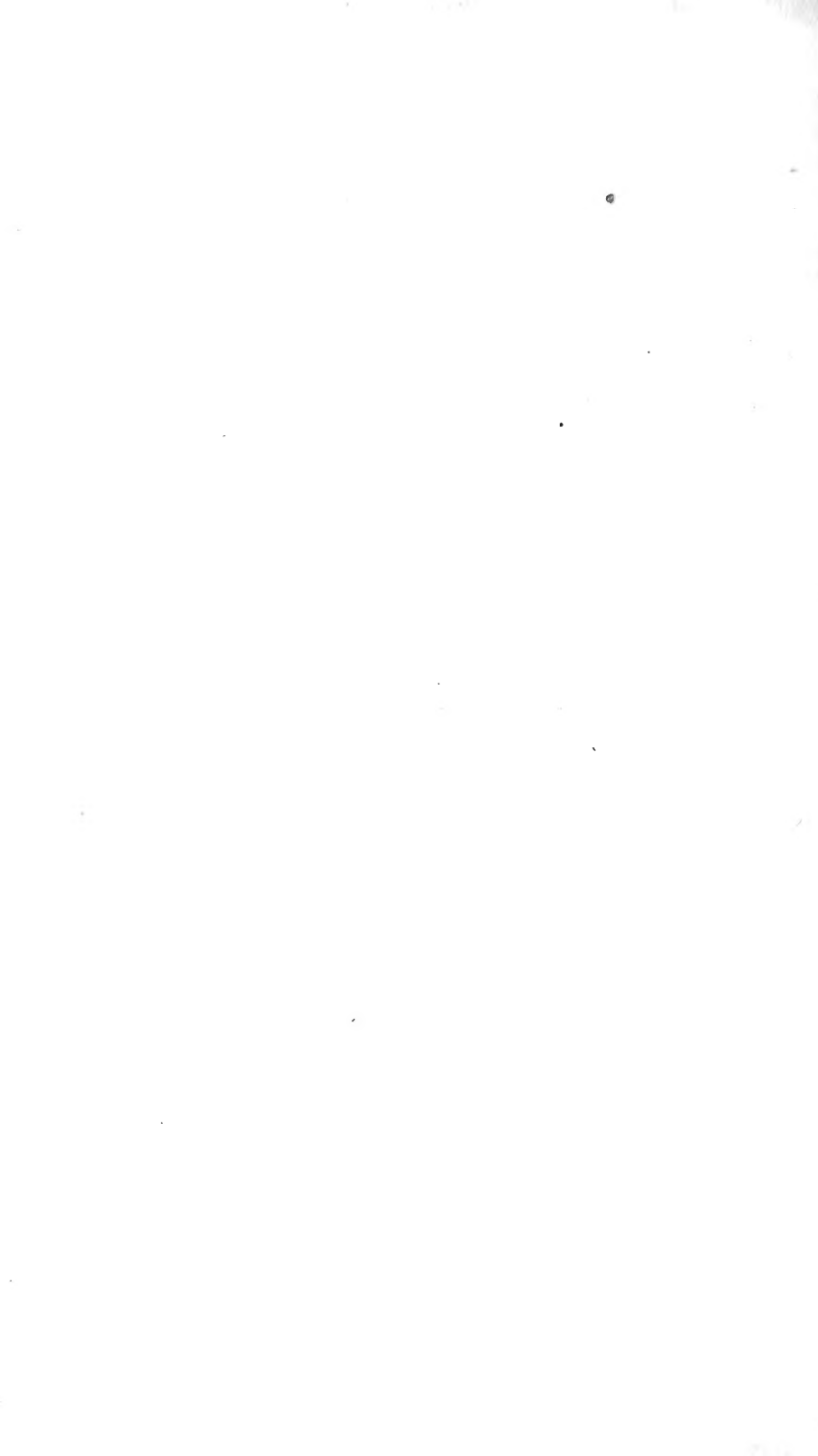
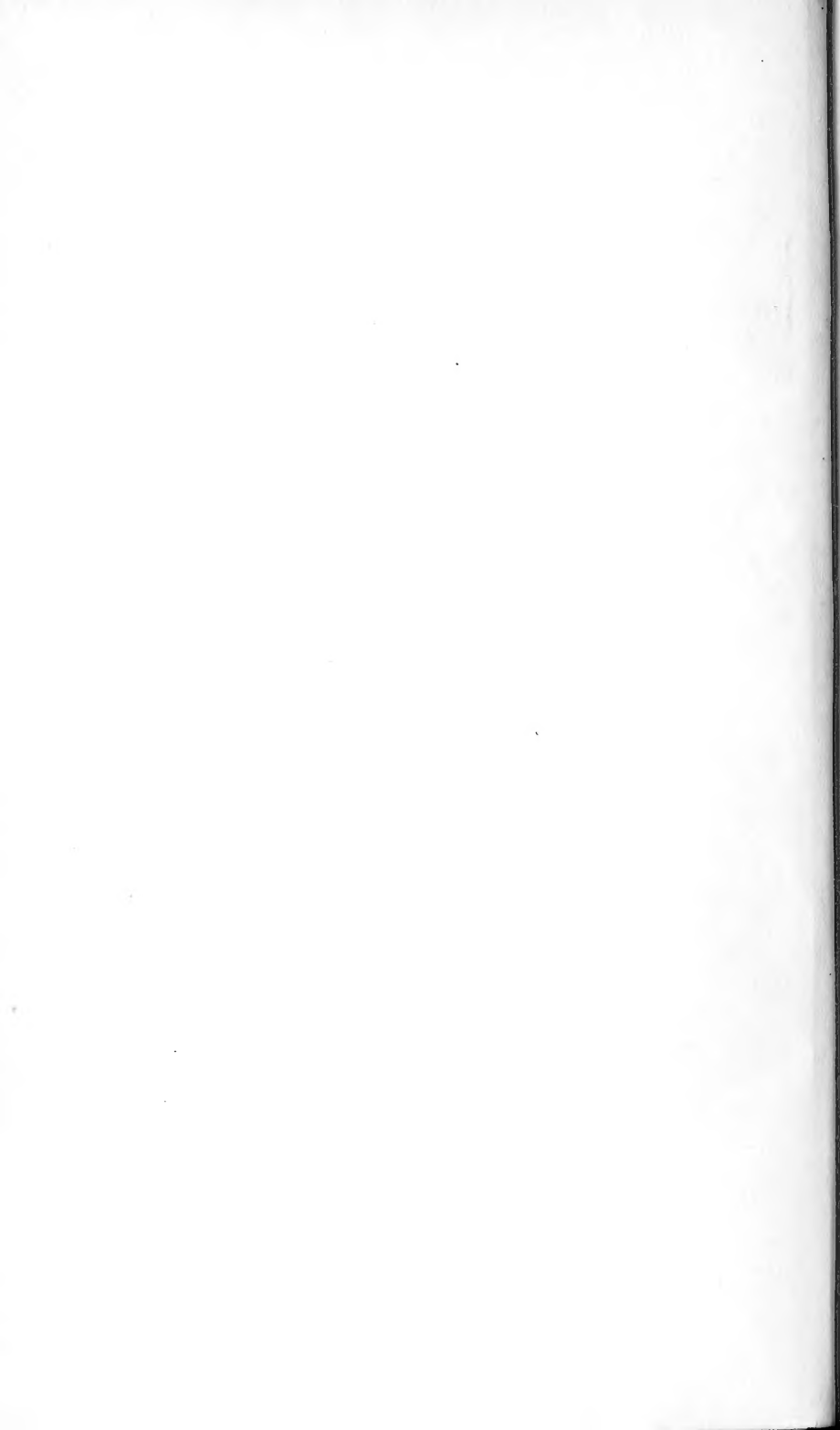


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I

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
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,
ARTHUR E. SHIPLEY, M.A., Sc.D., F.R.S., F.Z.S.,
AND
WILLIAM FRANCIS, F.L.S.

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VOL. XIV.—EIGHTH SERIES.  
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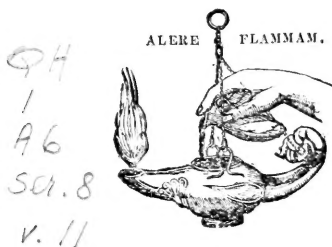
1914.

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

Page 258, line 39, for *nigrifrons* read *rugifrons*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

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

No. 79. JULY 1914.

I.—*Descriptions and Records of Bees.*—LX.

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

Lithurgus guamensis, sp. n.

♀.—Length 13–14½ mm.

Very close to *L. albofimbriatus*, Sich. (Tahiti), and *L. atratiformis*, Ckll. (Australia), but differing in various small characters. Vertical supraclypeal ridge not reaching lower margin of supraclypeal area, but leaving a punctured region between end of ridge and top of clypeus (no such punctured region in *albofimbriatus*); hair of cheeks and anterior coxæ fulvous; front and occiput with erect black or dark fuscous hair; hair of pleura black; scutellum not or barely depressed in middle; first recurrent nervure joining second s.m.; marginal nervure of hind wing not bent or angular near origin (in *albofimbriatus* it is bent or even slightly appendiculate); white abdominal bands as broad as in *L. atratiformis*; hair at apex of abdomen entirely black; sides of abdominal dorsum more strongly punctured than in *albofimbriatus*, herein like *atratiformis*.

Ann. & Mag. N. Hist. Ser. 8. Vol. xiv. 1

Hab. Island of Guam, 3 ♀ (*D. T. Fullaway*). U.S. National Museum.

This is really nearer to the Australian than to the Tahitian insect.

Megachile fullawayi, sp. n.

♀.—Length 9–10 $\frac{1}{4}$ mm.

Black, with white hair and entire white abdominal bands; vertex and disc of mesothorax, and scutellum more or less, with dark fuscous hair; ventral scopa mainly bright ferruginous, but broadly white basally, and black on apical part of last segment. Exactly like *M. palmarum*, Perk., from the Hawaiian Is., except that the clypeus has a smooth shining band down the middle (wanting in *palmarum*); the mesothorax has short pale appressed hair anteriorly and posteriorly; the tegulæ are more or less reddish, at least on margin; the ventral scopa is white basally; and there is black hair at sides of abdominal segments 4 to 6.

♂.—Length about 8 mm.

Like *palmarum*, but very easily separated by the apical transverse keel of abdomen (sixth segment), which is slightly depressed in middle, with about five little sharp teeth (broadly, deeply, semicircularly incised in *palmarum*). Tegulæ rather light reddish; mesothorax with appressed ochraceous hair, broadly in front, narrowly behind; middle of third and fourth ventral segments of abdomen each with a marginal patch of orange-fulvous hair, quite separate from the white hair-bands.

Hab. Island of Guam, 2 ♀, 1 ♂ (*D. T. Fullaway*). U.S. National Museum.

Easily known from *M. hedleyi*, Rainbow (Funafuti) by the hyaline (faintly dusky) wings and white abdominal bands. The male is the type.

Halictus saffordi, sp. n.

♀.—Length 7–8 mm.

Robust, with very little hair on head and body; head broad; clypeus sparsely but distinctly punctured, bluish green, suffused by dark purplish toward lower margin; mandibles with a bright ferruginous subapical patch; supra-clypeal area convex, purple-black, sparsely punctured; sides of face blackish; front dull purplish, shining at sides; cheeks olive-green above, suffused with crimson below; flagellum rather long and slender, dull red beneath except at base; mesothorax and scutellum shining violet (varying

to yellowish green suffused with violet), with extremely fine punctures; tubercles reddish, with a dense fringe of pale hair; pleura green suffused with red, but there is a violet area just below the wings; metathorax green, mostly dull, but brilliantly shining at sides above; area of metathorax, except apically, quite dull, and covered with fine but very distinct radiating rugæ; tegulæ dark reddish. Wings dusky; nervures and stigma dark rufo-fuscous; outer r.n. and t.-c. much weakened; first r.n. joining second s.m. some distance before end; third s.m. short, smaller than second. Legs dark reddish; middle femora with a large tuft of orange hair at base beneath; hind femora strongly arcuate, with a curled scopa on underside; hind spur with four stout teeth, the two basal ones long. Abdomen broad, shining, scarcely punctured, not banded, dark green, suffused with violet at sides (or very little so); the second segment may have a subbasal band of reddish colour; venter with an abundant light reddish curled scopa.

Microscopical characters:—Front longitudinally lineolate and minutely corrugated; vertex transversely lineolate; mesothorax very delicately tessellate between the punctures; tegulæ anteriorly with very few piliferous punctures; area of metathorax with about 26 rugæ, between which it is transversely striated basally, but the golden-tinted apical part beyond the rugæ is minutely cancellate; abdomen very finely transversely lineolate.

Hab. Island of Guam, 3 ♀ (*D. T. Fullaway*). U.S. National Museum.

Very close to *H. perpessicius*, Kohl, from Samoa, but the hind femora are strongly arched beneath, without a secondary subapical swelling. The colour also seems rather different. I have never seen *H. perpessicius*, and have depended on Kohl's description and figures. The new species is named after W. E. Safford, who has published a most excellent account of Guam.

It is singular that the above three species from Guam are all very closely related to other species of the Pacific islands, yet distinguishable. How did they reach the island? Could they have been brought with plants by the early settlers before the historic period? How much time is necessary to bring about the modification observed? Analogous questions are raised with respect to the mammals of the Andaman and Nicobar Islands by G. S. Miller in Proc. U.S. National Museum, xxiv. p. 791.

Prosopis guamensis, sp. n.

♀.—Length about $7\frac{1}{2}$ mm.

Robust; head and thorax black; tubercles, scutellum, and postscutellum yellow (turned red by cyanide in the material before me); upper border of prothorax with a small yellow mark on each side; face-marks reduced to a very obscure narrow band along each inner orbit; head broad and massive; mandibles thick, bidentate at end; clypeus very high, irregularly roughened with striæ and punctures; flagellum dark reddish beneath; front shining, with large punctures, those in the middle crowded, but on each side is a depression with scattered very large punctures; cheeks with rather small punctures; mesothorax shining, rather sparsely but strongly punctured, the longitudinal grooves distinct; area of metathorax crescentic, well defined, shining, with distinct ridges; sides of metathorax with white tomentum; tegulæ black. Wings clear, with dark fuscous nervures and stigma; first r. n. meeting first t.-c.; second s. m. very long; second r. n. with a strong double curve. Legs black, the hind femora reddish. Abdomen shining, dark green, finely subobsoletely punctured, second segment blackened basally.

♂.—(Head lacking in specimen studied.) Similar to the female, but more slender; anterior tibiæ and tarsi ferruginous; abdomen bluer and more distinctly punctured. This was examined by Dr. R. C. L. Perkins, and bears the following label in his handwriting:—"Belongs to group with largely developed wings of seventh ventral segment and bifurcate apex to eighth segment, the bifurcations expanded, as in *Prosopis cressoni*; see Metz's paper, Tr. Am. Soc. xxxvii. pl. iv. fig. 53 &c. This group is American, Australian, and European, and probably cosmopolitan." The terminal lobes or divisions of the eighth ventral plate are large and abundantly fringed with very long, coarse, dark branched hairs. The sagittæ are turned downward at the end, the downward curve beginning about the level of the ends of the stipites, which are furnished with long dark hairs.

Hab. Island of Guam (*D. T. Fullaway*). U.S. National Museum.

Not at all related to the Hawaiian *Prosopididæ*, but close to some of the Australian forms, from which it is readily known by the face-markings.

Paracolletes flavomaculatus, Cockerell.

A female from Kuranda (*Dodd*; Queensl. Mus. 86) has a patch of light fulvous hair on each side of face.

Paracolletes cæruleotinctus, Cockerell.

Sunnybank, Brisbane, Nov. 19, 1913 (*Hucker*; Queensl. Mus. 90).

Paracolletes erythrurus, sp. n.

♀.—Length about 12 mm.

Head and thorax black, abdomen bright but not shining ferruginous; wings unusually short, strongly dusky; head large and broad; hair of cheeks white, of sides of face white with fulvous overlapping, of front and vertex pale fulvous; clypeus convex, shining, with irregularly scattered not very large punctures, its lower margin red; labrum and mandibles, except apically, bright red; scape long and curved, red at extreme base; flagellum dull red beneath, except basally; mesothorax dull, with small indistinct punctures; hair on tubercles fulvous, on pleura creamy white, on thorax above short and thin, pale fulvous, more or less tipped with fuscous; area of metathorax dull; tegulæ dark red; stigma practically obsolete, nervures fuscous; b. n. falling just short of t.-m.; second s.m. of good size, receiving first r. n. about or a little beyond middle; third s.m. elongated, receiving second r. n. a short distance before end. Legs black, with the tarsi and anterior tibiæ in front clear ferruginous, middle tibiæ also reddened at end and in front; hair of legs pale, fulvous on tibiæ and tarsi; middle basitarsi broad, concave beneath; hind tibial scopa stained with fuscous above, especially basally. Abdomen dull red, without evident punctures and without hair-bands except on fifth segment (and to some extent at sides of fourth), where there is a greyish-brown band; sides of second segment with a large round black spot; venter with hair-bands, golden fulvous in middle, white at sides.

♂.—The convex subglobular labrum, mandibles (except apical margin), and clypeus cream-colour; face and front densely covered with bright golden-fulvous hair; scape bright red; flagellum long, crenulate, and obscure red beneath; head and thorax above with bright fulvous hair; knees (hind ones very broadly), tibiæ, and tarsi red, middle tibiæ largely blackish on outer side; apical abdominal seg-

ments without hair-bands; apical plate broadly rounded; venter with long white hair.

Hab. Yallingup, near Cape Naturaliste, S.W. Australia, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). British Museum.

Allied to *P. bimaculatus*, Sm., differing by the dark wings, details of venation, &c. There is a strong superficial resemblance to *P. fimbriatus*, Ckll., but that species differs greatly in the structure and sculpture of the abdomen. The female of *P. erythrurus* is the type.

All the bees of Turner's recent collections which I have received from the British Museum have been ascertained by Mr. Meade-Waldo to be distinct from all the species in the Museum, so that after I have compared them with my own materials they have been compared with most of the types of Australian bees.

Paracolletes nigrocinctus, sp. n.

♂.—Length 11–12 mm.

Head and thorax black; abdomen dull red, segments 1 to 5 having narrow subapical black bands, the margin beyond subhyaline, and on segments 2 to 5 having a thin fringe of short silvery-white hairs; middle of first segment wholly black; venter of abdomen dark, with light reddish (tegumentary) bands; clypeus, except the broad dark upper and lateral margins, reddish-cream colour, this light area sometimes strongly trilobed; labrum pale, not swollen; mandibles red; scape short, black; flagellum long, obscure reddish beneath; face, front, and cheeks with long pale hair, distinctly fulvous-tinted over clypeus; occiput with long fuscous hair; mesothorax and scutellum somewhat shining, with rather sparse shallow punctures; area of metathorax shining but not polished, not transversely keeled; discs of mesothorax and scutellum with abundant long dark fuscous hair, but pale greyish hair on thorax anteriorly, between mesothorax and scutellum, and on metathorax; a large patch of fuscous hair just below tegulae; tegulae dark rufous. Wings dusky greyish, nervures and the small stigma fuscous; b. n. falling a little short of t. m.; second s. m. small, square, receiving first r. n. about middle; third s. m. long, receiving second r. n. some distance before end. Knees, tibiae, and tarsi red, the tibiae broadly suffused with black. Abdomen feebly punctured on a dull ground; first segment with much white hair; apical plate rather small; sixth ventral segment with a median erect tuft of pale hair.

Hab. Yallingup, near Cape Naturaliste, S.W. Australia,

Sept. 14–Oct. 31, 1913 (R. E. Turner). 4 ♂, British Museum.

A very distinct species, known from all others by the ornamentation of the abdomen. It is related in a general way to *P. bimaculatus* and *erythrurus*.

Megachile abdominalis, Smith.

Brisbane, Sept. 12, 1913 (*Hacker*; Queensl. Mus. 94).

Euryglossina microxantha, sp. n.

♀.—Length about $3\frac{1}{2}$ mm.

Light sulphur-yellow; eyes olive-green; a black line on each side extending from near outer side of lateral ocelli downward near orbital margin to about level of front; antennæ placed very low down; mesothorax obscurely suffused with pale reddish; area of metathorax triangular, dark reddish-brown, with a central triangular yellow mark. Wings clear, stigma and nervures wholly pallid, light yellowish; b. n. falling far short of t.-m.; first r. n. joining first s.m. some distance from apex; lower side of first s.m. straight. Abdomen broad, with five broad reddish-brown bands, which end abruptly before the lateral margins; venter entirely yellow.

Hab. Mackay, Queensland, at flowers of *Leptospermum*, October 1898 (*Turner*). British Museum.

Related to *E. sulphurella*, Ckll., but easily known by the dark abdominal bands. It looks just like a small and pallid *Euryglossa furcifera*, Ckll., but that differs generically in the venation, the first r. n. entering the second s.m., while the second s.m. is much higher in proportion to its length.

Euryglossa brachycera, sp. n.

♀.—Length about 5 mm.

Light sulphur-yellow, slightly and variably suffused with pale reddish, especially on the mesothorax; mandibles reddened apically; a black line on each side passes outward from the lateral ocelli and, abruptly bending, descends parallel with the orbit to about level of middle of front; antennæ normal in position, but extremely short, the thick and very short flagellum dusky above and light ferruginous beneath; transverse sutures of thorax above all narrowly black; area of mesothorax cup-shaped in outline, black, with a large transverse yellow mark. Wings clear, nervures and stigma entirely pallid, slightly yellowish; lower side of

first s.m. arched; first r. n. entering the high second s.m. near base; stigma large. Abdomen broad, with dark brown bands; first segment with a median dark line and an oblique band on each side of basal declivity, and also a broad band along apical margin; second to fourth segments with basal and apical bands, the basal bands not reaching extreme base, so that the apical band of one segment is separated from the basal of the next by more or less of a yellow line; apex suffused with reddish brown.

Hab. Townsville, Queensland (*F. P. Dodd*, 5. 1. 03). British Museum.

A very distinct species, not unlike *E. furcifera*, but much larger.

Halictus mirandus, sp. n.

♀.—Length about 10–10½ mm.

Black, with the femora (anterior ones only apically), tibiæ, and tarsi bright chestnut-red; front and mesothorax obscurely æneous or greenish; head broad; clypeus shining, strongly punctured; front granular; flagellum very dark reddish beneath; cheeks with white hair, face, front, and vertex with black, but vertex, front, and sides of face also with pale hair; disc of mesothorax brilliantly shining, with scattered large and minute punctures; mesothorax and scutellum with erect black hair, but pale hair on mesothorax anteriorly and sides of scutellum; postscutellum densely tomentose anteriorly; tubercles and pleura with pale fulvous-tinted hair; area of metathorax large, finely granular, obscurely minutely lineolate, bounded by a groove, immediately beyond which is a ridge; posterior truncation sharply defined at sides; tegulæ clear ferruginous. Wings dusky reddish, quite strongly coloured, stigma and nervures bright ferruginous; second s.m. large; first r. n. meeting second t.-c.; outer r. n. and t.-c. weakened. Legs with pale golden-reddish hair; hind spur with two broad teeth. Abdomen black (second segment obscurely greenish basally), shining, very minutely punctured, with coarse black hair at sides and on apical part; segments 2 to 4 having near their latero-basal corners rather large, round, clearly defined patches of dense snow-white tomentum; first segment with a median tubercle.

Hab. Yallingup, near Cape Naturaliste, S.W. Australia, 4 ♀, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). British Museum.

A beautiful species, related to *H. conspicuus*, Sm. Mr.

Meade-Waldo has kindly compared it with Smith's type of *conspicuus*, and finds it certainly distinct. He finds that the prominent keel-like tubercle on the first dorsal abdominal segment of *mirandus* is wholly wanting in *conspicuus*, which also has the postscutellum transversely striate and the venter with a fulvous scopa. The scanty hair on abdominal venter of *mirandus* is light fulvous on basal half, black on apical.

Andrena berberidis (Cockerell).

According to Mr. Viereck, this is identical with *A. neuronæ*, Vier., from Seattle, Wash. *A. neuronæ* has never been fully described, but in Viereck's unpublished table of *Andrena* it is said to have the process of labrum not emarginate, whereas in *berberidis* it is very distinctly emarginate. The two are, however, very much alike, and may represent races of a single species.

On April 27, 1913, at flowers of *Odostemon*, at Boulder, Colorado, Mrs. M. D. Ellis took what is evidently the male of *A. berberidis*. On the same day, at the same flowers, she also took the female. The male *berberidis* looks at first sight like *A. leptanthi*, V. & C., which is the male of *A. porteriæ*, Ckll. It differs from *leptanthi* in the much shorter clypeus; shorter malar space; black hair behind upper end of eyes; angulation of the very broad cheeks lower (about level with middle of eye); anterior part of mesothorax (except median smooth line) dull and granular, not punctured; second s.m. much narrower; apical plate of abdomen smaller. They are certainly very closely allied.

Andrena ellisæ, sp. n.

♀.—Length about 12 mm.

Rather slender, black (tibiæ, tarsi, and antennæ all dark); hair of head and thorax rather short and stiff, very pale, with a greyish-ochreous tint; legs with mostly whitish hair, but light seal-brown on inner side of tarsi, the tuft on hind knees pale reddish; abdomen without conspicuous hair, except the bands and caudal fimbria; the bands on bands 2 to 4 broad and white, very narrowly interrupted on 2, but scarcely attenuated toward the interruption; band on fifth segment pale golden, fimbria light golden-ferruginous. Head broader than long, eyes slightly diverging above; process of labrum broad, rather narrowly truncate (not emarginate) apically; malar space linear; cheeks rounded, normal; clypeus prominent, microscopically tessellate, shining in middle, with rather close large punctures, and a

narrow elevated median line; facial foveæ very pale ochrey, rather narrow, separated from eye by a shining line, and going a little below level of antennæ; third antennal joint longer than the next two together, but not so long as the next three; mesothorax dullish, somewhat shining, with rather close punctures, weaker and smaller than those on clypeus; area of metathorax triangular, with no elevated rim, more than its basal half quite coarsely roughened; tegulæ rufo-piceous. Wings dusky reddish, but not very dark; stigma and nervures light ferruginous; b. n. falling some distance short of t.-m.; second s.m. ordinary, receiving first r. n. in middle. Scopa of hind tibiæ pale ochreous, rather short and stiff; spurs pale ferruginous. Abdomen shining, finely but not very densely punctured, the first segment with scattered very minute punctures; second segment depressed less than half, but rather over a third.

Hab. Boulder, Colorado, at flowers of *Lepidium medium*, Greene, May 26, 1913 (*M. D. Ellis*).

In various tables this runs rather persistently to the vicinity of *A. arabis*, Rob., but that is only 10 mm. long and has a fuscous fimbria. In Viereck's Connecticut table it appears to run to *A. hilaris*, Sm., which is considerably larger and more robust, with darker wings, and the eyes converging above.

In the following key I record other species of *Andrena* (♀) taken by Mrs. Ellis at Boulder, and contrast them with *A. ellisiae*:—

- | | |
|--|----------------------------------|
| Hair at apex of abdomen black or nearly | 1. |
| Hair at apex of abdomen pale or reddish or greyish. | 2. |
| 1. Abdomen blue-black, very shiny (May 23-24, fls. <i>Hydrophyllum fendleri</i>) | <i>geranii</i> , Rob. |
| Abdomen satiny green or blue (April 26, fls. <i>Salix</i> ; May 11, fls. <i>Taraxacum taraxacum</i>) | <i>candida</i> , Sm. |
| 2. Tarsi clear red; flagellum red beneath (May 11, fls. <i>Salix</i> and <i>Taraxacum taraxacum</i> ; May 18, fls. <i>Rhus trilobata</i>) | <i>salicinella</i> , Ckll. |
| Basitarsi dark | 3. |
| 3. Flagellum bright red at apex; abdomen strongly punctured; palpi very long and slender (May 22, fls. <i>Viola nuttallii</i>) | [Rob. <i>(Iomelissa) violæ</i> , |
| Flagellum not bright red at apex | 4. |
| 4. Abdomen greenish; thorax with dull purplish tints above; stigma amber (April 26, 23 at fls. <i>Salix</i>).
Otherwise, but all with amber stigma | <i>illinoensis</i> , Rob. |
| 5. Abdomen, including first segment, very strongly punctured (April 28, fls. <i>Taraxacum taraxacum</i>)
First abdominal segment feebly or not clearly punctured | <i>bridwelli</i> , Ckll. |
| | 6. |

6. Larger; clypeus strongly punctured and with a median raised line *ellisia*, Ckll.
 Smaller; middle of clypeus shining and broadly impunctate (May 23, fls. apple)..... [Cresson].
bipunctata,

The following are new records of Rocky Mountain *Andrena* :—

Andrena apacheorum, Cockerell.—Females at flowers of *Erigeron macranthus*, Estes Park, Colorado (*Frances Long*); Rio Ruidoso, New Mexico, at *Verbascum thapsus*, July 23, prox. 6900 ft. alt. (*C. H. T. Townsend*).

A. prunorum, Cockerell.—This species is generally represented in Northern Colorado by forms referable to variety or subspecies *gillettei*, Cockerell. A series examined showed much variation, and were tabulated as follows :—

- | | | |
|--|----|---|
| Females..... | 1. | |
| Males..... | 2. | |
| 1. Scape red. (Boulder, July 14; <i>Paul M. Dean</i>) | | <i>prunorum</i> . |
| Scape black. (Boulder, July 14; <i>Paul M. Dean</i>) | | <i>prunorum gillettei</i> . |
| 2. Second abdominal segment red, except a black mark on each side. (Colorado Springs, Colorado, at <i>Cymopterus aculis</i> , April 19; <i>W. P. Cockerell</i>) | | <i>prunorum gillettei</i> , form <i>a</i> . |
| Second abdominal segment black, with hind margin red | 3. | |
| 3. Hair of thorax above light fulvous; no lateral face-marks. (Florissant, Colorado, at <i>Antennaria microphylla</i> , June 20; <i>S. A. Rohwer</i>)..... | | <i>prunorum gillettei</i> , form <i>b</i> . |
| Hair of thorax above white; minute lateral face-marks. (Boulder, at <i>Argemone</i> , July 15; <i>W. P. Cockerell</i> .) | | <i>prunorum gillettei</i> , form <i>c</i> . |

A. luisii, Cockerell.—Female. Half Way (Pike's Peak), Colorado, at *Rubus strigosus* (*Frances Long*).

Colletes punctipennis, Cresson.

Described from the female, from Orizaba, Mexico. From the British Museum I have what I suppose to be the male of the same species, from Guatemala (*F. Smith's* collection, 79. 22). Malar space short, more than twice as wide as long; apical half of mandibles reddish; labrum with a broad and rather shallow central pit; clypeus depressed in

middle, with large elongate punctures; flagellum ferruginous beneath; mesothorax shining, with large strong punctures; hair of head and thorax greyish white, a little black or dark fuscous about ocelli and on disc of mesothorax, and much on scutellum; legs robust; tegulae rufo-piceous. Wings hyaline, with a dark fuscous mark at the lower side of the small stigma, a large triangular fuscous patch in apical field, and both on anterior and posterior wings fuscous suffusion along the veins approaching the margin; second s.m. very broad. Abdomen shining, with narrow white hair-bands; first two segments strongly and coarsely punctured, third less strongly, the others scarcely punctured; apical region with dark fuscous hair, and long coarse dark hair at sides except basally.

I have no female *punctipennis* to compare, but the spotted wings are so remarkable that it is probably safe to assume the identity.

Anthophora cingulata (Fabr.) (*gilberti*, Ckll.).

Blackwall Range, April 25, 1911 (*Wild*; Queensl. Mus. 126).

Anthophora rhodoscymna, Cockerell.

♀.—Like the male, but much larger and more robust; length $16\frac{1}{2}$ mm.; width of abdomen a little over 7 mm.; labrum and greater part of mandibles yellow; clypeus with a reversed yellow T; no supraclypeal or lateral face-marks; tegument of abdomen above entirely bright ferruginous; wings strongly brownish.

Brisbane, Jan. 20, 1914 (*Hacker*; Queensl. Mus. 125).

Anthophora luzonica, sp. n.

♀.—Length about 16 mm., width of abdomen $6\frac{1}{2}$.

Robust, black; head and thorax with mouse-coloured hair, being yellowish grey, strongly mixed with black above and on upper part of pleura, thin and black on clypeus, mainly black on front and face, but a band of prevailingly light hair across lower part of front; mandibles with nearly all of basal half cream-colour, the very large labrum the same, but stained with brownish, with the apical and basal margins narrowly, and spots at basal corners, piceous; clypeus densely punctured, with a narrow raised median line (failing above) and submarginal apical band, expanding at each lateral corner to a large patch, pale yellow; a pale

yellow stripe on each side next to clypeus, and a small triangular supraclypeal mark; scape black, flagellum obscurely subcastaneous beneath; third antennal joint as long as next three combined; mesothorax and scutellum finely and closely punctured; tegulae red. Wings reddish fuliginous. Legs black, tinged with reddish; outer side of tibiae and tarsi mainly with pale fulvous hair, but anterior tarsi with hair more fuscous, hind basitarsi with fuscous hair apically; hair on inner side of hind tibiae and tarsi black; spurs picuous. Abdomen black, with short inconspicuous black hair, and conspicuous but very narrow white hair-bands on apices of segments 1 to 4; first segment with fulvous hair at base; fifth segment with apical band very dark fuscous, but extreme sides of basal half with pale hair.

Hab. Mt. Makiling, Luzon (*C. F. Baker*, 2554).

Quite distinct from all previously known Philippine species. In Bingham's table of Indian species it falls next to *A. confusa*, Sm., which it resembles, differing in the colour of the hair on the legs. The marginal cell of *A. luzonica* is longer than usual, and the b.n. falls some distance short of t.-m.

Apis binghami sladeni, subsp. n.

Worker, with hair of thorax entirely rufo-fulvous; basal bands of abdomen inconspicuous.

Hab. Khasia Hills, India (*Sladen*).

True *Apis binghami*, Ckll., is from Celebes and the Philippines. One from the Philippines (*Baker*, 2553, marked "Bho") has the mesothorax covered with black hair and the light band at base of second abdominal segment very broad and distinct.

II.—*Revision of some Genera and Species of Starfishes, with Descriptions of a few new Genera.* By A. E. VERRILL.

[Plate I.]

Family Asteriidæ.

The genus *Leptasterias* (type, *L. mülleri*), established by me, 1866 (*Proc. Boston Soc. N. H.* vol. x. p. 350), has been adopted by some writers either as a full genus (*Perrier* and others) or as a subgenus (*Sladen*, 1889); others have often

refused to give it recognition. One peculiar feature of the genus is the fact that the eggs and young are carried attached in clusters to the oral region until the young become genuine little starfishes, furnished with sucker-feet and able to care for themselves, thus skipping the remarkable free-swimming larval stages of *Asterias*.

This has been observed in the case of many species, among them *L. mülleri*, *L. compta*, *L. littoralis*, *L. epichlora* (Br.) of Alaska and its six-rayed variety (*alaskensis*, Verrill), and others.

I have recently observed that in all these species the genital openings are on the under side near the mouth, instead of being on the upper interradial area, as in typical *Asterias* and most other northern genera. The eggs are also larger, with more yolk, and the ovarian lobes have a different form.

These additional characters ought to satisfy everyone that the genus is very distinct from *Asterias*, though the external characters are often very much alike.

Leptasterias hyerborea (Daniels. & Koren), 1884, p. 10, pl. iii. figs. 1-7 (as *Asterias*).—This fine Arctic species has not hitherto been definitely recorded from America. I dredged several good specimens near Eastport, Maine, as long ago as 1864, and others in later years. The largest were about eight inches in diameter; most were about six inches. It has regularly tapered, stout, terete rays, with a firm dorsal skeleton, due to thick plates and few papular pores; spines are numerous, subequal, obtuse, not slender.

Other species belonging to this genus are *L. æqualis* (St.) and *L. hexactis* (St.) of the N. Pacific coast; *L. grönlandica* (Arctic); *L. fascicularis* (Per.), W. Indies; and many others.

The same habit of carrying the eggs and young is shared by certain Antarctic genera of this family, otherwise very different. To express this feature I have adopted the term *pædophoric* habit. It appears to be always associated with ventral genital pores.

Podasterias (Perrier, 1896, emended). Type, *P. lütkeni*, Per., non Stimpson.—This is another pædophoric genus, with several Antarctic species. It has ventral genital pores, and carries its young in large clusters. It is diplacanthid and in general structure much like *Asterias*.

Fisher (1908, p. 89) was mistaken in making it a synonym of *Pisaster*, for the latter is monacanthid and, so far as known, is not pædophoric. Therefore the name *lütkeni* holds

good in this genus. *P. steineri* (Studer), *P. loveni* (Per.), and *P. spinosa*, Per., are other Antarctic species.

Pædasterias, Verrill. Type, *P. chirophora*, Ludwig, 1903, p. 43, pls. v.-vii.—This is another remarkable pædophoric genus from Antarctic waters. It is monacanthid with degenerate skeletal plates, covered with a thick dermis and bearing large felipedal pedicellariæ. It carries its young in large groups, like miniature clusters of grapes. These have been well described by Ludwig.

Sporasterias, Perrier, 1896. Type, *S. rugispina*, St.—This is a monacanthid pædophoric genus, with a reticulated dorsal skeleton not covered by a thick dermis. The species are Antarctic. Besides the type, it includes *S. rupicola*, Verrill; *S. antarctica* (Lützk.); *S. perrieri* (Smith), 6-rayed; and various nominal species, mostly referable to *S. antarctica*.

Anasterias, Perrier (type, *A. minuta*, Per., 1875). *Lysasterias*, Fisher (1908, p. 88).

This genus includes several pædophoric, monacanthid, Antarctic species, with a partially abortive dorsal skeleton, covered with a thick dermis. Besides the type, which was very young, it includes *A. studeri* (Per.); *A. verrillii* (Bell); *A. lactea* (Lud.); *A. belgicae*, Lud., 1903, p. 51; *A. tenera* (Koehler, 1905); *A. lysasteria*, Verrill = *A. perrieri*, Stud., non Smith.

Cryptasterias, Verrill. Type, *C. turqueti*, Koehler (as *Diplasterias*, 1905, p. 465).—This Antarctic genus has a reticulated dorsal skeleton, entirely concealed by a thick dermis, bearing papillæ enclosing rudimentary spines. It is diplacanthid, and is thought to be pædophoric.

Stichaster, Müller & Troschel, 1840. Type, *S. striatus*, M. & Tr., 1840 (non *Asterias striatus*, Lam.) = *Asterias aurantiaca*, Meyen, 1834 (non Linn.).

This genus, when proposed, was monotypic and based on the well-known Peruvian species usually called *S. aurantiacus*. The latter name is not tenable, because preoccupied by Linné, and thus *striatus* becomes the valid name. *Stichaster* has priority over *Tonia*, Gray, 1840, applied to the same type. Perrier (1894, p. 121, and 1896, p. 27) was in error as to the restriction of the genus to the type of *Asterias rosea* of Europe, which was not mentioned when the genus was first established.

Therefore the latter requires a new generic name; for it

I have proposed the name *Stichastrella*, with *S. rosea* as its type*.

Family Pedicellasteridæ.

Coronaster briareus, Verrill.

Asterias briareus, Verrill, Brief Cont. to Zool., No. 50, Amer. Journal Science, vol. xxiii. p. 220 (1882); vol. xlix. p. 209 (1895).

This elegant species is a typical *Coronaster*. It usually has ten or eleven slender rays. First taken off Cape Hatteras and off Delaware Bay in 57 to 373 fathoms. It has since been taken by the Expedition from Iowa University, off Florida, in 75 to 110 fathoms.

Family Brisingidæ.

One of the most remarkable and interesting of the American Antarctic and Patagonian starfishes is *Labidiaster radiosus*, Lütken. It is a large starfish with a small disk and twenty to forty-six rays. The rays increase by budding in between the older ones.

To this genus Sladen added (1889) another Antarctic species (*L. annulatus*). This, however, differs so much from *L. radiosus* that it should be separated as a distinct genus, for which I propose the name *Labidiastrella*, with *L. annulata* (Sl.) as the type. It has the dorsal and superomarginal plates nearly abortive distally beyond the genital region.

Labidiastrella annulata (Sladen) has forty to forty-five long slender rays. It occurred in 75 to 150 fathoms, off Kerguelen I. and off Heard Island.

Family Acanthasteridæ.

Acanthaster planci (Linn.).

Asterias planci, Linné, Syst. Nat. ed. x., Appendix, 1758, p. 823. Quotes Columna, Phytobasamus, pl. xxxviii. fig. A. (This is a characteristic figure of a fifteen-rayed species from Goa, Asia.)

This long-known large species, widely distributed in the Indo-Pacific Ocean, is generally called *A. echinites* (Lam.) or *A. echinus* (Ellis). The name *planci* has clearly the priority, and should be adopted.

* 'Monograph Shallow-water Starfishes North Pacific Coast,' Smithsonian Inst. pp. 40, 374 (May 1914).

Family Poraniidæ.

Rhegaster, Sladen, 1883, p. 155. Type, *R. murrayi* (Sladen).

This generic name has priority over *Lasiaster*, Slad., 1889, and *Poraniomorpha* (type *P. rosea*, Daniels. & Koren, 1884), even if they are all the same genus, as stated by Grieg (1906), and by Sussbach and Bæckner (1910, p. 219). Yet the authors last named adopt *Lasiaster* as the name of the genus. The type of the latter was *L. villosus*, Slad., 1889. These authors consider *villosus*, *rosea*, and *murrayi* synonyms of *Goniaster hispidus*, Sars, 1871, and adopt the latter specific name.

With "*L. hispidus*" they also unite the two American species—*Rhegaster spinulosus*, Verrill, 1879, as *Porania*; and *R. borealis*, Verrill, 1878, as *Asterina*. Both were later (1895) referred by me to *Poraniomorpha*, because recognized as closely related to the type, *P. rosea*, Daniels. & Koren. However, there is no evidence that the two American forms belong to one species, whether either be identical with that of Northern Europe or not. Indeed, they are very distinct in the character and arrangement of their dorsal spinules and plates, and still more so as to the interactinal spines and plates.

Rhegaster borealis, Verrill, 1878 (in part., 1895, p. 139).
(Pl. I. fig. 1.)

This has the entire dorsal surface and superomarginal plates densely covered with uniform, minute, obtuse, erect, miliary spinules, each terminated by a circle of microscopic points, giving the surface a plush-like appearance to the naked eye, and without any visible outlines of plates. In this respect it agrees well with *R. murrayi*, Sladen, which also has the same sort of thorny-tipped spinules, and similar papular pores and adambulacral spines.

Yet the under surface is quite different, for in *R. borealis* the interactinal plates are clearly defined, and each one bears a conspicuous group of acute, elongated, erect, and divergent spinelets, much longer than the dorsal ones, about six to ten on a plate. The plates are large, convex, imbricated in four rows parallel to the marginals. The inferomarginal plates are large, terminated by a crowded group of twenty to thirty spinelets, similar to the interactinal ones. As to the under side it is, therefore, more like *Lasiaster villosus*, but yet quite different in its spinulation, and cannot be considered the same species.

It differs more from *R. murrayi* in respect to the under surface, which, in the latter, is uniformly covered with small miliary spinelets. Probably *P. rosea*, Daniels. & Koren, may be identical with *R. murrayi*, for it agrees closely in spinulation on both sides, but its identity with *G. hispidus*, Sars, seems to me very questionable. The latter is more like *Lasiaster villosus*, Sladen, in having large superomarginal plates, spinules segregated on the dorsal plates, &c. These characters can hardly be considered as generic, and therefore it seems that all these forms should be referred to *Rhegaster*, as the earliest genus established for any of them. Thus *R. hispidus* would be the earliest species, with *R. villosus* a probable synonym, while *R. borealis*, Verrill (1878), and *R. spinulosus*, Verrill (1879), would be the next two in order. Thus, either one of these two names would supersede *R. murrayi* or *R. roseus*, should either prove to be identical with the latter. In my article of 1895, the descriptive notes added under *borealis* should have been put under *spinulosus*.

Rhegaster spinulosus, Verrill. (Pl. I. fig. 2.)

Porania spinulosa, Verrill, Proc. U.S. Nat. Mus. vol. ii. p. 202 (1879).

Poraniomorpha spinulosa, Verrill, Expl. by the 'Albatross,' p. 542 (1885); Amer. Journ. Sci. vol. xlix. p. 139 (1895).

This is a larger species, ranging from north of Cape Cod to Cape Hatteras in 80 to 640 fathoms. It sometimes has a radius of 80 mm.

This differs from *R. borealis* especially in having large flat interactinal plates*, covered with minute miliary spinules or granules, except at the outer end, where there are often two or three small, appressed, acute spinules in a row. The inferomarginal plates have about ten to twelve small marginal spinules in about two rows; the upper surface is closely covered with erect miliary spinules, as in allied species, and the papular pores are numerous, in clusters, over the whole dorsal surface and between the marginal rows of plates.

Marginaster, Perrier, 1881; 1884 (*pars*). Type, *M. pectinatus*, Per.—This genus, when established, included the young of two generic types: Sladen, 1889, designated the first as the type; the second (*M. echinulatus*) differs, among other ways, in having a regular furrow-comb on the adambulacral plates, as in *Rhegaster*, but the dorsal plates are invisible and have sparse spines, unlike the latter. *M. pectinatus* is very

* The term "interactinal plates" is used in place of "intermediate actinals" for the sake of brevity.

young, and probably it is simply the young of *Porania* or some similar genus. Other similar young forms have since been added to the genus by Sladen, Perrier, and others, none of which can, as yet, be united with adult forms.

