 'Challenger' Amphipoda, p. 783, pl. xlix. (in part.).
 1891. *Seba Saundersii*, Chilton, Trans. N. Z. Inst. xxiv. p. 260.

Male.—Closely allied to *S. Saundersii*, Stebbing, and also to *S. armata*, Chevreux, and apparently differing mainly in the first gnathopoda, which are large and strong; propod oblong, width at base equalling that of the end of the carpus, anterior border with an oblique row of setæ about the middle; palm transverse, its middle third with a rather deep depression, in which rises a small projection bearing a single short seta, the portions of the palm on either side of the central depression bearing three or four short setæ; dactyl stout, its inner border very minutely serrate.

Female.—Differs from the male in having the first gnathopod chelate and apparently very similar to that of *Seba Saundersii*.

Hab. Lyttelton.

Length about 2 mm.

M. Chevreux gives several small points in which *S. armata* appears to differ from *S. Saundersii*, such as the shape of the side-plate of the first segment of pereion, the relative lengths of the different joints of the antennæ, and of the peduncles and rami of the uropoda &c. After carefully comparing the figures and descriptions given by M. Chevreux and Mr. Stebbing with regard to these points, and after observing them in my specimens and in those of *S. Saundersii* sent by Mr. Walker, I must confess that I have little con-

ference in any of these differences as good specific characters, and consider that the distinction must be made principally by the characters of the first gnathopod of the male (see figure). For the sake of comparison, however, I give here a few points in which my (male) specimens appear to differ from the other species, it being understood that in the characters not mentioned there is no appreciable difference.



Seba typica: first gnathopod of male (highly magnified).

In the antenna the second joint of the peduncle is more slender than the first and is equal to it in length or only very slightly longer; the lower antenna is hardly, if at all, shorter than the upper; in all the pereopoda the meros is more or less produced alongside the carpus; in the first pereopod this projection reaches about to the middle of the carpus, in the last pereopod it reaches slightly beyond the distal end of the carpus, the intervening pereopoda showing intermediate stages; the first uropod has the peduncle a little shorter than that of the second, the outer branch is longer than the peduncle and about two thirds the length of the inner branch; in the second uropods the branches are subequal. My specimens are about the same size as *S. armata*, but considerably smaller than *S. Saundersii*.

LXXV.—On the Generic Name *Stolasterias*, Sladen.
By WALTER K. FISHER.

IN that invaluable work by Sladen on the Asteroidea of the 'Challenger' Expedition (Zoology, xxx.) we find the first systematic attempt to subdivide the large and unwieldy genus *Asterias* into smaller and more natural groups. Sladen considered these groups to be subgenera; but since then all have been accorded generic rank by Perrier and others. Some of Sladen's groups (as, for example, *Stolasterias*) have been again divided into narrower genera. In this division unnecessary confusion has been caused by the renaming of previously named genera and the transference of *Stolasterias* to a slightly different group—in other words, by giving it a new type species.

To begin at the beginning, the type of *Stolasterias*, Sladen, is *Asterias tenuispina*, Lamarck. In an article entitled "Notes on the Radiata in the Museum of Yale College, with Descriptions of new Genera and Species"*, p. 248, Verrill describes a new genus and species, *Coscinasterias muricata*, from New Zealand, giving a separate diagnosis for the genus. This species Sladen considered as strictly congeneric with *A. tenuispina*, for he placed it under the synonymy of *Asterias (Stolasterias) calamaria*, Gray, the third species (l. c. p. 583) of his "*Asterias tenuispina* group." It is curious that he did not recognize the claims of the generic name, which should have been given to the subgenus instead of a new designation, *Stolasterias*. In other words, the genus *Stolasterias*, including *tenuispina*, *calamaria*, *gemmifera*, *volsellata*, *stichantha*, *glacialis*, and other species, must be called by the much older name *Coscinasterias*, Verrill.

In 1894 Perrier † divided Sladen's group into three genera—*Coscinasterias*, Verrill (type *calamaria*), *Polyasterias*, Perrier (type, by inference, *tenuispina*), *Stolasterias*, Sladen, emended (type *glacialis*!). In 1896 ‡ he added another genus, *Distolasterias* (type *stichantha*, Sladen), for the five- and six-rayed species with two spines to each adambulacral plate. Since *tenuispina* had already been made the type of *Stolasterias*, the name *Polyasterias* was superfluous and falls

* Trans. Conn. Academy, i. part 2, Feb. 1867.