Poranisca, Verrill, gen. nov. Type, *P. lepidus*, Ver.—This name is proposed, as a matter of convenience, for another group of small young forms, belonging to this family, until they can be connected with adults. The type is from off the eastern coast of the United States, in 77 fathoms, No. 18,485, Nat. Mus. The dorsal surface, when dry, is covered with relatively large plates, imbricated by thin edges. The basal interradial and radial plates are larger and conspicuous, and bear one or two small spinules near the adcentral margin, and sometimes several other small spinules. Superomarginal plates are similar, large, usually with one or two spinules, sometimes none. Two definite rows of plates run from each basal interradial to the two interradial marginal plates. These, like the intermediate dorsals, may bear a few granules or spinules and, in life, are covered with a thin dermis that conceals their outlines. Papulæ stand singly between the radial plates and also between the marginal rows. Radii of the type 4.5 mm. and 8 mm.

Inferomarginals are larger, thickened, and have a marginal comb or fringe of slender spines, and (in the type) granule-like spinules clustered on the upper surface. These plates project beyond the upper ones. Interactinal plates are rather large and few, not concealed by dermis when dry, but hidden in alcoholic specimens. They form rows parallel with the marginals, the largest row being nearest the latter, with a larger unpaired plate in the middle, bearing in the type a single small spine. Other plates may also bear solitary spines. The other rows are shorter, with all the plates paired. Adambulacral plates have, in the type, two spines, one above the other. In some alcoholic specimens the whole surface, above and below, is covered with a soft dermis, obscuring or concealing the plates. Very young specimens, 6 mm. to 10 mm. in diameter, are more spinulose dorsally, otherwise similar. In life its colour is dark red. (Pl. I. fig. 3.)

To this provisional genus may also be referred *P. pymaa*, Verrill (Amer. Journ. Sci. vol. xvi. p. 372, 1878, as *Asterina pygmaea*).

Poraniella, Verrill, gen. nov. Type, *P. regularis*, Ver., sp. nov.—This name is proposed for a small flat starfish with

short rays, not uncommon in the Gulf of Mexico in 25-169 fathoms off W. Florida (coll. 'Albatross'; type is No. 10,190, Nat. Mus., 67 fathoms).

It is of special interest as a genus more or less connecting this family and the Asterinidæ. Indeed, it would probably be just as well placed in the latter. It has the form and nearly the plating of *Asterinides*.

All the genera of this family discussed above have the ventral or interactinal plates arranged either in rows sensibly parallel to the marginal plates or else in oblique rows from marginals to adambulacrals, the two methods being much alike. In *Poraniella*, as in Asterinidæ generally, they form chevrons or rows parallel to the adambulacrals, the largest plates or longest row being next the latter. This shows a very different mode of growth of the plates.

In *Poraniella* there is an unpaired median plate in each chevron, except the first. All these plates are rounded and imbricated in alternation. They are not entirely concealed by thick dermis in dry specimens, and each usually bears one to several small distal spinules in a fan.

Inferomarginal plates are large, oblong, prominent, with a terminal comb of slender webbed spines, four or five in the type, and a row of smaller acute spinules on the upper side. The supermarginals are relatively large, rounded, and have one or two, rarely three, small spinules on the most convex part.

Dorsal plates are nearly flat, imbricated in radial rows, with rounded edges exposed, much as in *Asterina*. They mostly bear two to five small sharp spinules at or near the edge. The median row is distinct and towards the disk its plates become compressed and sunken, with a row of papular pores each side of it; the basal plate is larger, as are the basal interradians. Papular pores stand singly between five radial rows of plates. Adambulacral plates have a regular furrow-comb of three webbed spines, and two or three larger divergent spines on the actinal face, in a transverse row. The dermis, in alcoholic specimens, conceals most of the plates. Radii of the type, 7 mm. and 12 mm. In life it was bright red.

Poraniella echinulata (Perrier, 1881); 1884; 1894, p. 169, fuller description (as *Marginaster*).—This West Indian species should also be referred to *Poraniella*.

Porania? austera, Verrill, Trans. Conn. Acad. vol. x. p. 221 (1899, as *Marginaster*).—This does not belong to *Marginaster*, but is probably a young *Porania*. The dorsal

plates are entirely concealed by thick dermis, even in dry specimens. The plates are irregular in size and form, and bear small, rough, spaced spinules, in irregular small rows or curved lines.

Interactinal plates are visible through the dermis, when dry; they form forked columns, running from the marginals to the adambulacrals—a few of them bear a single, small, central spine, rarely two. It is from the West Indies in deep water.

Culcitopsis, Verrill, gen. nov. Type, *C. borealis*, Sussb. & Breckner, Seeigel, Seesterne, und Schlangensterne der Nord- und Ostsee, p. 217, pl. i. figs. 4-6 (1910) (as *Culcita*).

This singular starfish does not seem to me to be a *Culcita*, nor a member of the same family, but rather one of the Poraniidæ, related to *Tylaster* and to *Chondraster*, Verrill, 1895—only in this the reduction of the skeleton has gone farther, and the margin has thus become swollen and puffy. The numerous interactinal grooves are like those of *Chondraster*, and the papulæ are grouped as in *Poraniomorpha*.

Family Astropectinidæ.

Sideriaster (?) *vestitus* (Say).

Asterias vestita, Say, Journ. Philad. Acad. vol. v. p. 143 (1825).

This large and peculiar species, described by Say eighty-eight years ago, and said to have been found at Cape May, N. Jersey, has not been seen by any later writer. The original specimen has, apparently, been lost. It has, in more recent times, been referred to *Astropecten* by Lütken, 1859, and all subsequent writers. However, the original description does not indicate that it is a true *Astropecten*.

Say stated that it has a large disk; that the entire upper surface is covered with large cylindrical papillæ (indicating small superomarginal plates); that the marginal plates have four appressed spines in a line; that it was one foot and three inches in diameter; and that it has a large madreporic plate.

All these characters correspond with those of *Sideriaster*, Verrill (1899), but not with *Astropecten*. The genus *Sideriaster* has small spineless superomarginal plates, confined to the lateral surface of the ray, and four appressed spines in a row on the larger inferomarginal plates. Its disk is broad; size large; madreporic plate very large. Its type, *S. grandis*, Ver., from 68 fathoms, in the Gulf of Mexico, does not agree sufficiently well to be identified as the same species, but it

seems almost certain that it is congeneric. When more specimens can be obtained it may prove to be the same species. Only one specimen is known.

EXPLANATION OF PLATE I.

- Fig. 1. *Rhegaster borealis*, Ver. Type. *a*, dorsal side; *b*, actinal side of the same. $\times 2\frac{1}{4}$ (*b*).
 Fig. 2. *Rhegaster spinulosus*, Ver. Type. $\frac{3}{4}$ nat. size.
 Fig. 3. *Poranisca lepidus*, Ver. Types. *a*, one of the larger specimens; *b, c, d*, three small ones. $\times 1\frac{1}{4}$.

III.—Note on the Characters of the Head and Mouth-parts in the Genera *Plectrotarsus* and *Æthalopectera* (*Trichoptera*). By BRUCE F. CUMMINGS, British Museum (Natural History).

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FOR being able to present an account of the head and mouth-trophi of these two remarkable genera of Trichoptera I am indebted first of all to Dr. Georg Ulmer, of Hamburg, who generously sent me spirit-material of *Æthalopectera*, and, secondly, to Mr. James A. Kershaw, Acting Director of the National Museum, Melbourne, who kindly gave me several specimens (dry) of *Plectrotarsus gravenhorstii*, Kol.

The Head of Æthalopectera dispar, Brauer (Family Hydropsychidæ).

The first species of *Æthalopectera* was made known by Kolenati in 1859 under the name *Setodes sexpunctata* (an East-Indian insect) (1). One of the essential characters of the genus *Setodes* is given as “palporum maxillariorum articulo basali brevissimo,” so that when, in 1875, Brauer, in describing a second species—the one at present under consideration (from W. Africa) (2),—observed the complete absence of palpi (maxillary and labial), he decided, on this and other grounds, to found a new genus (*Æthalopectera*). In subsequent descriptions of other species of this genus I have been unable to find any detailed reference to the mouth-trophi, with the exception of the general statement “Mundteile fehlend,” made by Ulmer in 1907 (3).

But, as will be seen from the illustrations given below,

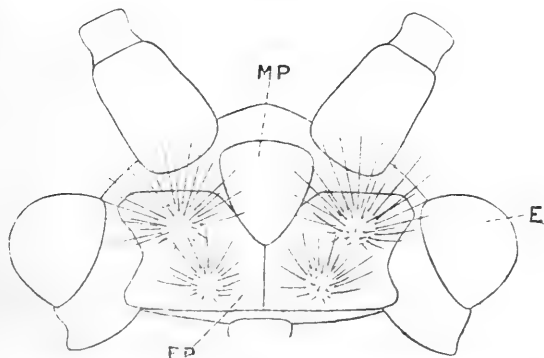
mouth-parts, including labrum and mandibles, are present in at least one species of *Æthalopectera*, though the precise homologies of some of the parts are problematical and of great interest.

R. Lucas (4) gave a very careful account of the mouth-parts of the Limnophilid, *Anabolia furcata*, McLachlan (= *A. levis*, Zetterstedt), in which he describes a labrum, a pair of first maxillæ with palpi and only a single pair of lobes, a large median fleshy haustellum, and a labium with palpi but no lobes. No mandibles were found. Lucas's description holds good for the Limnophilidæ, which prove to be the only family of Trichoptera in which mandibles are absent. Genthe (5), in 1897, demonstrated the presence of mandibles in *Hydropsyche* and *Neuriclepsis*, though he was mistaken in supposing that these two genera possess "kein eigentliches Haustellum." I have found the haustellum present in every family of the Trichoptera. It is absent, so far as I have discovered, in only one genus—*Dipseudopsis*—of the family Polycentropidæ. Mandibles exist in all the families as well, if not in every genus (with the exception of the Limnophilidæ); in some they are large and probably functional, e. g., in *Rhyacophila* and *Hydropsyche*.

In *Æthalopectera dispar* the head and mouth-parts are as follows:—

Head.—This is rather deep, but short fore and aft. The

Fig. 1.



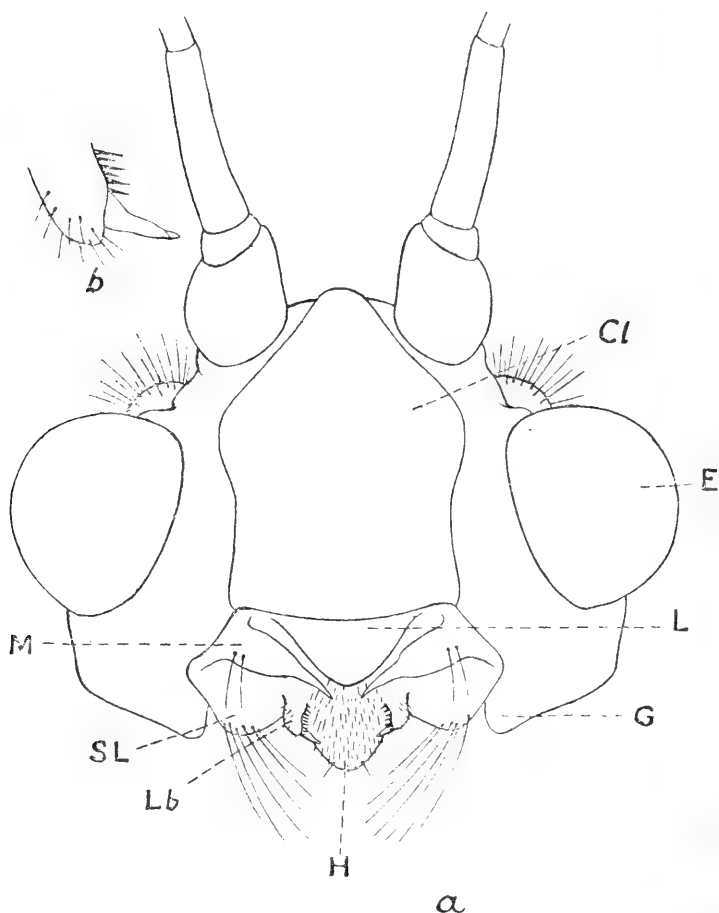
Epicranial area of head of *Æthalopectera dispar* (enlarged).

E, eye; *EP*, epicranial plate; *MP*, median plate.

two pillars or endosternites of the tentorium, which run across the head from the base of the occipital foramen to

their place of insertion into the front of the head one on each side of the clypeus, are correspondingly short, very broad, and plate-like. Fig. 1 shows the top or epicranial area of

Fig. 2.



a. Head of *Æthaloptera dispar* (seen from in front). Enlarged, semi diagrammatic.

b. Lobe, highly magnified.

Cl, clypeus; E, eye; G, gena; M, mandible; L, labrum; H, haustellum; Lb, lobe; SL, semicircular "ledge."

the head. The clypeus in the front of the head bulges outwards and is very convex. It is distinctly marked off from

the rest of the head, which is the case in all the Hydro-
psychidæ and allied families.

Antennæ.—Extremely long and slender. Basal joints
stouter than the rest.

Mouth-parts.—These are not easy to see without special
preparation, being situated in a small hexagonal area beneath
the lower margin of the long clypeus. They are small and
insignificant (fig. 2). They consist of:—

(1) *Labrum.*—This is roughly triangular, and, like the
rest of the parts, thinly chitinized.

(2) *Mandibles.*—Of an extraordinary character. Each
consists of a large basal part, which suddenly narrows, to
end in a very long, thin, somewhat irregularly shaped splint-
like piece of chitin, the extreme tip being sharply pointed
and more firmly chitinized than the rest of the mandible or
any other of the appendages. No condyles are present and
there is no true articulation, as the mandible grows out from
the angle on one side of the labrum, and shows no trace of a
joint or suture between it and the head. There are two
elongate hairs on the basal part of the mandible.

The rest of the mouth-parts consist of:—

(3) A median elongate lobe, with

(4) two small lobes on either side of it, and

(5) two broad flat lobes or semicircular “ledges,” forming
a kind of lower lip.

The median lobe I regard as the haustellum, and the two
lateral lobes are almost certainly the lobes of the first pair of
maxillæ. In all Trichoptera the first maxilla possesses only
a single lobe. The two ledges perhaps represent the labium.
Labial and maxillary palpi are completely absent. All these
parts are delicate and thinly chitinized, so that one is induced
to believe them to be the atrophied remnants of mouth-parts
now quite functionless.

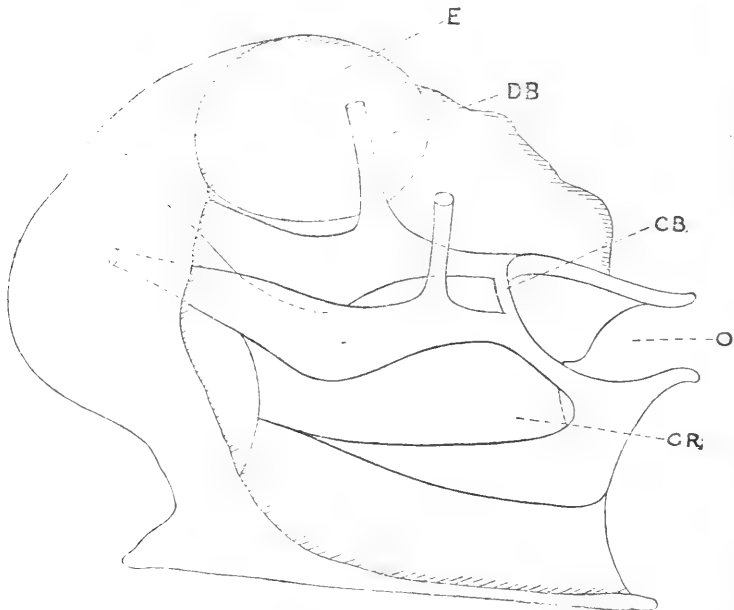
The Head of Plectrotarsus gravenhorstii
(Family Sericostomatidæ).

Ulmer (6) has given an interesting note on this peculiar
Australian insect, in which he shows that the so-called
“proboscis” stands in no relation with the lower lip, but is
“sicherlich als Anhang oder Fortsatz des Labrum anzusehen.”
Hagen (7), in 1881, had written that when the mouth-parts
of the Phryganeidæ are spoken of in general as short ones, “it
must not be forgotten that there exist genera with a devel-
oped proboscis much longer than the head, and certainly fit
to enter flowers; the greatest development I know of among

the group occurs in *P. gravenhorstii*." McLachlan (8) remarks that the "Australian genus *Plectrotarsus* has the parts of the mouth modified in an extraordinary manner, forming a beak or rostrum . . ." How inadequate and inaccurate the terms "beak" or "rostrum" are will be seen presently.

Head.—This is of a shape and character unusual in the order. In *Phryganea*, for example, it is more or less in the shape of a wedge, the base of the wedge being formed by the epicranium and the mouth-parts running down and graduating in size to form the narrow end. In *Phryganea*, too,

Fig. 3.



Tentorium of *Plectrotarsus gravenhorstii* (sides and roof of skull cut away).

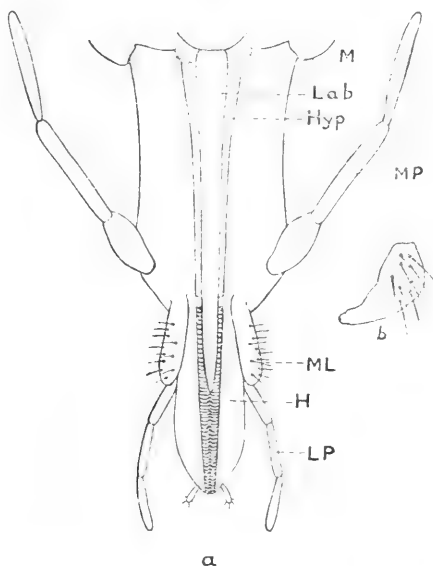
E, eye; *O*, occiput; *CB*, crossbar; *DB*, dorsal branch; *GR*, gular region.

and in most Trichoptera the whole of the gular region is membranous or very thinly chitinized, so that the base of the skull is incomplete beneath. On either side of this soft gular region the genæ extend downwards as two triangular flaps,

the apex being ventral; but in *Plectrotarsus* (and in some Hydrophilidæ and in *Chimarra*) the gular region is firmly chitinized, the skull is therefore complete, and the triangular flaps are absent. The shape of the skull of *Plectrotarsus* is unusually long, broad, and flattened dorso-ventrally (fig. 5).

Tentorium (fig. 3).—This is strongly developed in correlation with the size of the head. In structure it somewhat recalls the tentorium of *Phryganea*, *i. e.*, it consists of a cross-bar at the occiput and two long endosternites running forward from it to the clypeus. Each of these gives off a branch

Fig. 4.



- a. Mouth-parts of *Plectrotarsus gravenhorstii* (male), seen from in front. Semi-diagrammatic, greatly enlarged.
 b. Mandible. Highly magnified.

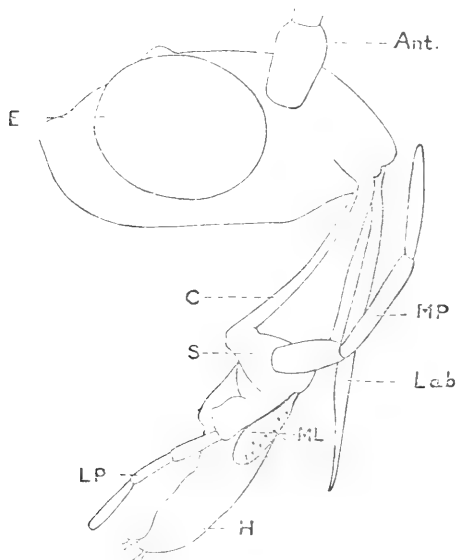
M, mandible; *Lab*, labrum; *Hyp*, hypopharynx; *MP*, maxillary palpus; *ML*, maxillary lobe; *H*, haustellum; *LP*, labial palpus.

dorsally (as in *Phryganea*) to the roof of the skull. The two long endosternites have developed broad wings for the attachment of the antennary muscles.

Antennæ.—The antennæ are thick, about as long as the fore wings, the basal joint about half as long as the head, a little thicker than the succeeding joints.

Mouth-parts.—The mouth-parts are merely an extreme development of the type shown in *Phryganea*. In the Hydropsychidæ and Rhyacophilidæ and more generalized families of the order the labrum is short, the mandibles powerful, and well chitinized, and the haustellum broader than long, delicate. In *Phryganea* and its allies the labrum is elongate, the mandibles reduced to small, soft, nipple-like warts, and the haustellum large, long, and fleshy.

Fig. 5.



Head of *Plectrotarsus gravenhorstii* (male). Side view, semi-diagrammatic, greatly enlarged.

Ant., antenna; *E*, eye; *C*, cardo; *S*, stipes; *Lab*, labrum; *MP*, maxillary palpus; *ML*, maxillary lobe; *LP*, labial palpus; *H*, haustellum.

In *Plectrotarsus* (figs. 4 & 5) the parts consist of:—

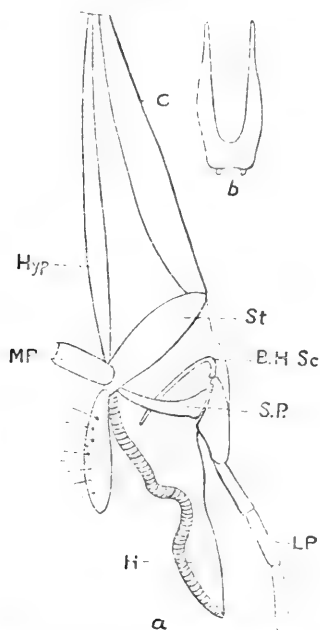
(1) The *labrum*, which, beginning with a short basal area of fairly firm chitin, is produced into a very long, narrow, delicate organ. This, according to Ulmer, is generally carried raised above the hypopharynx and slightly curled up at the tip—facts which suggest that it may be used as a kind of accessory antenna.

(2) The *mandibles* (fig. 4 *b*).

(3) The *hypopharynx*, a long narrow plate, covering the stalk or peduncle of the haustellum.

(4) The *first maxilla*. The sides of the elongate peduncle of the haustellum are held in by the cardo and stipes of the first maxilla. The cardo is very long and articulates with the base of the skull in a small niche or angle. The stipes is

Fig. 6.



a. Mouth-parts of *Plectrotarsus gravenhorstii*, to show internal structure of the haustellum. Side view, diagrammatic.

b. Basal haustellar sclerite, seen from behind.

C, cardo; St, stipes; Hyp, hypopharynx; MP, maxillary palpus; H, haustellum; LP, labial palpus; S.P., semicircular piece; B.H.Sc, basal haustellar sclerite.

shorter and carries the 5-segmented palpus (in the ♂ 3-segmented) and the maxillary lobe. The third and fourth segments of the palpus in the ♀ each show at their distal ends a circular impression, probably sensory areas, as they are known to occur on the antennæ of other insects. The lobes are carried in an abnormal position. In shape long

and rather narrow, instead of sloping transversely across the upper surface of the haustellum, they accompany the haustellum along its lateral margins, and are at first sight apt to be overlooked as part of the haustellum.

(5) The *haustellum*. A long narrow organ decurved at the tip. Along the whole length of the narrow dorsal surface runs a double series of short, comparatively broad chitin plates, arranged transversely and end to end (figs. 4 & 6). Between these two series is a deep median furrow running longitudinally. The upper surface of the haustellum is covered with minute hairs. From the underside of the tip project two small tubes with small hairs on them. I assume that the salivary glands open at the tips of these tubes. In *Phryganea* and others the salivary glands open in the same curious position, *i. e.* on the lower surface of the haustellum. But in these the opening is single, at the end of a large sausage-like fold of the integument.

(6) The *labium*. There are no labial lobes. Palpi 3-segmented.

Supporting Structures of the Haustellum.

In the more specialized groups of Trichoptera with well-developed haustellum the latter is supported by two semicircular chitinous sclerites which run one on each side dorso-ventrally from the base of the first maxilla down to the ventral surface, where they end freely and do not meet each other. Along the lower surface of the haustellum, situated longitudinally, there are also present usually two basal haustellar sclerites, longer than broad, flat, and sometimes branched. In *Plectrotarsus* (fig. 6) both the semicircular sclerites and the basal haustellar sclerites are present, but the two latter are not separate pieces, but become fused at their proximal ends just before bending downwards and then forwards to the labium. Moreover, they do not lie horizontally as supporting rafters beneath the haustellum, but are inclined at a steep angle within the haustellum.

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IV.—*Fishes from the Condoto River, Colombia, collected by Dr. H. G. F. Spurrell.* By C. TATE REGAN, M.A.

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IN 1913 (Ann. & Mag. Nat. Hist. (8) xii. pp. 462-473) I gave an account of the fishes of the San Juan River, based chiefly on a collection made in the Condoto by Dr. H. G. F. Spurrell. Three of the fifteen species then described as new had been described by Eigenmann in a paper of prior date ('Indiana Univ. Studies,' 1913, no. 18); there can be little doubt that

Xenurocharax spurrellii, Regan, = *Argopleura chocoensis*, Eigenm.

Bryconamericus rubricauda, Regan, = *B. ortholepis*, Eigenm.
 „ *juanensis*, Regan, = *B. scopiferus*, Eigenm.

The species that I described as *Creagrutus leuciscus* is the one recorded by Eigenmann as *C. affinis*, Steind., in the synonymy of which he places *C. notropoides*, Meek. Without actual comparison with specimens from the Cauca and Chagres Rivers I am unable to accept this identification. In *C. leuciscus* the depth of the body is 3 to $3\frac{1}{2}$ in the length, but in *C. notropoides* it is said to be 4. *C. leuciscus* has the interorbital width $\frac{1}{3}$ the length of head or more, but in *C. affinis* it is described as less than $\frac{2}{7}$.

Eigenmann has given the name *Astyanax ruberrimus* to the species recorded by me as *A. æneus*, Günth.

A second collection from the Condoto recently brought home by Dr. Spurrell includes several additions to the fish-fauna of the San Juan System.

Characidæ.

- 1.
- Hoplias microlepis*
- , Günth.

Anostomidæ.

- 2.
- Leporinus striatus*
- , Kner.

Sternarchidæ.

- 3.
- Sternarchus spurrellii*
- , sp. n.

Depth of body 7 to 8, length of head 6 to $6\frac{1}{2}$ in length to end of anal fin. Width of head $2\frac{1}{2}$ to 3 in its length, depth at occiput $1\frac{3}{4}$, length of snout $2\frac{1}{3}$ to $2\frac{1}{2}$, diameter of eye 12 to 15, interorbital width 5 to $5\frac{1}{2}$. Cleft of mouth extending to vertical from anterior margin of eye; lower jaw included. Vent below vertical limb of præoperculum. Anal 164-178; origin below gill-opening. Pectoral $\frac{2}{5}$ to $\frac{1}{2}$ length of head. 13 to 15 series of scales above lateral line. Brownish; a pale mid-dorsal stripe from snout to origin of dorsal filament.

Four specimens, the largest 180 mm. in total length.

- 4.
- Sternopygus macrurus*
- , Schneid.

- 5.
- Hypopomus occidentalis*
- , sp. n.

Depth of body $8\frac{1}{2}$ to 9, length of head $7\frac{1}{2}$ to 8 in length to end of anal fin. Snout $3\frac{1}{4}$, diameter of eye 10, interorbital width $5\frac{1}{2}$ in length of head. Lower jaw included. Vent below middle of operculum. Anal 200-240; origin below extremity of pectoral, or as far from gill-opening as the latter is from eye. Pectoral a little more than $\frac{1}{2}$ length of head. Length of tail, beyond anal fin, 5 to 6 in total length. Olivaceous, with numerous irregular, slightly oblique, narrow, brownish cross-bands, breaking up into spots below.

Six specimens, the largest, on which the above description is principally based, 150 mm. in total length.

Loricariidæ.

- 6.
- Loricaria jubata*
- , Bouleng.

- 7.
- Loricaria variegata*
- , Steind.

Pomadasidæ.

- 8.
- Pomadasys bayanus*
- , Jord. & Everm.

Mugilidæ.

- 9.
- Agonostomus nasutus*
- , Günth.

Gobiidæ.

- 10.
- Sicydium condotense*
- , sp. n.

Depth of body $6\frac{1}{2}$ in the length, length of head $4\frac{1}{2}$. Diameter of eye $\frac{1}{4}$ in length of head, interorbital width $\frac{5}{8}$. Teeth of upper jaw bi- or tricuspid; horizontal teeth of lower jaw concealed. Head naked; nape, an area behind pelvic fins, and a vertical strip connecting these just behind base of pectorals naked; scales ciliated, 60 in a longitudinal series, 16 or 17 between origins of second dorsal and anal. Dorsal VI, I 10. Anal I 10. Second dorsal and anal highest anteriorly; last rays, when laid back, not nearly reaching caudal. Pectoral as long as head. Caudal subtruncate. Greenish, with dark cross-bars and an indistinct lateral band; caudal with two dark cross-bars; soft dorsal with series of small dark spots on the rays; anal with a dark intramarginal line.

A single specimen, 60 mm. in total length.

Soleidæ.

- 11.
- Achirus panamensis*
- , Steind.

V.—*Descriptions of Fifteen new Japanese Marine Mollusca.*
By G. B. SOWERBY, F.L.S.

[Plate II.]

Turbo (Callopona) excellens, sp. n. (Pl. II. fig. 1.)

Testa globoso-turbinata, imperforata, crassa, pallide carnea, vivide rufo-fusco picta; spira conica, elatiuscula; anfractus 5, convexi, sutura anguste canaliculata sejuncti, spiraliter lirati, minute plicato-nodulosi; penultimus triliratus; anfractus ultimus in-
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flatus, subquadrato globosus, supra et infra breviter plicato nodulosus, ubique liris crassis rotundatis cingulatus; apertura subcircularis, intus argentea, peristoma simplex; columella crassa, lævis, alba; operculum subcirculare, extus album, valde convexum, ubique minute granulatum, cingulis elevatis 3, valde inæqualibus instructum, ad marginem acute carinatum.

Alt. 25, lat. 22 mm.

Hab. Nagashima, Kii, Japan.

Of the subgenus *Callopoma*, Tryon (Man. of Conch. vol. x. p. 210) admits of only two species (with several synonyms and varieties), viz., *T. fluctuosus*, Wood, and *saxosus*, Wood; a third, *T. shandri*, Hutton, being probably misplaced. The present species is much smaller than *T. fluctuosus*, and differs from it in several respects, particularly in the pustulated ridges on the upper part of the whorls. The operculum is different, being destitute of the elaborately crenulated concentric liræ so conspicuous in that species.

Leptothyra lavigata, sp. n. (Pl. II. fig. 5.)

Testa minuta, imperforata, oblique ovalis, crassa, lævis, carneo-albida, rufo-fusco marmorata, ad peripheriam albo balteata; spira parum elevata; anfractus 3, rotunde convexi; anfractus ultimus latus, rotundatus, infra obscurissime spiraliter striatus; apertura subcircularis, intus argentea; peristoma læve, crassum; columella valde callosa.

Alt. 4, diam. 4 mm.

Hab. Noto, Hizen, Japan.

A little shell of simple character, smooth and shining, silvery within, with a stout peristome.

Gibbula awajiensis, sp. n. (Pl. II. fig. 4.)

Testa minuta, globoso-turbinata, crassiuscula, lævis, fusca, nigro-fusco flammulata, ad peripheriam zona lutea fusco articulata picta; spira breviter conica; anfractus 3, rotundati; anfractus ultimus leviter inflatus, infra convexus; umbilicus parvus sed profundus; apertura subcircularis, intus argentea; peristoma continuum, vix incrassatum.

Alt. 4, diam. 4 mm.

Hab. Awaji, Japan.

I know of no species very closely resembling this little shell. In form it is rather globular, with a conical spire; its surface is smooth, umbilicus small, colour principally brown, with an articulated band at the periphery.

Natica ovata, sp. n. (Pl. II. fig. 3.)

Testa ovato-turbinata, ponderosa, breviter umbilicata, pallide luteo-fusca, aliter haud colorata; spira conica, elatiuscula; anfractus 4, convexi, fere læves, irregulariter oblique sculpti, sutura anguste impressa sejuncti; anfractus ultimus $\frac{5}{6}$ longitudinis testæ æquans, ovalis, infra rotundatus; umbilicus vix profundus, trigoniformis; apertura elliptica, latiuscula, intus fusco tineta, lævis; peristoma crassiusculum; columella crassicallosa, alba, polita, in regione umbilicali lobata.

Alt. 59, maj. diam. 48 mm.

Hab. Hidaka, Japan.

This species is allied to *N. ianthostoma*, Desh., but of a much more ovate form; the callosity in the umbilical region is different in form, leaving the umbilicus very narrowly open.

Natica bibalteata, sp. n. (Pl. II. fig. 7.)

Testa globosa, crassa, umbilicata, albida, fusco-carneo bibalteata; spira parva, vix elevata, anfractus 5, primi minuti, leviter convexi, oblique tenuissime striati, sutura anguste impressa sejuncti; anfractus ultimus inflatus, rotundus; apertura semicircularis, intus alba; peristoma acutum; columella oblique rectiuscula, postice valde callosa, in medio effuso; umbilicus vix profundus, callo columellari semi-obtectus.

Alt. 17, maj. diam. 17 mm.

Hab. Nagasaki.

This double-banded species bears some external resemblance on a small scale to *N. spadicea*, Gmel., but the umbilicus is much less open and the columella callus spread in a different form.

Natica figurata, sp. n. (Pl. II. fig. 6.)

Testa globosa, tenuis, griseo-albida, aurantio dense fulgurata; spira parva, levissime elevata; anfractus 4, convexi, læves; anfractus ultimus inflatus; apertura semicircularis; peristoma acutum; umbilicus callo columellari obtectus.

Alt. 14, diam. 13 mm.

Hab. Rikuzen, Japan.

A species characterized by elaborate figure-colouring; its umbilicus is completely covered, as in *N. imperforata*, Sow., from which species it differs somewhat in form and more in pattern.

Nerita levilirata, sp. n. (Pl. II. fig. 2.)

Testa suboblique globosa, pallidula, ferrugineo dense marmorata, maculata, et strigata; spira parva, depresso conica; anfractus 3, planulati, spiraliter lirati; anfractus ultimus inflatus, liris rotundatis parum elevatis latis et angustis alternatim instructus, oblique irregulariter striatus; apertura parviuscula, alba, intus breviter plicato-dentata; labrum ampliter effusum, leviter concavum, ad marginem acutum; columella late callosa, medio pauci pustulato, margo dextro pauci plicato, sinistro irregulariter rugose plicato.

Alt. 26, lat. 28 mm.

Hab. Oshima.

This *Nerita* bears some resemblance to *N. stella*, Ch., and *chameleon*, Linn., but it differs from both in form, and may be distinguished by its broad somewhat flattened ridges, mostly with narrow ridges intervening.

Solarium acutissimum, sp. n. (Pl. II. fig. 9.)

Testa percompressa, tenuis, circularis, late umbilicata, albidula, fulvo sparsim radiata; spira complanata; anfractus 7, primi minuti, laeves, deinde leviter concavi, acute marginati, liris numerosis angustis plus minusve confertis spiraliter sculpti, oblique irregulariter striati; anfractus ultimus brevis, concavo planulatus, acutissime carinatus; basis convexa, tenuiter lirata, in regione umbilicali conspicue plicato-lirata; umbilicus latus, perspectivus, intus valde plicatus; apertura parva, subquadrata; peristoma tenue, acutissime angulatum.

Alt. 11, maj. diam. 45 mm.

Hab. Kii, Japan.

Of this very remarkable species I have only as yet seen one specimen. It seems almost sufficient to say that it is peculiarly flat, with a sharp, very prominent keel at the periphery. A full description cannot yet be given, as the operculum is unknown, and it may possibly rank as the type of a new subgenus.

Turritella fortilirata, sp. n. (Pl. II. fig. 12.)

Testa turrita, ferruginea, versus apicem albidula; anfractus 13, declives, vix convexi, infra angulati, liris 4 spiralibus crassiusculis cingulati; anfractus ultimus $\frac{1}{4}$ longitudinis testæ æquans, infra biangulatus; basis leviter convexa, unilirata; apertura subquadrata; peristoma tenue; columella leviter arcuata, angusta.

Long. 78, maj. diam. 22 mm.

Hab. Nemura, Yesso.

Compared with *T. terebra*, Linn., this shell is shorter in proportion to its length, more angular at the base, and the spiral ridges are much stouter and less numerous.

Eutrochus pulcherrimus, sp. n. (Pl. II. fig. 13.)

Testa elato-conica, umbilicata, luteo-albida, maculis fuscis minutis liberaliter conspersa; spira acuta, gradata; anfractus 7, primi 2 laeves, deinde oblique plicati, exinde subquadrati, 2-3 carinati, liris angustis numerosis granulatis spiraliter instructi; anfractus ultimus brevis, latiusculus, tricarinatus, dense grano-liratus; basis leviter convexa, liris alternatim crassiusculis et angustis cingulata, oblique creberrimo striata; umbilicus rotundatus, medioeriter latus, profundus, intus laevis; apertura medioeriter lata, intus alba, levissime sulcata; peristoma continua, tenue.

Alt. 17, maj. diam. 16 mm.

Hab. Oshima.

A pretty shell, quite different from any other species of the genus. The numerous bright brown spots which adorn its surface are characteristic, as also the elaborate cancellation of the upper whorls.

Fissuridea elaborata, sp. n. (Pl. II. fig. 8.)

Testa ovata, medioeriter elata, antico levissime angustata, postice convexa, albida, nigro-fusco irregulariter sparsim radiata, costis radiantibus circ. 35 nodosis, lateralibus peculiariter denticulatis, interstitiis clathratis profunde et conferte fossulatis instructa; foramen oblongum, quadri-denticulatum, ante medium situm; interna callo tenui alba induta, ad marginem rugose crenulata.

Long. 20, lat. 12, alt. 8 mm.

Hab. Oshima.

It seems almost impossible to adequately describe the elaborate sculpture of this beautiful shell. The numerous radiating ribs are crossed by nodules or transverse bars, pointed at each end, giving them a scalloped character; there is here and there a narrow intervening rib, and the interstices throughout are deeply pitted.

Dolium pyriforme, sp. n. (Pl. II. fig. 14.)

Testa conico-pyriformis, albida, pallide fulvo sparsim maculata et strigata; spira conica, elatiusecula; anfractus 5, apicales fusco tincti, deinde rotunde convexi, spiraliter anguste lirati; anfractus ultimus leviter inflatus, postice rotundatus, antice attenuatus; apertura oblongo-ovata, utrinque attenuata, intus inconspicue lirata; labrum medioeriter latum, rugose plicatum; colu-

mella oblique multiplicatam, postice tenuiter callosa, antice rectiuscula.

Long. 46, lat. 31 mm.

Hab. Kii, Japan.

This closely ridged *Dolium* is more pyriform than its congeners, and its flattened peristome is strongly and closely plicated. I have only seen one specimen of the species.

Lima oshimensis, sp. n. (Pl. II. fig. 10.)

Testa ovata, leviter inflata, alba, liris radiantibus angustis planulatis confertissimis interdum confluentibus, interstitiis leviter crenulatis et puncturatis instructa, concentricè irregulariter liratum fasciata; periostracum ferrugineum, scabrosum; auriculis anticis parviusculis, posticis paulo latioribus; umbones leviter prominentes, incurvati; area cardinalis latiuscula, leviter concava; ligamentum trigonum, latiusculum.

Umbono-marg. 45, antero-post. 40 mm.

Hab. Oshima.

Here is an interesting addition to the genus *Lima*, of which I have only seen a single specimen. It is of a regular ovate form, but little inflated, very closely ribbed, the ribs being narrow and flattened and in some cases confluent, while the scabrous periostracum is formed in thin concentric ridges.

Placunanomia radiata, sp. n. (Pl. II. fig. 15.)

Testa orbicularis, plana, tenuis, valva sinistra albida ferrugineo late radiata, subtilissime rugulosa; umbo parvus, acutus, pone marginem dorsali locatus; valva dextra tenuissima, albo-nitens, foramen oblongum.

Long. 34, lat. 34 mm.

Hab. Iyo.

A flat shell of delicate substance, the left valve being for the most part smooth, but in some places minutely rugose. The only specimen I have seen is characterized by four rather broad rays.

Macoma awajiensis, sp. n. (Pl. II. fig. 11.)

Testa transverse oblonga, tenuissima, compressiuscula, albo-iridescens, concentricè subtiliter striata, postice obtuse angulata; area postica striis concentricis numerosis tenuissimis sculpta; umbones parvi, vix elevati, approximati, post medium locati; margo dorsalis anticus leviter arcuatus, posticus oblique descendens; ventralis suboblique arcuatus, postice leviter sinuatus;

dentes cardinales minuti, in utrinque valvulæ duo, divergentes, laterales nulli.

Diam. antero-post. 18, umbono-marg. 10 mm.

Hab. Awaji.

A white iridescent shell of very simple character, concentrically rather sharply and closely striated.

EXPLANATION OF PLATE II.

- Fig. 1. Turbo excellens.*
Fig. 2. Nerita lævilirata.
Fig. 3. Natica ovata.
Fig. 4. Gibbula awajiensis.
Fig. 5. Leptothyra lævigata.
Fig. 6. Natica figurata.
Fig. 7. — bibaltea.
Fig. 8. Fissuridea elaborata.
Fig. 9. Solarium acutissimum.
Fig. 10. Lima oshimensis.
Fig. 11. Macoma awajiensis.
Fig. 12. Turritella fortilirata.
Fig. 13. Eutrochus pulcherrimus.
Fig. 14. Dolium pyriforme.
Fig. 15. Placunanomia radiata.

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

Anthoglossa dives, sp. n.

♀.—Length about 16 mm.

Robust, black, the apical margins of the first four abdominal segments broadly banded with golden, thinly beset with short golden hair; head broad; clypeus smooth, with very few scattered punctures, more than its lower half, as well as the labrum and the basal two-thirds of the mandibles, clear ferruginous; cheeks with very long white hair, faintly tinged with fulvous beneath; front and face with light fulvous hair, more or less tinged with fuscous, the appressed hair at lower corners of face white; vertex with fuscous hair, but occiput with fulvous; scape black, flagellum largely dark chestnut-red beneath; mesothorax dull, scutellum shining in middle, both covered with short moss-like hair, reddish tipped with fuscous; area of metathorax triangular, dull, with a median sulcus; metathorax with abundant greyish-white hair; pleura with greyish-white hair posteriorly, anteriorly with reddish tipped with fuscous; tegulæ pellucid shining rufous (reddish-amber).

Wings short, strongly infuscated, stigma obsolete, nervures fuscous; b. n. falling just short of t.-m.; second s.m. very wide, receiving first r. n. a little before middle; anterior femora black, red above apically, and largely beneath, the posterior fringe of hair orange-fulvous; middle femora similarly coloured, but posterior fringe snow-white; hind femora black, with a long curled pale fulvous plumose scopa, and bright red hair at apex; tibiae and tarsi red (anterior and middle tibiae more or less suffused with blackish on outer side), with red hair; scopa of hind tibiae light golden red in front, much darker above; hind basitarsi broad. Abdomen black with four golden bands, the heavy fringe of hair on fifth segment rather dark rich red; apical plate truncate.

♂.—Length 16 mm.

Differs from ♀ thus: face densely covered with very bright golden-fulvous (very red) hair; the prominent clypeus yellowish suffused with reddish, with a dusky spot on each side; hair of cheeks below prolonged on each side into a long pale fulvous beard; hair of vertex and occiput long and red; scape short, red; flagellum long, bright ferruginous beneath, the last joint enlarged and flattened, discoid, pallid, with a large black spot; third antennal joint deformed, excavated in front and swollen behind; hair of thorax above longer, long on scutellum, the general effect mouse-grey; hind tibiae and basitarsi slender and elongated, the tibiae arched basally; abdomen with five broad golden bands; apex ferruginous.

Hab. Yallingup, near Cape Naturaliste, S.W. Australia, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). 1 ♀ (type); 2 ♂. British Museum.

Close to *A. aureotincta* and *A. hackeri*; the females of the three are separated as follows:—

- | | |
|---|----------------------------|
| First abdominal segment without a golden band.. | <i>hackeri</i> , Ckll. |
| First abdominal segment with a golden band.... | 1. |
| 1. Legs black; size smaller (13 mm.) | <i>aureotincta</i> , Ckll. |
| Legs largely red; size larger (16 mm.) | <i>dives</i> , Ckll. |

Paracolletes callurus, sp. n.

♀.—Length 10 mm.

Black, with the last two abdominal segments densely covered with bright ferruginous hair; hair of face, lower part of front, cheeks, thorax above anteriorly, tubercles, pleura, metathorax, and a tuft at each side of scutellum rather dull white; vertex and disc of thorax, including scutellum, with black hair; head broad, eyes converging below; mandibles with a red subapical spot; clypeus densely and strongly punctured, the lower middle shining and little punctured;

front closely punctured; flagellum very short, dull reddish beneath except at base; mesothorax and scutellum closely and finely punctured, but shining between the punctures; scutellum flattened in middle; postscutellum with a well-developed median tubercle, more or less hidden by hair; tegulae black, with very fine punctures. Wings strongly dusky, with piceous nervures and small stigma; b. n. meeting t.-m.; second s.m. small, receiving first r. n. about middle; second r. n. entering third s.m. some distance from end. Legs black, with white hair, more or less fulvous-tinted on inner side of tarsi; hind tibial scopa long and black behind, otherwise clear white; hind spur pectinate with many fine teeth. Abdomen very finely punctured, with thin white hair, thin and reddish on apical part of fourth segment, dense and bright red beyond.

Hub. Yallingup, near Cape Naturaliste, S.W. Australia, Sept. 14-Oct. 31, 1913 (*R. E. Turner*). 2 ♀. British Museum.

Mr. Meade-Waldo notes: "Nearly allied to *P. turneri* and *P. elegans*, but distinct." It is readily distinguished from these by the black abdomen.

Paracolletes dentiger, Cockerell.

Described in 1910 from a single female, precise locality unknown. At Yallingup, near Cape Naturaliste, Sept. 14-Oct. 31, 1913, Mr. R. E. Turner collected both sexes. To the description of the female should be added—hind tibiae with black hair posteriorly. The male closely resembles the female; the hind legs are long and slender, with the tibial hair all white; the scape is strongly punctured, and the flagellum is short, like that of a female.

In the descriptions of *Paracolletes* which follow, the published tables are referred to by numbers, as follows:—
Tab. 1 = Trans. Amer. Ent. Soc. xxxi. (1905) pp. 344-348.
Tab. 2 = Ann. & Mag. Nat. Hist., Jan. 1906, pp. 28-29.
Tab. 3 = Trans. Amer. Ent. Soc. xxxvi. (1910) pp. 206-207.

Paracolletes latifrons, sp. n.

♀.—Length about $11\frac{1}{2}$ mm.

Black, robust, very broad, with rather thin dull white hair: vertex with long black hair, posterior middle of mesothorax, and disc of scutellum, with short black hair; face very broad, eyes slightly converging above, hair of face entirely white; mandibles rufous except at base and apex; flagellum very obscurely reddish beneath; cheeks narrow; mesothorax and scutellum with a dullish, sericeous surface; area of meta-

thorax dullish, overlapped by hair; a broad vertical band of black hair on anterior part of pleura, descending from tegulae; tegulae piceous, with two dark rufous spots. Wings dilute fuliginous, the rudimentary stigma reddish, the nervures fuscous; b. n. falling a little short of t.-m.; second s.m. very broad, receiving first r. n. in middle; second r. n. joining third s.m. some distance before end. Legs black, with black and white hair, light brown on inner side of tarsi; hair on outer face of hind tibiae black; hind spur finely pectinate. Abdomen broad, dullish, with a sericeous surface, and exceedingly minute punctures; third and following segments more shining than the first two, abruptly contrasting; sides and base of abdomen with more or less short silvery hair, which extends to form partial thin bands on sides of second to fourth segments, on fourth quite well developed; fifth segment covered with pale grey hair, white at sides.

Hab. Coolangatta, Queensland, 11. 9. 13 (Queensl. Mus. 104).

In Tab. 1 runs straight to *P. obscurus*, Sm., but very distinct by sculpture and pubescence. In Tab. 2 runs to *P. rudis*, Ckll., but not closely related. In Tab. 3 to *P. argentifrons*, Sm., which differs in venation &c. Its nearest relative is probably *P. advena* (Sm.), which has a narrower abdomen with more distinct hair-bands.

Paracolletes thornleighensis, Cockerell.

Hitherto known only from the male, but a female from Brisbane, 2. 12. 13 (*Hacker*; Queensl. Mus. 103), is referred here with confidence. It has the stigma and nervures piceous, which may indicate a distinct variety or race. In Tab. 1 it runs near *P. nanus*, Sm., but is much larger. The abdomen is shining black, with slight metallic tints on the third segment; hind margins of segments 2 to 4 broadly rufous, 4 with a band of reddish-golden hair: second segment very distinctly punctured: hind spur long-pectinate; hind tibial scopa black on basal half on outer side, suffusedly blackish beyond; face broad; clypeus shining, well punctured; tongue normally colletiform; hair of face greyish white, of vertex black; mesothorax shining, sparsely and weakly punctured, with black hair except in front.

Paracolletes tenuicinctus, sp. n.

♀.—Length $12\frac{1}{2}$ –13 mm.

Very broad and robust; black, with black and white hair; head very broad; mandibles obscurely reddish

apically; clypeus very densely and strongly punctured, covered (but not thickly enough to hide surface) with pale brownish-tinted hair; cheeks, sides of face, and most of front with long white hair, but sides of front above with black hair; flagellum dark, but ferruginous beneath at apex; hair of thorax largely white, white also on occiput, but long and black on vertex; black on mesothorax, except the broad anterior border, and narrow lateral margins, and an admixture of white posteriorly; long black hair on scutellum, with white intermixed, black below tegulæ, and a large dark fuscous patch on under side of thorax; mesothorax and scutellum dull, with rather weak punctures; area of metathorax triangular, dullish; tegulæ black. Wings moderately dusky, darker in apical region; the very small stigma and nervures fuscous; b. n. falling just short of t.-m.; second s.m. very broad, receiving first r. n. a little before the middle; third s.m. receiving second r. n. a short distance before end. Legs black, the anterior tibiæ red in front, and the small joints of tarsi red; hair of legs mostly white, but pale yellowish brown on inner edge of tarsi, mainly fuscous on outer side of basitarsi and of anterior and middle tibiæ, but the loose tibial scopa of hind legs clear white, except at extreme base above; hind spur with such short and minute pectinations as to appear simple under a lens. Abdomen broad, without distinct punctures; hind margins of first four segments with very narrow white hair-bands; hair at apex black, white hair at sides of fifth segment; venter with light hair-bands.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913, 3 ♀ (*R. E. Turner*). British Museum.

Closely allied to *P. advena* (Sm.), but larger and broader, with white hind tibial scopa. In Tab. 1 it could run near to *P. argentifrons*, which is quite different, or to *P. obscurus*, from which it differs by the large size and abdominal bands. In Tab. 2 it runs nearest to *P. hobartensis*, which has no abdominal hair-bands. In Tab. 3 it runs to *P. argentifrons*.

Paracolletes sexmaculatus, sp. n.

♀.—Length 13–14 mm.

Robust; head, thorax, and legs black; abdomen dark but very distinct bluish green, with six very conspicuous though not large transversely elongated patches of pure white hair, on lateral hind margins of segments 2 to 4; the heavy apical fimbria black; head broad; mandibles black, very faintly reddish subapically, with a single inner tooth; clypeus shining, strongly punctured; flagellum dull red beneath apically; face and cheeks with glittering white hair; on lower part

of front it is long and white, faintly tinged with yellowish, on upper part of front and on vertex it is black; mesothorax shining, with shallow punctures, scutellum rougher; postscutellum with a mammiform median tubercle; area of metathorax brilliantly shining, not carinate, margined by a finely beaded groove; hair of thorax mostly dull white, but black on discs of mesothorax and scutellum, and a black patch beneath the wings, just behind the tubercles; tubercle of postscutellum with hairs partly dark; tegulæ black. Wings dusky, nervures and the lanceolate stigma dark reddish brown; b. n. meeting t.-m.; first r. n. joining second s.m. much before middle; second r. n. joining third s.m. near or at end. Hair of legs black or fuscous on outer side of tibiæ and tarsi, otherwise white, but yellowish on inner side of basitarsi (fulvous on anterior pair); hind spur with very slender long spines. Abdomen shining, weakly punctured; venter with white hair.

♂.—Length 11–12 mm.

Much more slender, with the light hair of head and thorax pale fulvous, brightest on face; flagellum very thick, with angular joints, suggesting ibex-horns; tubercle on postscutellum small and inconspicuous. Knees, all the tarsi, tibiæ at apex, and anterior tibiæ in front, clear red. Abdomen only very feebly metallic, and wholly without the spots of white hair; apical plate broadly rounded, subtruncate.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913. 2 ♀, 5 ♂ (*R. E. Turner*). British Museum.

The female is the type; the sexes were sent associated, otherwise I should have hesitated to put them together, as they look very different. They agree, however, in venation, metathorax, &c. The male, by its antennæ, resembles the much smaller *P. ibex*, Ckll. The female in Tab. 1 runs near *P. providus*, and may be compared also with *P. frontalis*; in Tab. 2 it runs out near *P. obscuripennis*; in Tab. 3 it runs to *providus*. It is very different from all of these. The male in Tab. 1 runs out at 7 if the abdomen is considered metallic; otherwise it goes near the quite distinct *P. chalybeatus*. In Tab. 2 it runs rather near *obscuripennis* and *subfuscus*; and in Tab. 3 near *providus*.

Paracolletes metallescens, sp. n.

♀.—Length about 11 mm.

Rather slender, black, the abdomen very dark bluish green; head broad; mandibles black, obscurely red apically; malar space linear; clypeus shining, with distinct, not very

dense punctures; antennæ black, with the flagellum bright ferruginous beneath apically; hair of cheeks white, of face white intermixed with black on clypeus, vertex and upper part of front with long black hair; mesothorax and scutellum brilliantly shining, with irregular shallow punctures; post-scutellum without a process; area of metathorax smooth and shining, with an obtuse transverse ridge; hair of thorax dull white, black on discs of mesothorax and scutellum, and a patch of black under the wings; tegulæ piceous. Wings dusky, the lanceolate stigma rufo-piceous, nervures fuscous; b. n. falling just short of t.-m.; second s.m. receiving first r. n. about middle; third s.m. receiving second r. n. some distance before end. Legs black, tarsi red at extreme apex; hair of legs largely white, but orange-fulvous on inner side of anterior tarsi, yellowish-tinted on inner side of hind tarsi, black or fuscous on outer side of tibiæ and tarsi; spurs pallid. Abdomen moderately shining, but with a sericeous surface, without distinct punctures or hair-bands; apical fimbria black; venter with much white hair.

♂ —Length about 9 mm.

Face covered with white hair; mandibles bright red sub-apically; flagellum dark, rather obscure red at apex, very strongly crenulated beneath; hair of mesothorax long, white in front, posteriorly grey or rather dilute black; scutellum with black hair. Legs black, tarsi red at extreme apex. Abdomen very dark bluish or blue-black, hind margins of segments obscurely reddish; apical plate broadly rounded, subtruncate.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913, 2 ♀, 1 ♂ (*R. E. Turner*). British Museum.

Apparently very close to *P. versicolor*, Sm., but differing by the darker abdomen, with pure white instead of yellow hair beneath. The male is allied to *P. ibex*, Ckll. *P. providus* has the abdomen bluer and more shining. The type of *P. metallescens* is a female.

Paracolletes subvigilans, sp. n.

♀.—Length 13½–14 mm.

Rather robust, with the abdomen dark yellowish or bluish green, the discs of the segments sometimes almost black, but the broad hind margins always green; head broad; mandibles dark; clypeus shining, strongly punctured; hair of cheeks and face (abundant in region of antennæ) white, but face with some fuscous hairs intermixed; hair of front and vertex black; antennæ dark, flagellum dull red beneath at apex; hair of

thorax largely dull white, but black on discs of mesothorax and scutellum, and a large black patch below wings; hair at sides of metathorax stained with fuscous; mesothorax and scutellum brilliantly shining, with irregularly placed shallow punctures; scutellum with a median sulcus; postscutellum with a very prominent obtuse tubercle, which is not bifid; area of metathorax triangular, shining, minutely striate on upper middle, somewhat bulging transversely, but not carinate; at sides of area the usual beaded impressed line expands, forming a series of elongate pits; tegulæ piceous. Wings brownish, nervures and the small lanceolate stigma rufo-piceous; b. n. meeting t.-m.; first r. n. joining second s.m. near end of first third; second r. n. joining third s.m. a short distance from end; tibiæ and tarsi with fuscous hair on outer side; hair on inner side of hind basitarsi grey; hind femora with a curled scopa of silvery-white hair. Abdomen with very little hair, and no bands or spots; punctures scattered and extremely minute; caudal fimbria black; venter with white hair.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913, 3 ♀ (*R. E. Turner*). British Museum.

Structurally very close to *P. sevmaculatus*, though that has a shorter process on postscutellum and a much more closely distinctly and punctured abdomen. Mr. Meade-Waldo notes: "Near *P. vigilans*, Sm., which we have from same locality." In *P. vigilans* the process on postscutellum is bidentate.

Paracolletes rhodopus, sp. n.

♀.—Length a little over 13 mm.

Rather robust, black; hind tibiæ bright ferruginous, with hair of the same colour on its outer side, and on inner paler and yellower; hind tarsi red, end of basitarsus and beyond suffused with dusky; anterior and middle tibiæ and tarsi black, with the last tarsal joint red; hair of head and thorax abundant, black in the same places as in *P. subvigilans*, otherwise pale ochreous-tinted; mandibles dark; clypeus shining, strongly punctured; antennæ black, reddish beneath at apex; scape long, flagellum short; mesothorax and scutellum shining, rather well punctured; postscutellum with a rather low conical process; area of metathorax shining, more or less transversely striate, slightly elevated in the middle, but not keeled; inner surface of basitarsi with bright red hair; anterior tarsi with fuscous hair on outer side, but middle with red; tegulæ black anteriorly, red posteriorly. Wings dusky, nervures and the lanceolate stigma dark rufo-fuscous;

b. n. meeting t.-m.; first r. n. joining second s.m. much before middle; second r. n. joining third s.m. very near end. Abdomen shining but rather roughened, especially the second segment, the punctures extremely minute; very thin pale ochreous hair, thicker at lateral apices of segments 2 to 4, forming rudimentary, very inconspicuous bands; apical fimbria black; venter with pale ochreous hair.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). British Museum.

Structurally allied to *P. subvigilans* and related species, but unique by the peculiar coloration of the legs.

Paracolletes bicolor (Smith).

This species appears to be variable (see *Trans. Amer. Ent. Soc.* xxxvi. p. 201), and I cannot separate a couple of males taken by Turner at Yallingup, although they have the mesothorax entirely green, the colour not at all "obscure." The tibiæ and tarsi are red, the tibiæ are more or less suffused with dusky. *P. plumosus*, Sm., has similar colours, and is very closely allied.

Paracolletes fimbriatinus hillieri, subsp. n.

♂.—Like *P. fimbriatinus*, Ckll., but smaller, length about 8 mm.; hair of head and thorax cream-colour; flagellum bright ferruginous above and beneath; abdomen more shining and less densely punctured, the hair on apical margins of segments wholly pale; femora black except at apex.

Hab. Hermannsburg, Central Australia (*H. J. Hillier*). British Museum.

Apparently a desert representative of *P. fimbriatinus*.

Paracolletes bimaculatus (Smith).

A single small male from Yallingup (*R. E. Turner*) is referred to this species, which appears to be somewhat variable. The abdominal segments are transversely clouded with dusky, and the round black spots at sides of second segment are small. The second s.m. is remarkably small and narrow. Smith described this species from the female.

Paracolletes castaneipes, sp. n.

♂.—Length about 10 mm.

Black, not at all metallic, the tibiæ and tarsi deep chestnut-

red, the tarsi more or less stained with black; mandibles with an obscure red mark subapically; flagellum long, but ordinary in form, dark coffee-brown beneath, redder at apex; clypeus finely and closely punctured, supraclypeal area elevated, shining; front dull; face and cheeks with shining silvery hair; on front the thin long hair is dull white, but on vertex it is fuscous, contrasting with the shining white of the occiput; hair of thorax white, except on disc of mesothorax and scutellum, where it is fuscous; prothorax shining, but mesothorax and scutellum appearing granular, somewhat glistening; the mesothorax under the compound microscope shows small punctures as closely placed as possible, the narrow margins between not tessellate; postscutellum without a process; area of metathorax glistening but minutely sculptured, somewhat bulging transversely in the middle, but not carinate; tegulae rufo-piceous. Wings dusky, the nervures and the narrowly lanceolate stigma dark rufo-piceous; b. n. falling a little short of t.-m.; second s.m. narrowed above, with sloping sides, receiving first r. n. much before middle; third s.m. receiving second r. n. some distance from end. Legs with glistening white hair; hind basitarsus with a projection on anterior side near base. Abdomen with hind margins of second and following segments narrowly reddish; no hair-bands; hair at apex pale chocolate; venter with white hair-bands. The abdomen is described as non-metallic, and yet in certain lights it seems to have an elusive, hardly appreciable greyish tint.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913 (R. E. Turner). 2 ♂. British Museum.

Apparently related to *P. rudis*, Ckll., but not its male, as the sculpture of the mesothorax is entirely different.

Paracolletes atronitens, sp. n.

♂.—Length 10 mm. or slightly over.

Shining black, not at all metallic, with white hair, long on head and thorax, but on vertex, and discs of mesothorax and scutellum, it is black, and there is a blackish stain just beneath the tegulae; head broad; mandibles rufescent at apex; clypeus shining, with rather close moderate-sized punctures; sides of vertex brilliantly shining, but front dullish; flagellum wholly dark, long and thick, the joints of the apical half swollen (but not angular) beneath; mesothorax brilliantly shining, with sparse feeble punctures; scutellum shining in front, otherwise rough and punctured; postscutellum without a process; area of metathorax peculiar, with a basal depressed trans-

versely striated band, limited by a transverse ridge, below which the (vertical) surface is shining except at sides, but in the middle, at the top of the vertical face, is a large deep triangular pit; tegulae piceous. Wings slightly dusky, nervures and the lanceolate stigma rufo-fuscous; b. n. meeting t.-m.; second s.m. broad, receiving first r. n. at or before middle; third s.m. receiving second r. n. not very far from end. Legs with glistening white hair, pale reddish on inner side of tarsi. Abdomen shining, the weak punctures not dense; hind margins of second and following segments very narrowly reddish; no hair-bands; hair at apex fuscous; venter with pure white hair.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913, 2 ♂ (*R. E. Turner*). British Museum.

Related to *P. chalybeatus* and *P. obscurus*, but differing in various details. The metathorax is peculiar.

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

Parasphecodes excultus, Cockerell.

Mt. Wellington, S. Tasmania, Jan. 15–Feb. 6, 1913 (*R. E. Turner*). Brit. Museum.

Parasphecodes wellingtoni, sp. n.

♀.—Length $8\frac{1}{2}$ – $10\frac{1}{2}$ mm.

Robust; head and thorax black; abdomen bright chestnut-red, first segment black or blackish at base, the limits of the dark patch not sharply defined, apical segments variably suffused with dusky; clypeus shining, more or less flattened or depressed in middle, very sparsely punctured; face glistening, but not smooth; front dull, more or less glistening at sides; the very scanty pale hair of face and cheeks more or less brownish; antennæ black, flagellum obscurely brown beneath; vertex, mesothorax, and scutellum with thin dark reddish-fuscous hair; fringe of tubercles pale ochreous; mesothorax strongly grooved in middle, dull in front, shining on disc, with small punctures of two different sizes; scutellum shining, with scattered minute punctures; postscutellum entirely dull, strongly contrasting with scutellum; area of

metathorax dull, granular in middle, at sides with a weak reticulate sculpture; truncation of metathorax without projecting lateral points above; tegulæ dark rufous clouded with fuscous. Wings very red, nervures and stigma ferruginous; first r. n. entering second s.m. near apex, or meeting second t.-c. Legs black, anterior tibiæ variably red in front, but the colour never very bright; hind tibiæ and tarsi more or less strongly red, especially on inner side; hair of hind tibiæ pale reddish, sometimes fuscous on posterior margin. Abdomen with short fuscous hair at apex; venter with shining white hair, long on second segment, more or less fuscous toward the apex.

Hab. Mt. Wellington, S. Tasmania, Jan. 15–Feb. 6, 1913 (*R. E. Turner*), 4 ♀. Brit. Museum.

The specimens come from an altitude of 1300–2300 feet. Among Smith's species this is nearest to *P. lithusca*, but differs by the dark legs. It is quite distinct from all the species described in recent years.

Parasphcodes turneri, sp. n.

♀.—Length about $8\frac{1}{2}$ mm.

Robust; head and thorax black; abdomen deep chestnut-red, first segment all red; a blackish stain about caudal margin; hair of head and thorax thin, black on clypeus, vertex, mesothorax, and scutellum, also at sides of front, but otherwise rather dull white; mandibles dark red at apex; clypeus and supraclypeal area brilliantly shining, sparsely punctured; front dull, glistening at sides; antennæ entirely black; mesothorax entirely dull and granular, under the compound microscope seen to be extremely densely confluent punctured; scutellum bigibbous, rough, the elevations shining; area of metathorax strongly longitudinally grooved, sharply truncate behind, the lateral posterior corners forming obtuse angles; tegulæ black. Wings dusky, but scarcely at all reddened; nervures and stigma sepia; first r. n. entering apex of second s.m. Legs black, with glittering white hair, but black or fuscous on outer side of tibiæ. Abdomen with fuscous hair at apex; hair of venter entirely white.

♂.—Length about 8 mm.

Similar to the female, but less robust, though not slender; mandibles with no yellow spot; labrum dark; clypeus with a broad apical pale yellow band, with a small pointed projection on its upper side in middle; flagellum long, dull red

beneath; abdomen black beyond the third segment, and with a round black spot on each extreme side of third near base; legs without red or yellow markings.

Hab. Eaglehawk Neck, S.E. Tasmania, Feb. 12–March 3, 1913 (*R. E. Turner*). 1 ♀ (=type), 1 ♂. Brit. Museum.

The male may be compared with *P. altichus*, Sm., but it has no black cloud on third abdominal segment, and the disc of thorax is not strongly punctured. The female is not much like any described species.

Parasphecodes recessus, sp. n.

♀.—Length about 9 mm.

Robust; head, thorax, legs, and antennæ black; abdomen shining, dark chestnut-red, first segment dorsally black except the very broad apical margin, apical segments red; second segment with a small and third with a large black spot on each extreme side near base; mandibles black, with an obscure subapical red band; clypeus shining, sparsely punctured; hair of head and thorax scanty, white on sides of thorax, pale ochreous on vertex and dorsum of thorax, mixed with fuscous on scutellum; mesothorax deeply grooved in middle, dullish, with fine weak punctures which become well separated on disc (under the compound microscope the punctures are seen as minute elevations surrounded by depressions, and the space between them is minutely and weakly tessellate); scutellum somewhat bigibbous, sculptured like mesothorax; area of metathorax with irregular fine rugæ basally, running into an irregular reticulation and disappearing on the apical part, which has a microscopical tessellation; posterior truncation sharply defined, with projecting points at upper corners; tegulæ black. Wings somewhat dusky, not reddened, stigma and nervures red-brown; second s.m. broad; first r. n. meeting second t.-c. Hair of legs mostly yellowish white, fulvous on inner side of tarsi, dark fuscous on outer side of hind tibiæ and basitarsi. Punctures of abdomen excessively fine.

Hab. Mt. Wellington, S. Tasmania, Jan. 15–Feb. 6, 1913 (*R. E. Turner*). Brit. Museum.

Among Smith's species comes closest to *P. tilachus*, but fourth and fifth abdominal segments not black, &c. The sculpture of mesothorax is quite different from that of *P. speculiferus*.

Parasphecodes perustus, sp. n.

♂.—Length about 8 mm.

Rather slender; head and thorax black, with thin white hair, tinged with brown dorsally; legs black, with the tibiæ partly red (anterior ones red, with a dusky patch on outer side) and the long tarsi clear red; abdomen very bright ferruginous, with the apex strongly suffusedly blackened, first segment entirely red; mandibles red at apex; clypeus with a broad, transverse, lemon-yellow, apical patch, sending a long pointed projection upwards; supraclypeal area minutely roughened; scape very short; flagellum extremely long, clear ferruginous beneath; mesothorax and scutellum entirely dull and granular, the microscope showing excessively close punctures on a tessellate surface; area of metathorax small, finely longitudinally ridged, with a raised margin; posterior truncation without projections at upper corners; tegulæ rufous. Wings dusky hyaline, nervures and stigma rufo-fuscous; first r.n. meeting second t.-c.; third s.m. much broader above than second (in *P. recessus* they are about equally broad above). Legs with white hair. Dorsal suture between first and second abdominal segments depressed.

Hab. Mt. Wellington, S. Tasmania, Jan. 15–Feb. 6, 1913 (*R. E. Turner*). Brit. Museum.

Among Smith's species this may be compared with *P. altichus*, but it is quite distinct. It is much smaller than *P. froggatti*, with a brighter red and much less hairy abdomen.

The following table separates the above species of *Parasphecodes*:—

Disc of mesothorax brilliantly shining, polished, with punctures of two sizes; scutellum brilliantly shining	<i>wellingtoni</i> , Ckll.
Mesothorax and scutellum dull, or, if somewhat shining, punctures of disc of mesothorax not of two sizes	1.
1. Abdomen black beyond the third segment	2.
At least fourth segment red	3.
2. Disc of mesothorax moderately shining, the punctures well separated and distinct under a lens; wings strongly reddened	<i>excultus</i> , Ckll.
Disc of mesothorax dull, the punctures not separately visible under a lens; wings greyish, not reddened	<i>turneri</i> , Ckll., ♂.
3. Red of abdomen very bright; tegulæ red	<i>perustus</i> , Ckll.
Red of abdomen dark; tegulæ black	4.
4. Area of metathorax strongly plicate all over	<i>turneri</i> , Ckll., ♀.
Area of metathorax plicate only basally	<i>recessus</i> , Ckll.

Prosopis accipitris, sp. n.

♂.—Length 5 mm.

Black, not very robust, having the form and appearance of the common European species; mandibles cream-colour, the broad bidentate end slightly reddish; labrum, clypeus, broadly triangular supraclypeal mark, and lateral face-marks (narrow, leaving clypeal margin about middle, extending upwards, gradually narrowing to a point a considerable distance above level of antennæ) pale primrose-yellow; face narrowed below; clypeus very high, microscopically tessellate, with sparse very weak punctures; scape yellow in front, flagellum light ferruginous beneath; third and fourth antennal joints very short, about twice as broad as long; middle of front very densely microscopically punctured, with a honeycomb-like effect, the basins of the cells ridged or wrinkled; cheeks beneath tufted with white hair; mesothorax microscopically tessellate and with very minute weak punctures, not visible under a lens, which shows only a dull surface; tegulæ piceous, microscopically tessellate; tubercles and linear marks on upper edge of prothorax light yellow. Wings hyaline, nervures and stigma sepia; first r. n. entering second s. m. or meeting first t. c. Anterior tibiæ and tarsi light rufo-fulvous, the tibiæ with a slight black mark behind; middle tibiæ with a pale yellowish stripe, their tarsi cream-colour, brownish apically; hind tibiæ with the basal third yellow, the rest black; their basitarsi yellowish white, pale reddish apically, but the other tarsal joints dark. Abdomen dullish, very finely sculptured, with very little hair.

♀.—Mandibles dark, the apex rufous; labrum dark; clypeus black, with a very broad, longitudinal, pale yellow band; lateral face-marks consisting of narrow bands along orbital margins; no supraclypeal mark; scape dark.

Hab. Eaglehawk Neck, Tasmania, Feb. 12–March 3, 1913 (*R. E. Turner*), 3 ♂ (one being the type), 3 ♀. Brit. Museum.

Prosopis perhumilis, sp. n.

♂.—Length about 4 mm.

Like *P. accipitris*, but considerably smaller; face broader above; lateral face-marks broad below, filling space between clypeus and eye; supraclypeal mark low and broad, its upper side flattened; scape with only a narrow light stripe. Wings dusky. Hind basitarsi black, with a little more than the basal third yellow. The sculpture of the front is as in *P. accipitris*.

♀.—Like that of *P. accipitris*, but smaller; hind tarsi entirely black.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913 (*R. E. Turner*), 6 ♂ (one of which is type), 3 ♀. Brit. Museum.

There are also two males labelled as collected by Turner on Mt. Wellington, Tasmania: is this, perhaps, an error?

These species run to 35 in my table of Australian *Prosopis*, but are distinct from the species there indicated and from allied ones subsequently described. *P. ancorata*, Ckll., shows many points of resemblance, but is easily separated by the cuneiform black marks on each side of clypeus and much more strongly sculptured mesothorax. *P. eburniella*, Ckll., has a much broader face than that of *P. perhumilis*, which it resembles somewhat in the markings.

Prosopis scintilla, Cockerell.

♂.—Length about $3\frac{1}{2}$ mm.

Clypeus and long narrow lateral face-marks, ending acutely above level of antennæ, pale yellow (the precise tint doubtful, the specimen being altered by cyanide, but certainly not bright yellow); no supraclypeal mark; labrum and mandibles pale yellow; middle and hind tibiæ pale apically as well as basally; tubercles pale reddish.

Hab. Mackay, Queensland, March 1900 (*Turner*, 1082).

I had determined this as probably the male of *P. scintilla* before noticing that the collector had himself indicated it as such. In my table of Australian *Prosopis* (*Ann. & Mag. Nat. Hist.*, Feb. 1910) this runs to 34, and runs out because of the absence of a supraclypeal mark.

Prosopis sanguinipicta, sp. n.

♂.—Length about $5\frac{1}{2}$ mm.

Rather robust; black, marked with ferruginous (on abdomen) and deep chrome-yellow; head round, orbits converging below, but face quite broad; cheeks and anterior coxæ tufted with long pure white plumose hairs; mandibles, labrum, entire face below level of antennæ, swollen extension of supraclypeal mark between antennæ, and very broad upward extension of lateral marks (reaching nearly to level of anterior ocellus) all shining (as if newly painted) rich yellow; depressed lower part of supraclypeal area appearing as a shining crescent, the concavity upward; clypeus finely

punctured, sides of face more coarsely; a pale yellow band along posterior orbits; scape thick, black above, ferruginous below; flagellum light ferruginous, strongly dusky above; mesothorax dullish, microscopically tessellate and shallowly punctate; scutellum and postscutellum black; tubercles and two short lines on upper border of prothorax yellow; coxæ and trochanters marked with pale yellow; femora black, the anterior and middle ones yellow in front, and apically above; anterior tarsi yellow, the others blackish, with light base; tegulæ small, rufo-testaceous. Wings dusky hyaline, nervures and stigma reddish-sepia; first r. n. meeting first t.-c., second joining second s.m. near apex. Abdomen broad, shallowly emarginate at apex; first segment red dorsally and along hind margin laterally; second segment with a reddish median patch.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). Brit. Museum.

A very distinct species, running in my table of Australian *Prosopis* to the vicinity of *P. rufipes*, Sm., but easily known from this and allied species by the deep yellow face-marks.

Gnathoprosopis rowlandi, sp. n.

♂.—Length about 5 mm.

Black, with yellow markings, largely reddened by cyanide in the type; face much narrower than in *G. hackeri*, wholly pale (light tan, but probably originally pale yellow) below antennæ, the lateral marks extending above with much the form of a hand with index-finger pointed (as in *G. euwantha*); scape very broad, dark above, wholly lemon-yellow below; cheeks wholly black; flagellum ferruginous beneath; prothorax with the thickened upper margin and the tubercles red, but evidently originally bright yellow; no other yellow on thorax; mesothorax extremely finely punctured. Legs yellow, with the coxæ and trochanters, the hind femora, and the other femora basally above, black; hind tarsi blackened apically; tegulæ piceous, with a rufous spot. Wings dusky hyaline, stigma and nervures fuscous; first r. n. meeting first t.-c. Abdomen broad, shining, finely punctured; third ventral segment with a pair of well-developed tubercles, but no ridge between.

Hab. Yallingup, S.W. Australia, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). Brit. Museum.

Allied to *G. bituberculata* (Sm.), but differing in various details of coloration. Also allied to *G. euwantha* (Ckll.),

from which it is known by the swollen scape and other characters. The mesothorax is much more finely punctured than in *G. hackeri*, Ckll.

Prosopis distractus, sp. n.

♂.—Length 6 mm. or slightly over.

Rather robust; black, with yellow markings (all turned red by cyanide in type); head broad for a *Prosopis*, the eyes little converging below; mandibles yellow, rather long, conspicuously bidentate at end; labrum yellow; a short indistinct yellow line on posterior orbital margin; face all yellow to level of antennæ, and lateral face-marks extending broadly upwards, then narrowing to a point on orbital margin above middle of front; clypeus broad, not especially high as in species of *Gnathoprosopis*, finely punctured; supraclypeal area large and long, depressed and shining, at its upper margin slightly elevated and bigibbous; upper extension of lateral face-marks shining and swollen; scape light in front, not swollen; flagellum light ferruginous beneath; mesothorax and scutellum dullish, microscopically tessellate and excessively minutely punctured; greater part of tubercles and slender interrupted line on upper border of prothorax yellow; no other yellow on thorax; thorax with an obtuse tubercle on each side beneath, in front of middle legs. Legs black, with the following parts yellow:—anterior coxæ and their trochanters beneath, small marks on hind coxæ, anterior femora beneath and at apex, middle and hind femora at apex, anterior tibiæ except a stripe behind, longitudinal band and ends of middle tibiæ, basal third of hind tibiæ, anterior tarsi, and basal part of middle and hind basitarsi; tegulæ ferruginous, with a yellow spot. Wings dusky hyaline, nervures and stigma dark sepia; first r.n. entering base of second s.m. Abdomen thick, moderately shining; third ventral segment with a strong transverse curved ridge, convex caudad, the ends not elevated into distinct tubercles.

Hab. Yallingup, Sept. 14–Oct. 31, 1913 (*R. E. Turner*). Brit. Museum.

Runs in my table nearest to *P. bituberculata*, which is a *Gnathoprosopis*. It is a singular species, with some of the characters of *Gnathoprosopis*, yet certainly to be excluded from that genus.

Euryglossa nubilipennis, sp. n.

♀.—Length about 9 mm.

Robust; head, thorax, and legs black; first three abdo-

minal segments red, clouded with blackish, the first segment broadly dark basally, and dark apically except at sides, leaving on each side a transverse bright ferruginous subapical stripe, second segment with the posterior middle (broadest at centre) dark, third with a dark green band just before the dark fuscous marginal depressed portion; fourth and following segments dark green, with piceous apical margins, the fourth suffusedly reddish at lateral base; flagellum dull red beneath; tegulae piceous. Wings somewhat dilute reddish fuliginous, nervures and the rather small stigma dark fuscous. Head broad; clypeus shining, with distinct but sparse punctures, the middle almost impunctate; mesothorax shining, irregularly punctured, very densely at sides, very sparsely on disc; scutellum with strong irregular punctures, and very minute ones between; area of metathorax shining, with an obtuse transverse ridge; the thin hair of thorax is mostly white, but greyish brown on vertex, and also brown, but very scanty, on mesothorax and scutellum; lower side of first s.m. strongly arched; second s.m. much broader (longer) than high, receiving the recurrent nervures not far from base and apex. Hind legs without any distinct pollen-collecting hairs; hind spur strongly pectinate. Abdomen broad, shining, very sparsely punctured; fifth segment with conspicuous black hair.

Hab. Mt. Wellington, S. Tasmania, Jan. 15–Feb. 6, 1913
(*R. E. Turner*). Brit. Museum.

Easily known from the species which it more or less resembles in the colours of the abdomen by the very dark wings.

VIII.—*New Nasua, Lutra, and Proechimys from South America.* By OLDFIELD THOMAS.

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Nasua judex, sp. n.

N. dorsalis group. Sides tipped with fulvous, back obscurely dark-lined.

Size and skull-characters about as in *N. dorsalis* and *canduce*, to the latter of which the new form is most nearly allied. General colour dark greyish, the tips of the longer hairs bright fulvous. Middle line of back darker, the hairs tipped with black, the darker area less marked

and broader—covering the whole breadth of the neck— anteriorly, narrowing and becoming a defined blackish line posteriorly. Under surface as in *N. candace*, the throat and chest dull buffy whitish, the belly mixed brown and buffy. Head grey, the hairs grizzled black and white, the grizzling becoming coarser posteriorly and passing into the grey-ringed, broadly black-tipped hairs of the nape. Eyes with marked black patches. Ears black, their upper edge whitish. Forearms and metacarpus pale buffy, as in *N. candace*, digits brown. Hind feet brown mixed with pale buffy. Tail with about eight black and whitish rings.

Skull, allowing for differences due to age, apparently quite like that of the type of *N. candace*.

Hind foot of type 81 mm.

Skull: greatest length 124; zygomatic breadth 53; interorbital breadth 25; breadth of brain-case 45; palatal length 74; palatal foramina 5; combined length of p^4 and two molars 19.3; breadth of p^4 5.8.

Hab. Bogota.

Type. Subadult male. B.M. no. 44.1.18.13. Purchased of Parzudaki.

This *Nasua* is clearly most nearly allied to the Medellin *N. candace*, agreeing with that species and differing from *N. dorsalis* by its buffy forearms. It differs, however, by its grey head and blacker mesial dorsal area.

[*Nasua quichua jivaro*, subsp. n.

Like true *quichua*, but larger.

Coloration essentially as in *quichua*, the grey patches on the anterior flanks behind the shoulders similarly developed, and rendered more prominent by the rufous colour of the back extending on to the nape between them. Colours of head rather darker and richer, the crown strong fulvous instead of buffy, divided mesially by black; muzzle darker; light patches above and below eyes smaller and less conspicuous. Back and tail rich ferruginous, the latter obscurely ringed with black. Belly darker, the longer hairs mostly tipped with fulvous or buffy instead of whitish.

Skull decidedly larger throughout than in *quichua*, the muzzle heavier, the forehead higher and more convex, the brain-case larger, rounder, more inflated.

Top of skull more heavily crested in the oldest example than in the type of *quichua*, though the latter has more worn teeth. Postorbital processes, on the other hand, less developed.

Dimensions of the type (measured in flesh) :—

Head and body 565 mm.; tail 405; hind foot 83; ear 32.

Skull: greatest length 121; condylo-basal length 110; zygomatic breadth 64.7; interorbital breadth 25; breadth of brain-case 42.7; palatal length 71; combined length of p^4 and the two molars 19; breadth of p^4 5.6.

Hab. Oriente of Ecuador. Type from Gualaquiza. Alt. 2500'.

Type. Adult male. B.M. no. 14. 4. 25. 39. Original number 294. Collected 23rd November, 1913, by Gilbert Hammond. Presented by Oldfield Thomas. Four skins with skulls, and two separate skulls.

Closely similar as this animal is externally to *N. quichua*, the uniform difference in the size of the skull indicates that it should have a special name. Three adult skulls measure in condylo-basal length, ♂ 115, 110, ♀ 110, as compared with 106.5 in a very old male of *quichua*. The combined length of the three last teeth in the latter is only 17.5, and the breadth of the carnassial 5.1. The type-locality of *N. quichua* is Jima, on the other side of the Eastern Cordillera, at an altitude of about 8000'.

A very pale *Nasua*, obtained by Mr. M. G. Palmer in 1910 at Baños on the Rio Pastasa, is evidently a semi-albino of this form. Its skull measures 114 mm. in condylo-basal length.

Lutra parilina, sp. n.

L. platensis group. Nose-pad naked, sharply defined, projected backwards above.

Most nearly allied to *L. emerita*, with which it agrees in having the nose-pad entirely naked, sharply defined above and below, and with the middle part of the upper edge projected backwards. But the projection is much broader and more strongly marked, not a mere small point, but a broad angular prominence, almost recalling the still more strongly triangular point of *L. canadensis*. Colours and other external characters as in *L. emerita*, a small yellowish patch on the chest of the type.

Skull with very narrow interorbital region, much narrower than in an *L. emerita* of similar age.

Upper carnassial slightly larger than in *L. emerita*, and its inner lobe broader, extending backwards nearly to touch the front edge of the molar.

Dimensions of the type (measured in flesh) :—

Head and body 570 mm.; tail 423; hind foot 102; ear 17.

Skull: condylo-basal length 102; zygomatic breadth 64; nasals, length on middle line 12·5, least breadth 5·5; interorbital breadth 19·7; tip to tip of postorbital processes 23·5; mastoid breadth 63; combined breadth of incisors 11·3; p^1 , length on outer edge 13, front angle to back of inner lobe 11.

Hab. Western Ecuador. Type from St. Juan, 15 miles W. of Huigra. Alt. 870'.

Type. Subadult female. B.M. no. 14. 4. 24. 15. Original number 210. Collected 12th August, 1913, by Gilbert Hammond. Presented by Oldfield Thomas.

This otter is most nearly allied to the Merida *L. emerita*, but differs by its more angularly projected nose-pad, its narrower interorbital region, and its slightly larger carnasial.

Proechimys centralis colombianus, subsp. n.

Essential characters of *P. centralis*; hamular process broadly spatulate as in that species, not narrow as in *P. xanthæolus*.

General colour above dark fulvous chestnut, rather richer and more rufous than in *P. c. chiriquinus*; quite different from the pale and more sandy colour of *P. c. panamensis*. Head and back heavily lined with black. Under surface pure sharply defined white. Hands and feet uniformly pale brown. Tail heavily haired, black above, rather paler below, but not strongly contrasted.

Skull most like that of *P. c. panamensis*, agreeing with it in the tendency to the occasional obsolescence of the middle part of the parietal ridges, and thus resembling *P. xanthæolus*. In *P. c. chiriquinus*, on the other hand, the ridges are heavily developed throughout. Supraorbital ledges broad, but not so thickened as in *P. c. panamensis*. Hamular processes of pterygoids broadly spatulate.

Dimensions of the type (measured in the flesh) :—

Head and body 260 mm.; tail 160; hind foot 51; ear 23.

Skull: greatest length 59·7; condylo-incisive length 48·5; zygomatic breadth 26·5; nasals 2·2, tip of nasals to back of premaxillary processes 20·5, interorbital breadth 13·5, greatest breadth on ridges 23; interparietal 8·2 × 11·8; palatilar length 21·7; breadth of hamular processes 2·2; cheek-tooth series 10.

Hab. Condoto, Choco, W. Colombia. Alt. 300'.

Type. Adult male. B.M. no. 14. 5. 28. 23. Original number 335. Collected 17th January, 1914, and presented by Dr. H. G. F. Spurrell.

This *Proechimys* would seem to be referable to *P. centralis*, and, by the lightness and partial obsolescence of the parietal ridges, to be most nearly allied to *P. c. panamensis*, from which, however, it differs by its conspicuously richer and stronger colour and its darker tail. In the interruption of its parietal ridges it approaches the Bogota species *P. xanthæolus*, but is readily distinguishable by its broader hamular processes.

IX.—*Some undescribed Cicadidæ.* By W. L. DISTANT.

Platypleura gowdeyi, sp. n.

Head, pronotum, and mesonotum virescent; front with a convex transverse fascia, vertex with a small spot near each anterior angle, a transverse fascia between the eyes, which is centrally broadened and encloses the ocelli, and some small spots on each side before the eyes, black; pronotum with a central longitudinal fascia—enclosing an ochraceous spot—and the fissures black; mesonotum with four obconical spots, the two central ones smallest, and a central lanceolate spot black with interior ochraceous markings, two rounded black spots before each anterior angle of the basal cruciform elevation; abdomen above black, greyishly pilose, the apical segment greyishly tomentose; body beneath and legs thickly greyishly pilose, the ground-colour more or less ochraceous, and the tibiæ somewhat castaneous; tegmina opaque, finely pilose, greyish with darker markings and mottlings, a distinct black fascia crossing radial area and fourth ulnar area, and the transverse veins at the bases of apical areas and apical and subapical marginal series of spots black; wings ochraceous, the apical margins, not entering abdominal area and continued from apex for about half across disk, black, the extreme posterior margin near abdominal area greyish; face broadly centrally longitudinally sulcate, the transverse ridges prominent; rostrum passing the posterior coxæ; opercula in ♂ short, broad, centrally slightly overlapping, not passing base of abdomen, their posterior margins rounded.

Long. excl. tegm. 16 mm. ; exp. tegm. 53 mm.

Hab. Uganda; Entebbe (*C. C. Gowdey*); Brit. E. Africa, Yala River, S. edge Kakumga Forest, 4800–5300 ft. (*S. A. Neave*, Brit. Mus.).

Allied to the South African species *P. wahlbergi*, Stål.

Pycna baxteri, sp. n.

♀. Head and pronotum dull ochraceous; a transverse waved line on front, another on vertex between eyes and enclosing the ocelli, a central fascia to pronotum which is widened anteriorly, medially and posteriorly, the fissures, and narrow lateral and posterior margins, black; mesonotum castaneous, the posterior area thickly closely greyish pilose, a central black longitudinal fascia and a black spot near each anterior angle of the basal cruciform elevation; abdomen above black, a broad subapical transverse greyish-white fascia, the anal appendage dull ochraceous with a black spot on each side, an elongate, central, basal castaneous spot; body beneath and femora ochraceous, central sulcation to face, two basal and two apical spots to clypeus, black; tibiæ and tarsi castaneous, two small black spots on apical segment and linear black markings on abdominal appendage; tegmina greyish opaque for about basal half, remaining area hyaline, prominently spotted with brownish, two spots near base, crossing costal membrane and radial area, a large spot just beyond apex of radial area, an oblique angulated macular fascia at commencement of hyaline area and extending about half way across tegmen, and a double series of small apical marginal spots; wings black from base to about middle, remaining area hyaline, a greyish spot at apex of abdominal area; head including eyes only about two thirds the width of base of mesonotum; pronotal lateral margins ampliate and angulate, the angular apices only reaching base of basal cell of tegmina; tegmina with the costal margin prominently arched at base and dilated, broader than costal area; pronotum posteriorly strongly transversely wrinkled; rostrum passing the posterior coxæ.

Long. excl. tegm., ♀, 30 mm.; exp. tegm. 96 mm.

Hab. German East Africa; Mamboya (*Dr. E. J. Baxter*, Brit. Mus.).

Burbunga aterrima, sp. n.