† Expéd. 'Travailleur' et 'Talisman,' Echinodermes, p. 108.

‡ "Contrib. à l'Etude des Stellérides de l'Atlantique Nord," Rés. Campag. Scientif. du Prince de Monaco, fasc. xi. p. 34.

as a synonym of *Stolasterias*. The calm transferring of the name *Stolasterias* to another species and the use of it in other than the original sense cannot be too strongly condemned. This change was entirely unnecessary, since *Asterias glacialis* has already served as the type (sub nomine *foliacea*) of *Marthasterias*, Jullien*.

Whether these smaller groups of Perrier are valid genera or not is probably a matter of opinion. The distinction between *Marthasterias* and *Distolasterias* is simply the possession by the former of one, by the latter of two, adambulacral spines. Species of the latter group have plates with only one spine scattered among the others. It is even seriously to be questioned whether some of these groups are worthy of subgeneric rank, but they have been so placed in the following list in order to straighten out the claims of the various names. The subgenus *Stolasterias* †, Sladen, will therefore become the genus *Coscinasterias*, Verrill, and the names *Polyasterias*, Perrier, and *Stolasterias*, Perrier (but not of Sladen), will drop out of nomenclature. The list is as follows:—

Genus COSCINASTERIAS, Verrill, 1869.

Subgenus COSCINASTERIAS, Verrill, 1869; type, *Asterias calamaria*, Gray, sub nomine *C. muricata*.

Subgenus STOLASTERIAS, Sladen, 1889, restricted; type, *Asterias tenuispina*, Lamarck. (Syn. *Polyasterias*, Perrier.)

Subgenus MARTHASTERIAS, Jullien, 1878; type, *Asterias glacialis*, O. F. Müller, sub nomine *M. foliacea*. (Syn. *Stolasterias*, Perrier, nec Sladen.)

Subgenus DISTOLASTERIAS, Perrier, 1896; type, *Asterias (Stolasterias) stichantha*, Sladen.

Stanford University, California, U.S.A.,
March 14, 1906.

* Bull. Soc. Zool. France, 1878, p. 141. *Marthasterias foliacea* is equivalent to *Asterias glacialis*, O. F. Müller, according to Sladen and Ludwig.

† Employed as a genus in Sladen's sense by Ludwig, Mem. Mus. Comp. Zoology, xxxii, 1905 (July 17), p. 221.

LXXVI.—A new Vole from Spain.

By OLDFIELD THOMAS.

AMONG a collection of small mammals obtained by Mr. Martinez de la Escalera in the mountains just north of Madrid there occurs a specimen of a large vole which appears to represent an entirely distinct form, not closely allied to any known European species. I propose to name it in honour of Sr. A. Cabrera Latorre, the well-known mammalogist of the Madrid Museum, to whom we are indebted for much of our knowledge of Spanish mammals.

In addition to the above specimen, an imperfect example of the same species has been in the British Museum since 1853, having been purchased from the dealer Parzudaki in that year. It was said to be from Spain, but the correctness of the locality has hitherto seemed too doubtful to justify its description.

Microtus Cabrerae, sp. n.

Size large, about as in *M. ratticeps* or *nivalis*, therefore decidedly larger than in any of the forms of *arvalis* or *agrestis*. Form thick and stout. Fur long and loose; shorter hairs of back about 11, bristle-hairs about 18 mm. in length. On the rump the bristle-hairs are particularly numerous and long. General colour above coarsely lined olive or hair-brown, though, perhaps, part of the yellowish suffusion in the olive is due to alcoholic discoloration. Under surface not sharply defined, rather lighter, the hairs dark slaty basally, dull yellowish terminally, but this may again have been artificially caused. Feet long and heavy; soles with six clearly defined pads; upper surface of hands and feet grizzled brownish yellow proximally, yellowish white terminally. Tail short, brownish white above, white below.