♀. Body above black; anterior lateral margins of vertex of head, posterior margin of pronotum, narrow margins of two obscure obconical spots to mesonotum and cruciform

elevation to same, exposed margins of metanotum and posterior abdominal segmental margins, ochraceous; head beneath and sternum black, more or less greyishly tomentose; a longitudinal spot at apex of face, anterior lateral margins of vertex, sternal segmental margins and lateral areas to same, base of rostrum, posterior segmental margins to abdomen, and inner lateral areas of anal segment ochraceous; legs and rostrum piceous, coxæ, trochanters, and apices of femora ochraceous; tegmina and wings hyaline, the venation blackish, in places ochraceous; tegmina with the vein above radial area and the greater part of the veins defining clavus ochraceous, basal cell castaneous; head with the front strongly conically projecting, vertex profoundly wrinkled and sulcate between ocelli; pronotum with the fissures profound, posterior area finely transversely wrinkled; rostrum about reaching the posterior trochanters; body more or less finely pilose, and in parts cretaceously tomentose.

Long. excl. tegm., ♀, 20 mm.; exp. tegm. 62 mm.

Hab. N.W. Australia; Cue (*H. W. Brown*, Brit. and Sydney Muss.).

Pauropsalta fuscomarginatus, sp. n.

Head black slightly mottled with brownish, ocelli red; pronotum brown, a central fascia and the margins ochraceous, margins of the central fascia, the fissures and a posterior submarginal line black; mesonotum brownish-ochraceous with four black obconical spots, the two central spots very short, the lateral spots long and percurrent, a small black spot near each anterior angle of the basal cruciform elevation; abdomen above black, the tympanal orifices and subposterior segmental margins pale castaneous, the extreme posterior margins greyish; body beneath somewhat thickly greyishly pilose, abdomen beneath with a broad central longitudinal black fascia; tegmina and wings hyaline, the first with the veins and the postcostal area virescent, the costal membrane ochraceous, the base very narrowly pale testaceous, apical margins of the first, second, and fourth ulnar areas, and the apical margins of the apical areas more or less broadly infusate; wings with the veins black, margins of the abdominal area brownish-ochraceous; vertex broadly sulcate between the ocelli; pronotum moderately, centrally longitudinally impressed; face centrally sulcate for about two-thirds its length, rostrum reaching the intermediate coxæ; ope^{cula} in ♂ short, broad, somewhat

oblique, not passing base of abdomen nor meeting internally, abdominal margins beneath strongly, laminately raised; wings with five apical areas.

Long. excl. tegm., ♂, 16 mm.; exp. tegm. 44 mm.

Hab. New South Wales; 540 miles west from Sydney; open scrub country (*Walter W. Froggatt*, Brit. and Sydney Mus.).

"A scrub Cicada, away from the river, living on the roots of scrub trees" (*W. W. F.*).

Pauropsalta mixta, sp. n.

Head black, ocelli red, at base between the ocelli a small ochraceous spot; pronotum brownish-ochraceous, the sub-basal margin and two central longitudinal lines black, extreme basal and anterior margins pale ochraceous; mesonotum black, the basal cruciform elevation and a spot in front of each of its anterior angles ochraceous; abdomen above black, greyishly pilose, the tympanal cavities and posterior margins of the segments ochraceous; body beneath black, greyishly pilose; lateral margins and a central anterior spot to face, coxal margins, longitudinal streaks to femora, apices of femora, bases and apices to tibiæ, lateral areas of sternum, opercula—excluding bases—and lateral marginal areas of abdomen beneath, ochraceous or greyish ochraceous; tegmina and wings hyaline, venation black or fuscous, tegmina with the costal membrane pale ochraceous, the postcostal area fuscous; vertex distinctly sulcate between the ocelli; pronotum about as long as head, the fissures well pronounced; abdomen attenuated posteriorly; face centrally broadly sulcate, the sulcation scarcely extending beyond middle, transverse striations distinct; rostrum reaching the intermediate coxæ; opercula in ♂ small, not passing base of abdomen, inwardly well separated, posteriorly rounded; lateral marginal areas of abdomen beneath laminately reflexed; tegmina only a little more than twice as long as broad; wings with five apical areas.

Long. excl. tegm., ♂, 10 millim.; exp. tegm. 24 mm.

Hab. N. S. Wales; Breewarrina District (*W. W. Froggatt*, type Brit. Mus.).

Allied to *P. dubia*, Godd. & Frogg.

"A scrub Cicada, away from the river, living on the roots of scrub trees" (*W. W. F.*).

Pauropsalta signat_{cu} sp. n.

♂. Head black, front with a sp³ at apex, base, and on

each lateral margin ochraceous; pronotum ochraceous, anterior and posterior margins palely ochraceous, a broad central longitudinal fascia and the fissures black; mesonotum black, with two central longitudinal fasciæ—narrowed anteriorly, medially inwardly widened and posteriorly inwardly excavated—and a spot on each side of basal cruciform elevation ochraceous; abdomen above black, the tympanal cavities and posterior segmental margins ochraceous; body beneath and legs black; lateral margins and a central anterior longitudinal fascia to face, coxal streaks, apices of femora and streaks to same, tibiæ—excluding spots and apices—ochraceous; opercula, lateral and posterior segmental margins to abdomen beneath, greyish-ochraceous, the lateral margins with dark spots; tegmina hyaline, venation black, costal membrane and upper vein to claval area greyish, postcostal area infuscated; wings hyaline, basal venation greyish, outer venation pale ochraceous; vertex prominently sulcate between the ocelli; pronotum about as long as head; face finely, narrowly sulcate for about half its length; rostrum reaching the intermediate coxæ; opercula in ♂ small, directed inwardly but with their apices well separated, not passing base of abdomen, their bases black; abdomen beneath with its lateral margins laminately reflexed; tegmina about two and a half times as long as broad; wings with five apical areas.

Long. excl. tegm., ♂, $10\frac{1}{2}$ mm.; exp. tegm. 26 mm.

Hab. N.W. Australia; Cue (*H. W. Brown*, Brit. and Sydney Mus.).

Allied to *P. stigmatica*, Dist.

X.—*Descriptions of Two new Cyprinodont Fishes from Mexico, presented to the British Museum by Herr A. Rachow.* By C. TATE REGAN, M.A.

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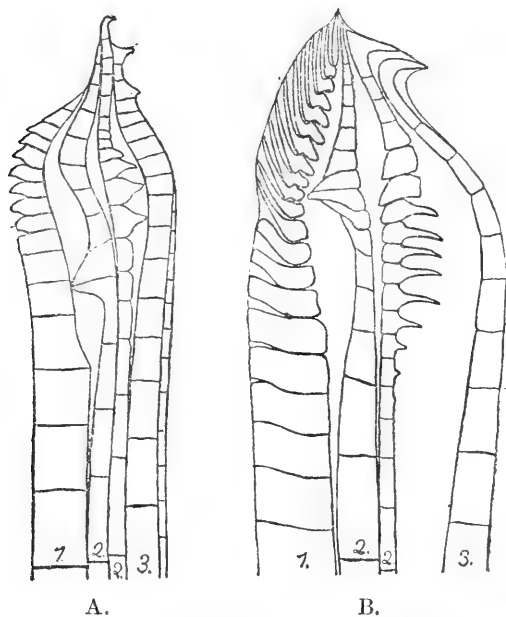
HETEROPHALLUS, gen. nov.

Closely related to *Gambusia*, differing only in the somewhat different structure of the intromittent organ. The first prolonged ray is shorter than the second and third, and its distal segments have not the characteristic *Gambusia* structure, but are formed as in *Belonisoa*; the hooks or spines at

the end of the third and the posterior branch of the second prolonged rays are small, also as in *Belonesox*, but the anterior branch of the second has the "elbow" seen in all the species of *Gambusia*.

Heterophallus rachovii, sp. n.

Depth of body 3 to $3\frac{1}{2}$ in the length, length of head 4. Diameter of eye 3 in the length of head, interorbital width 2. 30 scales in a longitudinal series. Dorsal 7, entirely behind anal; origin twice as distant from snout (σ) or eye (ρ) as from base of caudal; fin rather elevated, in males reaching to within a short distance of the caudal when laid back.



Extremity of intromittent organ of A. *Heterophallus rachovii*,
B. *Gambusia yucatana*.

The first, second, and third prolonged rays are numbered 1, 2, 3.

Anal 10; free edge straight or a little convex. Pectoral as long as head. Caudal rounded. Olivaceous; a dark line along side of body; dorsal with a dusky intramarginal band.

Vera Cruz.

Six specimens (3 σ , 3 ρ) up to 35 mm. in total length.

Gambusia yucatanæ, sp. n.

Depth of body $2\frac{2}{3}$ to 3 in the length, length of head $3\frac{1}{3}$ to $3\frac{1}{2}$. Diameter of eye $3\frac{1}{4}$ to $3\frac{1}{2}$ in the length of head, inter-orbital width about 2. 28 scales in a longitudinal series. Dorsal 7-9; origin above posterior end of base of anal (♀), equidistant from head and base of caudal (♂) or nearer caudal (♀); longest rays $\frac{1}{2}$ length of head. Anal 11; first and second branched rays somewhat produced, free edge emarginate (♀). Pectoral $\frac{3}{4}$ length of head or more, extending to above origin of anal. Caudal rounded or subtruncate. Least depth of caudal peduncle $\frac{2}{3}$ length of head. A dark bar below eye; series of small dark spots along rows of scales on upper part of body; dorsal and caudal fins spotted.

Progreso, Yucatan.

Four specimens (2 ♂, 2 ♀) up to 50 mm. in total length.

This species is closely related to *G. nicaraguensis*, but has a larger head and the dorsal fin further forward. The intromittent organ differs considerably in structure from that of males of *G. nicaraguensis* from Southern Mexico (cf. P. Z. S. 1913, p. 983, fig. 168, A); males from Lake Nicaragua have not yet been described.

XI. — *Preliminary Notes on the Local Races of some Canarian Lizards.* By CÆSAR R. BOETTGER and LORENZ MÜLLER.

THE material on which the following notes are based was collected by myself in 1913 on the Canary Islands, and was worked out together with Prof. L. Müller. A more detailed account of the Canarian Lizards, containing all described species, accompanied by coloured plates, is in preparation. For the present, it has seemed useful to give a preliminary account of the more noteworthy points, together with diagnoses of some new local races of *Lacerta galloti*, Dum. et Bibr. We have to thank Hofrat Dr. Steindachner, at Vienna, for having sent us for comparison some lizards of O. Simony's collection, preserved in the Hofmuseum.

CÆSAR R. BOETTGER.

I.—*LACERTA GALLOTI*, DUM. ET BIBR.

In working out the material of *L. galloti*, Dum. et Bibr., before us, it became at once apparent that each of the islands

where this species occurs is inhabited by a well-marked geographical race or subspecies. We first give a rather accurate description of *Lacerta galloti galloti*, and then differential diagnoses of the new subspecies.

Lacerta galloti galloti, Dum. et Bibr.

Lacerta galloti, A. M. C. Duméril et G. Bibron, *Erpétologie générale*, tome v. (Paris, 1839), pp. 238-240.

Type-locality. Island of Tenerife.

Proportions. General body-form stout; head large, its length somewhat more than $\frac{1}{4}$ of the length of head and body, moderately flattened; ♂ with the cheeks very broad. Snout slender, rounded in front. Neck slightly constricted in front of shoulders; rump broad, moderately flattened; limbs strong. Length of fore limb about $\frac{1}{3}$, of hind limb about $\frac{1}{2}$, of tail about twice that of head and body.

Scales. Rostral not in contact with nostril. Only post-nasal in contact with first and second supralabial. 5 of the 8 supralabials in front of subocular. Fronto-nasal as long as broad, usually shorter than præfrontals; præfrontals $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as broad. Frontal very variable in size and shape, its length sometimes equal to breadth, but sometimes even $1\frac{1}{2}$ to $1\frac{2}{3}$ of it; anterior angle pointed or obtuse, always shorter than its distance from rostral. Fronto-parietals $1\frac{1}{3}$ to $1\frac{2}{3}$ as long as broad. Parietals $1\frac{1}{2}$ to $1\frac{2}{3}$ as long as broad, as long or somewhat longer than distance of frontal from snout. Interparietal generally small. Occipital very variable in shape and size; in some specimens it is much larger than the interparietal, in others equal to it, its length being sometimes equal to the breadth, but sometimes much longer. In some specimens the lower margin of occipital is as broad as frontal, in others half its breadth, &c. 4 supra-oculars, the two central ones largest, separated from the supraciliaries by a well-defined series of granules. Orbit surrounded by a ring of small shields, the anterior and inferior ones are very small, whereas the posterior 3 or 4 are large. The uppermost of these four shields, which is the largest, is in contact with the last supraciliary and the last supraocular. Behind these four shields there are three, of which the lowermost, which touches the subocular and the seventh supralabial, is the largest; the uppermost, which sometimes extends to the lower parietal margin, is the smallest. Lower parietal margin bordered by 5 supra-temporals—rarely 4 or 6. Temporal scales small, the upper rounded or polygonal ones usually smaller than the lower

oblong ones ; all not keeled. Masseteric usually broad, now and then replaced by two or three smaller shields, rarely entirely absent. A large, oblong, tympanic, upper margin of ear-opening always present. 7 sublabials. Behind the symphysial 5 pairs of large chin-shields, followed by another pair, which is usually small, but now and then quite well developed. As a rule, only the shields of the two anterior pairs in contact with one another. Collar with very slightly or slightly serrated edge, composed of 9 to 15 shields. Gular fold always visible, generally very distinct. 38 to 45 scales in one line between collar and third pair of chin-shields. Dorsal scales small, roundish-rhomboidal, flat on sides of body, keeled in the middle of back. Between the individual scales there are minute granules, which never form complete rings round the dorsal scales as in *Lacerta simonyi*, Steind., but are limited to their anterior and posterior margins. 87-106 scales across the middle of the body, but usually less than 100. 3 to 4 lateral scales correspond to the length of one ventral shield. Ventrals in 12 to 14 longitudinal and 29-31 transverse series. Laterally of the ventrals there are always large lateral scales ; now and then the lateral scales gradually pass into the ventrals. Therefore, all the shields which are less than $\frac{2}{3}$ of a normal ventral are not counted as such.

Differentiation of ventrals variable. Shields of the first transverse series decidedly longer than broad. Pectoral triangle always well developed ; shape of ventrals of the different series different. Shields of the two median series as long as broad, the two following on the right and left distinctly broader than long, the extreme lateral ones longer than broad.

Except the number of the longitudinal series, the differentiation of the ventrals appears to be an important character, which separates the races of *Lacerta galloti*, Dum. et Bibr., from those of *Lacerta simonyi*, Steind. It would also seem that this character is of special importance with regard to the question which of the two large species of *Lacerta* in the western group is more primitive.

Præanal hexagonal, usually broader than long, about $\frac{1}{3}$ of the breadth of anal opening, surrounded by 2 (rarely 3) semicircles of small plates.

Forearm with two, upper arm with one series of broad shields ; anterior surface of thighs and lower legs also with a series of transverse plates. The differentiation of the scales has gone further here than in *Lacerta simonyi*, Steind., in which there are no broad shields at all on the upper arm,

and those on the thigh are less perfectly developed than in *Lacerta galloti*, Dum. et Bibr. Scales of outer surface of lower leg distinctly keeled and smaller than those of back. 24 to 31 femoral pores.

Caudal shields long and narrow, truncated behind; distinctly keeled on upper side of tail, less so below, especially at base of tail, where it is often scarcely visible.

Colour. Very variable.

Female and young specimens usually with more or less well-defined longitudinal light and dark lines and stripes. In the usually olive-brown or greyish-brown young and female specimens, the dark dorsal zone is generally bordered on each side by a paler dorso-lateral one. There may be or not two dark longitudinal stripes from the posterior parietal margin to base of tail, which are variable as regards breadth and distinctness; accordingly the pale dorso-lateral zone is more or less sharply set off from the median dark one.

Pale dorso-lateral zone strongly constricted occasionally, especially at neck, where colour becomes lighter and more intense. In this case it forms a pale stripe, which sometimes extends to the hips, but usually becomes, by and by, broader and indistinct on rump. Below pale dorso-lateral zone a well-marked dark lateral band, followed below by another pale zone. Between the last and the ventrals there is a further dark zone. Sometimes the lower pale zone is narrowed to a well-defined stripe. In many *young* specimens there is a short, often interrupted stripe from orbit to upper margin of tympanic.

Transverse bands formed of pale spots and lines, which often fuse to form transverse bars, but are usually separated from one another by the black areas which surround them. These markings are best developed on the flanks, but often reach the middle of the back. By the combination of the transverse and longitudinal markings a great variation in the style of marking is produced, which will be described more fully in a forthcoming paper.

In the females there is a row of blue spots in the upper part of the dark lateral band, and another composed of very pale spots near the margin of the ventrals.

Under side olive-green, yellowish, or reddish grey, sometimes darker-clouded. Chin and throat with a number—usually three pairs—of greyish-black stripes, converging forwards. In many specimens there are pale round spots on a greyish-black ground on the lower part of the sides of neck.

Old *males* as variable as old females. The most common

colour-phase has a dark rusty-brown rump and bright greenish-yellow or green transverse bands and spots, which are best developed on neck and anterior back. This light green reticulation is developed from the marking of the young animals; the transverse rows of spots fuse and form transverse bars and lines, and their colour changes from pale or yellowish grey to green.

In connection with this process the ground-colour of the body becomes darker and often nearly, or totally, obliterates the light areas. The head, neck, and throat become deep brownish black, chest and belly black, posterior portion of belly strongly clouded with reddish. Cheeks below tympanic lighter or darker bluish grey, this colour only slightly extending to throat. The two rows of blue spots, so strongly developed in the female, only extend to chest or loins. Now and then these spots are very large on the shoulders.

In another colour-phase the transverse bands are little or not developed, the ground-colour being very dark, nearly black, and the two rows of blue spots more or less distinct and often the only marking. This style of marking corresponds to that of the local race of *Lacerta simonyi*, Steind., inhabiting the Roques of Salmore.

There are all kinds of intergradations between these two forms, and there are also specimens of a uniform deep brown colour.

Length of head and body in the two largest measured specimens: ♂ 135 mm., ♀ 126 mm.

Distribution. Island of Tenerife.

Lacerta galloti palmae, subsp. n.

Type-locality. Island of Palma.

Type. Munich Museum (Zool. Samml. München, no. 241/1913).

This form is smaller than the Tenerife race. The largest males measured were about as large as medium-sized males from Tenerife. The structure of the scales is almost exactly as in *Lacerta galloti galloti*, Dum. et Bibr.; the colour, however, is constantly different.

♂. The variation is comparatively limited, not by far so enormous as it is in the typical race. Markings of *male* comparatively simple. Bright green spots and transverse bands, so characteristic of most of the Tenerife specimens, always entirely absent. Ground-colour of upper side more or less dark brown with a yellowish or bluish hue. Head, sides of neck, and anterior portion of rump, also underside of

head, neck, and chest deep black. The black colour gradually becomes lighter posteriorly and, on the sides, passes through bluish grey into brown and, on the lower surface, dissolves into a spotting and clouding on a reddish or bluish-grey ground. Dorsal zone, especially on the posterior third of rump and base of tail, nearly always traces of the two dark longitudinal bands often found in the female of *Lacerta galloti galloti*, Dum. et Bibr. More or less distinct traces of a transverse striping only on posterior half of rump, whereas in *Lacerta galloti galloti*, Dum. et Bibr., the strongest striping is always on neck and anterior portion of rump.

These transverse bars are never green as in *Lacerta galloti galloti*, Dum. et Bibr., but are bluish or brownish grey. Two rows of blue spots of variable size and intensity on sides of body, which are largest on anterior portion of rump and often almost disappear posteriorly. The blue spots on the shoulders are always the largest, but never attain the size and irregular shape often found in the Tenerife form. A very distinctive character of the male is an enormous *cheek-patch* of a bright blue colour, which begins below the masseteric, which has the same blue colour and extends anteriorly to the posterior margin of the third pair of gulars, posteriorly to about midway between collar and gular fold. Below, the two cheek-patches are merely separated by a narrow black zone, but even that may be absent. Limbs lighter or darker brown, hind limbs with generally slightly developed eye-spots. Lower margin of every second caudal ring with lighter spots.

♀. By far most of the *females* with very distinct longitudinal stripes. Transverse stripes only indistinctly developed and only on posterior back. Female and young specimens with the same gular markings as in *Lacerta galloti galloti*, Dum. et Bibr.

Length of head and body in the two largest measured specimens: ♂ 112 mm., ♀ 98 mm.

Distribution. Island of Palma.

Lacerta galloti gomerae, subsp. n.

Type-locality. Island of Gomera.

Type. Senckenberg Museum, Frankfurt (M.), no. 6041, 2 a.

Size and scales. Smaller than *Lacerta galloti galloti*, Dum. et Bibr., and *Lacerta galloti palmae*, C. Bttg. et L. Müll.; scales slightly different from the typical form. 6 pairs of large chin-shields, the last pair, which is usually rudimentary

in *galloti* and *palmae*, being well developed; number of ventrals usually less—minimum 10 instead of 12,—*galloti* and *palmae*, maximum always below 14.

♂. *Colour of male* dark. Markings, if at all present, reduced to longitudinal stripes. Very small light yellow or grey points, found all over the back, must apparently be regarded as the last traces of transverse bars. Except these points and some blue eye-spots, there are no markings on neck and anterior back; but there are traces of dark bands on posterior back and root of tail on a slightly paler ground. In very dark specimens head and neck are deep black, as is also lower surface, except that of tail which is reddish grey. Posterior portion of belly sometimes paler. The two lateral rows of ventrals with more or less numerous blue spots. There are also blue spots on the limbs, of which a larger one on upper arm close behind shoulder and one on thigh are especially characteristic for this race.

In the lighter specimens, which are clay-coloured, there are two comparatively narrow dorso-lateral bands from parietals to root of tail, where they fuse on neck and anterior back. They are bordered below by a narrow pale stripe. Lower surface as in the dark specimens.

♀. Ground-colour of *female* greyish to reddish brown. From superciliaries to first third of tail a yellowish-brown stripe, which is light and narrow anteriorly, broader and darker posteriorly, and margined posteriorly on each side by a narrow brownish-black band, both of which fuse on anterior fourth of tail. Laterally follows a broad dark lateral band, margined by a light line, which begins below the auditory meatus and is only distinct on neck and anterior back. A light stripe from eye across masseteric and upper margin of auditory meatus, which is broken up into spots in the temporal region. Throat, chest, and anterior portion of belly black as in male. Small, round, whitish spots on sides of neck. Posterior portion of belly lighter, bluish grey. Flanks with occasional light spots, probably the remains of transverse bars. Small blue spots at upper end of limbs as in male.

Young. Colour as in ♀. Lower surface much lighter, pale reddish yellow. Throat deep black, with some light spots on sides of neck.

Length of head and body in the two largest measured specimens: ♂ 102 mm., ♀ 83 mm.

Distribution. Island of Gomera.

Lacerta galloti cæsaris, Lehrs*.

Lacerta cæsaris, Lehrs, Abstract of the Proceedings of the Zoological Society of London, no. 134, p. 41 (1914).

Type-locality. Island of Hierro.

Very small, even the largest specimens not larger than good specimens of *Lacerta serpa*, Raf. Female and young specimens with very distinct stripes.

The discovery of a pigmy race of *L. galloti* on Hierro Island is very striking, the more so as one was inclined to suppose that it was inhabited by *L. simonyi*, Steind., which, however, was not procured, and obviously does not occur in Hierro in our days. This new race proves to be very closely related to *L. g. gomeræ*, from which it has evolved by extreme specialization. The size has been reduced and the markings still more developed. The number of scales has also been reduced, the ventrals being never more than 12, but only 10 in a greater percentage of specimens than in *gomeræ*. Maximum number of scales across middle of body 107. There are almost no interspersed granules. 6 pairs of large chin-shields behind symphysial.

As in *gomeræ* there are *dark males* with only small spots on a brownish-black ground. Blue shoulder-spots minute, spots on thigh and upper arm well developed. Lower surface, except that of tail, deep black.

Light phase of males also as in *gomeræ*, except that the dark dorso-lateral bands are broader and with light spots and intervals upon them. Posterior part of belly sometimes bluish grey.

♀ much as in *gomeræ*; dark bands broader and more pronounced, generally deep dark brown; light stripes very light, narrow and well defined almost for their entire length. Throat and chest always black, belly greyish blue.

Young with light belly, throat always black.

Length of head and body of the two largest measured specimens: ♂ 82 mm., ♀ 78 mm.

Distribution. Island of Hierro; one specimen collected on the largest of the Roques del Zalmore.

* After this paper had been finished, I received the Abstract of the Proc. Zool. Soc. of London, May 13th, 1914, where Dr. Lehrs described the Hierro form of *galloti* as a new species, *Lacerta cæsaris*. He based his investigations on materials collected by myself at Las Lapas in the Island of Hierro. I do not think it justified to regard this lizard as a distinct species. Dr. Lehrs did not see how nearly his *Lacerta cæsaris* comes to the subspecies of *Lacerta galloti*, especially to *Lac. gall. gomeræ*. I therefore regard *cæsaris* as the Hierro subspecies of *Lacerta galloti*. The coloration of *cæsaris* is, in my opinion, not a primitive one, but, on the contrary, is highly specialized.—C. R. BOETTGER.

II.—THE SPECIES OF *CHALCIDES* OF THE WESTERN CANARIES.

The specimens of *Chalcides* from Gran Canaria, of which Steindachner has described a number of colour-varieties, are constantly distinguished from typical *C. viridanus*, Grav., of Tenerife, Gomera, and Hierro not only by their colour and markings—which may vary in all of them,—but also by the proportions of their body. They have not the formless cylindrical shape and the small head which is not set off from the neck, nor the short thin limbs, but their head is larger and thicker, better set off from the neck; the neck is longer in proportion to the body and slightly constricted in front of the shoulders, and the limbs are longer and stouter. In addition to these habitual characters, the throat and belly are *never* black as in typical *viridanus*. There is, further, a tendency to develop longitudinal stripes, a character never observed in any of the numerous specimens of *C. viridanus*, Grav., from Tenerife, Gomera, and Hierro.

The *Chalcides* of Gran Canaria must therefore be regarded as a separate species, for which the oldest name is *Chalcides sexlineatus*, Steindachner.

Chalcides viridanus, Grav.

Gongylus viridanus, J. L. C. Gravenhorst, Verhandlungen der Kaiserlichen Leopoldinisch-Carolinischen Akademie der Naturforscher, 15. Band (Breslau und Bonn, 1851), 1 Abtheilung, pp. 348-350, Tab. xxxv.

Type-locality. Island of Tenerife.

Proportions. Body regular cylindrical, rather slender. Head small, scarcely set off from neck, moderately high, with slightly broader cheeks in ♂, which, however, are always distinctly narrower than rump. Distance from snout to auditory meatus $6\frac{3}{4}$ –7 times contained in that from snout to anus in ♂, $7\frac{1}{2}$ – $7\frac{3}{4}$ in ♀. Neck relatively short, indistinctly set off from rump. Distance from snout to shoulder contained in that from shoulder to loin twice in ♂, $2\frac{1}{2}$ times in ♀. Limbs short and weak, lower leg flattened; length of fore limb contained in that of head and body at least $5\frac{1}{2}$ times in ♂, 6 times in ♀, of hind limb $3\frac{3}{4}$ –4 times in ♂, $4\frac{1}{2}$ in ♀. Tail usually regenerated in adults, in younger specimens its length is about $1\frac{1}{4}$ that of that of head and body.

Scales. Nostril in front of suture between rostral and first supralabial. Rostral twice as broad as high, concave behind; supranasals in contact with one another. Internasal broader

than long. Frontal slightly longer than broad; interparietal moderately large. Parietals forming a suture behind interparietal. Fifth supralabial below the eye. Lower eyelid with transparent disc. 4 supraoculars. Parietal bordered laterally by 2 large supratemporals. Scales in 28-32 longitudinal series.

Colour. Fairly constant. Upperside coppery or olive-brown, with metal gloss. Sides of neck, rump, tail, and limbs deep brownish black. Lower surface deep black or bluish grey, with black centres to the individual scales. Brown dorsal zone separated from black sides by a slightly paler longitudinal stripe which occupies two scales in breadth. A number of small light yellow or metal-greenish spots, with darker margin, usually placed in 8-9 irregular longitudinal lines on back.

Length of head and body in the two largest measured specimens: ♂ 87 mm., ♀ 89 mm.

Remarks. In most of the specimens from Hierro and Gomera there is a number of small bluish-white points and lines in the dark lateral zone; but there are also specimens without any markings on upper surface and sides, and occasionally these markings are found in animals from Tenerife. We are therefore not at present prepared to regard the *Chalcides* from Gomera and Hierro as a separate subspecies.

Distribution. Islands of Tenerife, Gomera, Hierro.

Chalcides sexlineatus, Steindachner.

Chalcides viridanus, Grav., var. *sexlineata*, F. Steindachner, Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften, C. Band, 1 Abtheilung (Wien, 1891), pp. 302-304.

Type-locality. Caldera de Tirajana, island of Gran Canaria.

Proportions. More like a *Mabuia* than a *Chalcides*. Rump cylindrical, flattened above, with well-differentiated head and neck, in strong contrast to *C. viridanus*, Grav. Head comparatively large, well set off from neck, rather high and broad, with very broad cheeks in ♂, head therefore much broader than neck and scarcely narrower than rump; head in ♀ slightly narrower than neck. Distance from snout to auditory meatus contained in that from snout to anus $5\frac{1}{2}$ -6 times in ♂, $5\frac{3}{4}$ -6 times in ♀. Neck rather long and distinctly set off from rump. Distance from snout to shoulder contained in that from shoulder to loin 2 times in ♂, occasionally a trifle more in ♀. Limbs short but stout, lower leg not flattened. Length of fore limb contained in

that from snout to anus always less than 5 times in ♂ and ♀, of hind limb $3\frac{1}{4}$ – $3\frac{1}{2}$ times. Tail at most $\frac{1}{6}$ longer than head and body.

Scales. As a whole, much as in *C. viridanus*, but the average number of the longitudinal series of scales larger, up to 35.

Colour. The most primitive form as regards colour and markings appears to be the phase called "*bistriata*" by Steindachner. Back roe-brown, with light whitish-grey spots with black margin, arranged in longitudinal rows. Dorsal zone margined by a narrow light stripe from supra-ciliaries to base of tail, which is margined with black in many specimens. Upper half of lateral zone occupied by blackish-brown band with lighter spots, extending from eye to loin and base of tail; lower half light, with darker and lighter spots, so as to form a "pepper-and-salt" coloration. Limbs brown, with dark margins to the scales and lighter and darker spots. Tail brown, with darker median and lateral zone and indistinct light spotting. Lower surface yellowish to greenish white, with small grey points on belly. Throat ochraceous yellow.

Steindachner's "*var. nigrescens*" is based on melanistic specimens of this type.

The "*var. sexlineatus*" of Steindachner is most strikingly marked. Dorso-lateral band deep black, extending from nostril to base of tail, separated from lateral zone, which is also deep black, by a narrow light yellow or greyish-white line. Dorsal zone with 4 narrow yellowish-brown lines. Lateral zone divided into a broader upper and narrower lower portion by a very narrow greyish-white line, extending from ear across shoulder to loin. A second white line, margined black on border of lateral and ventral zone on anterior portion of rump. Limbs brownish, with narrow blackish margins to the individual scales. Chin and throat ochraceous yellow; chest and belly bluish, paler anteriorly, darker posteriorly. Tail metal-blue, scales of upper sides margined with black.

Length of head and body in the two largest measured specimens: ♂ 87 mm., ♀ 81 mm.

Distribution. Island of Gran Canaria.

III.—*TARENTOLA DELALANDEI*, DUM. ET BIBR.

The Geckos of Gran Canaria are a well-characterized race which has been separated by Steindachner as *Tarentola*

delalandei boettgeri. The Geckos of Tenerife, Palma, Gomera, and Hierro must be included in *Tarentola delalandei delalandei*, Dum. et Bibr., although there is a good deal of local variation; specimens from Tenerife and Palma are fully identical, in those from Gomera there occur many in which the dorsal tubercles are whitish grey; the Geckos from Hierro are, as a rule, more different, and more approach *T. d. boettgeri*, Steind. These differences, however, seem to us to be too slight to be of subspecific importance.

XII.—Notes on the Forficularia.—XXII. Notes on the Wing-venation in the Dermaptera. By MALCOLM BURR, D.Sc., F.E.S., &c.

[Plates III.-V.]

THE beauty of the earwig wing has long been a favourite theme of writers on Natural History, but it was only so recently as 1911 that any attempt was made to employ its structure as a taxonomic character. This was in a chapter in Zacher's important paper on the genitalia in the Protodermaptera ("Studien über das System der Protodermapteren," Zool. Jahrb. xxx. p. 303, 1911), a work which we shall have occasion to discuss in greater detail elsewhere.

The difficulty of opening and mounting this extremely delicate organ has been the chief obstacle, but it must be remembered, too, that very many genera are totally apterous. Still, it is most probable that very useful characters may be found in the venation.

The earwig wing resembles that of the Gryllid genus *Tridactylus*, and of the Phasmids, in that the anal area is enormously developed at the expense of their other parts. In the earwig wing there are five distinct portions.

The *marginal area* is a small, narrow, acuminate field at the base of the anterior margin; it contains no veins.

The *squama* is the chitinised portion which usually protrudes from beneath the elytra when at rest, and is generally of the same texture and coloration as the elytra themselves. It is narrower at the base and dilated towards the apex.

Beyond the squama, and separated from it by a vertical hinge, is the lanceolate *apical area*. These three portions between them occupy almost the whole of the costal margin of the wing.

Behind the squama is a clear, almost veinless, field, the *ulnar area*, bounded anteriorly by the posterior margin of the squama, and elsewhere by the strongly curved and prominent *ulnar vein*.

The whole of the rest of the wing is delicate and membranous ; this is the prominent *anal area*.

From the apex of the ulnar area there radiate seven nervures, which extend to the margin of the wing. These radial nervures are altogether twelve in number, the remainder arising from the more basal portion of the ulnar vein. Intercalated within these nervures there are in all nine secondary nervures, which arise midway between the ulnar vein and the margin: all these are connected by a spurious vein which runs a short distance inside the posterior margin of the wing, and parallel to it, from the base to the apex. A little distance inside this spurious vein, each nervure, both main and secondary, is slightly dislocated by what may be described as an incipient secondary spurious vein. About this point each secondary nervure is usually somewhat chitinised and inflated. The nervures are nearly all bent at this point.

In the squama there are, according to Zacher, always three chitinised veins which he provisionally discriminates by numbers, the first and third forming the anterior and posterior boundaries of the squama, the third being short, only extending about a quarter of the total length of the squama, and straight. In some instances these are connected near the basal portion by a cross-vein. The third vein sometimes has a sector branching from it into the ulnar area.

In the apical portion of the latter, an inner branch arises and is directed towards the base, to meet the apex of the sector. As a rule, these two fail to meet, the ends of each being obsolete, but in some instances their junction can be detected under a high power.

The apical area usually has a faint longitudinal vein.

The first eight radial nervures, continuing from the apex backwards towards the axillary angle, are more or less straight: sometimes the ninth, always the tenth, eleventh, and twelfth, are of irregular shape.

When the wing is folded, it shuts like a fan radially about the starting-point of the nervures, arising at the apex of the ulnar area; and then again is folded in a plane at right angles, about the line or hinge which separates the apical area from the squama.

Of these features, those to which taxonomic importance are attached by Zacher are the following:—

Presence or absence of cross-vein connecting the veins of the squama.

Presence or absence of sector to third vein of squama.

Presence or absence of internal branch to ulnar vein.

Presence of a "triangular field" (often hairy) at base of ninth or tenth radial nervures.

Shape of the tenth radial nervure.

To which I add:—

Shape of the ninth and eleventh radial nervures, and separation or junction at the base of the first and second radials.

Thus it will be observed that the greater portion of the wing offers, so far as we can see, few characters of value.

It may here be noted that apparently the wing is invariably weaker and more delicate in the more primitive forms, and stronger in the higher. The veins and nervures themselves are stronger, and the membrane more visible in the Eudermaptera. Indeed, in some genera of the latter, the wings are very highly coloured (*Pterygida*, *Allodahlia*, *Eudohnia*).

As regards the practical question, I have little to say. I detach the wing as carefully as possible with a fine scapel: all my specimens are mounted for microscopic examination by Lt.-Col. F. Winn Sampson, and it is with pleasure that I acknowledge here my very great indebtedness to this gentleman's skill and patience, which is rapidly providing me with a rich material for the study of the genital armature of earwigs. Incidentally, Colonel Winn Sampson has prepared for me the few wings, which are the material for this brief paper. I will only say that rather strong staining is advisable, more particularly in the case of the paler and more delicate Protodermaptera, when mounted in Canada balsam. The veins are more visible if the specimens are mounted dry.

Omitting for the time being the Paradermaptera, the wings of which I have not yet studied, the differences in the venation of the wings in the two main groups are thus proposed by Zacher:—

Protodermaptera: veins of squama with no cross-connection: third vein usually without sector (except in *Labidura*); ulnar vein usually with inner branch;

tenth radial nervure always, ninth usually, with triangular field.

Eudermaptera: veins of squama with cross-connection: third vein with sector; ulnar vein without inner branch; triangular field to ninth radial nervure; the tenth 4-shaped.

We may now proceed to a consideration of the wings of a few species, and then see to what extent these observations affect Zacher's expressions.

PROTODERMAPTERA.

Kalocrania picta, Guér. (Pl. III. fig. 1.)

The wing is extremely delicate; my specimen being unstained, the smaller nervures are very obscure, the whole wing being remarkably transparent and ghost-like.

Both squama and ulnar area are strongly broadened apicad and narrow basad. Veins of squama with no cross-communication.

Third vein with no sector.

The inner branch of the ulnar vein is very strong, more prominent indeed than the ulnar vein itself; soon after its origin it throws off a short, straight subsidiary branch at right angles, and then fuses with the ulnar vein at the origin of the tenth radial nervure, then branching off again to the base of the wing.

Ninth radial nervure straight.

Tenth Y-shaped.

Eleventh looped.

No pubescence.

The first and second nervures are joined at the base.

Allosthetella malayana, Zacher. (Pl. III. fig. 2.)

The wing is rather long and narrow. Zacher states that the first vein of the squama is strong and hairy, the other two very faint. As I read my specimen, the first is hairy, the first and third faint, and the second strong. Contrary to what Zacher says, the inner branch of the ulnar vein does actually reach, though very indistinctly, the third vein of the squama and so is confused with the sector. The apex of the ulnar area, as well as the triangular field of the tenth nervure, are hairy; the first and second nervures are joined at the base.

The ninth nervure is straight, the tenth Y-shaped, and eleventh looped.

Labidura bengalensis, Dohrn. (Pl. III. fig. 3.)

In the squama I see a fourth vein near the base, very short; no cross-communication. Third vein with faint sector; inner branch of ulnar very strong. The first and second nervures are joined at the base, the eleventh is looped, as in the two preceding species, but I find two characters in common with the Eudermaptera: namely, the ninth radial nervure has a triangular area, *i. e.*, is strongly angled, and the tenth is 4-shaped, not Y-shaped.

EUDERMAPTERA.

Labiidæ.

Marava wallacei, Dohrn. (Pl. IV. fig. 4.)
(=*grandis*, Dubr.)

Here the ulnar area is rather broad, the first and second radials are separate at the base; the ninth is angled, the tenth 4-shaped, but the fourth very narrow and the eleventh has an open loop.

Labia annulata (Beauv.). (Pl. IV. fig. 5.)

The wing is rather long and narrow; the first and second radials are separate at the base; the ninth is angled, the tenth is Y-shaped, and the eleventh has a closed loop.

Chaetospasia australica, Dubr. (Pl. IV. fig. 6.)

The wing is rather narrow; the first and second radials are separate at the base; the ninth is angled at the base; the tenth is 4-shaped, but the 4 is very narrow, and the eleventh is not looped.

Forficularidæ.

Forficula auricularia, L. (Pl. V. fig. 7.)

To Zacher's observations I will add that the tenth nervure is 4-shaped, the eleventh simple, and the ninth angled. That no part is hairy, that the whole wing is short, broader and stronger and darker than in the Protodermaptera.

Eparchus insignis, Haan. (Pl. V. fig. 8.)

Scarcely differs from the preceding; the sector is distinct; an inner branch to ulnar vein is faintly visible in one specimen.

Doru lineare, Esch. (Pl. V. fig. 9.)

I cannot see any cross-communication in the squama; there is a faint but visible inner branch to the ulnar vein; the ninth nervure is slightly angled, the tenth 4-shaped, and eleventh simple. The wing is somewhat narrower than in the two preceding species.

From the meagre material I deduct the following:—

The presence or absence of cross-communication in the squama is of doubtful constancy and difficult to detect. A fourth vein may be present in the squama.

The sector of the third vein of the squama and inner branch of the ulnar vein are one thing, though often indistinct in the middle and so divided into two, and that Zacher overrates the value of this feature. The ninth radial nervure may be angled, that is, has a triangular field in the Eudermaptera, but is straight in the Protodermaptera: this seems to me a better expression.

The first and second radial veins have a common base in the Protodermaptera, but not in the Eudermaptera.

The ninth radial is straight in *Allostethella* and *Kalocrania*, but angled in *Labidura* and in the Eudermaptera.

The tenth radial is Y-shaped in *Allostethella* and *Kalocrania*, but 4-shaped in *Labidura* and in the Forficulidæ; it is of intermediate shape in the Labiidæ, the 4 being so narrow as to pass insensibly into a Y in some species.

The eleventh radial has a closed loop in the Protodermaptera, but is simple in the Forficulidæ; it is of intermediate form in the Labiidæ, the loop being actually closed in *Labia annulata*.

Thus it will be seen that apparently there is no set of characters provided by the neururation sharply dividing the Protodermaptera from the Eudermaptera, but that *Labidura* and the Labiidæ have some features in common with the Pygidieranidæ and *Allostethinæ* on one hand, and with the Forficulidæ on the other.

EXPLANATION OF THE PLATES.

PLATE III.

Fig. 1. *Kalocrania picta*, Guér. $\times 4$.

Fig. 2. *Allostethella malayana*, Zacher. $\times 6$.

A. Marginal area.

B. Squama,

C. Apical area.

D. Ulnar area.

- E. Anal area.
 H. Hinge.
 I, II, & III. First and second and third veins of squama.
 U. Ulnar vein.
 1-12. Radial nerves.
 V.S. Vena spuria.
 T. Triangular area.

Fig. 3. Labidura bengalensis, Dohrn. $\times 5$.

PLATE IV.

Fig. 4. Marava wallacei, Dohrn (= *grandis*, Dubr.). $\times 8$.

Fig. 5. Labia annulata, Beauv. $\times 10$.

Fig. 6. Chætospania australica, Dubr. $\times 8$.

PLATE V.

Fig. 7. Forficula auricularia, L. $\times 8$.

Fig. 8. Eparchus insignis, Haan. $\times 6$.

Fig. 9. Doru lineare, Esch. $\times 6$.

XIII.—*Pleurosaurus and the Homologies of the Bones of the Temporal Region of the Lizard's Skull.* By D. M. S. WATSON, M.Sc., Lecturer on Vertebrate Palæontology in University College, London.

[Plate VI.]

IN the most primitive known Tetrapod skulls, represented for us by the Amphibian *Pteroplax* and the Reptile *Seymouria*, there are three bones in the temporal region. The outer of these is usually much the largest and has the following relationships:—

It covers a large area on the side of the skull, being connected by suture with the quadrato-jugal below, the jugal and postorbital in front, and the intertemporal and "supratemporal" above. Its posterior border is bent inwards below the otic notch, and covers the back of the quadrate; finally, this flange unites with the pterygoid in a long suture.

The other two temporal bones lie entirely on the surface, and come into relationship with no cartilage-bone, unless, perhaps, the epipterygoid.

Most palæontologists—Broili, Boulenger, Gadow, v. Huene, Jaekel, for example, amongst those working to-day—call the outer bone the squamosal, and Broom has recently been converted to this view; but Case has consistently called it a prosquamosal, and some other workers object to its

identification with the mammalian bone. I have recently endeavoured to show by direct tracing from a mammal down the Therapsid line to the primitive *Varanosaurus* that it is really the true mammalian squamosal.

In all the Therapsid reptiles the relations of the squamosal are very constant.

In all it forms a large part of the border of the temporal fossa, sending a long process forward on the anterior face of the parietal which in early types actually meets a similar backward prolongation of the postorbital. Below the fossa it sends forward a similar process above and within the jugal towards the postorbital, which in many early types sends back a similar process lying above and without the jugal to meet it. These two processes meet and form the body of the bone, which has a powerful articulation with the outer end, and in some cases (e. g., *Endothiodon* and *Diademodon*) with a small area of the anterior face of the paroccipital; to the outside of this articulation the bone passes down and out behind the quadrate. In *Varanosaurus* the part of the squamosal which lies below the articulation with the paroccipital is in contact with the posterior end of the quadrate ramus of the pterygoid, precisely as in *Pteroplax* and *Seymouria*. In most types, owing to the reduction of the pterygoid, this no longer happens. When an unreduced quadrato-jugal is present (*Deinocephalia*, *Dimetrodon*), it is articulated with the outer edge of the quadrate and the lower edge of the squamosal, and passes forward within and below the posterior end of the jugal.

So far as I have been able to observe, the directions of overlap of bones given above are constant for all Therapsids.

In the great majority of Therapsids a tabular is present. In all cases it lies entirely behind the parietal and squamosal on the posterior surface of the skull, and commonly reaches down outside the post-temporal fossa to touch the posterior upper corner of the end of the paroccipital.

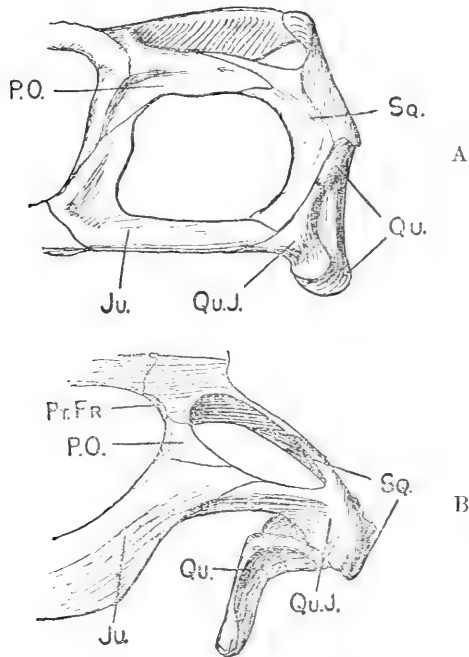
In the skull of *Sphenodon* (fig. 1 A) there is a single bone in the temporal region; the work of Swinnerton and Howes has shown conclusively that this is really single in origin.

In the adult animal it has the following relationships:—

It forms a large part of the border of the temporal fossæ, sending a long process forward on the anterior face of the parietal and a similar process forward within the corresponding backward process of the postorbital. A third ramus passes downwards and forwards along the upper and inner side of the jugal; this last ramus covers some of the front edge of the quadrato-jugal.

These three rami meet and form a cap over the top of the quadrate. The bone in this region has a powerful articulation with the end, and particularly the front face of the paroccipital—in fact, it sends a special thick process down the front face of that bone, which (in some specimens at any rate) actually reaches and touches the distal end of the

Fig. 1.



A. Temporal region of the skull of *Sphenodon*, $\times 2$.

B. Temporal region of the skull of *Uromastix*, $\times 2$.

Ju., jugal; P.O., postorbital; Pr.Fr., postfrontal; Qu., quadrate;
Qu.J., quadrato-jugal; Sq., squamosal.

pro-otic. This process separates the head of the quadrate from the distal end of the paroccipital. Another special little process runs back along the posterior surface of the pterygoid wing of the quadrate at the top, and its forward end has a distinct suture with the pterygoid.

Comparison of this description with that of the squamosal

of Therapsids given above will show that it is certain that the single temporal bone of *Sphenodon* is really a squamosal, as, except for the difference due to the presence of a single temporal fossa in one and two in the other type, the relations of the two bones are identical.

The quadrato jugal is applied to the outer side of the quadrate, separated from it largely by the foramen quadrati; its anterior border is in connection with the squamosal, and a small process runs forward within and below the jugal.

In the lizards, except where lost by reduction, there are two elements in the temporal region. The homologies and names of these bones have been very much disputed.

The inner bone has been called:—mastoidien, by Cuvier; mastoid, by Owen; squamosum, by Gegenbauer, Baur, and Gaupp; supra-temporal by Parker, Huxley, Cope, and Boulenger; and tabular, by Williston and Broom.

The outer bone has been called:—temporal, by Cuvier; quadrato-jugal, by Owen, Gegenbauer, and Baur; squamosum, by Parker, Huxley, Cope, Boulenger, Williston, and Broom; paraquadrate, by Gaupp.

These lists make no pretence to be complete, or even to give the changes of opinion of individual authorities, but give some idea of the conflict of opinion.

The inner bone has the following relations:—

It forms part of the border of the temporal fossa, sending a process forward along the front of the parietal. The body of the bone forms a small cap on the head of the quadrate; above and within this the bone has a powerful articulation with the end of the paroccipital, and sends a process forward along its front face which in Mosasaurs penetrates between the pro-otic and paroccipital nearly to the labyrinth region. The outer face of the bone is covered by the lateral temporal element.

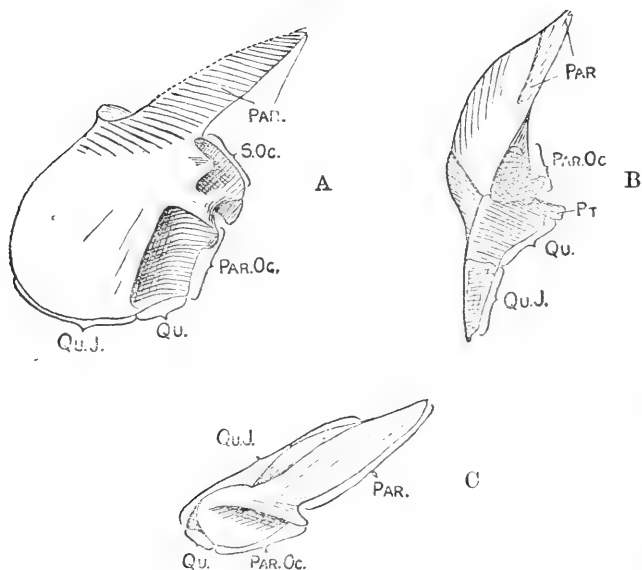
It will be seen that this bone has exactly the same relations to the quadrate, paroccipital, and parietal that the squamosal of *Sphenodon* or a Therapsid has, a fact which establishes a strong presumption that it is really a squamosal. If it is a squamosal, the outer bone must be a quadrato-jugal, for no other bone ever lies outside the squamosal*.

The lateral bone in *Uromastix* (fig. 1 B, QU.J.) has the following relations:—It covers a good deal of the outer

* Except, perhaps, in *Ichthyosaurus*.

surface of the squamosal, overlapping its upper border so as to meet the parietal; its body is in contact with the head of the quadrate, and it sends a long process forward, which lies below and within the jugal. In some lizards the post-orbital passes backward along the upper edge of the jugal to meet this bone.

Fig. 2.



- A. Right squamosal of *Endothiodon* from behind.
 B. Right squamosal of *Sphenodon* from behind.
 C. Right squamosal of *Uromastix* from behind.

PAR., facet for parietal; PAR.Oc., facet for paroccipital; QU., facet for quadrate; QU.J., facet for quadrato-jugal: S.Oc., facet for supra-occipital.

The lateral bone resembles a quadrato-jugal in the following features:—

- 1st. It lies outside the squamosal.
- 2nd. It connects the quadrate with the jugal.
- 3rd. Its mode of articulation with the jugal is identical with that of the undoubted quadrato-jugal of *Sphenodon*.

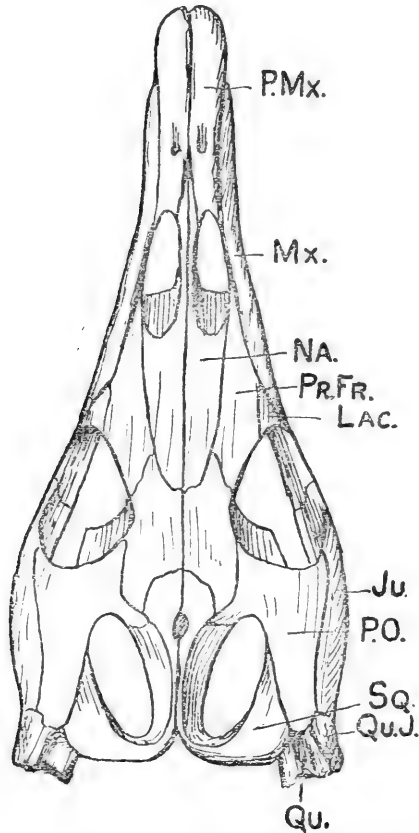
That it is not a squamosal is rendered almost certain by the facts :—1st. That it does not touch the paroccipital as the squamosal does in every known reptile with a skull with a fenestrated temporal region, and in many Cotylosaurs and all Chelonia ; and 2nd. That its method of articulation with the jugal is the exact reverse of that which always occurs between the squamosal and the jugal.

That the upper temporal bone is not a tabular, as Williston and Broom believe, is, I think, shown by the following considerations :—In all reptiles in which a tabular is certainly known (Cotylosaurs and Therapsids) it lies on the extreme back of the skull, in the latter group standing vertically behind the overlapping processes of the squamosal and parietal. No type is known in which it overlaps the front face of the outer wing of the parietal. The close relationship of the inner bone of lizards with the end of the paroccipital, which, in the exaggerated state in which it occurs in Mosasaurs, was the origin of Williston and Broom's view, is of no decisive importance, because of the very close and, in fact, identical form of connection between the squamosal and paroccipital in such diverse types as the Therapsids and *Sphenodon*. The extension of the squamosal down between the pro-otic and paroccipital in Mosasaurs seems to me to be a specialization produced to meet the necessity of strengthening the support of the quadrate in very large and powerful carnivorous animals.

It will be noticed that the view of the homologies of these bones which I have supported above will necessitate the belief that the lizards have always had a single temporal fossa, and that their present curious arrangement results from the gradual reduction of a formerly broad temporal arch, the processes culminating in the upward retreat of the quadrato-jugal, to allow of the freeing of the quadrate. Williston, from his study of the skull of the remarkable Early Permian reptile *Acroscelis*, has expressed his belief in the primitively one-arched nature of the lizards, and this view was also held at one time by Baur. The most important argument against it—the presence in lizards of a ligament connecting the distal end of the quadrate with the jugal, which may be plausibly interpreted as representing a lower arch which has disappeared—may, perhaps, be answered by pointing out that such a connection is almost a mechanical necessity for the support of the quadrate, and is hence quite likely to have been newly formed after the development of the streptostyly.

This view has the great virtue of explaining the structure of the skull and the systematic position of the two reptiles from the Lithographic Stone, *Sauranodon* and *Pleurosaurus*. The structure of the skull of these types has hitherto only

Fig. 3.



Restored dorsal aspect of the skull of *Pleurosaurus goldfussi*, $\times 1$.

Ju., jugal; LAC., lachrymal; Mx., maxilla; NA., nasal; P.Mx., premaxilla; P.O., postorbital; PR.FR., prefrontal; Qu., quadrate; Qu.J., quadrato-jugal; Sq., squamosal.

been known from Lortet's descriptions of the Lyons material; these are difficult to follow, and rather vitiated by a pre-conceived notion that the animals were like *Sphenodon*. A

specimen of *Pleurosaurus goldfussi*, which has been for many years in the British Museum, has recently been more fully developed, and now shows in perfect preservation the whole structure of the upper and lateral surfaces of the skull (Pl. VI.).

The skull is comparatively little crushed for a Solenhofen Slate specimen, and, although the bones are much cracked, the sutures are very easily identified. The specimen is a skeleton lacking the greater part of the tail, and is exposed from the dorsal surface.

The skull is elongated and depressed, the orbits are large, as is usual in lizards, and the single temporal fossa rather small. The length of the head depends on the great pre-orbital extension, which results in the formation of very large bony external nares, looking upwards and outwards, and only separated by narrow processes of the nasals—these lie very far behind the anterior end.

The physiognomy of the preorbital part of the skull is very like *Varanus*, and its structure is as follows:—

The premaxillæ (P.Mx.) are massive bones, meeting in a long suture on the dorsal surface, but posteriorly separated by the nasals. Their anterior ends are depressed, and each seems to carry one blunt tooth (the exposure of the specimen makes this not quite certain). The long outer faces are covered by the maxillæ, and the posterior border forms the front edge of the external nares. Each bone has a curious foramen opening into its dorsal surface.

The maxilla (Mx.) is a very large bone. The lower border is nearly straight, and is shown by other specimens to bear a single row of bluntly pointed acrodont teeth, the last of which is exposed in the British Museum specimen. The anterior part of the maxilla overlaps the outer face of the premaxilla with a thin squamous edge; behind this its upper border is slightly depressed and smoothly rounded, forming the outer border of the nostril. It then again becomes squamous and overlaps the prefrontal and lachrymal until it drops down to form part of the lower margin of the orbit; finally, it is covered above and without by the jugal.

The nasal (Na.) is a large bone which has a long median suture with its fellow; its anterior edge is in contact with the premaxilla, and the part of the bone between the nares is a very narrow rod; posteriorly it expands and forms a considerable area of the top of the head, its lateral border being in contact with the prefrontal and its posterior end with the frontal.

The prefrontal (Pr.Fr.) is a large bone whose anterior border

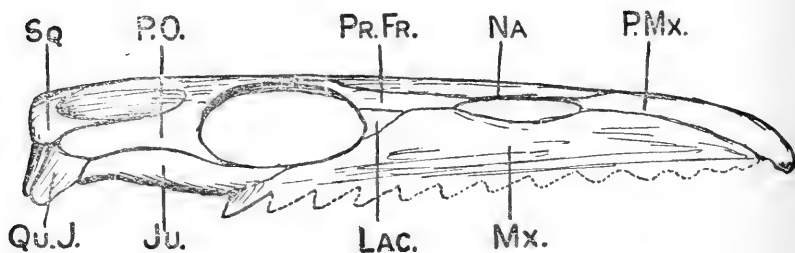
enters into the nostril and posterior edge forms a good deal of the margin of the orbit. Its upper edge is suturally connected with the nasal and frontal, and its lower edge is overlapped by the maxilla and has a suture with the lachrymal. A well-marked foramen enters the bone just above the edge of the maxilla.

The lachrymal (LAC.) is a very small bone forming a part of the orbital boundary, and wedged in between the prefrontal and maxilla.

The frontal is a comparatively small bone which forms part of the orbital border and articulates with the prefrontal, nasal, parietal, and postorbital, as well as with its fellow.

The parietal has a long suture with its fellow, interrupted at one point by the small oval pineal foramen; anteriorly it is in contact with the frontal and postorbital, posteriorly with the squamosal, but I cannot be certain of its exact relationship with the latter bone.

Fig. 4.



Restored lateral aspect of the skull of *Pleurosaurus goldfussi*, $\times 1$.

Reference-letters as in fig. 3.

The postorbital (P.O.) is a large bone which forms a large part of the borders of the orbit and temporal fossa. Its inner end is in contact with the frontal and parietal, and below it has a very long suture with the jugal, extending backwards along its upper edge to overlap the anterior part of the squamosal and the quadrato-jugal.

The jugal (Ju.) is a bone which forms a small part of the lower border of the orbit, and extends backwards below the postorbital to articulate with the quadrato-jugal.

The squamosal (Sq) is an L-shaped bone which forms much of the border of the temporal fossa. Its inner leg is in contact with the parietal, but the details of the attachment are not

clear in the specimen. The middle of the bone articulates with the inner part of the head of the quadrate; its relations (if any) to the paroccipital cannot be made out. The anterior limb of the bone passes forwards below the temporal fossa, to be overlapped by the postorbital.

The quadrato-jugal (Qu.J.) is a small bone covering the whole of the outer edge of the quadrate, but not covering its head at all. Its upper end is covered by the postorbital and part of its front margin by the jugal.

The quadrate (Qu.) is a remarkable bone; it is very short and broad, nearly square when viewed from behind. Its lower edge has the usual grooved articulating surface. The inner edge of the bone has a strong rounded ridge running vertically, outside which there is a deep pocket on the posterior surface. Except for the fact that its outer border is covered by a quadrato-jugal, it very strongly recalls the quadrate of an Agamid.

Of the palate very little can be said; there are obviously large posterior nares and very large suborbital vacuities, and the specimen suggests very strongly that the transverse bones are lost.

Judging from Lortet's figure and some casts, the skull of *Sauranodon* (*Sapheosaurus*) seems to resemble that of *Pleurosaurus* described above in the condition of the temporal region. With the exception of Boulenger, all recent authors seem to have regarded these reptiles as Rhynchocephalia closely allied to *Sphenodon*. Boulenger*, speaking of Lortet's figures of *Pleurosaurus*, says:—"It is, however, quite clear that the cranial characters are not Rhynchocephalian. The temporal arch appears to be essentially of a Lacertilian type and to correspond with what is found in the Agamidæ." This statement seems to me to be still essentially true. The fact, definitely shown in Lortet's figures as well as in the British Museum specimen, that there is only a single temporal vacuity, is conclusive that the form is not a Rhynchocephalian. If the temporal bones of a lizard are interpreted as I have done above, the condition of the arch is really strikingly similar to that in such an Agamid lizard as *Chlamydosaurus*, whose arch can be simply derived from it by the reduction of the anterior limb of the squamosal (that which meets the postorbital) and the retreat upwards of the quadrato-jugal in accordance with the

* Ann. & Mag. Nat. Hist. ser. 6, vol. xi. p. 208 (1893).

freeing of the quadrate. The connection of the quadrato-jugal with the parietal is for me a secondary condition demanded for the efficient support of the quadrate.

In the postcranial skeleton there is nothing to prohibit a genetic connection with the *Lacertia*.

The vertebræ are slightly biconcave and their arches and centra correspond well enough with those of lizards. The single rib-facet is carried on a short process at the suture of the neural arch and centra, some way behind the anterior edge, exactly as in lizards.

The ribs have a single expanded head, exactly as in lizards.

The limb-girdle and limbs, although modified for an aquatic life, are quite *Lacertilian*, as is the tail and so much of the squamation as is known.

In fact, the only character which is not thoroughly *Lacertilian* is the presence of a complete plastron composed of very delicate splints. This feature has in the past had a very exaggerated importance attached to it, and the reduced remnants of a plastron known in a recent lizard (*Tiliqua*) shows that it cannot be held to invalidate the other very striking resemblances.

The oldest definitely known lizard is *Euposaurus thiollieri*, described by Lortet from the Lithographic Stone of Cirin, and first recognized as a lizard by Boulenger.

The small skull of *Paliguana whitei* from the *Procolophon* beds (Middle ? Trias) of Donnybrook, Upper Zwort Kei, South Africa, seems to me to be not quite definitely determinable. The specimen in its present condition agrees exactly with Broom's figures, but seems to me to give no satisfactory evidence that the quadrate was really free and that there was not a lower arcade, the anterior end of which is, in fact, actually shown. When I examined the specimen I was impressed by the resemblance of its quadrate to that of *Howesia*, which is certainly no lizard.

I think, therefore, that it is reasonable to regard *Pleurosaurus* (and *Sauranodon*) as the little modified descendant of the ancestral lizard stock, and that it may be put in a special suborder of the Squamata, for which H. v. Meyer's ordinal name *Acrosauria* may, perhaps, be used, of equal value with the other suborders, *Pythonomorpha*, *Dolichosauria*, *Lacertilia*, and *Ophidia*.

This view does not necessarily conflict with that of Williston, that *Acrosceles* is an ancestral lizard, although it will necessitate slightly altering his views as to the mode of development of the streptostylic quadrate. Prof. Williston

is, however, certainly in error in suggesting that the lizard postfrontal has fused with the postorbital; in many lizards both bones are present, the former being always very small and obviously disappearing, and, so far as I know, always excluded from the border of the temporal fossa—a strange character in which the lizards resemble the Therapsids.

It is very doubtful if the upper temporal bone in Stegocephalia and early reptiles, which is usually called supra-temporal, can retain that name. The original use of the term supratemporal was by Bakker in Cuvier and Valenciennes' *Hist. Nat. des Poissons*, t. i. p. 388 (1828), for a bone and the skull of a modern Teleost. The homologies of this bone, and, in fact, of most others in the Teleostean skull, are very doubtful, and it seems inadvisable at present to apply it to any bone in the Tetrapod skull.

Broom has proposed to use for the bone in Stegocephalia Owen's term supra-squamosal. This term is very suitable in itself, but, unfortunately, was applied by Owen to the squamosal of *Archegosaurus*.

In *Ichthyosaurus* the name "supratemporal" was applied to the inner bone in the temporal region. I am, however, inclined to believe, from its relations as determined by Andrews in *Ophthalmosaurus*, with which *Ichthyosaurus* is shown by many specimens to agree, that this bone is really the squamosal.

This view has the great disadvantage of leaving unexplained the outer temporal element.

EXPLANATION OF PLATE VI.

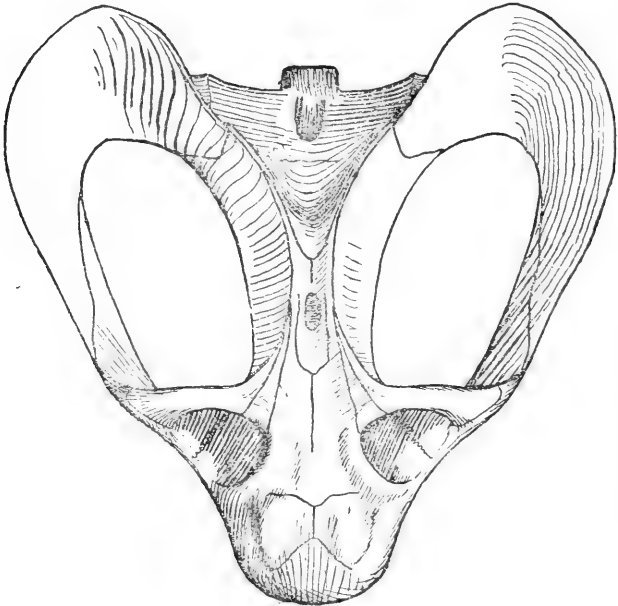
Skull with mandible in articulation and anterior part of the body of the British Museum skeleton of *Pleurosaurus goldfussi*, v. Meyer (37008). × 1.

XIV.—*Dicynodon halli*, *sp. n.*, an *Anomodont Reptile from South Africa*. By D. M. S. WATSON, M.Sc., Lecturer in Vertebrate Palæontology at University College, London.

ON the farm Kuils Poort, F. C. Niewveldt II., Dist. Beaufort West, Cape Province, which has already yielded the types of several new species of fossil reptiles from the *Cistocephalus* zone of Upper Permian age, I was so fortunate as to find most of the skeleton of a medium-sized *Dicynodon* in

most perfect preservation, at a horizon about 300 feet above the homestead.

As is clearly shown by the skull, which is represented in the figure with its slight distortion corrected, it is different from any described species. In many ways it is nearest to *Dicynodon kolbei*, Broom, but differs in the considerably smaller face, which is, indeed, amongst the feeblest known in the genus. One curious feature in which it resembles *D. microtrema*, Seeley, is the small occipital condyle, a plain cylindrical process showing no trace of the tripartite division



Dicynodon halli, Watson, sp. n. $\frac{1}{3}$ nat. size.

which is nearly always present in the genus, and squarely truncated behind.

There is clear evidence of a transpalatine bone, the long dispute about the presence or absence of which is due to the fact that it is present in many, perhaps most, species of *Dicynodon*, but actually absent in others.

There is a small septo-maxilla in this species, placed nearly entirely within the nostril.

The skull is likewise of interest, because it shows quite indubitably the presence of a tabulare as a small bone on the posterior surface overlapping the posterior ends of the parietal and postorbital and the anterior end of the squamosal. Its inner border is in contact with the interparietal, and its outer border does not reach down outside the post-temporal fossa to the paroccipital, but ends far above it.

The lower jaw of this individual served as the foundation of my account of that of the genus [Ann. & Mag. Nat. Hist. ser. 8, vol. x. p. 576, fig. 2 (1912)]. The suture between the dentary and coronoid shown in that figure is clear as a very fine dark line in this specimen and in several others in the British Museum, but I have never been able to see a clear distinction of the bones in section, and the apparent suture is, perhaps, something else; it might, for example, mark the lower edge of the horny beak.

I intend to describe the rest of the skeleton in detail on another occasion, but take this opportunity of pointing out that the interclavicle is wide and not in the least T-shaped, and that, as is clearly shown by many specimens in the British Museum, there is no symphysis between the two pubes and the two ischia in *Dicynodon*.

A large series of specimens collected in association by Mr. T. Bain at Tafel Berg, Nieuveldt, which I found in the British Museum collection, are all obviously *Dicynodon microtrema*, Seeley, and show individuals of both sexes and all ages. The males are provided with large tusks, the females are toothless, and have in consequence rather more delicate faces. Young individuals, about half the size of the adult, have a series of small teeth in the maxilla and dentary inserted in a characteristically Endothiodont way.

For the new species represented by the magnificent skeleton of a female which is shortly described above I propose the name of *Dicynodon halli*, sp. n., after Mr. R. Hall of the British Museum, as a slight token of my indebtedness, and, in fact, that of all palæontologists, to him for the exquisite skill and infinite patience with which he has prepared nearly the whole of the great collection of South African fossil reptiles in the British Museum. Only those who have personal experience of the intractability of the matrix of many South African specimens can fully understand in how large a degree our knowledge of these animals depends on his work.

XV.—*On the Nomenclature of the South-African Pariasaurians.* By D. M. S. WATSON, M.Sc., Lecturer on Vertebrate Palaeontology in University College, London.

THE first Pariasaurian to be described was *Pariasaurus serridens*, Owen, founded on a specimen exposed by Andrew Geddes Bain in 1838 whilst blasting for the Government road north of Fort Beaufort. In his celebrated paper on South-African geology Bain records this specimen in the following words:—"It was near Bluikwater Port that I succeeded in extracting from the scarp of a steep hill of sandstone the lower part of the pelvis, a fragment of the bony cuirass, the head armed with sixty teeth, and other bones of a large reptile"*. In the manuscript "Catalogue of Fossils from South Africa," 1843, which accompanied Bain's collection this specimen is recorded as follows:—

1. Head with 60 teeth, of a large reptile.

1 (A). Supposed scapula.

1 B. Part of vertebræ and ribs.

1 (C). Do.

1 (D). Pelvis.

1 E-Z *aa, bb*, and detached fragments. (See also nos. 53 & 54).

53. } One of these belongs to specimen 1. The other is
54. } part of a fossil found near it.

The only part of this individual figured by Owen in the original description of *Pariasaurus serridens* in the 'Catalogue of Fossil Reptiles of South Africa in the British Museum' (1876) was the skull.

This skull has now disappeared, with the exception of a fragment of the lower jaw about 10 cm. long, which has been cut into three slabs by a lapidary's wheel.

In the manuscript records of the Geological Department of the Museum is a list in the handwriting of Wm. Davies, which probably refers to the arrangement of a case; in this, with mention of other important specimens of South-African reptiles mostly figured by Owen in 1856, is the following entry:—

"Great pelvis 1 D in the first catalogue without locality."

This entry, in my opinion, gives clear evidence that the pelvis of the type-specimen had been developed, and was in existence about 1860.

* Trans. Geol. Soc. ser. ii. vol. vii. p. 56 (1845).

The Bain collections only contained two *Pariasaurian* pelves, both of which are extant—one is unnumbered, the other bears Bain's no. 57.

The unnumbered pelvis, which well deserves the epithet "great," is that which was figured by Owen in *Phil. Trans.* vol. 152. pl. xxiii. figs. 1 & 2, and pl. xxiv. fig. 1, as *Dicynodon*.

This pelvis is, in my opinion, quite certainly a part of the type-specimen of *Pariasaurus serridens*, and gives much information about that much-misunderstood animal.

The whole of the dorsal surface of this pelvis between the crests of the ilia is covered with very large scales which are of the *Propappus* type, but differ in their more definitely pitted ornament and much larger size. In the Bain collection there are three masses of rock identical with the matrix of the pelvis which are full of these scutes; they show some dorsal vertebræ, ribs, and a scapula. I think it nearly certain that they also are part of the type-specimen.

Another *Pariasaurian* of which the type-specimen forms part of the A. G. Bain collection is *Propappus omocratus*, Seeley. This was founded on a femur from East Brak River. This specimen no longer bears Bain's original number, but the corresponding femur, which is in identical mineral condition and is registered under the succeeding number in the Museum Catalogue, bears Bain's number 57.

The reference is as follows in the manuscript catalogue sent by Bain in which this is included:—

57. Slab containing pelvis, femur, humerus, &c., of a large Reptile.

A. Mass of bones with some scales in matrix.

B. Ditto.

C, D, E, F. Fragments with scales in matrix.

G-Q. Fragments of bones.

R. Phalanges.

S. Scale or coprolite.

T. Scales.

East Brak River.

Fort Beaufort.

The following bones now in the British Museum (Natural History) bear Bain's original number 57:—

The sacrum, figured *Trans. Geol. Soc. ser. ii. vol. vii. pl. xxxiii. figs. 4-7*, and *Cat. Foss. Rep. S. Afr. pl. xxxvi. figs. 2-4*.

The os innominatum, figured Trans. Geol. Soc. ser. ii. vol. vii. pl. xxxiv. fig. 1; Phil. Trans. vol. 152. pl. xxiv. fig. 2; and Cat. Foss. Rep. S. Afr. pl. xxxvii. figs. 1 & 2.

The lower end of the humerus, figured Trans. Geol. Soc. tom. cit. pl. xxxiv. fig. 4.

A femur and tibia.

The series of caudal vertebræ figured by Owen in the Cat. Foss. Rep. S. Afr., woodcut p. 74, fits into a block of matrix which itself fits the visceral surface of the pelvis mentioned above.

The other Pariasaurian type-specimen in the Bain collection is *Anthodon serrarius* recorded in the third manuscript catalogue as follows:—

45. Skull of a small species of Bluikwater reptiles. A. Vertebræ and dermal bones of ditto with scales.
Stylkrantz, Sneeuwberg, about 7000 feet above the sea.

Another old Pariasaurian type is recorded in an extract from W. G. Atherstone's note-book as follows:—

“Four miles from ‘Jan Willem Fontein.’ A few miles further we found another fossil, which the Boer's son had discovered the evening before our arrival; so we dug it out, and found amongst other bones a perfect lower jaw and part of the upper with 22 teeth, the upper overlapping the lower.”

This is the type of *P. bombidens*.

The discovery of these type-specimens makes it necessary to give new generic names to the large Pariasaurians of the group.

A brief generic diagnosis of such of the South-African Pariasaurians as are represented in the British Museum is given below:—

PARIASAURUS, Owen, 1876.

Medium-sized Pariasaurians, with an extensive armour of very large pitted scutes with a central knob. Skull with deep cheeks and pointed form. Sacrum of four vertebræ. Centra very much constricted in the middle. Ilium much inclined backwards, with the ventral border spread outwards. Ischia very short.

Type, *P. serridens*, Owen. *Cisticephalus* zone, U. Permian, Bluikwater, Dist. Fort Beaufort, Cape Province.

Type-specimen, cast of skull, part of lower jaw, pelvis,

scapula, dorsal vertebra, and scutes. B.M.N.H. R. 4063, A. G. Bain Collection.

PROPAPPUS, Seeley, 1888.

Medium-sized *Pariasaurians* with an armour of scutes of moderate size, ornamented with shallow pits and grooves, and with a central knob. Skull unknown. Sacrum of four vertebrae, the centra not markedly constricted in the middle. Ilium not very much inclined backward, but with its lower border everted. Ischia short.

Type, *P. omocratus*, Seeley. *Cisticephalus* zone, East Brak River, Dist. Fort Beaufort, Cape Province, S. Africa.

Type-specimen, sacrum, os innominatum, femur, tibia, part of humerus, caudal vertebrae. B.M.N.H. R. 4064, A. G. Bain Collection.

ANTHODON, Owen, 1876.

Small *Pariasaurians*, with very evenly notched teeth forming a large segment of a circle.

Type, *Anthodon serrarius*, Owen. *Cisticephalus* zone, Stylkrantz District, Graaf Runet, Cape Province, S. Africa.

Type-specimen, imperfect skull, anterior vertebrae. B.M.N.H. 47337, A. G. Bain Coll.

BRADYSAURUS, gen. nov.

Large *Pariasaurians* with a very feeble armour of smooth scutes in the dorsal region. Skull depressed and rounded. Sacrum of four vertebrae. Ilium inclined backwards, the ventral border only slightly everted. Ischia long. Lower surface of pelvis flat and very broad. A large olecranon process to the ulna.

Type, *Bradysaurus baini* (Seeley). *Tapinocephalus* zone*, De Bad, Tamboer Fontein, Dist. Beaufort West, Cape Province.

Type-specimen, whole skeleton, B.M.N.H. R. 1971, Seeley Collection.

EMBRITHOSAURUS, gen. nov.

Large *Pariasaurians* with a feeble armour of smooth scutes. Skull deep and pointed. Sacrum of four vertebrae. Ilii inclined backwards, the ventral border only slightly everted. Ischia long. Lower surface of pelvis rounded and relatively narrow. No olecranon process to the ulna.

* The fact that *Pariasaurus* is a *Cisticephalus*-zone form makes it necessary to give a new name to the lowest zone of the Beaufort beds. I therefore call it the *Tapinocephalus* zone.

Type, *Embrithosaurus schwartzi* (Broom). *Tapinocephalus* zone, Van de Byls Kraal, Dist. Fraserburg, Cape Province, S. Africa.

Type-specimen, whole skeleton in the South-African Museum, Cape Town, described by Broom, Ann. S. Afr. Mus. vol. iv. p. 123, as *P. serridens* in error.

XVI.—On a new Species of the Genus *Pipa* from Northern Brazil. By LORENZ MÜLLER, Curator, Division of Herpetology, Munich Museum.

AMONG a number of Reptiles and Amphibians recently submitted to my inspection by Dr. Emilia Snethlage, the distinguished zoologist of the Pará Museum, there are several examples of a "Surinam toad," which evidently belong to a well-characterised new species of that peculiar Neotropical genus. I have before me one male and two females, the latter with empty egg-capsules on the back, consequently fully adult. I propose to name this interesting form in honour of Dr. E. Snethlage.

Pipa snethlageæ, sp. n.

Type in the Zoological Museum, Munich, No. 1/1914; ♀, Utinga, near Pará (Belém), State of Pará, N.E. Brazil. Collected by Miss E. Snethlage.

Type-locality. Utinga, near Pará, N.E. Brazil.

Differs from *Pipa pipa* (Linn.), hitherto the only known representative of the genus, by its smaller, less decidedly triangular head; more rounded snout, hardly projecting beyond the mandibular symphysis; stouter, less depressed, on its posterior portion much enlarged, rump; shorter as well as weaker limbs with the upper arm and the upper thigh mostly concealed in the skin; by the rudimentary development of the tentacles on the snout and of the dermal flap at the angle of the mouth. Moreover, the four rows of small glands on the back, so conspicuous a feature in *Pipa pipa*, are entirely lacking, while the general structure of the skin is altogether different, and the inner metatarsal tubercle is much less pronounced in the new species. Besides, *Pipa snethlageæ* is very much smaller, the adults being hardly half as big as specimens of *P. pipa* in corresponding age.

♀. (Type.) From snout to vent, 75 mm.

♂. From snout to vent, 73 mm.

A more detailed account of this interesting water-toad will be given in another paper.

XVII.—*Descriptions of new Genera and Species of Drepanidæ and Thyrididæ.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

THE numbers attached to the species of THYRIDIDÆ refer to their position in my classification of the Family, P. Z. S. 1897, pp. 603-633.

Family Drepanidæ.

Oreta gonioptera, sp. n.

Antennæ of female with uniseriate branches; hind tibiæ with one pair of spurs, the tarsi fringed with hair above; fore wing with apex produced and falcate, the termen strongly angled at vein 3 and excised above and below that point.

♀. Head scarlet, the vertex and antennæ brown; thorax silvery grey-brown; abdomen with the basal half dark brown, the terminal half red-brown; pectus, legs, and ventral surface of abdomen scarlet, the hind tibiæ with black streaks. Fore wing silvery grey tinged with brown and striated with dark brown; an oblique dark medial shade with a grey discoidal point on its outer edge; a dark sub-terminal line excurved below costa and at middle, with a pale rufous band on its outer side defined by a waved whitish line; cilia black-brown. Hind wing red-brown suffused with silvery grey, the terminal half and inner area irrorated with black points. Underside of fore wing grey mixed with red and irrorated and striated with black; hind wing yellowish suffused with red and strongly irrorated with black.

Hab. S. NIGERIA, Ilesha (*Humfrey*), 1 ♀ type. *Exp.* 40 mm.

Oreta sulphurea, sp. n.

Antennæ of male bipectinate with long branches; hind tibiæ with one pair of spurs.

♂. Head yellow with a brown bar above frons; thorax and abdomen pale yellow, the legs fringed with reddish hair. Fore wing pale yellow striated with red-brown; an oblique red-brown line from apex to middle of inner margin with an elliptical black spot beyond it just before termen below apex; the costal edge towards apex and cilia on apical half rufous. Hind wing pale yellow sparsely striated with dark brown except on basal and costal areas; a double brown antemedial line on inner area.

Hab. GOLD COAST (*Dudgeon*), 1 ♂ type. *Exp.* 28 mm.

Oreta glaucinoe, sp. n.

♀. Head bright rufous; thorax and abdomen yellowish white; pectus in front, fore legs, and the tarsi rufous with a crimson tinge. Fore wing pale yellow suffused with purplish grey, thickly irrorated with silvery scales and with numerous faint dark striæ; a small black discoidal spot; a slight oblique brownish line defined on outer side by pale yellow from below apex to middle of inner margin; cilia blackish at tips especially towards apex. Hind wing pale yellow suffused with purplish grey, thickly irrorated with silvery scales and with numerous faint dark striæ; an oblique brownish antemedial line; cilia with some blackish scales at tips. Underside thickly irrorated and striated with fuscous and tinged with rufous, the inner area of hind wing pale, an oblique dark line from apex of fore wing to inner margin of hind wing before middle.

Hab. GOLD COAST, Bibianaha (*Spurrell*), 1 ♀ type. *Exp.* 36 mm.

Oreta thermidora, sp. n.

♀. Head, thorax, and abdomen bright chestnut-red; pectus, legs, and ventral surface of abdomen with a slight crimson tinge, the hind tibiæ with black streaks. Fore wing bright chestnut-red with numerous faint dark striæ; an indistinct diffused and slightly incurved blackish sub-terminal line from below apex to inner margin near tornus; cilia blackish towards apex and above tornus. Hind wing bright chestnut-red with some five ill-defined series of small blackish spots except on basal area. Underside with a slight crimson tinge; both wings with numerous series of small blackish spots and striæ except on basal area.

Hab. JAPAN, Fushiki (*Leech*), 1 ♀ type. *Exp.* 30 mm.

Genus METADREPANA, nov.

Type, *M. glauca*.

Proboscis absent; palpi short, porrect; antennæ in both sexes bipectinate with long branches; tibiæ fringed with long hair, the hind tibiæ with terminal spurs only, the mid and hind tarsi fringed above with hair. Fore wing with the costa highly arched, the apex produced and falcate, the termen in male strongly excurved at middle and excised above and below middle, in female typically slightly excurved at middle; vein 3 from well before angle of cell; 5 from just above angle; 6 from upper angle;

7, 8, 9 stalked; 10, 11 stalked. Hind wing of male with the termen oblique to vein 4, where it is strongly produced and falcate, then excised, in female typically much less produced at vein 4; veins 3 and 5 from close to angle of cell, the lower part of which is produced; 6 from upper angle; 7 from middle of cell, anastomosing with 8; frenulum absent.

Metadrepana glauca, sp. n.

♂. Head, thorax, and abdomen brown mixed with whitish, the antennæ towards base, vertex of head, and tegulæ whiter, the prothorax tinged with rufous. Fore wing silvery grey tinged with brown and thickly irrorated and striated with blackish; medial and postmedial blackish spots on costa; a small red-brown subterminal spot between veins 4 and 3; cilia black at the excisions above and below middle. Hind wing grey suffused with brown and thickly irrorated and striated with fuscous; a slight oblique dark line defined on outer side by whitish from costa near apex to inner margin beyond middle; small black subterminal spots above and below vein 4. Underside white tinged with brown and slightly irrorated and striated with black; fore wing with indistinct oblique subterminal dark line.

♀. Fore wing with indistinct incurved dark subterminal line; underside of hind wing with indistinct curved dark postmedial line from costa to vein 2.

Hab. S. NIGERIA, Lagos (*Strachan*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 44, ♀ 46 mm.

Metadrepana heterogyna, sp. n.

Fore wing of male with the termen excised below apex and produced to a point between veins 4 and 3; hind wing with the termen crenulate, oblique to between veins 4 and 3 where it is strongly produced, then excised; fore wing of female with the termen excised below apex, then evenly curved; hind wing with the termen evenly curved and not crenulate.

♂. Head white tinged with rufous; frons and palpi except at tips deep red-brown; tegulæ white with a brownish line near tips; thorax grey mixed with brown; abdomen grey, tinged with rufous towards extremity; pectus, legs, and ventral surface of abdomen white tinged with rufous. Fore wing silvery purplish grey, irrorated and striated with black-brown, faintly except towards base; traces of an obliquely curved black-brown antemedial line and of

an oblique sinuous medial line with prominent black-brown striation beyond it in and below the cell; an indistinct black-brown postmedial line, oblique to vein 4, then inwardly oblique and waved, a red-brown patch beyond it between veins 7 and 6; the costal edge dark brown towards apex; a narrow dark brown band just before termen from below apex to vein 4, then a rather lunulate line with some dark brown beyond it on termen; cilia dark brown. Hind wing silvery purplish grey thickly striated with dark brown except towards base; an oblique ochreous-white line from below apex to inner margin beyond middle; the striations forming obscure subterminal patches between veins 5 and 3; cilia brown. Underside of fore wing ochreous suffused with brown beyond the cell, the inner area white, an oblique blackish subterminal line; hind wing ochreous yellow, the terminal area suffused with brown except towards tornus, a blackish discoidal point and postmedial line excurved from vein 6 to 2 where it terminates.

♀. Tegulae with red-brown mixed except towards base; fore wing much more suffused with pale red-brown, red-brown suffusion beyond the medial line in and below the cell and beyond the postmedial line, a slight oblique pale subterminal line from below apex to inner margin, the area beyond it greyer, the markings before termen forming a line of black-brown striations; hind wing suffused with pale red-brown except towards costa, the termen not striated with black-brown; underside bright yellow, the fore wing slightly striated with brown and the terminal area tinged with rufous except towards tornus.

Hab. UGANDA, Victoria Nyanza, Sesse Is., Bugulla I. (*G. D. H. Carpenter*), 1 ♂, 1 ♀ type, cotypes in Mus. Oxon. *Exp.*, ♂ 40, ♀ 44 mm.

Drepana thermopasta, sp. n.

♂. Head, thorax, and abdomen orange suffused with rufous. Fore wing orange thickly irrorated with rufous; a rufous discoidal point; traces of a sinuous rufous antemedial line and of two similar postmedial lines; a patch of rufous suffusion on terminal area below apex. Hind wing orange, the basal and inner areas irrorated with rufous; traces of an obliquely curved antemedial line and of postmedial and subterminal lines on inner area only. Underside orange with some rufous on terminal area of fore wing below apex.

Hab. W. CHINA, 1 ♂ type. *Exp.* 28 mm.

Drepana cretacea, sp. n.

♀. Head, thorax, and abdomen white, the head tinged with rufous. Fore wing chalky white, thinly scaled; a slight brownish spot at lower angle of cell; a very faint oblique fulvous postmedial line from vein 5 to inner margin, and points before termen on veins 7 to 5. Hind wing chalky white with faint traces of a curved postmedial line.

Hab. W. CHINA, Huang-Mu-Chang (*Pratt*), 1 ♀ type. *Exp.* 52 mm.

Genus HYALOSTOLA, nov.

Type, *H. phænicochyta*.

Proboscis fully developed; palpi porrect, short; antennæ of male bipectinate with moderate branches. Fore wing with the apex rounded, the termen evenly curved; vein 3 from well before angle of cell; 5 from well above angle; 6 from upper angle; 7, 8, 9 stalked; 10, 11 stalked, 11 anastomosing with 12. Hind wing with the termen evenly curved, the inner margin long; vein 3 from well before angle of cell; 5 from well above angle; the upper part of cell shorter; 6 from angle; 7 from middle of cell, anastomosing with 8; frenulum absent.

Hyalostola phænicochyta, sp. n.

♂. Head, thorax, and abdomen white. Fore wing semihyaline white irrorated with rufous scales and tinged with purplish crimson to beyond middle; traces of a rufous postmedial line, oblique to vein 4, then incurved; some rufous marks before termen. Hind wing semihyaline white tinged with purplish crimson, and irrorated with some rufous scales; some diffused rufous marks on termen.

Hab. BORNEO, Sarawak (*Wallace*), 1 ♂ type. *Exp.* 26 mm.

Deroica coreana, sp. n.

♀. Head, thorax, and abdomen white; antennæ with the shaft ringed with black, the branches black; tarsi fuscous ringed with white. Fore wing semihyaline white; the costa blackish towards base; short antemedial blackish streaks on the costa and veins; an oblique blackish striga on upper discocellular and blackish mark above it on costa; a curved diffused pale fuscous postmedial line with minute black streaks at the veins, a series of small fuscous spots beyond it

also with minute black streaks at the veins; a series of pale fuscous spots in the interspaces of terminal area. Hind wing semihyaline white; indistinct diffused curved pale fuscous postmedial and subterminal lines and a series of spots in the interspaces of terminal area.

Hab. COREA, Quelpart I. (*S. Ichikawa*), 1 ♀ type. *Exp.* 28 mm.

Family Thyrididæ.

(3) *Plagiosella pyromera*, sp. n.

♀. Head and thorax fiery red; antennæ brownish; abdomen brown with some fiery red at base of dorsum, the ventral surface yellow tinged with red. Fore wing fiery red mottled with yellow to near middle; a blackish subbasal line from costa to vein 1, with two blackish points beyond it on costa; medial line blackish, defining the red area, slightly curved and expanding into a small spot at costa; the terminal half red-brown, tinged with grey beyond the medial line and with small fiery-red spot on costa; a fiery-red patch mottled with small yellow spots from costa to vein 5, extending on costa to apex and below vein 8 not reaching the termen, crossed by a maculate blackish subterminal line; a fine black terminal line; cilia tinged with grey. Hind wing with the basal area fiery red mottled with yellow and defined by a curved black line; the rest of wing red-brown tinged with fiery red and yellow towards termen and thickly striated with brown, the inner margin pale yellow; a fine black terminal line; cilia tinged with grey. Underside reddish orange; fore wing with some small black spots on costa and with dark striæ except on basal area and apical part of costal area.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♀ type. *Exp.* 32 mm.