Skull thickly and heavily built, very different in shape from that of any other European vole; the brain-case peculiarly short and high, not flattened above. Nasals projecting over incisors, so that these are hidden from above; behind, the nasals are less narrowed than usual, the posterior breadth three fourths the anterior; interorbital surface concave mesially above, the low ridges close to its edges in the type, more nearly approaching but not touching each other in the 1853 specimen. Anteorbital foramina open above, their outer walls more distant from each other above than below, instead of being nearly parallel. Palatal foramina large, widely

open, their posterior margins with sharpened edges. Bullæ fairly large.

Molars broad and powerful, of a simple type; m^1 and m^2 as usual, not as in *agrestis*; m^3 not unlike Blasius's fig. 190 (" *A. amphibius*," Säug. Deutschl. p. 345), but the posterior internal angle sharper and equal in projection to the other two. M_1 with six closed spaces and an anterior triangle, which has one outer and two inner angles.

Dimensions of the type (measured in the spirit-specimen):—

Head and body 107 mm.; tail 34; hind foot 22; ear 12.

Skull: greatest length 28; basilar length 24.1; zygomatic breadth 16; nasals 9; breadth of brain-case 12.3; height of brain-case from alveolus of m^3 10.2; palatilar length 14.3; diastema 8.5; palatal foramina 5.7; length of upper molar series (crowns) 6.3.

Hab. Sierra de Guadarrama, near Rascafria, N. of Madrid. Altitude about 1000–1300 m.

Type. Subadult male. Collected by Mr. M. de la Escalera.

This remarkable vole is not closely allied to any known species. Prof. Bocage's *Arvicola rozianus*, from Portugal, is a member of the *agrestis* group, while *M. Cabrera* would seem to be a large aberrant form of the *arvalis* type.

MISCELLANEOUS.

On the Dates of Publication of the Natural History Portions of the 'Encyclopédie Méthodique.' By C. DAVIES SHERBORN and B. B. WOODWARD.

SINCE our previous notes on this subject (Proc. Zool. Soc. 1893, pp. 582–4, and 1899, p. 595) a considerable amount of additional information has come to hand, so altering our first results as to render it desirable to put the whole on record *de novo*.

The existence of two fragmentary sets in the original wrappers has become known to us: one at the Academy of Sciences, Philadelphia, U.S.A., for details concerning which we are very greatly indebted to Mr. E. J. Nolan, of that institution; the other set is in the library of the "Hull Literary and Philosophical Society," and we have to thank Mr. T. Sheppard, of the Hull Museum, for assisting us to obtain detailed information about it. Our other sources of information are set out in the table that follows.

Some few blanks still remain to be filled, despite a patient search through contemporary literature.

Vol. & Pt.	Contents.	Pages.	Titlepage dated	Date of publication.	Livraison in which it appeared.	Source of information.
Tom. I. pt. 1.	{ "Histoire Naturelle des Animaux." By DAUBENTON (1).	pp. i-xciii, 1-320 (2).	1782.	Nov. 1782.	1	Encyclop. Méthod. "Avertissement" prefixed to 'Beaux Arts, Tom. I.' pp. lxii-lxxxiv & xvii.
2.	{ "Ornithologie." By MAUDUYT.	pp. 321-691	.....	Oct. 1783.	5
II. pt. 1.	"	pp. 1-400 (3).	1784.	Feb. 1784.	7	
2.	{ "Animaux Quadrupèdes Ovipares et les Serpens." By DAUBENTON (4).	pp. 545-712	Oct. 1784.	11	
III.	{ "Poissons." By DAUBENTON.	pp. i-lx, 1-435.	1787.	May 1787.	22	
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2.	"	369-704.	[1792] (6).	51	
VII. pt. 1.	"	pp. 1-368.	1792.	[1792 or 93].	54	
2 (7).	"	369-827.	[1797].	61	
VIII. pt. 1.	{ "Insectes." By OLIVIER [& LATREILLE] (8).	pp. [1-360]. 361-722.	1811.			
2.	{ "Insectes." By LATREILLE & GODART (9).	pp. 1-328.	.....	1812.	77
IX. pt. 1.	"	329-828.	1819.	1819.	87	
2.	{ "Insectes." By LATREILLE, LE PELLER- TIER DE ST.-FARGEAU, SERVILLE & GUÉRIN [-MÈNEVILLE].	pp. 1-344. 345-832.	.....	1824.	95
X. pt. 1.	"		1825.			
2.	"		.....	1828.	100

Livraisons, in the original wrappers, in the Library of the "Academy of Natural Sciences of Philadelphia."