(5) *Plagiosella rufivestis*, sp. n.

Head, thorax, and abdomen pale rufous, the vertex of head yellow, the tegulæ rather darker rufous; pectus and ventral surface of abdomen yellowish. Fore wing pale rufous rather sparsely striated with red-brown, the costal edge red-brown; a subterminal series of red-brown striæ slightly bent inwards at vein 6; a terminal series of black points. Hind wing pale rufous with numerous red-brown striæ forming ill-defined lines; a terminal series of black

points. Underside with the striæ forming better-defined series on both wings.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♂ type, Kapaur (*Doherty*), 1 ♀. *Exp.*, ♂ 22, ♀ 24 mm.

(1 a) *Striglina pyrostola*, sp. n.

Fore wing with the termen excised below apex and ex-curved at middle; hind wing with the termen slightly angled at vein 4.

♀. Head, thorax, and abdomen brilliant fiery red; palpi, frons, antennæ, and fore legs red-brown. Fore wing yellow, thickly striated and suffused with brilliant fiery red; a small elongate blackish spot beyond the discocellulars, with an indistinct oblique red line from it to inner margin; some dark striæ in terminal part of submedian interspace; cilia fuscous brown. Hind wing brilliant fiery red mottled with some yellow and with a few dark striæ; the base and inner margin pale yellow; an oblique blackish medial line with a yellow spot beyond it in discal fold; cilia fuscous brown. Underside yellow with numerous fiery-red and some blackish striæ; fore wing with blackish spots beyond the discocellulars and at middle of submedian fold.

Hab. BR. GUIANA (*Kaye*), 1 ♀ type. *Exp.* 46 mm.

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

♂. Head, thorax, and abdomen rufous; fore tibiæ black; the mid and hind tibiæ with small black spots just before extremities; ventral surface of abdomen reddish ochreous. Fore wing rufous, the costal and terminal areas irrorated with small blackish spots; some five or six ill-defined sinuous red-brown lines and an oblique red-brown line from apex to inner margin beyond middle; a small black discoidal spot and a terminal series of black points. Hind wing rufous with numerous red-brown striæ forming ill-defined lines and numerous minute blackish spots; a small black discoidal spot; a terminal series of black points. Underside paler with the spots and striæ more distinct.

Hab. FRIENDLY IS., Vavau Group (*Eclipse Exp.*), 2 ♂ type. *Exp.* 26 mm.

(7) *Striglina castaneata*, sp. n.

Head, thorax, and abdomen bright red-brown; fore legs dark brown, the tarsi blackish ringed with white; pectus behind and ventral surface of abdomen reddish ochreous.

Wings bright red-brown, thickly and evenly striated with blackish. Underside paler red-brown with the black striæ much more prominent.

Hab. SINGAPORE (*Ridley*), 5 ♂, 1 ♀ type; BORNEO, Pulo Laut (*Doherty*), 1 ♀. *Exp.* 26 mm.

(8) *Striglina flavidiscalis*, sp. n.

♀. Head fuscous brown; tegulæ fuscous brown at base, ochreous at tips; thorax red-brown; abdomen rufous, the 3rd and 4th segments and a patch at extremity red-brown; legs chocolate-brown, the tarsi with whitish rings; pectus and ventral surface of abdomen yellowish white. Fore wing rufous with numerous blackish striæ forming ill-defined reticulate lines with yellowish spots between them on medial area; a prominent yellow spot beyond the cell and sub-terminal spots below costa and vein 7; cilia black-brown. Hind wing rufous with numerous blackish striæ forming ill-defined lines; cilia whitish with a black-brown line through them. Underside paler rufous with the black striæ more prominent, sparser towards costa of fore wing.

Hab. SINGAPORE (*Ridley*), 2 ♀ type. *Exp.* 26 mm.

(9) *Striglina strigigrapha*, sp. n.

♂. Head and tegulæ red-brown, the thorax and abdomen paler rufous; fore legs chocolate-brown, the tarsi streaked chocolate-brown and whitish, the fringe of hair on inner side of hind tibiæ chocolate-brown. Fore wing rufous thickly striated with blackish, the striæ tending to form pairs with greyish between them on terminal area, the costal edge whitish; a more prominent blackish spot beyond the discocellulars; cilia fuscous brown. Hind wing rufous with numerous black striæ tending to form series of pairs; a greyish-brown bar from costa to lower angle of cell and a postmedial mark on costa; cilia fuscous brown. Underside with more prominent black striæ and more prominently filled in with grey-brown on hind wing and inner area of fore wing; a minute black mark formed of spots on terminal area of fore wing below apex.

Hab. BORNEO, Sarawak, Sadong (*Hewett*), 1 ♂ type, Paku (*Shelford*), 1 ♂. *Exp.* 30 mm.

FOR HYPOLAMPRUS insert

Betousa, Wilk. xxxiii. 1111 (1865) Type
dilecta,
which has priority.

(13 f) *Betousa chrysotherma*, sp. n.

♀. Head and thorax bright rufous; frons golden yellow; abdomen golden yellow suffused with rufous. Fore wing golden yellow with numerous reticulate rufous lines; some rufous suffusion below the costa to beyond middle and at middle of inner area; a sinuous rufous band just beyond the cell from costa to vein 1, giving off an excurved line from its outer side at vein 5 to just above termen; a slightly incurved rufous line across apical area, then sinuous just before termen and met by streaks from the excurved line above and below vein 3. Hind wing golden yellow with numerous reticulate rufous lines; three more prominent lines on basal area and a deep rufous band just beyond the cell narrowing to inner margin; the terminal area with some prominent reticulate lines. Underside of both wings with some black-brown on the bands beyond the cell which do not reach the costa or inner margin of either wing.

Hab. GOLD COAST, Ashanti (*Bergman*), 1 ♀ type. *Exp.* 36 mm.

(2 g) *Rhodoneura cyclothyris*, sp. n.

Tibiæ of male tufted with long hair, the hind tarsi with the 1st joint fringed with long hair above.

♂. Head black-brown with some fiery red on vertex; tegulæ ochreous, black-brown at base; thorax and abdomen fiery scarlet; pectus, legs, and ventral surface of abdomen pale yellow, the pectus in front, fore legs, and the tarsi black-brown, the last ringed with whitish. Fore wing fiery scarlet with numerous black striæ, the costal area tinged with fuscous; a round hyaline spot defined by black below end of cell; cilia fuscous brown. Hind wing fiery scarlet with numerous blackish striæ; cilia black at base, brownish white at tips; the hair on inner margin fuscous. Underside pale red with the black striæ much more prominent; fore wing with the lower extremity of cell, the area just below end of cell, and the area beyond the cell to near termen pale yellow, some black suffusion beyond the hyaline spot and a spot before termen on vein 6; hind wing with the base and inner margin whitish.

Hab. SINGAPORE (*Ridley*), 2 ♂ type. *Exp.* 24 mm.

(16 a) *Rhodoneura thermographa*, sp. n.

♀. Head, thorax, and abdomen yellowish white tinged with rufous, the patagia near base and 1st two segments of

abdomen with chocolate-brown patches. Fore wing glossy yellowish white tinged with rufous and with numerous reticulate lines formed by rufous striæ; a chocolate-brown streak below costa; a slightly curved chocolate-brown ante-medial line with striga beyond it in the cell; medial X-shaped chocolate marks in the cell and submedian interspace and above inner margin, and similar marks beyond the cell and above and below vein 2, the mark beyond the cell giving off an oblique streak from which a postmedial series of striæ run to the inner margin, and from its extremity an oblique line to quadrate patches above and below vein 2 near tornus; an oblique line across apical area; cilia chequered yellowish and chocolate. Hind wing glossy yellowish white tinged with rufous and with numerous reticulate rufous lines; an oblique subbasal chocolate-brown line; a medial line slightly angled outwards at middle and giving rise to large chocolate-brown reticulations on the terminal half of wing; an oblique chocolate line across apical area, then curved and running just before termen to vein 3; cilia chocolate-brown. Underside similar.

Hab. S. NIGERIA, Ilesha (*Humfrey*), 1 ♀ type. *Exp.* 50 mm.

(16 d) *Rhodoneura ophiographa*, sp. n.

♂. Head, thorax, and abdomen purplish red-brown mixed with whitish, the abdomen with slight whitish dorsal segmental lines. Fore wing purplish red-brown mixed with whitish and slightly irrorated and striated with darker brown; an oblique pale band defined at sides by whitish and black lines from costa to median nervure with a small round whitish spot below it below the cell; a similar medial band with sinuous edges from costa to inner margin, expanding at costa and enclosing a small triangular red-brown mark on the costa; a similar postmedial band, forking at costa, excurved to discal fold, then oblique and expanding on inner side below vein 2; a blackish mark at lower angle of cell; a slight blackish subterminal line, oblique across apical area, then waved, and at veins 4, 3 forming small oblique elliptical spots with pale centres. Hind wing purplish red-brown mixed with whitish and irrorated and striated with darker brown; subbasal and medial bands formed by whitish spots striated with red-brown and defined by dark brown, the medial band with a small white spot beyond it beyond the cell; a similar postmedial band formed of irregular spots; a slight blackish line across apical area. Underside similar, but the bands whiter and more distinct,

the apex of both wings whitish; hind wing with series of small spots defined by white and blackish on costal area, some deep chocolate-brown in and beyond upper angle of cell, and an irregular band beyond the postmedial band giving off oblique teeth to termen.

Hab. S.E. PERU, Chaquimayo (*Watkins*), 2 ♂ type.
Exp. 38 mm.

(23 a) *Rhodoneura gilva*, sp. n.

♂. Head, thorax, and abdomen creamy white faintly tinged with rufous. Fore wing creamy white faintly tinged with rufous, the basal area and costal area to beyond middle rather more strongly tinged; some dark brown points on costa and antemedial and medial series of brown striæ; a small quadrate hyaline spot defined at sides by brown below end of cell; a double postmedial series of brown striæ filled in with red-brown suffusion between veins 3 and 1; a series of dark brown striæ from costa well before apex to termen at vein 1; cilia red-brown. Hind wing creamy white faintly tinged with rufous and with a few red-brown striæ; a curved brown medial line; cilia red-brown. Underside of fore wing with some rufous suffusion beyond the hyaline spot.

Hab. STA. LUCIA (*H. H. Smith*), 1 ♂ type. *Exp.* 16 mm.

(33 a) *Rhodoneura mesosticta*, sp. n.

♀. Head, thorax, and abdomen whitish tinged with pale yellowish brown, the tegulæ browner; antennæ brown. Fore wing whitish thickly striated with pale yellowish brown; a more distinct medial line, slightly incurved in the cell, then slight sinuous, a brownish patch between it and the postmedial line above vein 1, a brownish patch at costa; a slight black mark at upper angle of cell and small spot at lower angle; postmedial line brown with a small patch at costa, incurved to vein 5 where it is slightly angled outwards, then more strongly incurved to below vein 3 and again to near the medial line at submedian fold, with oblique line from its outer side below veins 5 and 3 meeting at submedian fold near the subterminal line, which has a small patch at costa, then curved and slightly sinuous; two dark marks on costa towards apex; the terminal area with oblique reticulate lines, connected with the subterminal line on inner half; cilia yellowish, intersected with brown at the veins. Hind wing whitish thickly reticulated with yellowish-brown lines; three more distinct lines on medial

area from vein 2 to inner margin and a slightly waved subterminal line, connected with the termen by oblique lines on inner half; a black point at lower angle of cell. Underside of fore wing with a short fascia of black and silvery-white scales in middle of cell, a streak of elongate black scales in upper angle of cell, and blackish mark beyond upper angle.

Hab. PERU, Yahuar Mayo, 1 ♀ type. *Exp.* 48 mm.

(40 a) *Rhodoneura cymographa*, sp. n.

♀. Head, thorax, and abdomen whitish tinged with pale red-brown, the vertex of head whiter. Fore wing glossy whitish suffused with pale red-brown; a pale red-brown sinuous antemedial line excurved in the cell; a narrow pale red-brown sinuous medial band defined by darker lines, and a similar band at end of cell; the terminal area with slight dark striæ; some small black subterminal spots between veins 8 and 4. Hind wing whitish suffused with pale red-brown and with numerous faint brown striæ and black points. Underside similar, but the fore wing with some black points and striæ.

Hab. DUTCH N. GUINEA, Mimika R. (*Wollaston*), 1 ♀ type. *Exp.* 34 mm.

(45 a) *Rhodoneura perigrapha*, sp. n.

Head and tegulæ rufous; thorax and abdomen creamy white tinged with ochreous brown, the latter with fuscous dorsal streak; fore legs brownish in front. Fore wing creamy white tinged with ochreous and thickly reticulated with fine brown lines, the costa suffused with brown towards base; a double sinuous medial line rather more prominent, and a V-shaped mark at upper angle of cell with double line from it to inner margin; an oblique line from costa beyond middle, forking at tornus, and an oblique line across apical area. Hind wing creamy white tinged with ochreous and thickly reticulated with fine brown lines and some darker lines: an incomplete discoidal annulus and an oblique line across apical area. Underside similar, but the fore wing slightly tinged with rufous.

Hab. GOLD COAST, Kumasi (*Whiteside, Sanders*), 4 ♂, 1 ♀ type. *Exp.* 22 mm.

(83 a) *Rhodoneura fulvipicta*, sp. n.

♂. Head, thorax, and abdomen white tinged with brown. Fore wing white with numerous pale brown points, the points

on costa black; the inner and terminal areas tinged with pale brown; a medial elliptical pale fulvous spot defined by brown in and below the cell, and a similar rounded spot below end of cell; a fulvous tinge below costa towards apex with an oblique white mark from beyond it to termen at vein 6. Hind wing white with numerous pale brown points, the terminal area tinged with pale brown except towards tornus; a faint brown medial band, excurved round end of cell and becoming blackish at inner margin. Underside of fore wing with antemedial and medial fulvous patches edged with brown below the cell, and an elliptical black-brown patch below end of cell, some fine black and white streaks in middle of cell and beyond upper angle, a fulvous fascia below costa from above end of cell to termen, where it is curved downwards, the costa with fine black streaks and striæ.

Hab. W. AFRICA (*Dudgeon*), 1 ♂ type. *Exp.* 22 mm.

(98 a) *Rhodoneura ferreiceps*, sp. n.

♀. Head and front part of thorax dark iron-brown with some silvery scales between antennæ and on prothorax, the hinder part of thorax silvery white; fore legs, the greater part of mid tibiæ, and the base of hind tibiæ iron-brown, the tarsi iron-brown ringed with white; abdomen white dorsally suffused with rufous except basal segment. Fore wing silvery white mostly suffused with rufous, the medial area with some waved brown lines, the terminal area with some black striæ; the costal area dark iron-brown towards base, then mostly white; cilia glossy brown. Hind wing silvery white with reticulate brown lines and the veins streaked with brown; an irregular fulvous subbasal band; a brown medial band with some white spots on it, excurved round end of cell; the terminal area suffused with rufous except at apex. Underside of fore wing with the cell except lower extremity, the area below it to middle of wing and the area beyond its upper angle fiery rufous with fine black streaks and pencilling and some silvery blue scales, a wedge-shaped fiery-rufous patch edged with black-brown below end of cell, and a quadrate black-brown spot above tornus, a rufous fascia below costa from above end of cell to termen, the costa with brown bars and black striæ, hind wing with the costa suffused with rufous and with black striæ, a subterminal rufous mark edged with black below vein 2.

Hab. BR. GUIANA, Potaro R. (*Kaye*), 1 ♀ type. *Exp.* 40 mm.

(98 d) *Rhodoneura phænicophora*, sp. n.

Head and front part of thorax bright rufous sometimes with some pale crimson and leaden grey mixed, the rest of thorax silvery white; pectus and legs rufous with some white, the tarsi with fine black and white streaks; abdomen silvery white. Fore wing silvery white with some fine rufous reticulate lines and black striæ; the costal area rufous with crimson patches with black streaks on them except towards apex; an annulus filled in with pale rufous in middle of cell, and a discoidal annulus with line from it to inner margin towards which it forks; the terminal area with striated black lines and crimson patches; the termen crimson and rufous. Hind wing silvery white with pale rufous striated lines, the terminal area with striated black lines and some crimson; a rufous and crimson terminal line. Underside similar.

Hab. N. NIGERIA, Minna (*Macfie*), 1 ♂ type, Zungeru (*Macfie*), 4 ♀. *Exp.* 26 mm.

(103 a) *Rhodoneura pachystrigata*, sp. n.

♀. Head and front part of thorax greyish fuscous, the hinder part of thorax silvery white; fore tibiæ and the tarsi banded black and white; abdomen silvery white. Fore wing silvery white with numerous fuscous-black striæ forming reticulate lines, the terminal area with black striæ; the costa with very numerous black points; the termen with series of black points. Hind wing silvery white with nacreous-white spots on terminal area in one light, in another light nacreous white with silvery-white spots; some slight fuscous striæ, the terminal area with some black striæ and a terminal series of small black spots except towards tornus. Underside of fore wing with black striæ, the costal area yellow; hind wing with black striæ on costa and in discal fold except towards base.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♀ type. *Exp.* 26 mm.

(2) *Orneostoma albitessellata*, sp. n.

♀. Head, thorax, and abdomen grey-white mixed with red-brown; tarsi black-brown ringed with white. Fore wing grey striated with dark brown; a whitish and rufous streak striated with dark brown below base of cell; a similar streak in upper extremity of cell; an oblique wedge-shaped white patch striated with red-brown from base of

vein 2 to inner margin, a small spot at middle of inner margin and postmedial patch from vein 4 to inner margin with small spot beyond its upper extremity; a white streak striated with red-brown at middle of costa, small postmedial spot on costa, and oblique rather maculate band from costa before apex to termen at vein 4, with a small spot beyond it below apex. Hind wing grey striated with brown; a white antemedial patch in and below the cell with some blackish striae on it, a small black mark with reddish-yellow centre below middle of cell, and a small black spot with reddish-yellow point on its lower extremity at lower angle; a whitish postmedial patch striated with red-brown on costa and an elliptical patch between veins 4 and 1; the costal area towards apex striated with red-brown; cilia dark red-brown with some white at tips. Underside of both wings with the grey areas suffused with red-brown.

Hab. PERU, Yahuar Mayo, 1 ♀ type. *Exp.* 32 mm.

XVIII.—Notes on British Forms of Apodemus.

By MARTIN A. C. HINTON.

THIS paper contains an account of the results of a study of the long tailed field-mice collected in the Hebrides for Mr. Ogilvie-Grant by Mr. W. R. Sheppard in 1912, and by Mr. D. Anderson, Mr. P. D. Montague, and Mr. C. H. B. Grant in 1913. Several of the Hebridean forms have to be recognized as new subspecies of *A. sylvaticus* and *A. hebridensis*. In addition, a new subspecies of *A. fridariensis*, based upon material collected by Mr. Ogilvie-Grant in the Shetlands, is described.

In his great paper on *Mus sylvaticus* the late Major Barrett-Hamilton remarks* that the possible range of the variations of this animal, "whether individual or geographical, would seem to be narrow. Within this narrow range, however, variation is very evident and perplexing. The animal, indeed, while apparently having small power of varying, uses to the utmost the power which it possesses." In working out the first collection from the Hebrides he and I were struck with the differences which exist between some of the insular races then examined, but lacking specimens from certain islands, since visited, and without a far more detailed investigation of the cranial characters than was then

* P. Z. S. 1900, p. 393.

possible, we were unable to do more in our first paper than refer all the material to *A. sylvaticus* and notice the tendency of certain of the island forms to approach *A. hebridensis* of the Outer Hebrides.

The skull-material obtained by the collectors named above and a carefully chosen series from other British localities have now been investigated. A long series of measurements were taken with the utmost care. The data so collected will, I hope, be published later elsewhere, but in the table at pp. 120-121 a summary consisting of the average relative values of the various dimensions in each British race is given. It is important to observe that in all cases, unless the contrary be stated, the measurements refer to thoroughly adult skulls in which the teeth are at least half-worn.

It now appears that in practically every island of the Hebrides differentiation from the parent stock has proceeded so far that the most logical course would be to describe the mice of each island as distinct subspecies. On the mainland of Britain the same process is seen at work. Skulls from the English plains taken here as being typical of *A. s. sylvaticus* seem to be distinguishable from those of Wales or from the Scotch Highlands; those from the lowlands of Scotland in turn have their peculiar characters. But in order to define these mainland forms it will be necessary to have far more material of the right kind than is at present available. To quote Barrett-Hamilton once more, the work must be based upon averages, and not upon individuals, and it will require the most careful procedure.

Apodemus sylvaticus, Linnæus.

A. NON-HEBRIDEAN BRITISH RACES.

A. sylvaticus sylvaticus, L.

Twelve old skulls from Kent, Essex, Middlesex, Oxfordshire, Gloucester, Leicester, and Suffolk, in which the condylo-basal length ranges between 22 and 23.6 mm., are treated as representative of this subspecies; the average values of the reduced dimensions, the condylo-basal length taken as 100, are given in the table at pp. 120-121.

The Welsh skulls (c.-b. l. 22.2-23.6) show a slight tendency to become narrower and deeper, and more definite indications of shortening of the postmolar and diastemal lengths, accompanied by a decrease in the size of the bullæ.

Two types seem to occur in Scotland. In one, represented by skulls from Edinburgh, Lanark, and Dunphail, Elgin

(c.-b. l. 23·2-23·5), which is not unlikely characteristic of the lowlands, the size is about as in English *s. sylvaticus*. In this form the zygomatic, interorbital, and cranial widths are relatively small, the brain-case more depressed, the postmolar length and bullæ are smaller, while the nasals, rostrum, incisive foramina, and masseteric plate tend to be narrower. The second or highland type is represented by the specimens * from Loch Awe and Fortrose. These are rather small (c.-b. l. 22-23·4; 7 being 22·8 or less); their zygomatic breadth, though greater than in the "lowland" form, is relatively less than in England; the cranial width and depth are slightly increased; the palatal length is distinctly greater, the postmolar length, on the other hand, shorter, although the bullæ remain about as in England; the nasals are rather larger, especially wider; the diastema and incisive foramina are slightly longer, the latter a little wider; the rostral breadth and the width of the masseteric plate are about as in England.

A skull from the mainland of Shetland (North Roe) † resembles the highland form in its small size, broad deep brain-case, and short postmolar length; but it differs in other respects. Although further material is necessary before the exact status of this form can be determined, it obviously represents *A. sylvaticus*, and is quite distinct from the large form inhabiting the neighbouring island of Mid Yell which is described below as a subspecies of *A. fri-dariensis*.

Skulls from Jersey agree with the largest English ones in size; their relative dimensions show increased zygomatic, interorbital, and cranial widths; a deeper brain-case; shorter postmolar length; rather short diastema, with long and wide incisive foramina. In several of these respects there is agreement with the form of the Scotch highlands. The skull of the Alderney form is considerably larger; in its narrower and rather depressed brain-case and less expanded zygomata it agrees with English or Welsh crania.

All four skulls from Scilly are larger than the largest from England (c.-b. l. 23·8-24·3); the biggest one is nearly equal to that from Alderney. The zygomatic and interorbital breadths are small; the brain case is as narrow but not quite so deep as in Wales; the postmolar length is as in

* I have to thank Mr. C. H. Alston, Mr. Hugh St. Quintin, and Mr. Ogilvie-Grant for this material.

† North Roe is at the northern end of the island; at Dunrossness, at the southern end, a large form is known to occur, which may turn out to be a form of *fridariensis*.

*sylvaticus.**Apodemus sylvaticus.*

	Scotland.											Channel Islands.	<i>A. sylvaticus butei.</i>
	England.	Wales.	Lowlands.	Highlands.	Shetland mainland.	Jersey.	Albion.	Scilly.	Man.	Ireland.	Skye.		Bute.
	(12)	(4)	(3)	(9)	1 ♂.	(2)	(1)	(4)	(2)	(6)	(8)		(11)
1.	23.0	22.97	23.33	22.6	22.4	23.55	24.4	24.0	23.15	23.08	22.46		21.94
1 <i>n.</i>	100	100	100	100	100	100	100	100	100	100	100		100
2.	110.08	109.5	108.5	109.8	111.5	110.5	109.5	109.66	109.0	108.66	110.08		110.85
3.	55.75	54.82	52.8	54.62	57.2	57.35	55.0	54.12	55.95	55.13	56.32		56.32
4.	17.73	17.5	16.56	17.7	17.85	18.25	16.8	17.2	17.75	17.57	18.03		18.44
5.	49.68	49.25	47.7	50.9	52.2	50.3	49.2	49.25	50.6	49.35	50.65		51.9
6.	34.02	35.17	32.56	35.43	36.1	35.45	34.4	34.45	34.8	33.36	36.01		35.76
7.	47.25	46.77	46.26	46.45	46.4	46.55	46.3	47.27	46.25	46.86	46.56		46.56
8.	27.45	26.77	26.96	27.61	27.2	27.0	27.5	26.97	27.0	26.93	27.02		27.7
9.	39.89	40.15	39.35	40.16	40.6	41.65	38.9	40.92	39.55	40.06	39.62		40.72
10.	11.89	11.52	10.83	12.14	11.6	11.67	12.3	11.87	12.3	11.92	11.35		12.03
11.	53.94	53.82	54.13	54.32	53.6	53.95	54.5	53.9	54.45	53.62	53.7		54.3
12.	28.51	28.05	28.53	28.9	29.0	28.25	28.3	28.2	29.4	28.3	28.11		28.35
13.	23.25	23.07	24.13	23.82	24.1	24.25	23.8	22.6	23.3	23.55	24.05		23.8
14.	7.34	7.72	6.86	7.77	8.05	8.27	7.4	6.87	8.42	7.0	7.78		8.04
15.	20.28	19.8	19.13	20.31	19.6	20.65	19.3	19.47	20.3	19.65	19.11		19.43
16.	10.25	10.75	10.0	10.29	10.7	9.97	11.5	11.27	10.6	10.74	10.07		10.52
17.	15.64	15.57	15.56	15.79	15.6	16.15	16.0	15.94	16.0	15.83	16.33		16.25

Number in () of skulls upon which averages are based.

1. Condylar-basal length; average in millimetres.

Reductions:—

1 *n.* Condylar-basal length equals 100.

2. Occipito-nasal length.

3. Zygomatic breadth.

4. Interorbital constriction.

5. Cranial width.

6. Cranial depth, in middle.

7. Postmolar length; condyle to m. 3.

<i>Apodemus hybridensis.</i>												<i>A. fritularis.</i>	
<i>hybridensis.</i> Western Lewis.	<i>hybridensis?</i> Stornoway, Eastern Lewis.	subspecies? Barra.	<i>hamiltoni.</i> Rum.	subspecies? Eigg.	<i>cumbrae.</i> Great Cumbrae.	subspecies? <i>cumbrae.</i> Tuce.	<i>maclean.</i> Mull.	subspecies? Jura.	subspecies? Islay.	<i>foliagan.</i> Arran.	<i>fritularis.</i> Fair Isle.	<i>graniti.</i> Mid Yell, Shetland.	<i>A. flavicollis whitnoui.</i> Hereford and Shropshire.
(3)	(7)	(1)	(2)	(2)	(3)	(2)	(3)	(2)	(5)	(6)	(2)	(2)	(3)
24.13	23.64	23.1	25.3	23.05	23.16	22.7	23.73	23.7	22.98	23.51	25.55	24.9	26.06
100	100	100	100	100	100	100	100	100	100	100	100	100	100
110.33	110.5	109.5	109.0	110.75	110.75	110.0	109.83	109.5	110.66	110.62	109.75	110.0	109.0
55.16	56.6	55.9	53.9	55.25	56.56	56.0	53.03	54.4	55.2	55.43	54.75	55.8	55.23
17.53	17.96	18.0	16.6	17.3	16.8	17.4	17.28	17.1	17.52	17.65	16.6	16.85	16.9
48.83	50.04	50.2	47.8	49.65	51.0	50.5	48.26	49.55	49.84	49.63	46.95	48.0	47.93
34.93	35.23	35.5	35.6	34.25	35.6	35.5	34.06	34.35	35.04	35.1	33.05	32.85	33.1
45.53	45.97	45.9	45.25	45.55	45.56	46.3	45.9	46.25	45.94	46.23	46.95	46.75	47.76
26.53	26.77	26.0	25.7	26.45	26.6	26.45	25.93	26.0	26.46	25.3	26.4	25.9	28.76
40.86	41.5	39.8	40.1	41.8	40.23	42.1	41.8	40.1	39.9	40.94	41.1	40.4	39.63
10.46	11.65	11.3	11.67	11.9	11.91	11.7	11.93	11.8	12.09	12.1	10.75	10.65	12.01
54.23	54.11	53.2	55.4	55.3	54.33	55.95	54.03	54.4	54.18	54.63	54.35	53.95	53.13
29.8	29.51	29.0	30.25	27.75	28.9	28.65	29.9	29.05	29.12	28.48	29.35	28.5	28.13
24.13	23.71	22.5	24.5	24.5	23.56	24.7	24.7	24.9	24.6	23.15	24.85	25.1	20.2
7.46	7.73	7.35	7.33	7.0	7.46	7.73	6.86	8.65	7.85	7.32	7.45	7.45	7.03
18.76	19.64	20.8	19.15	18.85	18.96	19.8	18.83	19.65	19.24	19.53	18.2	20.65	20.7
0.46	10.51	10.8	10.47	11.25	10.66	10.35	10.26	11.2	10.73	11.28	12.35	10.65	10.33
6.03	16.31	16.5	15.8	17.55	16.25	16.95	16.0	16.05	15.86	16.6	15.1	15.25	14.95

8. Condyle to front surface of bulla.

9. Nasal length.

10. Nasal width.

11. Palatal length.

12. Diastema.

13. Length of incisive foramina.

14. Width of incisive foramina.

15. Rostral breadth.

16. Width of masseteric plate (least), *i. e.*, the outer wall of infraorbital canal.

17. Cheek-teeth, coronal length.

England, but the bullæ are rather smaller; the incisive foramina are distinctly smaller; the masseteric plate is wider and the molars slightly longer (as in Alderney).

The Manx skulls agree in size with the English ones (c.-b. l. 23·1-23·2); a slightly decreased postmolar length, a slightly increased palatal length, with a longer diastema, wider incisive foramina, and deepening of the brain-case are the principal modifications.

The Irish skulls (c.-b. l. 22·5-23·7) have the zygomatic breadth relatively smaller than in English, though greater than in Welsh or Scotch specimens; the interorbital and cranial widths are about as in Wales, but the brain-case is more depressed; the postmolar length is rather short, the bullæ slightly smaller than in England; the average palatal length is slightly diminished. Irish skulls agree more closely with those from England and Wales than with Scotch specimens.

The skulls of the wood-mice taken on Clare Island and Inishmore*, off the west coast of Ireland, were unfortunately macerated, and are now in fragments. In one from Inishmore, with much worn teeth, the condylo-basal length appears to have been about 24; other dimensions were:—interorbital constriction 4·2; palatal length 13; nasals 9·3 × 2·7; diastema 6·9; incisive foramina 5·8 × 1·8; rostral breadth 4·5; masseteric plate 2·4; cheek-teeth (crowns) 4; mandible 14·5. This is a large-skulled form which might be worth further investigation.

B. HEBRIDEAN RACES.

Apodemus sylvaticus.

Hab. SKYE.

Material examined and dimensions. Three from Armadale and one from Ardasar, collected by Mr. P. D. Montague; and eleven from Uig and Struan, collected by Mr. C. H. B. Grant:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Maximum. No. 3034, Struan, ♂, 6th July, 1913	99	98	22	16	23·1 (23·3)
Average of 14 adults	91·5	81·64	21·22	15·1	..

In appearance these mice are much like those from the Scotch highlands and Bute; the backs are rather dark and

* Barrett-Hamilton, Proc. Roy. Irish Acad. xxxi. p. 2 (1912).

the silvery ventral surfaces frequently show a feeble pectoral spot and traces of a median abdominal yellowish wash.

The skull (c.-b. l. 20·6–23·3) agrees with the "highland" race in size; in its great zygomatic breadth, broad inter-orbital region, the postmolar length, and long molars it agrees with or approaches the Bute form; the brain-case is no wider than in the highlands, but still deeper than in Bute; the bullæ are slightly smaller than in either; as in Welsh and Irish skulls the palatal length averages slightly shorter than usual; the incisive foramina are slightly longer and narrower than in Bute.

*A. sylvaticus butei**, subsp. n.

Apodemus sylvaticus sylvaticus, Barrett-Hamilton & Hinton, P. Z. S. 1913, p. 835.

Hab. BUTE.

Material examined. Seventeen adults (nine male, eight female), collected by Mr. R. W. Sheppard between 9th and 23rd March, 1912. Dimensions:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average.....	88·7	77·8	22	14·76 (of 14)	22·04
Maximum and type..	100	86 (90)	22·5 (23)	15 (16)	23·2

This form is characterized *externally* by its small size and dark coloration; a faint trace of the pectoral spot is frequently present.

The *skull* is small (c.-b. l. 20·4–23·2); the relative dimensions show, in comparison with *A. s. sylvaticus* of England, distinctly greater zygomatic, interorbital, and cranial breadths; a deeper brain-case; shorter postmolar region, with the bullæ enlarged rather than diminished; longer and rather wider nasals; greater palatal length; slightly longer and much wider incisive foramina; narrower rostrum; and longer molars. A comparison of the data given in the table at pp. 120–121 will show that in several respects, *e. g.*, the palatal and postmolar lengths, this form resembles the "highland" race, but in others, *e. g.*, the zygomatic, interorbital, and cranial widths, it stands quite apart or else resembles the specimens from Skye.

There can be no question that this race is distinct from that inhabiting England, and I have therefore given it a new subspecific name. The forms from Skye and the Scotch

* In honour of the Marquis of Bute, to whose generosity we largely owe this Hebridean collection.

highlands agree with the Bute race in coloration, and to a greater or less extent in skull-characters; but they are slightly larger and their skulls have some peculiarities of their own. Much more material is required from the Scotch highlands before the status of these forms can be satisfactorily determined.

Apodemus hebridensis hebridensis, de Winton.

Hab. LEWIS, Outer Hebrides.

Material examined and dimensions. (a) Seven from Garrynahine, Callernish, Western Lewis, collected by Mr. D. Anderson, 5th-10th April, 1913:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b.l.
Average.....	90.43	85.78	23.01	14.78	..
Maximum. No. 23, ♂, 6th April, 1913	98	95	24	14.5 (15)	24.7

The males have the pectoral spot feebly developed; the silvery ventral surface shows hardly a trace of a yellowish tinge, but to either side of the clear median line it is darkened here and there by the slaty bases of the hairs which show through. Line of demarcation rather sharp. In the females the pectoral spot is larger and the ventral surface shows a well-marked tendency to be suffused with buffy, particularly in the median region, where this tint forms an irregular backward extension from the pectoral spot. Line of demarcation less clearly defined than in the males. These characters are more obvious in nos. 19 and 21 than in nos. 24 and 25.

(b) Two from Tarbet, Harris, collected by Mr. Anderson:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.
No. 26, ♀, 20th April, 1913	90	83	22.5	14.5
No. 27, ♀, 21st " "	85	79	23.5	14.5

These agree with the females from Garrynahine in character of the ventral surface; they are nearly as in nos. 19 and 21.

(c) Sixteen from Stornoway, North-east Lewis, collected by Mr. Anderson, 20th-31st March, 1913:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average	95·85	87·82	23·25	15·2	..
No. 18, ♂, 31st March, 1913	102	90	24	16	23·8 (24·1)
No. 6, ♂ juv., 22nd March, 1913	77	72	23	15	..
No. 5, ♀ juv., 21st March, 1913	78	65·5	22	15	..

The males nos. 3, 9, and 18 have the ventral surface as in the males from Garrynahine; the pectoral spot becomes gradually larger and the general buffy suffusion more intense in the other specimens, and culminates in nos. 12 and 13, in which these features are quite as well developed as in nos. 19 and 21 from Garrynahine. The females have larger pectoral spots than have nos. 3, 9, and 18, but they are by no means so buffy below as nos. 12 and 13. The young specimens (nos. 5 and 6) were taken in a covert, and may belong to the same litter; in view of de Winton's assertion (Barrett-Hamilton, P. Z. S. 1900, p. 404) it is of interest to note that while the male has a coat like the adult, in which the flanks are light, the under surface silvery, with a bright pectoral spot and a paler median buffy suffusion behind, the female has the flanks still dark, and, though a faint beginning of the buffy stripe can be seen, the under surface is greatly darkened by the slaty bases of the hairs.

Cranial characters.—The condylo-basal length of adult skulls ranges between 22·7 and 25 mm.; the average is more than 1 mm. longer than in *A. s. sylvaticus* of England. The type-skull from Uig, Western Lewis, and the almost topotypical skulls from Garrynahine differ from *s. sylvaticus* most strikingly in their relatively much shorter postmolar lengths and smaller bullæ; the zygomatic, interorbital, and cranial breadths are slightly smaller, the brain-case a little deeper; the nasals are rather longer and distinctly narrower; the palatal length is slightly greater, the diastema and incisive foramina are distinctly longer, the rostrum narrower; the masseteric plate is slightly wider and the molars a little longer. The skulls from Stornoway differ, as will be seen from the table at pp. 120–121, in several respects from those from Western Lewis. In them the zygomatic and cranial widths are considerably greater relatively, the brain-case deeper; the nasals are slightly longer and distinctly wider; the diastema and incisive foramina are a little shorter, the rostrum broader; the masseteric plate is a little wider and

the molars a little longer. The postmolar length still averages much less than is normally found in any of the races of *sylvaticus* examined. In view of these differences it is worth recalling that both de Winton and Barrett-Hamilton thought that two distinct forms of *Apodemus* occur on Lewis (P. Z. S. 1900, pp. 395, 400).

In the few skins before me from North Uist, South Uist, and Barra (inclusive of those in the Royal Scottish Museum, kindly lent on a former occasion by Mr. Eagle Clarke) the ventral surface is silver, with hardly any trace of a buffy suffusion.

In the single skull before me from Barra the zygomatic breadth is relatively a little less than the Stornoway average, but the interorbital, cranial, and nasal widths and the postmolar lengths are nearly identical. The bullæ are slightly smaller, the palatal length is distinctly, the diastema a little shorter than in *h. hebridensis*, with distinctly smaller incisive foramina, broader rostrum, slightly wider masseteric plate, and longer molars.

SOUTH UIST.

One from Loch Boisdale, collected by Mr. D. Anderson:—

		Tail,	Hind foot,		
		Head without	without		
		& body.	hairs.	claws.	Ear.
No. 46, ♂, 14th May, 1913..	91	86	22	15	(old, teeth much worn, but skull broken).

Apodemus hebridensis hamiltoni, subsp. n.

Hab. The island of RUM, Inner Hebrides.

Material examined. Five, collected by Mr. D. Anderson, viz.:—

		Tail,	Hind foot,			
		Head without	without			
		& body.	hairs.	claws.	Ear.	C.-b. l.
No. 56, ♂, 5th June, 1913..	105	91	24	15	..	
No. 57, ♂, 7th " " ..	95	89	24	15	25.5	(type).
No. 54, ♀, 4th " " ..	110	91	24	15	..	
No. 55, ♀, " " " ..	105	100	25	16	..	
No. 58, ♀, 7th " " " ..	104	97	24	15	25.1	
Average	103.8	95.6	24.2	15.2	..	

This form resembles *A. h. hebridensis*, its closest ally, in its large size, big hind feet, and short ears. The general colour of the neck is as in *hebridensis*; the silvery ventral surface is irregularly darkened by the slaty bases of the

hairs which show through here and there. An evident though not very bright pectoral spot is present, together with some trace of a general yellowish wash.

The *skull* is distinctly larger and more massive than that of *hebridensis*, from which it is further distinguished by its relatively less expanded zygomata, narrower interorbital region and brain-case, and greater palatal length. The shoulders of the brain-case are rather strongly ridged in a manner recalling *A. flavicollis*; from the latter it is readily distinguished by its much smaller bulge, greater palatal length, and relatively much longer incisive foramina.

This form is named in honour of the late Major Barrett-Hamilton, to whom we owe the first scientific attempt to unravel the complex history of the *sylvaticus* group.

Apodemus hebridensis, subsp. ?

Hab. Eigg.

Material examined and dimensions. Two, collected by Mr. P. D. Montague :—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
No. 51, ♂, 29th March, 1913. . . .	85	78	23	15	23.3
No. 56, ♀, " " "	90	78	23	15	22.8

Like the vole of the island these mice have unusually long thick fur. The back is dark, the line of demarcation is not sharply defined; the ventral surface has a pectoral spot and median abdominal wash of buff, which are better developed in the male.

The relative dimensions of the skulls show some considerable differences from those of *h. hebridensis*, e. g., greater palatal length, wider masseteric plate, and longer molars. The teeth, however, are only slightly worn, and these differences may be due to immaturity. The status of this animal cannot be determined without further material.

The wood-mice of Great Cumbrae, Gigha, Tiree, Mull, Jura, and Islay are, in my opinion, local races of *A. hebridensis*, and they fall into two groups. In the first three islands their backs appear rufous, the black hairs being comparatively few; in the remaining islands a greater abundance of black hairs darkens the backs. The most rufous mice are those of Great Cumbrae, the darkest those of Jura.

Apodemus hebridensis cumbrae, subsp. n.

Apodemus sylvaticus sylvaticus, Barrett-Hamilton & Hinton, P. Z. S. 1913, p. 835.

Hab. GREAT CUMBRAE.

Material examined and dimensions. Six adults (four male, two female), collected by Mr. R. W. Sheppard between 27th and 30th March, 1912:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average	93	90·3	22·8	15·4	(of 4) 22·95
Maximum	95	92	23	15 (16)	23·4
Type.....	93	90	23	15	23·2

Description. Back rufous, little darker than flanks, the black hairs being few in number and short; line of demarcation clear, though contrast between flank and belly is not unusually striking; ventral surface nearly clear silver, with hardly a trace of a pectoral spot.

The skull is much like that of *A. h. hebridensis*, from which it differs principally in its smaller size. From the relative dimensions it would appear to have the interorbital region a little narrower, the cranial width greater, the nasals slightly shorter and wider, the diastema and incisive foramina a little shorter than usual in the typical subspecies.

The dimensions of a female from GIGHA (P. Z. S. 1913, p. 836) are:—H. B. 100, T. 85, H. F. 22·5, E. 15; its general appearance is not unlike that of the Cumbrae mice. It differs in having the back and flanks slightly darker, the line of demarcation much more definite, in its greater size and shorter tail. In the absence of the skull one must leave it for the moment with the Cumbrae form.

Four adults from TIREE (8th to 13th July, 1912), average 102·5–84·25–23·1–13·5, the maximum being 105–88–24–13 (13·5), are larger than those of Great Cumbrae, and have considerably shorter ears and tails. In colour they are quite like the Cumbrae form. The only complete skull before me, though with the teeth nearly worn out, is very small (c.-b. l. 22·8); in them the nasals appear to be longer than usual, the palatal length increased, the diastema is short as in Great Cumbrae, but the rostrum is a little broader. When further material comes to hand this form will probably need distinct subspecific recognition.

*Apodemus hebridensis maclean**, subsp. n.

Apodemus sylvaticus sylvaticus, Barrett-Hamilton & Hinton, P. Z. S. 1913, p. 836.

Hab. MULL, Inner Hebrides.

Material examined. Five adult males, collected by Mr. R. W. Sheppard between 13th and 22nd June, 1912:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average	97	87.4	23.2	14.4	(of 3) 23.73
Maximum	100	87 (92)	22 (24)	14 (15)	24.2
Type	100	80	24	14.5	24.2

Description. This mouse is distinguished from the Great Cumbræ race externally by its larger size, bigger feet, shorter tail, and ears; in these respects it makes a nearer approach to *h. hebridensis*. The colour is darker than in *A. h. cumbræ*, the back being clouded by the relatively numerous and long black hairs; the flanks are lighter, becoming more pallid below; the line of demarcation is somewhat irregular, and not at all sharply defined; ventral surface nearly clear silver, with at the most a feeble trace of the pectoral spot.

The skull differs from that of *h. hebridensis* in its slightly smaller size; relatively much narrower zygomatic arches; slightly narrower interorbital region and brain-case, the latter being more depressed; the postmolar length is slightly greater (about as in Stornoway), the bullæ distinctly smaller, though larger than in the form from Arran; the nasals are rather long and wide, nearly as in Stornoway; and the incisive foramina are long and narrow. From the skull of the Cumbræ form it is distinguished by its greater size, general narrowness, and relatively smaller bullæ.

With this mouse may be placed for the present the wood-mice of Jura and Islay; the latter, however, differ from the Mull form and from each other in such a way as to suggest that with further material we shall be obliged to regard each as belonging to a distinct subspecies.

* In allusion to the local clan.

JURA.

Three, collected by Mr. Sheppard between 16th and 18th May, 1912 :—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average.....	97·6	78·5	22·6	14·5	23·7
Maximum.....	100	(84)	22 (24)	14·5	23·9

In this series the back is heavily clouded with black and the flanks are dark; line of demarcation straight and very sharply defined; ventral surface clear silver, with very feeble trace of the pectoral spot. In the skull the zygomatic and cranial widths are relatively greater, the brain-case slightly deeper, the postmolar region longer, though the bullæ are no larger; the nasals and diastema are shorter; the incisive foramina and masseteric plate are broader. In some of these respects, as the dimensions show, there is an approach towards *h. hebridensis*.

ISLAY.

Eight, collected by Mr. Sheppard (3rd to 9th May and 7th to 8th August, 1912), and two in the Royal Scottish Museum :—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average of 9 adults..	93·3	81·6	22·5	14	(of 5) 22·98
Maximum.....	101	85 (90)	22 (23·5)	14·5 (15)	24·1

This animal is much like the Mull form in external appearance; it is, however, smaller, with smaller feet, relatively longer tail, and longer ear. The skull is distinguished by its greater zygomatic and interorbital widths, broader and deeper brain-case, rather larger bullæ, shorter nasals and diastema, and broader rostrum and masseteric plate. In most of these features it makes a nearer approach to *h. hebridensis* than do the mice of Jura and Mull.

A young specimen (no. 167, female, 8th August, 1912) differs remarkably from the young of *h. hebridensis* in having the whole ventral surface from lip to anus of a beautiful clear white; the flanks are but slightly lighter than the back, the general dorsal colour being like that of the adults; the line of demarcation is quite straight and most sharply defined. The dimensions (65-64-17-8) suggest that this interesting pelage is an earlier one than that represented in

the young specimens from Lewis and Skye noted above; if this be so, the quite surprising similarity which exists between this young animal and the adult pelage of *A. epimelas* may serve as a hint of the nature of the ancestor of the *sylvaticus* group.

Apodemus hebridensis fiolagan *, subsp. n.

Apodemus sylvaticus sylvaticus, Barrett-Hamilton & Hinton, P. Z. S. 1913, p. 835.

Hab. The island of ARRAN, Inner Hebrides.

Material examined and dimensions. Nine, collected by Mr. R. W. Sheppard:—

	Head & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
Average of 9	98.3	84.5	23.5	14.5	(of 6) 23.53
Maximum	105	86	23.5 (24)	14 (15)	24
Type	105	83	24	15	24

In the paper above cited Barrett-Hamilton and I described this as "a rather large reddish mouse, with a tendency towards the large foot and short ear of *hebridensis*." The careful examination of the skull which I have since made leads me to refer it to *hebridensis* and not to *sylvaticus*. The peculiar characters of this form entitle it to subspecific rank. In addition to the external characters mentioned above, it is noteworthy that in the eight specimens, including the type, which were collected at Brodick, Arran, the ventral surface has no trace of a pectoral spot and is silvery, though occasionally darkened to some extent by the slaty bases of the hairs; the line of demarcation is sharp. In a female (no. 61) from the cliffs near King's Caves there is a bright pectoral spot which is continued backwards as a median yellowish wash.

The skull, though a little smaller than in *h. hebridensis*, is distinctly larger than in *s. sylvaticus*. The average relative dimensions show that it differs from true *hebridensis* principally in the lengthening of the pterygoid region, the post-molar length being longer and the bullæ smaller; the nasals are a little wider, the palatal length rather longer, the diastema shorter, with somewhat smaller incisive foramina; the masseteric plate is distinctly broader and the molar series longer. The differences noted appear to be correlated with the muscular needs of a rather more powerful dentition.

* *Fiolagan* is the name of this mouse in the local Gaelic of Arran (*Alston*).

Apodemus fridariensis grantii, subsp. n.

Hab. Mid Yell, Shetland. "Caught on edge of stream on hill; altitude 300'" (*W. R. Ogilvie-Grant*).

Material examined and dimensions. Five adults (four males and one female):—

	Head without & body.	Tail, without hairs.	Hind foot, without claws.	Ear.	C.-b. l.
No. 1, ♂, 22nd June, 1913 ..	104	91	23	16.5	..
No. 2, " " " " ..	100.5	87	23	16.5	25.1
No. 5, " 25th " " ..	98	79	24	15.5	..
No. 6, " " " " ..	105	80	25	15.5	24.7 (type)
No. 3, ♀, 22nd " " ..	97	96	23	15.5	..
Average.....	100.9	88.25	23.6	15.9	..

External characters. This form is outwardly distinguished from *A. f. fridariensis* by its slightly smaller size and relatively shorter tail. In coloration it is practically identical with the type-form, save that a small pectoral spot appears to be present constantly, and the contrast between the upper and lower surfaces of the tail is much less evident. The line of demarcation is unusually distinct on the flanks.

Cranial characters. The skull differs from that of *A. f. fridariensis* in its slightly smaller size; it has the brain-case shorter and rounder, more like that of *sylvaticus* in form; the auditory bullæ are smaller; the nasals slope more gently forwards, and the dorsal profile appears throughout flatter and less convex. In *A. f. fridariensis* the infraorbital canal has its outer wall* unusually powerfully developed and projecting far in front of its roof; in the present form the outer wall is much smaller, and resembles that of *sylvaticus* or *flavicollis*. In the mandible the coronoid process is as short as and even more slender than in *A. f. fridariensis*; on the other hand, the angular process is exceptionally long, a feature which renders it very conspicuous when compared with the mandibulæ of the other forms of Western Europe.

Remarks. Large specimens from Dunrossness, at the southern end of mainland, suggest that a similar form may occur on that island also. I have much pleasure in naming this form after its discoverer, to whom I am indebted for much kindness and material.

* = "masseteric plate."

II. NOTE ON THE GLANS PENIS OF *APODEMUS*.

Prof. L. Méhely* has recently obtained good differential characters from the structure of the glans penis in *Sicista*, and he suggests that in many difficult groups of rodents (*e. g.*, Microtinae) the genitalia will be found to be of great systematic importance. Unfortunately many of the spirit-specimens of *Apodemus* before me are too young to yield satisfactory characters, but nevertheless they are of much interest.

Two types of penis are found in these specimens. In one the organ tapers distally below the bend; the glans is complex, with a large *papilla centralis* †, distinct *p. laterales*, a more or less evident rudiment of a dorsal inner annular fold, and a large frequently trifid *p. lingualis*. *P. centralis* is lofty and projects noticeably beyond the margin, or outer annular fold, of the glans; usually it extends from the centre of the glans to the dorsal border, in which case, viewed from below, it is diamond-shaped, and probably consists of both *p. centralis* and *p. dorsalis*, which have fused; I have not seen the latter element distinct in this genus; less frequently *p. centralis* is small and separated from the outer margin of the glans by an inner dorsal annular fold which connects the two *p. laterales*. This complex type of glans was observed in:—*A. hebridensis*, B.M. 11. 1. 3. 415, Barra; *A. sylvaticus*, 98. 9. 29. 3-6, Alderney; 81. 1. 11. 1, Bishopstone, Hereford; *A. s. callipides*, 94. 1. 1. 10-12, Villalba, N.W. Spain; 94. 3. 19. 1, Coruna; *A. s.* "islandicus," 0. 8. 12. 1-3, Iceland; *A. agrarius*, 55. 11. 6. 3, Brants. In these specimens the length of the penis, from bend to end, varied between 3.7 and 5.3 mm., and was in most cases between 4 and 4.5 mm.; its breadth ranged between 1.5 and 2.2 mm.; the testes in all but one case were small (from 4 to 7 mm. in diameter); in one of the Villalba mice the testis was 11 mm. in diameter.

In the second type the penis is cylindrical below the bend and considerably larger; the glans is much simpler, the only structures visible being a large dorsal inner annular fold and two lateral ventral papillæ of large size, each of which is sometimes fused dorsally with the inner annular fold; these structures are low and do not project noticeably beyond the level of the outer margin of the glans, which appears

* L. v. Méhely, Ann. Mus. Nat. Hungarici, xi, 1913, p. 231.

† The names used by Tullberg.

squarably truncated. Such a penis was found in:—*A. sylvaticus*, 85 5.5.1, Leicestershire (penis 6.4×2.4 ; testis 12 mm.); 74. 11. 25. 3, Shropshire (penis 6.2×2.4 ; testis 12.5 mm.); eight from Fortrose given to me by Mr. Ogilvie-Grant (penis $4.2-6.5 \times 2-2.3$; testis 12-14 mm.); *A. flavicollis wintoni*, 81. 1. 1. 4, Bishopstone, Hereford (penis 6.1×2.3 ; testis 6 mm., shrivelled and collapsed); 94. 7. 23. 2-3, Eszek, Slavonia (penis 6×2.2 ; testis 12.5 mm.); *A. s. dichrurus*, 93. 9. 15. 6-7, Corsica (penis 5.5×2.4 and 6×2.6 ; testis 4 mm.); *A. mystacinus*, 77. 8. 13. 6-7 (penis 8×3.5 and 7×3 ; testis 15 and 14 mm.).

It would seem from these facts that the complex type of glans penis characterizes the young, the simpler one the adults of *A. sylvaticus* and allies. The retention of complexity in a Villalba specimen with large testes may indicate that such complexity is sometimes characteristic of species or races; it is to be hoped that adult spirit-specimens of the island forms will be forthcoming. A complex glans is found in *Cricetus**, a simple one in *Epimys*† and Murinæ generally, and we may, perhaps, regard the complex condition as the more primitive in this group of rodents. In this connection its presence in the young of *Apodemus* is a matter of great interest; and if such a primitive complex glans does survive in the adult of any true murine, *Apodemus* is, perhaps, one of the most likely genera to have such a species.

XIX.—*What is Binary Nomenclature?*

By EINAR LÖNNBERG, Ph.D., F.M.Z.S., &c.

No doubt most zoologists hoped that, since the International Rules of Zoological Nomenclature had been adopted by the International Zoological Congresses, the inconsistencies and irregularities with regard to the scientific designation of genera and species would cease within a short time. Of course, some necessary alterations were expected, and would cause troubles at first (that was foreseen!), but soon permanent stability would prevail. Now several years have passed since the adoption of these Rules, but everybody must admit that we are still far from a fixed nomenclature. New and

* Tullberg, 'Nagethiere,' Taf. 1. fig. 2.

† *Op. cit.* Taf. 1. fig. 16.

troublesome questions arise one after the other, and well-known names which have been almost exclusively and unanimately used in zoological literature are proposed to be thrown overboard or, still worse, to be used for quite different genera and species of animals. One of the very worst examples may be quoted to illustrate this. I suppose that not one zoologist did not know that the name *Cercopithecus* designated the Guenons or Long-tailed African Monkeys. Now an American zoologist has made the discovery that *Cercopithecus* was, at an earlier date, given by Gronovius to the South-American Tamarins, formerly called *Midas* or *Leontocebus*, and he demands, by virtue of the law of priority, the transfer of the name *Cercopithecus* to the latter, while the Guenons are favoured with the hitherto almost unknown name *Lasiopyga*. What an awful confusion must arise by such a proceeding is easily imagined! It is not much better when the name *Amia* is taken from the ganoid fish, which, hitherto, has been known in literature under this name, and transferred to the percoid genus hitherto called *Apogon*, and so on.

The question then presents itself: "Is this in accordance with the International Rules of Zoological Nomenclature?" The International Commission on Zoological Nomenclature, which has been elected by the International Zoological Congresses for the purpose of solving difficult problems of nomenclature, has already given an affirmative reply to this question by its "Opinion" rendered as no. 20*. But *errare humanum est*, and I venture to think that this Opinion itself is against "the International Rules of Zoological Nomenclature," and I will endeavour to prove this point.

The quoted "Opinion 20" is written by the Secretary to the International Commission, Dr. Stiles, who discusses the question whether the genera of Gronovius shall be accepted or not in the following way: "An examination of Gronow's (1753) *Zoophylacii* [&c.], Fasciculus primus, establishes the fact that Gronow uses mononominal generic names, quoted with references from other authors or published with diagnosis. Under the genera he cites species, with references or diagnosis or both; *these species are not named binominally* † except so far as binominal names are given in synonymy; essentially, *Gronow's specific designations are polynominal* † and diagnostic" (*l. c.* p. 49). Nevertheless, Dr. Stiles con-

* Smithsonian Publications 1938.

† *Italics* by the present writer.

tinues on the next page, "*It is clear that Gronow's nomenclature is binary*"*—that is, he names two units or things, genera and species. *His generic names*, therefore, correspond to the provisions of the Code, and *are to be accepted** as available under the Code." In this remarkable conclusion 11 members of the Commission joined with the Secretary, and thus the "Opinion" was passed. Only one of the members voting dissented, distinctly saying that Gronow has not applied the principles of binary nomenclature.

By this "Opinion," however, the Commission has decided that a specific designation which is polynominal at the same time can be binary! This appears to be a *contradictio in adjecto*, unless to the word "binary" is given a meaning contrary to what is generally understood by this word in Natural History. Strange to say, the Commission appears to have done that. Another of the "Opinions" (no. 35 †) is said to consider "types of genera of binary but not binominal authors"! This Opinion is also written by Dr. Stiles, and none of the Commissioners voting has had anything to remark with regard to whether such an interrogation as this is entitled to be discussed by the Commission. "Opinion 20" appears thus in the mind of the Commission to have already settled the question concerning the interpretation of "binary" as having in zoological nomenclature a meaning different from, and nearly opposite to, that of binominal.

Let us then return to "Opinion 20" and see how it corresponds with the "International Rules of Zoological Nomenclature." Article 2 of these reads as follows: "The scientific designation of animals is uninominal for subgenera and all higher groups, binominal for species, and trinominal for subspecies." It is evident enough that this Article does not leave room for any polynominal names—on the contrary, it states explicitly that the specific names shall be *binominal*. Gronovius' nomenclature is thus *not* in accordance with these Rules.

Article 25, *b*, of the latter states that the law of priority can be carried out only on the condition "that the author has applied the principles of binary nomenclature." The validity of this is admitted by the writer of "Opinion 20," who even quoted this passage. Nevertheless, he says that Gronovius' nomenclature is polynominal and "binary" without detecting any opposition between these two words. On the contrary, he gives the explanation quoted above,

* *Italics* by the present writer.

† Smithsonian Publication 2031, pp. 82-83.

viz., that "Gronow's nomenclature is binary" because "he names two units or things, genera and species."

This definition of binary in combination with nomenclature is, however, entirely wrong and illogical, because it is in opposition to the original meaning of the word as well as to the import it has received in Natural History.

Binary (*binarius*) is derived from *bis* = twice, *bini* = two each time, twins. "Binary" means thus, consisting of two things, twofold, double. Consequently a binary name is a name consisting of two units, *i. e.* of two words (N.B., *not* a designation of two things), and it is identical with binominal (*resp.*, binomial). Binary nomenclature cannot be anything else than a nomenclature in which binary (=binomial) names are used, or identical with binomenclature. It has been generally applied in such a sense hitherto and must still be used in that way. It is thus impossible for me to give any other interpretation to the words (in Article 25, *b*, of the International Rules) "principles of binary nomenclature" than that they are equal to "principles of binomenclature."

Fortunately, Article 26 of the repeatedly quoted Rules proves with absolute certainty that I am quite right in this. Article 26 reads as follows:—"The tenth edition of Linné's 'Systema Naturæ,' 1758, is the work which inaugurated the consistent general application of the binary nomenclature in Zoology. The date 1758, therefore, is accepted as the starting-point of zoological nomenclature and of the Law of Priority." Now, it is well known to every zoologist that it really is the binominal names, or the binominal nomenclature (binomenclature), which received "consistent general application" in 'Systema Naturæ,' editio x. (1758). The word "binary" in Article 26 of the International Rules of Nomenclature must, therefore, stand for binominal, and it appears absolutely inconsistent to give the same word "binary" quite another purport in Article 25, *b*, to suit the interpretations of Dr. Stiles.

It must also be remembered that if the word "binary" were not to have the same meaning as binominal, but would admit such a misinterpretation as Dr. Stiles has tried to give it in "Opinion 20," it would be incorrect to determine 1758 as the "starting-point" of zoological nomenclature. "Binary" nomenclature in the Stilesian sense is much older. Linné and Artedi had consistently applied the same (that is, used an uninominal constant generic name and a "polynominal" specific designation at least twenty years before), and a similar proceeding can be traced to still earlier

authors. Artedi especially has put the nomenclature of his branch of science, Ichthyology, in a clear system. We read, for instance, in his 'Philosophia Ichthyologica' (p. 64), 1738, the following thesis: "Nomen Genericum est vocabulum illud, quo omnes species, ad unum genus pertinentes, insigniuntur"; and, further on in the same work (p. 80), "Nomen specificum est Epitheton illud aliquot vocabulis constans, quod nomini Generico postponitur, ut una species Piscium a reliquis Ejusdem Generis dignoscatur." This is, I think, clear enough*, but, in spite of it all, the generic names found in such older works have not been claimed as valid—if they have not independently been taken up by later authors,—although they are analogous to those of Gronovius. This fact also supports my view that only binominal authors have the right to be considered in modern nomenclature.

As a conclusion of the above, I insist that:—

(1) The word "*binary*" in Article 25, *b*, of the International Rules of Zoological Nomenclature must be understood as equivalent with *binominal*, and every attempt at giving *binary* in connection with the words "name" or "nomenclature" in zoological literature any other meaning is of no avail, as being based neither on etymological nor on historical facts, nor on usage.

(2) "Opinion 20" of the International Commission on Zoological Nomenclature, as being based on a misinterpretation of the word "*binary*," must be declared void, and the same must be the case with "Opinion 37" and any other Opinion which has been based on the same premises.

BIBLIOGRAPHICAL NOTICE.

Manual of the New Zealand Mollusca. With an Atlas of Quarto Plates. By HENRY SUTER. Published by the Authority of the Government of New Zealand. 8vo. Wellington, N.Z., 1913. Pp. xxiii, 1120.

SINCE the publication in 1880 of Capt. F. W. Hutton's 'Manual of the New Zealand Mollusca' a very considerable number of species has been added to the New Zealand fauna. At that date only just 450 forms were known, now close on 1190 are recognized. The

* If only "aliquot vocabulis" had been changed to "uno vocabulo," we should have had the modern nomenclature introduced already in 1738.

descriptions of these addenda are scattered through many different scientific publications; hence the resolve of the New Zealand Government to undertake the publication of a new 'Manual' is one that deserves the highest commendation, especially since the work is to be accompanied by an Atlas of Plates (still to come) depicting, we believe, all the species.

The compilation of this 'Manual' was entrusted to Mr. H. Suter, than whom few, if any, are better qualified to carry out such a big work at all satisfactorily. Not only is the successful accomplishment of such a task by a single writer remarkable, but it has to be borne in mind that the Antipodean naturalist is most severely handicapped by the fact that a very large part of the material and most of the necessary literature is only to be found over here. Thus, to cite two examples only under the latter category, when Mr. Suter began his mission Thiele's important monograph upon the Chitons had not reached him and Reeve's 'Conchologia Iconica' was not available. All the greater the meed of praise to Mr. Suter, therefore, for the admirable way in which he discharged his undertaking. The volume will not only be of immense value to students of the New Zealand Mollusca, but will be equally indispensable to all workers in Malacology.

All this is not to say that the work is free from criticism; on the contrary, it simply bristles with points needing revision and correction, especially in matters nomenclatorial.

The classification adopted is that of Dr. Pelseneer in Lankester's 'Treatise on Zoology,' vol. v., save that, for reasons that do not seem adequate, the retrograde step of treating the Pteropods as a class apart has been adopted, whilst we are treated to the extraordinary statement "that the Gastropods were derived from Pteropods, and not from Opisthobranchs," and that "The Pteropods undoubtedly already appear in the Palæozoic," which latter assertion no wise palæontologist will endorse; nor can one call to mind any creditable morphologist who would derive the Gastropoda from the Opisthobranchia. The location of the Pteropods as a link between the Amphineura and the Gastropoda is distinctly anomalous.

Much to be deprecated is the too scrupulous insistence in employing original names, even when faultily founded, such as the still-born *Lymnoea*, which Mr. Suter expands into *Lymnoëa* (misspelt *Limnoëa* on p. v), for *Limnaea*. Worse still, the unhappy interchange of *Tehys* and *Aplysia* finds endorsement, and yet the family name *Aplysiidæ* is left to do duty in the old sense!

On the whole, except in the case of the few poor cuts, the book is fairly well printed, but there are some pages in which the "quads" have printed that should not have been passed. Why paper of four different shades, which do not correspond in any way with the contents, should have been used is not explained, whilst the dual instead of a single alphabetical index detracts from facility in reference. It is to be hoped that the plates, when they arrive, will prove superior to the text in "get up."

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

March 11th, 1914.—Dr. A. Smith Woodward, F.R.S., President ;
and afterwards Dr. H. H. Bemrose, J.P., Vice-President,
in the Chair.

Mr. E. T. NEWTON, in exhibiting a series of small mammalian and other remains from the rock-shelter of La Colombière, near Poncin (Ain), said that, during the year 1913, Dr. Lucien Mayet and M. Jean Pissot were working systematically at the prolific deposits of this locality, and towards the end of the year made known the discovery of a number of incised bones and stones, representing the human form as well as several animals. This discovery was published in the *C. R. Acad. Sci. Paris* (vol. clvii. p. 665), and some account of it, with several figures, appeared in the '*Illustrated London News*' for November 1st, 1913.

The upper part of the deposit is referred to the Neolithic and Magdalenian ages: but below this, at a depth of $6\frac{1}{2}$ feet, a bed (10 inches thick) was found, which yielded the incised drawings above mentioned, as well as numerous mammalian remains and flint-implements; and this is regarded as of Aurignacian age. Immediately below the last-mentioned bed a deposit of sand and small rock-fragments was penetrated to a depth of 10 feet, and this deposit, also referred to the Aurignacian, was found to contain an enormous number of bones of small mammals and other animals. Some twenty species have already been recognized by the discoverers.

The large number of small bones now shown were obtained by the exhibitor in sifting about 1 cubic foot of this lower, remarkably prolific, deposit, which had been sent to him by Dr. Lucien Mayet, of Lyons.

The following communication was read:—

'On an apparently Palæolithic Engraving on a Bone from Sherborne (Dorset).' By Arthur Smith Woodward, LL.D., F.R.S., Pres.G.S.

The author is indebted to Mr. R. Elliot Steel, of Sherborne School, for the opportunity of studying a fragment of bone bearing an incised drawing of the fore-part of a horse in the style of drawings already well known from several habitations of Palæolithic Man. The specimen was found by schoolboys in an old mound of

débris from a quarry in the Inferior Oolite near Sherborne. Nothing is known of the circumstances under which it originally occurred; but the situation of the quarry is in a small dry valley, on a steep slope facing south-westwards, and the bone may perhaps have been removed with the remains of a rock-shelter. No associated specimens of any interest were recovered; but at the lower end of the same valley, about a quarter of a mile distant, teeth of mammoth and woolly rhinoceros have been found. Like the only other British specimen hitherto discovered—that described by Prof. Boyd Dawkins from the Creswell caves—the drawing is made on a fragment of rib; and the neck of the horse is fringed by fine lines, which indicate the short hog-mane usual in sketches made by the Palæolithic race.

April 29th, 1914.—Dr. A. Smith Woodward, F.R.S., President;
and afterwards William Hill, Vice-President, in the Chair.

The following communication was read:—

‘On the Lower Jaw of an Anthropoid Ape (*Dryopithecus*) from the Upper Miocene of Lérida (Spain).’ By Arthur Smith Woodward, LL.D., F.R.S., Pres.G.S.

The Author describes and discusses the greater part of a mandibular ramus and symphysis of *Dryopithecus fontani*, lent to him by Prof. L. M. Vidal, of Barcelona. The specimen was found by Señor José Colominas in association with the *Hipparion* fauna at Seo de Urgel, in the Province of Lérida (Northern Spain). It is, therefore, the latest jaw of an Anthropoid Ape hitherto discovered in Europe, although probably contemporaneous with the isolated Anthropoid teeth from the Böhmerz of Würtemberg and the well-known Anthropoid femur from the Sands of Eppelsheim (Hesse-Darmstadt). The relatively small size of the first molar is to be regarded as a primitive character, lost in all modern Anthropoids except some Gibbons. The shape of the mandibular symphysis is almost remarkably primitive, with the surface of insertion for the digastric muscle nearly as large as that of the ancestral Macaques (for instance, *Mesopithecus*). The anterior face of the symphysis slopes directly upwards from the front edge of this insertion, as in the Macaques, some Gibbons, and very young individuals of the Chimpanzee, Gorilla, and Orang. It thus differs considerably from the mandibular symphysis in adult individuals of these existing Apes, in which the lower portion of the slope curves backwards into a more or less well-defined flange or shelf of bone, while the digastric insertion is reduced in extent. The mandibular symphysis of *Dryopithecus* is, indeed, intermediate in shape between that of the Upper Miocene or Lower Pliocene *Mesopithecus* and the Lower

Pleistocene *Homo heidelbergensis*. So far as its lower jaw is concerned, *Dryopithecus* is, therefore, a generalized form from which modern Anthropoid Apes and Man may have diverged in two different directions.

May 27th, 1914.—Dr. A. Smith Woodward, F.R.S., President,
The following communication was read:—

‘On the Development of *Tragophylloceras loscombi* (Sow.)’
By Leonard Frank Spath, B.Sc., F.G.S.

During his investigation of the Charmouth Lias, Mr. W. D. Lang has carefully collected abundant fossil material with reference to its exact stratigraphical horizon, and the Author is indebted to him for permission to study the ammonites. In the material, *Tragophylloceras loscombi* (Sow.) is represented by hundreds of specimens (chiefly young), and a study of the ontogeny of this interesting ammonite forms the basis of the paper.

A considerable number of specimens were dissected back to the initial chamber or protoconch, and their development was traced in detail. Horizon and history (notably previous interpretations and generic vicissitudes) are also discussed, tables of measurements are given, and the other species of the genus [especially the pre-*ibex* *Tragophylloceras numismale* (Quenst.) which had long been confused with the post-*ibex* *Tr. loscombi* (Sow.)] are reviewed.

The evolution of the suture-line was worked out in great detail, and one of the most important points brought out was the demonstration of a simple *Psiloceras*-like suture-line persisting to a late and post-constricted stage. The speculations regarding the bearing of all the important facts upon the phylogeny of the genus *Tragophylloceras*, and upon the connexion of the latter with allied lineages, will prove, it is hoped, of general interest. The development of the suture-line in *Psiloceras* and *Rhacophyllites* is given for comparison.

Since *Tragophylloceras* has morphic equivalents in *Rhacophyllites*, as well as in *Analytoceras*, but, by its suture, is more nearly related to *Euphyllites* and the *Psiloceratidæ*, it is argued that it can more naturally be attached to those *Mojsvarites*-descendants that Prof. Diener would group in the *Pleuracanthidæ* than to the typical *Phylloceratinaë*.

The pre-Triassic ancestors of the *Monophyllitinaë* are also reviewed, and a new classification of the family *Phylloceratidæ* is proposed.

MISCELLANEOUS.

On the Dates of Publication of C. W. Hahn and C. L. Koch, 'Die Arachniden,' 1831-1849. By C. DAVIES SHERBORN.

(Published by permission of the Trustees of the British Museum.)

THERE are 16 volumes of this work, of which Vols. I.-XV. were issued in 6 parts each, and Vol. XVI. ended at part 4. Each part had an original wrapper, on which were printed the month and year of publication. Messrs. Friedländer and Son of Berlin have favoured me with the following note:—"14 Feb., 1914.—We have a fine copy of the 16 vols., in which the wrappers of the parts are bound up with the volumes; the dates, however, which are printed on the backs (month and year) are not special to each part, but are the same for several parts. For instance, in Zweiter Band the wrapper of part 1 is altered in writing to 'Zweiter Heft,' while the contents on p. 4 of the wrapper remain the same. It therefore appears to us that the dates on the fourth page of the wrappers are without any value."

The statement in the last sentence of Messrs. Friedländer's letter is, I venture to believe, unduly pessimistic. I have carefully compared the data of their copy with the records in Wiegmann's 'Archiv' and those of the British Museum, and find that for all practical purposes, at this distance of time, we can rely on them to a very considerable extent. Unfortunately the British Museum copy has been despoiled of its original wrappers; but the careful system there in vogue, of pencilling the date of receipt on each part in each parcel received, has fortunately preserved data now of the utmost value. These pencil dates of receipt not only show that the dates on the original wrappers are in the main accurate, but they also show that the British Museum received the parts some time before the recorder for Arachnida of Wiegmann's 'Archiv.' For instance, Vols. XIII.-XV. :-

Dates on Original wrappers.		Recorded by Wiegmann.	Received by Brit. Mus.
XIII.	1.	1846	14 Feb., 1846.
	2. Jan. 1846.		12 Nov., 1846.
	3. Feb. 1846.		Unmarked.
	4. Mar. 1846.		
	5. May 1846.		13 Apr., 1847.
	6. June 1846.		13 Apr., 1847.
XIV.	1. June 1846.	1847-8	13 Apr., 1847.
	2. Dec. 1846.		13 Apr., 1847.
	3. Mar. 1847.		Unmarked.
	4. Apr. 1847.		
	5. May 1847.		8 Nov., 1847.
	6. May 1847.		
XV.	1. June 1847.	1849-51	15 Mar., 1848.
	2. July 1847.		Unmarked.
	3. July 1847.		
	4. Aug. 1847.		14 Nov., 1848.
	5. Sept. 1847.		
	6. Sept. 1847.		

Taking these facts into consideration, the general accuracy of dating of the wrappers of Hahn and Koch's other works, together with a number of odd records, I am accepting the following table of dates for my 'Index Animalium' as a close approximation to the truth. Any corrections will be most welcome.

I have to thank Messrs. Wesley and Son for an odd copy of Vol. VI. Part 2, kindly sent to me :—

I. 1.	Mar. 1831.	IX. 1.	1841.
2.	Sept. 1832.	2.	1841.
3.	Dec. 1832.	3.	1841.
4.	Mar. 1833.	4.	1842.
5.	July 1833.	5.	1842.
6.	Oct. 1833.	6.	1842.
II. 1.	Dec. 1833.	X. 1.	1842.
2.	May 1834.	2.	?
3.	July 1834.	3.	1843.
4.	Oct. 1834.	4.	1843.
5.	May 1835.	5.	1843.
6.	Aug. 1835.	6.	?
III. 1.	Jan. 1836.	XI. 1.	1844.
2.	Feb. 1836.	2.	1844.
3.	July 1836.	3.	1844.
4.	1836.	4.	1844.
5.	Dec. 1836.	5.	1844.
6.	1837.	6.	1844.
IV. 1.	May 1837.	XII. 1.	1845.
2.	Oct. 1837.	2.	1845.
3.	Oct. 1837.	3.	1845.
4.	Nov. 1837.	4.	1845.
5.	Nov. 1837.	5.	1845.
6.	May 1838.	6.	1845.
V. 1.	May 1838.	XIII. 1.	1846.
2.	May 1838.	2.	Jan. 1846.
3.	Sept. 1838.	3.	Feb. 1846.
4.	Sept. 1838.	4.	Mar. 1846.
5.	Sept. 1838.	5.	May 1846.
6.	1839.	6.	June 1846.
VI. 1.	1839.	XIV. 1.	June 1846.
2.	Apr. 1839.	2.	Dec. 1846.
3.	1839.	3.	Mar. 1847.
4.	1839.	4.	Apr. 1847.
5.	1839.	5.	May 1847.
6.	1839.	6.	May 1847.
VII. 1.	July 1839.	XV. 1.	June 1847.
2.	1839.	2.	July 1847.
3.	1839.	3.	July 1847.
4.	1839.	4.	Aug. 1847.
5.	1839.	5.	Sept. 1847.
6.	1840.	6.	Sept. 1847.
VIII. 1.	1840.	XVI. 1.	Oct. 1847.
2.	1840.	2.	Oct. 1847.
3.	1841.	3.	Oct. 1847.
4.	1841.	4.	1847.
5.	May 1841.		
6.	1841.		

Heric-Schaeffer's "Schlusswort" in Verzeichniss, Jan. 1849.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 80. AUGUST 1914.

XX.—*Preliminary Account of Aspidodrilus, a remarkable Epizoic Oligochaete.* By H. A. BAYLIS, B.A.

(Published by permission of the Trustees of the British Museum.)

ELEVEN specimens of a very remarkable little worm, collected in Sierra Leone by Major H. Kelsall, R.A., were recently presented to the British Museum by the Imperial Bureau of Entomology.

According to Major Kelsall's account, they were found living as "external parasites" on a large earthworm common in the district. In the absence of specimens of the host it is impossible to state at present to what genus it belongs; but as the "parasite" is of considerable interest, it is proposed to give a brief account of it, leaving a more complete study of it until further well-preserved material is available.

Major Kelsall's account, as given in a letter to the Bureau of Entomology, is interesting, and I quote the following passage from it:—

"The worm [*i. e.* the host] is terrestrial, and about 12 or 13 inches long, in general appearance very like the ordinary large earthworms of this country [*sc.* Great Britain]. Many that I noticed were infested with the small whitish parasites (or what appeared to be parasites). I usually found the worms crawling on the roads or paths, and the parasites

were plainly visible, being, as far as I recollect, 2 to $2\frac{1}{2}$ mm. in length, flattish in shape, and moving about on the slimy surface of the worm.

"The worms, when irritated by touching with a stick, used to squirt out a clear liquid from a number of pores, as far as I recollect, arranged in transverse rings about half an inch apart. The liquid was squirted to a distance of a couple of inches, and the natives disliked touching [the worms], believing them, I think, to be poisonous."

Aspidodrilus kelsalli, gen. et sp. n.

The worms are found at various stages of growth, and are not all alike as regards sexual maturity.

The largest specimens measure about 5 mm. in length, and have a maximum width of about 1.40 mm. Small individuals, showing no signs as yet of genital organs, measure only 2 mm. in length.

In shape they are somewhat flattened dorso-ventrally—less so in the anterior half of the body than posteriorly. At first sight it was impossible to avoid the impression that they were some peculiar kind of Trematode, showing not a little resemblance to forms such as *Aspidogaster*. On further study, however, it soon became clear that they must be referred to the Chætopoda.

The anterior half of the body is nearly cylindrical, tapering in front, and shows distinct segmentation. The inter-segmental grooves, however, are only faintly marked on the dorsal surface, and scarcely visible at all on the ventral surface. It was only when a specimen was stained, cleared, and mounted, that positive evidence of segmentation was found, in the shape of delicate septa and segmentally arranged internal organs.

There is a small prostomium, which forms the dorsal lip of the mouth, as in a typical earthworm, and this is succeeded by ten segments in front of the clitellum. Each of these ten segments bears ventrally, towards either side, a pair of simple, short, pointed chætæ, directed backwards, and having their inner ends embedded in special sacs, with muscles attached to the body-wall.

Behind the tenth segment there is a distinct band of thickened glandular skin, containing large clear cells, and extending across the dorsal surface and on to the sides of the body. There can be little doubt that this represents a clitellum; it appears to occupy only one segment.

Opposite this glandular patch, on the ventral surface, there is a large, nearly circular, sucker-like organ, having a diameter of 0.55 mm. in a transverse direction, but slightly less than this antero-posteriorly. This sucker is composed of muscular tissue, the muscles running partly vertically, and partly concentrically and parallel with the circular edge. At the sides of this organ, and somewhat behind its transverse diameter, there open a pair of ducts surrounded by thick muscular tissue: these are, I believe, the male ducts, and may be capable of evagination, though they have not been seen in an extruded condition.

Immediately behind the sucker the body becomes much flattened, and at the same time expanded laterally, so as to form a large, oblong, or somewhat oval disc, in length equal to half that of the whole animal. This disc, or "shield," is bordered by a delicate frilled membrane, which takes its origin beneath the posterior and lateral projecting parts of the sucker, and extends round on either side to the anus, which is placed at the posterior end of the "shield."

The hinder part of the intestine can be seen running down the middle line of the shield, even in a specimen which has not been artificially cleared.

On either side of the shield, on the ventral surface, there is a series of transverse rows of simple chætæ, each chæta being embedded in its own sac with special muscles. Presumably, though this has not yet been definitely ascertained, each row corresponds to a segment. In an adult specimen the anterior rows are about 0.12 mm. apart, but the distance between each row and the succeeding one diminishes gradually on passing backwards, the rows nearest to the anus being very closely crowded together. Conversely, the number of chætæ in the rows steadily increases from before backwards. Thus, in a mature example, which had about 37 rows on either side, there were four bristles in the first row, five in the second, and so on up to twenty or more in the last six fully-formed rows.

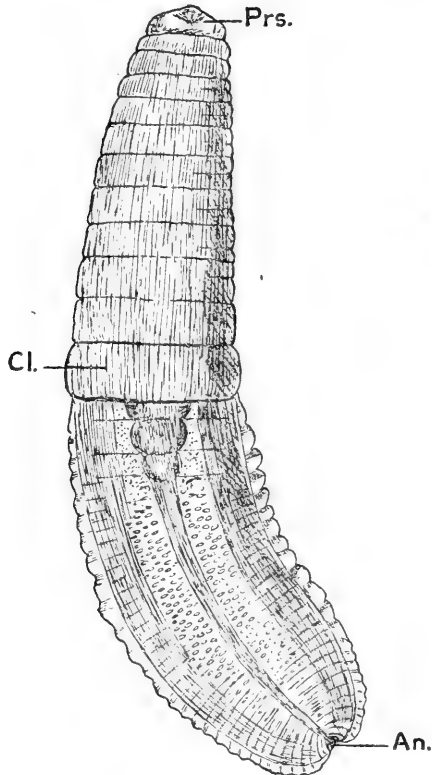
The first row on either side, situated immediately behind and to the side of the sucker, seems invariably to contain four bristles, which are directed backwards, while the succeeding rows have their bristles more or less inclined forwards—very markedly so in the most posterior rows.

All this armature, consisting of sucker, frilled disc, and chætæ, serves doubtless as a very efficient means of attachment to, or locomotion on, the slimy surface of the earthworm.

Internal Anatomy.

I will not attempt to give here a complete account of the internal organs, as the study of sections of thoroughly well-preserved material may clear up some points which at present

Fig. 1.



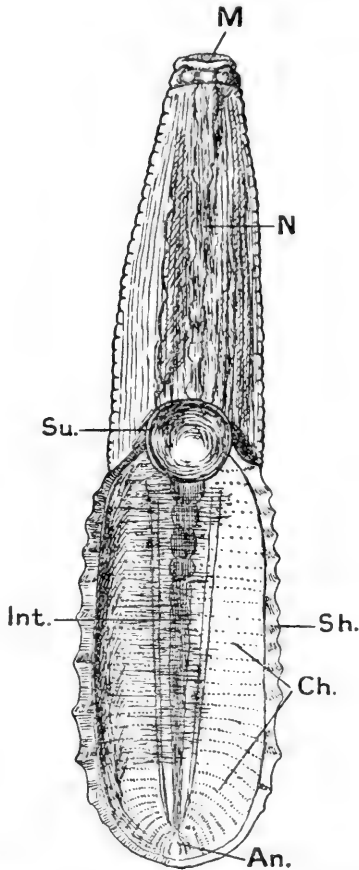
Aspidodrilus kelsalli. Dorsal view of a mature individual, as seen by reflected light. Magnified about 22 diameters.

An., anus; *Cl.*, clitellum; *Prs.*, prostomium.

could only be stated in a tentative manner. It may be said, however, that in most respects the animal shows a remarkable resemblance in its structure to an earthworm. The

mouth, placed rather on the ventral surface, is bounded dorsally by the prostomium, and ventrally and laterally by

Fig. 2.



Aspidodrilus kelsalli. Ventral view of another specimen, at a similar magnification.

An., anus; *Ch.*, rows of chætæ on "shield"; *Int.*, intestine (seen by partial transparency); *M*, mouth; *N*, ventral nerve-cord; *Sh.*, frilled margin of "shield"; *Su.*, sucker.

the first true segment or peristomium, which, however, does not appear to be separated by a definite septum from the

prostomium. There is a large pharynx with very muscular roof, and large muscles extending from it, mainly backwards, to the body-wall. Behind this there is a rather narrow œsophagus extending from the third to the fifth segment, while the sixth segment contains a lobed and saccular diverticulum of the œsophagus, lined with cilia, which is very probably the homologue of the calciferous glands of earthworms. Behind this the intestine becomes large and voluminous, and its contents appear to consist chiefly of earth and vegetable débris, suggesting that the animal is not in any sense a true parasite, but rather a commensal, of the earthworm "host," and that it avails itself of the latter as a means of transport to favourable feeding-grounds. The digestive portion of the intestine is covered externally with large flask-shaped cells, the expanded portion of which projects into the cœlom. These, perhaps, represent the chloragogen-cells of other oligochætes.

The intestine runs directly to the anus, becoming narrow as it passes backwards. It shows a constriction at the point where it perforates each septum, and a slight expansion in each segment.

A pair of nephridia have been seen in each segment from the sixth to the ninth, and in some of the segments which compose the caudal "shield," but neither the occurrence nor the structure of the nephridia has been worked out in detail.

Large lobed sperm-sacs, containing clumps of sperm-mother cells similar to those of earthworms, and sperm in various stages of formation, are found arranged more or less symmetrically in segments viii.-x., and in the tenth segment they contain a pair of large ciliated funnels, connected, apparently, by long and much convoluted ducts with the apertures already mentioned at the sides of the ventral sucker.

The ovaries are very peculiar, and need further study. There appear to be on either side, in segments ix.-x., four small rounded clumps of ovarian cells, as well as large masses which appear to be ova with a very abundant supply of yolk. These eggs are very large in proportion to the size of the animal, and seem to be developed, one or two at a time, from the ovarian clumps, which are apparently floating freely in the cœlom. How the ova escape when ready for laying is at present unknown, no trace of female ducts having yet been found.

At the sides of the third segment there are a pair of openings with thickened fleshy lips, which lead into what appear to be the spermathecae. These are a pair of tubes

with thick muscular walls, containing spermatozoa in the lumen; after running inwards till they nearly meet in the middle line, the two organs turn backwards and outwards, and end in blind expansions just in front of the "calciferous glands."

Just in front of and behind the distal branch of the spermathecae are two large crescentic organs of peculiar histological structure, lying across the body-cavity from side to side, dorsal to the œsophagus. Their nature is as yet mysterious, and it can only be said that they seem to receive an abundant nerve-supply from the visceral system, represented by a pair of ganglia lying just at the hinder and outer angles of the pharynx.

The nervous system, on the whole, is similar to that of any annelid, the cerebral ganglia being situated in the first segment, and connected by circum-pharyngeal connectives with a double nerve-cord which lies along the ventral side of the body, close to the body-wall, and is interrupted by a pair of ganglia in every segment.

The blood-vascular system has not yet been worked out, but some portions of branches of what would seem to be a subneural vessel have been detected near the head end of the worm.

The following is a brief generic diagnosis:—

ASPIDODRILUS, gen. nov.

Small Oligochæta, having the posterior half of the body flattened and expanded into an oval disc bearing numerous transverse rows of chætæ ventrally. Anterior segments each bearing two pairs of short, straight chætæ. Clitellum occupies segment xi.; on the ventral side of that segment there is a muscular sucker, at the edges of which are the openings of a pair of sperm-ducts.

Ovaries, four pairs, situated in ix.–x., lying free in cœlom; ova large, with much yolk.

Spermathecae open in iii. Sperm-sacs in viii.–x., with large sperm-funnels in x.; sperm-ducts long and coiled.

Species, *A. kelsalli*, sp. n.

With the characters of the genus.

Length 5 mm.

Living attached to the exterior of a large earthworm.

Hab. Sierra Leone, West Africa.

Type specimens in the British Museum (Natural History).

XXI.—*A new African Squirrel presented to the British Museum by Capt. the Hon. R. O. B. Bridgeman, R.N.*
By GUY DOLLMAN.

(Published by permission of the Trustees of the British Museum.)

Paraxerus bridgemani, sp. n.

Allied to *Paraxerus sponsus*, Thos. & Wrought., but distinguished at once by its paler colour and orange bordered tail.

General body-dimensions as in *sponsus*. Colour of dorsal surface of body speckled grey washed with pale yellow, without the rufous tint so dominant in *sponsus*. Hairs of back with slate-black bases, pale lemon-yellow middles, white subterminal rings, and dark tips; in *sponsus* the middle portions of the hairs are rufous-orange and the tips darker and considerably longer. Nasal region, sides of face, and backs of hands and feet yellowish orange, near "ochraceous-buff" (Ridgway, 1912). Entire ventral surface of body yellowish orange, considerably paler than the underparts of *sponsus*, which are almost rufous. Tail conspicuously different from that of the Inhambane species, the orange colour being much more restricted in its distribution, forming a kind of margin or border to the tail, the median portion, both above and below, coloured like the back; the orange colour is much the same as that of the belly, and paler than in *sponsus*, where the rufous hair-tips give the tail a general rufous appearance rather than a richly coloured border.

Skull shorter and with smaller cranium; nasals more parallel-sided, the anterior breadth not conspicuously greater than that of the median constricted area.

Dimensions of the type (measured in the flesh):—

Head and body 180 mm.; tail 190; hind foot 42; ear 22.

Skull: greatest length 46; condylo-incisive length 39·8; basilar length 34·6; length of nasals 14·3; greatest width across nasals 6; zygomatic breadth 26·1; squamosal breadth across brain-case 19·5; palatilar length 17·5; length of upper check-teeth 8·2.

Hab. Indook, Panda, Portuguese East Africa. Altitude 700 feet.

Type. Adult female. B.M. no. 14. 7. 18. 1. Original

no. 4. Collected and presented by Captain the Hon. R. O. B. Bridgeman, R.N.

The general colour of this squirrel renders it easily distinguishable from the Inhambane species; the cranial differences are such that it seems best to regard this form as a distinct species.

Capt. Bridgeman, after whom this handsome squirrel is named, collected a second specimen, exactly like the type, at the same locality.

XXII.—*Indian* Pyrgotinæ (*Diptera*).

By Prof. M. BEZZI, Turin, Italy.