Bibl. Franç. 5 July, 1812, p. 481.
 " " 13 Feb. 1819, p. 89.
 " " 17 July, 1824, p. 433.
 { "Fér. Bull. iv. 1825, p. 283.

Bibl. Franç. 1 Oct. 1825, p. 649.
 " " 13 Dec. 1828, p. 886.

"Histoire naturelle des Vers."									
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2.	"	345-758.	1792.					
II. pt. 1.	{ By BRUGUIÈRE, LA-	pp. i-vii, 1-256. }	1830.	1830.					
2.	{ MARCK, and DES-	1-144. }							
"	{ HAYES (11).		.....	1832.					
III.	By DESHAYES.	pp. 145-594.	1832.	1832.					
"Histoire naturelle des Zoophytes."		595-1152.	1832.						
Pt. 1.	{ By LAMOUROUX, BORY	pp. i-viii, 1-376. }	1824.	1824.					
2.	{ DE ST. VINCENT, and	377-819. }	.....	1827 (12).					
	{ EUD. DESLONGCHAMPS }								

- (1) The Quadrupeds were edited from Buffon.
- (2) The last page of this part is misprinted as "230."
- (3) We make the division here on account of the change of font in the numeral "4" of the pagination and other minor indications.
- (4) To the " Animaux " and " Oiseaux " no specific names are appended ; to the " Quad. ovip.," the " Serpens," and the " Poissons " the genera and species of earlier authors are appended, but no new names are given and precedence is given to the French version.
- (5) This volume was evidently issued in two parts like the others, but we have as yet no evidence as to the exact division. Five "discourses préliminaires" (pp. i-cclxxxviii and i-cclxxxiii) by Mauduyt are prefixed (Guéneau de Monthéillard, who had been entrusted with the work, died before he could carry out his mission). Mauduyt also contributed some of the articles, which he signed. Olivier took up the systematic portion of the work from the beginning.
- (6) The dates of publication given in square brackets are taken from dated portions of other subjects that appeared in same livraison.
- (7) "M. Olivier, obligé de s'absenter pendant plusieurs années pour remplir dans le Levant une mission de Gouvernement [from 1792-1798, in company with Bruguière, who died out there], reprend ici la rédaction de ce Dictionnaire, qui avoit été confiée à d'autres personnes depuis la lettre L." That is to say, from vol. vii. p. 601 to vol. viii. p. 45 (on which page is the note quoted). Since B. E. Manuel signed the last page of vol. vii. and the article so signed was not completed, it is probable that he was the chief person to whom the work was entrusted.
- (8) Pp. 1-45 of T. VIII. pt. 1 was written by B. E. Manuel. On p. 468 we find the following:—"Nous avons engagé M. Latreille . . . à se charger d'abord de quelques articles qui seront souscrits des trois premières lettres de son nom."
- (9) Mr. W. F. Kirby has copies of these two parts as issued. The article "Papillons" was written by Godart (see the preface to the volume).
- (10) In the article *Conus*, the definition of the genus, its divisions, and the Latin diagnoses of the species and varieties were the work of C. H. Hwass (for an account of whom see 'Journal of Conchology,' vol. xi. 1906), while Deshayes supplied the general observations, the synonymy, and the French descriptions of the species ('Vers,' Tom. I. p. 598). According to Lamarck, who evidently had not read this passage, Hwass superintended the drawing of the plates from the actual specimens described ('Anim. s. Vert,' Tom. VII. 1822, p. 442).
- (11) Neither Bruguière (+1798, not 1799 as usually stated) nor Lamarck (+1829) had any part in this volume, which was entirely the work of Deshayes.
- (12) A limited number of advance prints of Bory de St. Vincent's article on the "Microscopiques" (8°, pp. 104) was issued in 1826. (See review by Desmarest in Fér. Bull. viii. 1826, pp. 303-9, 407-13, & 441-8.)

} Livraisons, in the original wrappers,
in the possession of M. G. Dollfus.

{ Fér. Bull. xxv. 1831, p. 123.
{ Bibl. Franç. 6 Feb. 1830, p. 85.

" " " 29 Sept. 1832, p. 548.

" " " 17 July, 1824, p. 433.
" " " 3 Oct. 1827, p. 811.
{ Fér. Bull. xiv. 1823, p. 160.

ZOOLOGIE.—Plates (with Explanations and Appendices).

	Pages and plates.	Titlepage dated	Date of publication, in which it appeared.	Source of information.
"Mammalogie." By DESMAREST.	pls. i.-xlviii. pls. xlix.-cxii.	..... .....	1790, 1791.	Livraisons, in the original wrappers, in the Library of the "Hull Literary and Philosophical Society."
	pp. 1-276; suppl. pls. i.-xiv, pp. i-viii, 277-556.	1820.	1820, 1822.	
"Tableau encyclopédique et méthodique des Trois Règnes de la Nature."	pp. i-xli, 1-28; pls. i.-xii.	1789.	1789.	Livraisons, in the original wrappers, in the Library of the "Hull Literary and Philosophical Society."
"Cétologie." By BONNATERRE.	pp. i-xxviii, 1-70; pls. i.-xxvi, pls. i.-xxxv.	.....	.....
"Erpétologie."	pp. 1-32; pls. xxxvi.-xliii.	1790.	1790.	Livraisons, in the original wrappers, in the Library of the "Hull Literary and Philosophical Society."
"Ophiologie."	pp. i-xlv, 33-76.	.....	.....
"Ornithologie."	pls. i.-lxxxvii.	.....	.....	Livraisons, in the original wrappers, in the Library of the "Hull Literary and Philosophical Society."
	pls. lxxxviii.-cclxxvii. { pp. i-lxxx; pls. cclxxviii.-cccxxix. & i.-vii.	1823.	1790, 1791. [1792].	
	pp. lxxxix.-xcvii, 1-192.	.....	1820.	Bibl. Franç. 6 Jan. 1821, p. 1. " " 6 July, 1822, p. 411. " " 26 July, 1823, p. 438.
	pp. 193-320. [pp. 321-528].	.....	1823.	
	pp. 529-848.	.....	1823.	Livraisons, in the original wrappers, in the "Hull Literary and Philosophical Society's" Library.
	[pp. 849-1460].	1788.	1788.	
"Ichthyologie." By BONNATERRE.	pp. i-lvi, 1-215; pls. i.-cii,	1818.	1790.	Bibl. Franç. 8 Aug. 1818, p. 452. " " 13 Dec. 1823, p. 886.
"Crustacés, Arachnides, et Insectes." By LATREILLE.	pls. i.-xxxii. pls. xxxiii.-lxxv. pls. lxxvi.-cclxv. pls. cclxvi.-cclxxvii. (13). pp. 1-39; pls. cclxxviii.-cccxcvii. pp. 1-142 (text to pls. i.-cclxxviii.).	..... ..... ..... ..... .....	1791. [1792]. 1797. 1818. 1828.	

"Dictionnaire." By LAMARCK, continued [Tom. V.-VIII.] by POISSON.
Tom. I. pt. 1. pp. i-xlv. 1-368?

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--- "Supplément." By POISSON.

Tom. I. pt. 1. pp. i-xviii, 1-

2. -761.

II. pt. 1. 1-384.

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IV. pt. 1. 1-368.

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"Illustrations des Genres." By LAMARCK, continued [Tom. II. pt. 2-III. & Suppl.] by POISSON.

Tom. I. pt. 1. pp. 1-232.

2. 233-496.

II. pt. 1. 1-136.

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"Planches" subsequently made up into 4 vols. of 250 plates each.

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Bibl. Franç. 29 Nov. 1811, p. 83.
" " 5 July 1812, p. 481.
" " 17 Sept. 1813, p. 406.
" " 8 Sept. 1814, p. 241.
" " 29 June, 1816, p. 273.
" " 14 Dec. 1816, p. 545.
" " 1 Nov. 1817, p. 593.
" " Verso of title to vol. ii. "Lettre," p. 12 note, prefixed to "Histoire," Tom. V.

Mag. Encyclop. 1797, Tom. I. p. 270.
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Bibl. Franç. 6 Nov. 1819, p. 513.

" " 1 Mar. 1823, p. 121.

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Mag. Encyclop. 1797, Tom. I. p. 270.

Bibl. Franç. 6 Nov. 1819, p. 513.

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