No species of this interesting subfamily had been described from India or Ceylon up to the end of 1913; the *Oxycephala* ? *pictipennis*, Walker ('List of the Spec. of Dipt. Insects in the Coll. of the Brit. Museum,' iv. 1849, p. 1162), from East India, which, in Van der Wulp's Catalogue, p. 172, is recorded as belonging to *Pyrgota*, is, indeed, a beautiful species of the Platystomine genus *Xenaspis*, Osten-Sacken, 1881 (*Polistomima*, Enderlein, 1912), as was first shown by Prof. Hendel (Wien. entom. Zeitung, xxvii. 1908, p. 150). This same species was described as *X. vespoides* by Prof. de Meijere ('Bijdragen tot de Dierkunde,' xvii. 1904, p. 107) from Darjiling, and is recently recorded from the same locality by Brunetti ('Records of the Ind. Museum,' ix. 1913, p. 275). I have seen some specimens of it taken near Bhowali, Kumaon, 5700 feet, July 1909 and June 1910, by Prof. A. D. Imms.

In 1913 a very important paper appeared on the subfamily ("Neue Beiträge zur Kenntnis der Pyrgotinen," Archiv für Naturgeschichte, lxxix. 1913, pp. 77-118, pl. i.) by Prof. Hendel, who, in 1908, had already published the monograph of the group in 'Genera Insectorum' of Wytzman. In this paper are described the following Indian species, the types of which are to be found in the British Museum:—

1. *Adipsilia brahma*, Hend.—Nilgiris.
2. ——— *vulpina*, Hend.—Sikkim.
3. ——— *armipes*, Hend.—Sikkim.
4. ——— *scutellata*, Hend.—N.W. Provinces.
5. ——— *magnicornis*, Hend.—Ceylon.
6. *Apyrgota pictiventris*, Hend.—Ceylon.
7. ——— *unicolor*, Hend.—Ceylon.

In some material (from India and W. China) of the Indian Museum before me I find four species, one of which is new to science; and in other material, collected by Prof. A. D. Imms in the Himalayas, I find three very large species, one of which is representative of a new genus. My thanks are due to Dr. Annandale and to Prof. Imms for having placed at my disposal for study such important material, which is now to be found partly in the Indian Museum and partly in the British Museum.

I will here call attention to the fact that the subfamily Pyrgotinæ is, perhaps, not devoid of economic importance—indeed, a North-American species has been recognized as parasitic upon Coleoptera Lamellicornia*. The striking resemblance of these strange flies with the Conopidæ is again further confirmed by these parasitic habits. They are, perhaps, of nocturnal habits, as some of the Indian specimens were caught at light; the European *Ad. coarctata* was, however, observed by Prof. Handlirsch flying in the sunshine.

I give the following key for the determination of the Indian Pyrgotinæ known to me; it must be remarked that the species no. 2 is from China:—

1. (2) Antennal grooves coalescent, forming a single very deep cavity; scutellum entirely bare, with only a pair of erect bristles at the posterior end; all the femora below towards the apices armed with a double row of rather strong bristles; second longitudinal vein with a præapical stump; anal vein complete to the end; posterior cross-vein very oblique, and therefore the inferior angle of the discal cell very acute † 1. *Apyrgota pictiventris*, [Hend.]
2. (1) Antennal grooves well separated by a prominent complete keel; scutellum usually haired, and when bare the marginal bristles are at least two pairs; femora unarmed.
3. (12) Third longitudinal vein ending at the apex of the wing; ovipositor without a strong basal tubercle.
4. (9) Anal vein very short; second longitudinal vein usually without a stump or rarely provided with a very

* *Pyrgota undata*, Wied., on *Lachnosterna*, by S. A. Forbes.

† In all the species here described the costa reaches the end of the fourth longitudinal vein, but after the end of the third it is very thin and often hardly distinct.

short one; bristles and hairs of the body entirely black, the macrochaetae of the head, chiefly the verticals, being very long and strong; ovipositor shortly but densely pilose; species of smaller size, not more than 8 mm. in length.

5. (6) Wings very broad, with a short præ-apical stump on the second longitudinal vein; posterior cross-vein very oblique. 2. *Adapsilia magnicornis*, [Hend., var. *amplipennis*, n.]
6. (5) Wings of usual width; no stump on the second vein; posterior cross-vein much less oblique.
7. (8) Sides of the frons near the base of the antennæ bare and shining; third antennal joint longer than the second and attenuated towards the end 3. *Adapsilia scutellatu*, [Hend.]
8. (7) Sides of the frons near the base of the antennæ dull and clothed with rather numerous short hairs; third antennal joint as long as the second, and not attenuated at end, equally broad through its whole length 4. *Adapsilia opaca*, sp. n.
9. (4) Anal vein complete; second vein always with a very long stump; bristles and hairs wholly yellow, the macrochaetae of the head very short and thin; ovipositor almost bare; scutellum bare, with 4-6 rather thin bristles; species of greater size, at least 11 mm. long.
10. (11) Frons narrow, not broader than an eye at the base; jowls as broad as the third antennal joint; peristoma much shorter than the vertical diameter of the eye; front femora below with only a few thin bristles; body entirely of a pale yellow colour; wings wholly hyaline 5. *Adapsilia angustifrons*, [sp. n.]
11. (10) Frons very broad, twice as broad as the eye at the base; jowls above almost twice as broad as the third antennal joint; peristoma at least as broad as half the vertical diameter of the eye; front femora externally with a row of rather strong bristles; thorax and abdomen partly black; wings partly infuscated 6. *Adapsilia nocturna*, [sp. n.]
12. (3) Third longitudinal vein ending before the apex of the wing; ovipositor below toward the base with a strong tubercle; antennæ proportionately very short; no stump on the second longitudinal vein; wings spotted; body entirely clothed with long and dense hairs 7. *Tylotrypes immsi*, [sp. n.]

1. *Apyrgota pictiventris*, Hend., 1913.

This species is described after a single female specimen in the British Museum taken by Green at Ceylon. There are in the Indian Museum two ♀ specimens from Katihar, Purneah Distr., N. Bengal, 26. iii. 1909, $\frac{9586}{15}$ and $\frac{9587}{16}$ (*C. Paiva*), and an additional female specimen from Siliguri, base of E. Himalayas, Darjiling Distr., 28. iii. 1910, $\frac{6030}{16}$, caught at light (*Annandale*).

These specimens agree very well with Hendel's description, and no doubt belong to the same species, which is very distinct; also by the coloration of body. The ovipositor is only slightly hairy.

This species shows much resemblance with *Eumorphomyra tripunctata*, Dol., from Java, chiefly in the shape of head, in the position of the hind cross-vein, and in the armed femora; but the small cross-vein is placed much after the end of the auxiliary vein.

2. *Adapsilia magnicornis*, Hend., 1913, var. *amplipennis*, n. var.

The species is described from some specimens of both sexes in the British Museum collected by Green at Pundaluoya, Ceylon. There is in the Indian Museum a single female specimen from Yunnan, W. China, between Tengyueh and Tali Fu, x. 1909, $\frac{6103}{16}$ (*J. C. Brown*), which I refer with doubt to this species, describing it as a variety, which may be later recognized as a distinct species.

It is of greater size, measuring 8 mm. in length, the wing being 7.5 mm. long. The third antennal joint is distinctly longer than the second and exactly shaped as in the following species. Mesopleura showing a brown band along the fore border like the following. The wing is 3 mm. broad, and has the stump on the second longitudinal vein as in the following; the hind cross-vein is placed obliquely, the inferior angle of the discal cell being therefore acute, as in the preceding species.

3. *Adapsilia scutellata*, Hend., 1913.

Described from a single female in the British Museum from the N.W. Provinces, India. There are in the Indian Museum some specimens of both sexes from Katihar, Purneah Distr., N. Bengal, 18. iii. 1909, 15-16. v. 1910, 4-5. x. 1908, $\frac{9589}{15}$, $\frac{9585}{15}$, $\frac{8801}{15}$, $\frac{8802}{15}$, $\frac{8803}{15}$, $\frac{6057}{16}$ (*C. Paiva*).

They agree very well with Prof. Hendl's good description. The back of the thorax shows a more or less distinct brown pattern, like that of the preceding species.

The undescribed ♂ is very like the ♀; the abdomen is of a reddish-brown colour on the sides; the genitalia are rounded, yellow, with a prominent strong spine forwards.

The wing of this species is only 2.4 mm. broad; the body of the male measures only 6 mm. in length.

4. *Adapsilia opaca*, sp. n., ♀.

Length of body 6 mm., of a wing 5.5 mm.; breadth of a wing 2.1 mm.

Type in the Indian Museum: a single specimen from Kangra Valley, 4500 ft., Sikkim, $\frac{9590}{15}$ (*Dudgeon*).

Nearly allied to the preceding species, but separated by the shape of the third antennal joint and by the dull anterolateral portion of the frons.

Head entirely of a pale yellow colour, whitish below on the sides of occiput and on the face; a black stripe on each side on the lower edge of each antennal groove; frontal stripe brown; the whole of the head is dull, excepting the face, which is very shining. Antennæ wholly reddish yellow, proportionally short, the third joint being as long as the second, not attenuated towards the end, wholly rectangular; arista bare. Proboscis and palpi yellow, these last long and broad, black pilose. Frons with parallel sides, as broad as the eye, flat, not prominent at the vertex; frontal stripe clothed with short black hairs, which extend also on the sides near the base of the antennæ. The macrochætæ are black and strong; a frontorbital on each side; the inner verticals are very long, the outer short; the ocellars are robust, the postverticals very distinct.

Thorax yellow, but viewed from before it appears to be covered on the back by a white dust; there are on the back four brown stripes, the middle ones approached and extended to the neck, the outer broader but abbreviated before and interrupted on the suture; pleuræ pale yellow, with a brown vertical stripe on the fore part of mesopleura extending to the sternopleura, which is entirely brown; a small brown spot on the pteropleura and on the hypopleura. The back is clothed by short and dense black hairs, which on the pleuræ become longer; the macrochætæ are black and strong.

Scutellum entirely pale yellow, clothed with black hairs and provided with four long bristles on the border. Meso-

phragma dark brown. Squamulae whitish; halteres pale yellow, with a reddish knob.

Abdomen dark yellow, with black hairs, the segments after the first being dark brown; the ovipositor is a little longer than the abdomen, dark brown towards the base, yellow in the middle and at end, clothed with rather thick black hairs; it bears at end a strong hook.

Legs pale yellow, with brownish tibiae and tarsi; femora short pilose, without bristles below.

Wings greyish hyaline, with a less distinct fuscous pattern, consisting of a dark border on the hind cross-vein and of a dark spot at end of the second longitudinal vein; costa extending to the fourth vein, but very thin after the third; third vein straight and ending a little before apex of the wing; hind cross-vein very long, much longer than its distance from the small cross-vein, a little sinuous, less oblique, the inferior angle of discal cell acute; anal vein short, reaching the hind border with a spurious continuation.

5. *Adapsilia angustifrons*, sp. n., ♀.

Length of body (with the ovipositor) 11–11.5 mm., of a wing 12–12.5 mm.; breadth of a wing 5–5.1 mm.

Type in the British Museum, and an additional specimen in my collection from Kumaon, near Bhowali, 5700 ft., 14th June and 2nd July, 1910, collected at light by Prof. A. D. Imms.

Very nearly allied to the Japanese *Ad. flavopilosa*, Hend., but smaller and easily distinct by the much narrower frons and peristoma. It is entirely of a pale yellow colour, with all the bristles and hairs of body and legs, without any exception, yellow.

Frontal stripe with parallel sides, dull, of a dark reddish colour, brownish near the upper corner of the eyes; occiput greyish-dusted, dullish, with a brown transverse stripe above near the vertex and two faintly distinct and narrow reddish stripes in the middle, one on each side; sides of frons, jowls, and face very glittering; peristoma opaque; a shining black spot on the inferior edge of the antennal grooves, continued as a narrow line to the mouth-edge; a shining black stripe on the peristoma below the eyes. Vertex less prominent, but the frons hollowed before it; the frons at the base is not broader than an eye, and viewed from the side it appears to be very produced at the base of the antennae, being almost as broad as the eye; the face is therefore

distinctly retreating, the antennal grooves ending at some distance above the mouth-edge; the jowls below and the peristoma are comparatively narrow, about half as broad as in the figure of *luteola* by Hendl (p. 84, fig. 2). The antennæ are comparatively short, wholly yellow, the third joint as long as the second and bearing a bare arista inserted towards its middle. The macrochætæ are very thin and short; the frons bears only a few short hairs. Palpi long, but not broad, yellow, and yellow-haired; proboscis yellow.

Thorax and scutellum entirely of a pale yellow colour, without any dark spot on the pleuræ or on the mesophragma; the hairs on the back and on the sides and the very thin macrochætæ are yellow. Scutellum bare, with six marginal macrochætæ. Squamulæ and halteres yellow.

Abdomen yellow, but dorsally more darkened than the thorax; first segment cylindrical, a little constricted towards the middle, almost twice as long as the following segments together; ovipositor yellow, very strongly shining, with a few short hairs, arched ventrally, as long as the abdomen, 3.2 mm.

Legs with the coxæ entirely of a pale yellow colour; they are clothed with short hairs and lack all the longer bristles; front femora below with two rows of short bristly hairs, which are of a rather dark colour; on the dorsal surface they are very short, pilose. In the allied Indian species, *vulpina*, Hendl., the legs are much more pilose.

Wings very broad and long, greyish hyaline, without any distinct pattern or any infuscation on the cross-veins; the veins are yellow; stump of the second longitudinal vein very long; third vein ending exactly at the apex of the wing, the distance of the second vein from it being only a little greater than that of the fourth; costa very thin after the third vein; hind cross-vein as long as its distance from the small one, wholly straight; inferior angle of discal cell less acute; anal vein extended to the hind border.

6. *Adapsilia nocturna*, sp. n., ♂.

Length of body 12 mm., of a wing 13 mm.; breadth of a wing 4.5 mm.

Type in the British Museum; a single specimen from Kumaon, near Bhowali, 5700 ft., 18th June, 1910, caught at light (*Prof. A. D. Imms*).

The present species seems to be allied to *armipes*, Hendl., from Sikkim, which, however, is black-haired and has black

bristles, and the femora much more hairy and armed below. It differs from the preceding in the colour of body, in the shape of head, and in the more narrow and variegated wings.

Head yellow, opaque on the frons and on the occiput, shining on the jowls and on the face; frons very broad, twice as broad as the eye; frontal stripe reddish brown, but yellow at the base and towards the sides; occiput grey-dusted, adorned with three brown stripes, forming a triangle; the black streak at end of the antennal groove is less distinct and the vertical black stripe below the eye is also less developed; vertex prominent, the frons very hollowed before it and produced on the sides in a circle around each eye; peristoma as broad as half the vertical diameter of eye; antennal grooves not reaching the mouth-edge. Antennæ entirely yellow, rather short, the third joint as long as the second, with a bare arista. Palpi and proboscis yellow and yellow-haired; the short and thin bristles and the few hairs of the frons are yellow.

Thorax on the back with four very broad and confluent dull black stripes, the laterals abbreviated before, thus allowing only the sides and the shoulders more broadly yellow, the suture and the notopleural line being black; pleuræ black, with broad yellow spots on mesopleura, on sternopleura above, and on hypopleura; propleura also yellow; mesophragma black; all the hairs black, those on the back very short; the macrochætæ are thin and of a dark yellow colour. Scutellum pale yellow, bare, with six marginal macrochætæ. Squamulæ and halteres yellow.

Abdomen black, with yellow hind borders to the segments; hairs and bristles yellow; first segment as long as the three following together, cylindrical, restricted towards the middle; fourth segment as long as the second and third together, more broadly yellow; genitalia with a broad prominent lamella below, of a light yellow colour.

Legs dark yellow, but the middle and hind femora much darkened, almost blackish; the external row on the ventral side of front femora is formed by rather strong but short black spines; the other hairs and bristles are all short and yellow.

Wings grey-yellowish, with less developed but distinct dark patches near the small cross-vein and at end of the fourth longitudinal vein; nervation like that of preceding species, but the hind cross-vein a little shorter than its distance from the small cross-vein; the common base of fourth and fifth longitudinal veins is much thickened and callose, unusually broad, and of a blackish colour.

TYLOTRYPES, gen. nov.

This new genus is distinguished from all the others on account of the third longitudinal vein ending some distance before the apex of the wing; in this character it agrees with *Diasteneura*, Hend., from which it is separated by the very different shape of head and antennæ. There is some resemblance with the Ethiopian genus *Tephritopyrgota*, Hend., chiefly on account of the wing-pattern.

Head as broad as thorax; frons flattened, $1\frac{1}{2}$ times as broad as eye; vertex very slightly prominent; jowls very narrow, less prominent above; peristoma narrow, not more than $\frac{1}{5}$ the vertical diameter of the eye; antennal grooves very short, hardly any longer than half the length of the face; ocelli wanting; eyes broadly oval, less than $1\frac{1}{2}$ as long as broad, with the anterior areolets distinctly dilated. Antennæ very short, not surpassing the half of the face; third joint as long as the second, oval, with a bare arista inserted basally; palpi rather long, but not dilated; proboscis small. Macrochætæ rather long and strong—a pair of ocellar, a pair of divergent postvertical, two pairs of vertical (the outer much weaker), a single pair of rather weak orbital.

Thorax as broad as long, convex, clothed with long and dense hairs; macrochætæ rather long and strong; a humeral, three notopleural (2:1), a præsutural, three supra-alar; a pair of dorso-central and a pair of præscutellar, both rather weak and less distinct between the long hairs; the pleural macrochætæ are not distinct between the hairs, only the posterior sternopleural being long and prominent. Scutellum rather convex, distinctly bilobate at end, clothed with thick hairs, even longer than those of the thorax, and bearing only a pair of apical macrochætæ, which are long and diverging.

Abdomen short and broad; first segment narrowed at base and strongly dilated in the distal half, the abdomen being therefore stalked; the segments bear on the sides below some rather long and strong bristles. Ovipositor exceedingly strong and thick, clothed with long and dense hairs; it is longer than the abdomen, and bears at base below a very large prominent tubercle, directed forwards.

Legs rather short and strong, with somewhat thickened femora; the femora are clothed with long hairs, those of the front pair showing below a complete row of very long but thin bristles; coxæ with long bristles.

Wings rather small, proportionally short and narrow; second and third longitudinal veins straight and parallel, the

third ending at a rather long distance before the tip; costa ending a little after the end of the third vein, but prolonged very thin to the end of the fourth; the distance between the ends of the second and third veins is not greater than that between the ends of the third and of the fourth; small cross-vein placed on the middle of the wing, a little beyond the end of the first vein; hind cross-vein as long as its distance from the small one, a little arched outwards, its inferior angle almost right; anal vein prolonged to the hind border, but very thin after the middle; lower angle of anal cell very short, almost not drawn out.

Type, *Tylotrypes immsi*, sp. n.

7. *Tylotrypes immsi*, sp. n., ♀.

Length of body (with the ovipositor) 15 mm., length of wing 9.2 mm.; breadth of wing 3.5 mm.

Type in the British Museum, a single female specimen from near Bhowali, Kumaon, 5700 ft., 21st June, 1910, collected by Prof. A. D. Imms, in whose honour the species is named.

A strong, very hairy species of great size; body dark brown, with partly yellow head, legs, and ovipositor; all the bristles and the hairs, these last very thick and long, are black.

Frontal stripe of a reddish-brown colour, yellowish before the vertex, blackish on the sides and above the base of antennæ, clothed with numerous but not long hairs; jowls and occiput greyish yellow, this last with five black spots along the upper border; antennal grooves shining dark yellow, with a dull black stripe below, but the whole of the head is opaque; palpi and proboscis dark yellow, the first with short black bristles. Antennæ entirely yellow, the arista almost whitish.

Thorax and scutellum of a shining dark brown colour, only the humeral spots being paler yellow; they are clothed with very long and thick erect black hairs, which before scutellum and on the pleuræ are longer. Squamulæ whitish; halteres yellow.

Abdomen blackish brown, clothed with dense but rather short hairs; ovipositor of a shining reddish-yellow colour.

Legs brown, the femora above and the tarsi paler yellow.

Wings greyish yellow, with a not sharply defined pattern, consisting of a dark spot extending from the base of the third

vein to the small cross-vein, including a large hyaline spot in the submarginal and in the first basal cell; a brown patch at ends of second and third veins, including two hyaline spots, one after the other, in the apical part of the submarginal cell; the hind cross-vein is besides margined with fuscous; small cross-vein with a broad brown border; there is also a brown shade outwards of basal and anal cross-vein.

NOTE.

Trypeta (*Acinia*) *ferruginea*, Walker ('*Insecta Saundersiana*,' iv. 1853, p. 387), described from the East Indies, belongs to the Pyrgotinae, according to a notice sent me by Dr. Speiser, who has seen the type at the British Museum. The wing-pattern is very different from that of any other at present known Indian species, and approaches that of the Ethiopian *Tephritopyrgotæ* or the Australian *Epicerellæ*.

XXIII.—On *Stenopylis*, a proposed new Genus of Endodontidæ. By HUGH C. FULTON.

THIS new genus is proposed for three closely allied species which have been referred to several genera; the comparatively large *Brazieria*, Ancey, has a similar-shaped peristome, and the many-whorled *Microphyura*, Ancey, is somewhat similar in form, but neither has the internal processes of *Stenopylis*.

STENOPYLIS, gen. nov.

Shell minute, planorboid; umbilicus broad; whorls $3\frac{1}{2}$, apparently smooth, but with microscopic spiral incised lines on the underside of shell; aperture constricted; peristome continuous, thickened, and almost free, bent inwards near the middle of the columellar margin; *parietal wall with two spiral laminae*.

Type, *S. hemiclausa*, Tate.

No. 1. *Stenopylis hemiclausa*, Tate. Central Australia.

1894. *Planispira hemiclausa*, Tate, Trans. Roy. Soc. S. Aust. vol. xviii. p. 192.

1896. *Microphyura hemiclausa*, Tate, Horn Exped. (Mollusca) p. 185, pl. xvii. fig. 1.

Tate's figure, perhaps, rather exaggerates the prominence of the spiral incised lines; they are only just discernible under the microscope. The description makes no mention of the internal spiral laminae. Specimens examined by me were part of those collected by the Horn Expedition.

No. 2. *Stenopylis coarctata*, Mölldff. Masbate, Bohol,
and Panglao Islands.

1894. *Plectopylis coarctata*, Mölldff. Nachr. d. d. Malak. Ges. p. 113; Tryon's Man. of Conch. (series ii.) vol. ix. p. 146.

1897. *Brazieria coarctata*, Mölldff. Abhand. d. Naturf. Ges. Görlitz, p. 123.

1897. *Brazieria coarctata*, v. *majuscula*, Mölldff. Abhand. d. Naturf. Ges. Görlitz, p. 123.

In this species the laminae are reduced to two small nodules. Specimens received from Quadras of *coarctata* from Panglao Island and of *coarctata*, var. *majuscula*, from Masbate Island show no appreciable difference in size or otherwise. I have not been able to find any description of the v. *majuscula*.

No. 3. *Stenopylis microdiscus*, Bavay. Humboldt Bay,
New Guinea.

1908. *Helix (Polygyra) microdiscus*, Bavay, Moll. terr. et fluv., Résultats de l'Expéd. Sc. Néerland. à la Nouv. Guinée, v., Zool. p. 283, pl. xiv. figs. 10 a-d.

A co-type in the collection of Prof. Bavay has $3\frac{1}{2}$ whorls, thus agreeing with the description quoted above, but the figure given has $4\frac{1}{2}$ whorls. If Prof. Bavay's specimen agrees with the type, *microdiscus* is not, in my opinion, separable from *hemiciclusa*.

The wide geographical range of the foregoing species has been suggested as a difficulty in placing them together in one genus, but to me, judging by their shells only, it seems highly improbable that such closely allied forms can belong to different genera.

I am indebted to J. H. Ponsonby, Esq., for valuable suggestions, and also to Prof. Bavay for allowing me to examine his specimen of *S. microdiscus*.

XXIV.—On a few undescribed Cicadidæ from California.

By W. L. DISTANT.

My friend Mr. E. P. van Duzee has sent me some specimens of the genus *Okanagana* for examination with some other already described but rare species of Nearctic genera. Three species require description and a new genus to be proposed for a species described by the late Prof. Uhler.

Okanagana vanduzeei, sp. n.

Body black; ocelli, narrow posterior margin to the pronotum, centre and angles to the cruciform elevation and two small spots in front of same on the mesonotum, base of rostrum, lateral and posterior margins to face, margins of clypeus, coxæ (excluding central spots), apices and longitudinal streaks to femora, tibiæ (excluding longitudinal black streaks), opercula (excluding central black spots), and posterior abdominal segmental margins, beneath, ochraceous or pale sanguineous; tegmina and wings hyaline, the venation mostly black; tegmina with the costal membrane ochraceous, its margins black, basal cell ochraceous more or less suffused with black, base of clavus black, inner basal area pale sanguineous; wings with the extreme base ochraceous, followed by a narrow blackish suffusion, base of abdominal area pale sanguineous, narrowly margined with black; exposed tympanal cavities creamy white; body more or less, especially beneath, palely pilose; head with the front moderately conical, centrally longitudinally, linearly, ochraceously impressed, vertex sulcate between ocelli; pronotum with a deep black central fascia, widened anteriorly and more so posteriorly, and anteriorly longitudinally sulcate; face centrally sulcate; rostrum slightly passing the anterior coxæ; legs longly hirsute, subspinulose; opercula in ♂ reaching the basal abdominal margin, longer than broad, apically inwardly directed; tegmina broad, about two and a half times as long as broad.

Long., excl. tegm., ♂, 20–22 mm.; exp. tegm. 52–58 mm.

Hab. California; San Diego County (*E. P. van Duzee*, type Brit. Mus.).

Var. *consobrina*.

Differing from typical *O. vanduzeei* in the following

characters:—The two small pale spots in front of the cruciform elevation are larger and appear as the apices of two ill-defined obconical spots to the mesonotum, the lateral abdominal margins beneath are almost entirely ochraceous, the venation to the basal areas of both tegmina and wings is ochraceous; structural characters as in *O. vanduzeei*, and the specimens are received from the same locality as that from which the typical species was derived.

Okanagana californica, sp. n.

♂. Body above black; a spot at apex of head, a lateral spot above the insertion of the antennæ and another between the ocelli, lateral and posterior margins and a central linear spot to pronotum, a lateral spot at each basal angle, the apices of two indistinct central obconical spots united to a spot at each anterior angle of the cruciform elevation to the mesonotum, and the cruciform elevation itself ochraceous; body beneath and legs ochraceous; face (excluding two central spots and lateral margins), clypeus and space between face and eyes, rostrum (excluding base), apices of femora and bases of tibiæ, and sternal spots black; tegmina and wings hyaline, the venation mostly ochraceous; tegmina with the costal membrane ochraceous, its inner margin black, post-costal membrane black, basal cell ochraceous, extreme base pale sanguineous with an anterior black spot; wings with the extreme base and base of abdominal area pale sanguineous, both followed by a slight and narrow blackish suffusion; body finely greyish pilose; head sulcate between the ocelli; opercula in ♂ longer than broad, their apices widened and inwardly directed; rostrum reaching the intermediate coxæ.

♀. With a subapical transverse ochraceous fascia to the abdomen above.

Long., excl. tegm., ♂ 18, ♀ 16 mm.; exp. tegm., ♂ 51, ♀ 48 mm.

Hab. California; San Diego County (*E. P. van Duzee*, type ♂ Brit. Mus.).

TIBICINOIDES, gen. nov.

Head (including eyes) considerably narrower than base of mesonotum and almost equal to its length (including cruciform elevation), front shorter than vertex, which is centrally sulcate; pronotum longer than head, its lateral margins

sinuate, its posterior angles dilated; mesonotum (including the cruciform elevation) almost as long as head and pronotum together; abdomen longer than space between apex of head and base of cruciform elevation; tympana completely exposed, coverings entirely absent; face more or less centrally sulcate; rostrum reaching the intermediate coxæ; opercula small, transverse; abdomen beneath with the lateral margins broadly recurved; tegmina and wings semiopaque; tegmina with the basal cell about twice as long as broad; apical areas short in length, eight in number, a curved rudimentary vein, curved inwardly, crossing tegmen from base of first ulnar area to base of lower apical area; posterior tibiæ with a few fine spines.

Type, *T. cupreosparsa*, Uhler (*Tibicen*).

XXV.—*Some Cretaceous and Tertiary Cirripedes referred to Pollicipes.* By THOMAS H. WITHERS, F.G.S.

[Plates VII. & VIII.]

THE Cirripedes discussed in this paper include certain sessile forms belonging to the family Brachylepadidæ and a number of pedunculate forms of the family Pollicipedidæ. For the sake of convenience, they are dealt with in the following order:—(1) the species herein referred to the genus *Brachylepas*; (2) a group of species now included in a new genus *Pycnolepas*; and (3) certain species that can now be proved to belong to the more primitive forms of *Scalpellum* (*sensu lato*) included in the subgenus *Scillælepas* of the genus *Calantica*. All these have been hitherto referred to *Pollicipes*.

Darwin, in his Monograph on the fossil pedunculate Cirripedes, distinguished the whole of the described species as either *Pollicipes* or *Scalpellum*, and determined certain characters by which one could distinguish the separate valves of the species belonging to those two genera. Except for the more advanced forms of *Scalpellum* (*sensu lato*), these distinctions can no longer be followed, and as our knowledge of the fossil pedunculate forms increases, it becomes more evident that the reference of many of these to the genus *Pollicipes* can not be maintained; indeed, it will probably be found eventually that very few really belong to that genus.

All the fossil species in which the valves are not modified to the extent obtaining in those of *Scalpellum* were included by Darwin in *Pollicipes*; but it is evident now that some of these are really primitive forms of *Scalpellum* (*sensu lato*), and that others belong to forms quite distinct from *Pollicipes*.

If we consider that *Pollicipes* or a *Pollicipes*-like Cirripede was the ancestral type which gave rise to the various forms of pedunculate Cirripedes and to certain sessile forms, we are not at all surprised to find in the Cretaceous rocks a group of species, which, while in some instances retaining the *Pollicipes* type of valve, were modified in respect to the number, relative position, and structure of the valves of the capitulum. Such forms as the pedunculate Cirripedes *Zeugmatolepas**, *Calantica* (*Scillelepas* and *Titanolepas**), and *Pycnolepas*, gen. nov., and the sessile Cirripede *Brachylepas*, illustrate this point.

All of these possess valves which, if found separately, would unhesitatingly be referred to either *Pollicipes* or *Scalpellum* (*sensu lato*), and, indeed, such has always been the case. *Zeugmatolepas* and *Titanolepas*, however, possess valves which, if found singly, would have been referred some to *Pollicipes* and others to *Scalpellum*.

Hence, until we can piece together the whole or the greater part of the capitulum in certain of the less modified species, it is obvious that no true idea of their affinities can be attained. It is in this direction that future work must lie, and much work is necessary before the phylogeny of the group can be studied with advantage.

The purpose of this paper is to discuss certain of these forms from this standpoint, with a view to indicating their phylogenetic position.

Family *Brachylepadidæ*.

Sessile barnacles in which the shell is composed of an upper whorl of 8 valves, namely, a widely semiconical carina, paired scuta, paired long and narrow upper latera, and a rostrum almost equalling the carina in size, with four whorls of subtriangular imbricating plates encircling the bases of the valves of the upper whorl. Basis probably membranous.

The family consists of the single genus *Brachylepas*.

* Withers, T. H., Proc. Zool. Soc. London, 1913, pp. 938, 943.

GENUS BRACHYLEPAS, II. Woodward.

1901. *Brachylepas*, II. Woodward, Geol. Mag. dec. iv. vol. viii. p. 150.

Genotype. *Brachylepas naissantii*, Hébert, sp.

The genus *Brachylepas* and the family Brachylepadidæ were founded to embrace the single species *Pyrgoma cretacea* from the *B. mucronata*-zone of Norwich, and subsequently (1906, Geol. Mag. dec. v. vol. iii. pp. 339-340) Dr. Woodward referred to *Brachylepas* the species *Mitella lithotryoides*, Bosquet, from the Maestrichtian of Holland, and *Pollicipes fallax*, Darwin, from the Upper Senonian, *B. mucronata*-zone of Norwich. A recent paper (Withers, 1912, Geol. Mag. dec. v. vol. ix. p. 321) proved the identity of *Brachylepas cretacea* with the valve figured by Ed. Hébert (1855, Mém. Soc. géol. France, ser. 2, vol. v. p. 374, pl. xxix. fig. 10) as *Emarginula* (?) *naissantii*, whence the name of the genotype became *Brachylepas naissantii*, Hébert, sp. The type-species was fully discussed and a restoration given (reproduced, text-figure 5, p. 201).

Now that we know the form, number, and disposition of the valves comprising the capitulum of *B. naissantii*, we can discuss the species *Mitella lithotryoides* and *Pollicipes fallax*. The last-named species is dealt with under the new genus *Pycnolepas* (see p. 175).

Brachylepas lithotryoides, Bosquet, sp.

1857. *Mitella lithotryoides*, J. Bosquet, Notice sur quelques Cirripèdes récemment découverts dans le Terrain Crétacé du Duché de Limbourg, p. 23, pl. iii. figs. 5-10.

1857. *Mitella fallax*, Darwin, sp., *tom. cit.* p. 21, pl. ii. figs. 8-12, pl. iii. figs. 1, 2.

1906. *Brachylepas lithotryoides*, Bosquet, sp.; H. Woodward, "Cirripedes from the Trimmingham Chalk and other localities in Norfolk," Geol. Mag. dec. v. vol. iii. p. 339, figs. 1-4.

Of *Mitella lithotryoides* Bosquet figured carinæ, a scutum, upper latus, rostrum, and a subrostrum. The subrostrum and one of the carinæ have at the base at least two whorls of imbricating plates, of which some show exteriorly a median basal notch, just as in *B. naissantii*. The so-called subrostrum is evidently a rostrum, for it is wider in proportion to its length than the carina, and, like the carina, has a series of imbricating plates at its base; it therefore could not have served as a subrostrum. Although the presence of a median basal notch in some of the imbricating plates

shown in Bosquet's figures renders it very probable that the plates were attached precisely as in *B. naissantii*, one cannot, in the absence of the original specimens, say definitely that this is the case. The scutum, and the upper latus especially—if, indeed, it be an upper latus,—depart widely from the type of valve seen in *B. naissantii*, but I am not at all convinced that they belong to *B. lithotryoides*. Since it is likely, however, that the carina and rostrum (=Bosquet's subrostrum) with the imbricating plates at the base combined to build up a shell in the same way as in *B. naissantii*, the species may be left, at any rate provisionally, in the genus *Brachylepas*.

Type. I have so far been unsuccessful in tracing the type-specimens of this species. Prof. K. Martin, in answer to an enquiry, says that they are not in the Geological Museum of the University of Leyden, and Prof. Eugène Dubois informs us that they are not in Teylers Stichting, Haarlem. I select the original of Bosquet's figure 6 a-c, a carina, as the holotype.

Distribution. Maestrichtian: between Vilt and Sibbe, Nédercanne, Bémelen, Geulhem, and at St. Pierre, Duchy of Limbourg, Holland.

Measurements. The carina figured by Bosquet (pl. iii. fig. 6 a-d) appears to be the largest known valve, and the length of this is given as 13 mm., which apparently includes the imbricating plates at the base.

Family Pollicipedidæ.

PYCNOLEPAS †, gen. nov.

Pollicipeds in which the capitulum is composed of a single whorl of 8 valves, namely, a long and narrow carina, paired scuta, paired upper latera which are long and narrow and overlap the scuta and terga on either side, paired terga, and a rostrum nearly as large as the carina. Peduncular plates large.

Genotype. *Pollicipes rigidus*, J. de C. Sowerby.

Pycnolepas rigidus, J. de C. Sowerby, sp.
(Pl. VII. figs. 15-19; Pl. VIII. figs. 1-4.)

1836. *Pollicipes rigidus*, J. de C. Sowerby, Trans. Geol. Soc. 2nd ser. vol. iv. p. 335, pl. xi. fig. 6*.

† πικνός = compact.

1851. *Pollicipes rigidus*, J. de C. Sowerby; C. R. Darwin, Pal. Soc. Monogr. Foss. Lepadidæ, p. 73, pl. iv. fig. 7.
1854. *Pollicipes rigidus*, J. de C. Sowerby; C. R. Darwin, Ray Soc. Monogr. Subclass Cirripedia, Balanidæ, Synop. et Index Systematicus, p. 638.
1854. *Pollicipes rigidus*, J. de C. Sowerby; J. Morris, Cat. Brit. Foss. 2nd ed. p. 96.
1865. *Pollicipes rigidus*, J. de C. Sowerby; J. W. Salter and H. Woodward, Cat. and Chart Foss. Crustacea, p. 27, pl. i. fig. 5.
1877. *Pollicipes rigidus*, J. de C. Sowerby; H. Woodward, Brit. Mus. Cat. Brit. Foss. Crustacea, p. 149.

Diagnosis. Capitular valves transversely ridged and generally longitudinally ridged. Scuta elongately triangular, with the basi-lateral portion produced and a narrow wall-sided ridge curving from the apex to the basi-lateral angle. Terga with the apical portion much curved towards the scuta, and a ridge like that of the scuta curving from the apex to the basal angle. Peduncular plates with an inwardly projecting basal ledge, the inner extremity of which is furnished with a median socket; externally these plates are irregularly ridged longitudinally and transversely.

Distribution. Albian, Gault: Folkestone and Maidstone, Kent; Eastweare Bay, Sussex; Eclaron (Haute-Marne), France. Cenomanian, Cambridge Greensand, near Cambridge. Chalk Marl, near Cambridge.

Type. J. de C. Sowerby founded this species on a scutum and two imperfect carinæ from the Gault of Folkestone, but I do not know what has become of the specimens. I select the scutum as the holotype of the species. Of the three valves figured by Darwin (1851) from the Gault of Folkestone, two, the carina and scutum, are in the Geological Department of the British Museum, registered respectively I. 13643 and I. 13644.

Material. *Pollicipes rigidus* has hitherto been recorded only from the Gault (Albian), at which horizon it is comparatively common, especially at Folkestone. There is in the Geological Department of the British Museum, registered I. 13670, a single scutum from the Gault of Eclaron (Haute-Marne), France; and I have two carinæ from the Cambridge Greensand, as well as some valves from the Chalk Marl (Cenomanian) of Cambridge.

Up to the present only the scutum, tergum, and carina have been described, but we are now able to add considerably to our knowledge of the species by the discovery in the Gault of Folkestone of a rostrum, an upper latus, and 15 plates of the peduncle. A single upper latus (Pl. VII. fig. 17)

and 6 peduncular plates (three figured, Pl. VIII. figs. 1-3), together with a scutum (Pl. VII. fig. 16), were found embedded in a small piece of clay measuring barely 1 cubic inch, and may therefore belong to the same individual. This might also be the case with the rostrum (Pl. VII. fig. 15) and 8 peduncular plates, which were found together in a similar piece of clay. The remaining single peduncular plate was found together with a carina.

It is a very significant fact that these peduncular plates were found on three different occasions, and in association with the other valves of *P. rigidus*, for if there had been a lower series of valves to the capitulum of this species it is extremely unlikely that one would find 15 peduncular plates and not a single example of a valve of a lower whorl. We are therefore led to the conclusion that there was no lower whorl, and that the capitulum of *P. rigidus* was formed of a single whorl of 8 valves.

Measurements. The valves here figured from the Gault of Folkestone measure respectively:—

	Length. mm.	Breadth. mm.
Rostrum	8·9	5·7
Scutum.....	13·0	5·8
Upper latus	5·8	2·7
Tergum.....	11·1	6·7
Carina	14·6	5·6
Peduncular plate (Pl. VIII. fig. 1) ..	1·5	2·4

A further peduncular plate has a length of 1·8 mm. and a breadth of 3·2 mm. Much larger valves are known from the Gault of Folkestone than any of the above, and in the British Museum are four valves with measurements:—

	Length. mm.	Breadth. mm.
Rostrum. I. 13631	15·0	8·8
Scutum. I. 13488	15·2	7·8
Tergum. I. 13486	19·4	10·6
Carina. I. 13639	19·3	7·1

In the Museum of Practical Geology (no. 26854) there is a scutum measuring 18·4 mm. in length and 7·5 mm. in breadth, and this is the largest scutum seen by me.

The valves from the Chalk Marl of Cambridge are rather small, the largest, a scutum (Pl. VIII. fig. 4), being 4·8 mm. long and 2·1 mm. broad.

Description of valves. All the valves of this species are conspicuously marked on their outer surface with sharp, narrow, steep-sided, prominent ridges parallel to the growth-lines, and each of these ridges appears to have been formed at the completion of each period of growth. In some of the specimens from the Albian (Gault) the spaces between the ridges are smooth, and in others they are plainly marked with longitudinal ridges; but, since all the specimens seen from the Cenomanian (Chalk Marl) have longitudinal ridges and the ornament altogether is more pronounced, it seems as if the valves from the Gault with smooth interspaces came from a lower horizon than those with ridged interspaces. All the valves from the Chalk Marl are very much smaller than the valves from the Gault. The following descriptions are based on valves from the Gault of Folkestone, but any distinctive features shown by the valves from the Chalk Marl are pointed out where considered necessary.

Carina (Pl. VII. fig. 19) semicylindrical, widening gradually from the apex to the basal margin, moderately bowed inwards, strongly convex transversely, not carinate, basal margin slightly concave in the middle. Outer surface ornamented with a number of irregularly spaced, raised, and somewhat undulating ridges, which on the extremely narrow parietes are obliquely upturned; in some specimens the spaces between these ridges are smooth, but in others, especially in those from the Chalk Marl, they are plainly marked with longitudinal ridges. The apical half of the valve projected freely, and on the inner surface this part of the valve is marked with growth-lines which extend from the basal angles and meet in an acutely rounded angle on a slight but well-marked median ridge.

Rostrum (Pl. VII. fig. 15) semiconical, smaller and proportionally wider than the carina, widening rapidly from the apex to the basal margin, considerably bowed inwards, strongly convex transversely, basal margin concave. Outer surface ornamented similarly to the carina. The apical half projected freely, and on the inner surface this part is marked with growth-lines which extend from the basal angles and meet below the apex in a wide flatly rounded angle.

Scutum (Pl. VII. fig. 16; Pl. VIII. fig. 4) elongately triangular, with the basi-lateral portion produced, strongly convex transversely, especially in its apical portion, apex acuminate and strongly curved towards the terga; occludent margin strongly convex; basal margin about half the length of the occludent margin, and making with it an angle con-

siderably above a right angle; tergo-lateral margin concave in its upper part, the lower part being rounded and protuberant. Basi-lateral angle somewhat acute, with a slight, narrow, square-edged extension formed by the projection of the ridge extending from the apex to this point; this projection is extremely prominent in the scuta from the Chalk Marl (Pl. VIII. fig. 4). The apico-basal ridge is very conspicuous, being formed of a single ridge in the Gault valves and of two ridges in the Chalk Marl valves, and extends in a strongly curved line from the apex about midway between the outer margins; it is narrow, being usually about half the width of a zone of growth, and has perpendicular sides, or is, as Darwin said, wall-sided; where the transverse ridges cross this ridge it is produced into slight prominences, varying in prominence in different specimens; but in those from the Chalk Marl the ridge is produced into sharp points. A slight ridge extends from the apex near and parallel to the upper part of the tergo-lateral margin, and from this ridge the valve is inwardly rounded. Some valves are ridged longitudinally, and others not, but all those from the Chalk Marl are strongly ridged longitudinally between the transverse ridges. On the inner surface the occludent edge is broad and flat, is widest adjoining the top of the pit for the adductor muscle, being there nearly half the width of the valve, and is marked with growth-lines; a deep triangular furrow, marked with growth lines, lies near the tergal margin, and serves for the reception of the scutal angle of the tergum; just below the furrow and the flat occludent edge there is a deep pit for the adductor muscle.

Tergum (Pl. VII. fig. 18) subrhomboidal, almost flat transversely, with a curved, narrow, wall-sided ridge like that of the scutum, extending from the apex to the basal angle, where it is produced; apical portion much curved towards the scuta. The apico-basal ridge is situated about one-third the width of the valve from the carinal margin, is only very slightly raised where crossed by the transverse ridges, which are not so prominent as on the other valves; in the valves from the Chalk Marl the ridge is produced into prominent sharp points. The upper carinal margin is slightly longer than the lower, and makes with it almost a continuous curve; occludent margin slightly concave, shorter than the scutal margin. A portion of the valve along the occludent margin is rounded and protuberant to the extent to which the valve was overlapped by the scutum; this raised portion is followed by a depression, which is bounded by a slight but

distinct ridge which extends from the apex to about the middle of the scutal margin. On the inner surface the upper carinal edge is flat and wide, and the inner occludent edge is rounded and narrower, both edges being marked with growth-lines.

Upper latus (Pl. VII. fig. 17) a very acute-angled isosceles triangle. External surface marked with irregularly spaced, slightly undulating, transverse ridges, slightly upturned at the lateral margins, and in the single valve seen there are feebly marked longitudinal ridges. The growth-lines are continued on the inner surface, where they are obliquely upturned, and meet in a raised, sharp-edged, median ridge, which extends to the apex. The portion marked with growth-lines overlapped the scuta and terga on either side, the smooth triangular portion being covered by the corium or membrane lining the inside of the valves.

Peduncular plates (Pl. VIII. figs. 1-3). There are fifteen examples known, and, although of different sizes, all are of the same type. They have a longitudinally ridged outer wall, with from two to three prominent transverse ridges, and an inwardly projecting basal ledge, on the inner extremity of which is a deep, median, elliptical socket; the base of the inwardly projecting portion is concave. Except for this socket they agree well with some peduncular plates that appear to belong to the species *Pollicipes glaber*, F. A. Roemer.

Pycnolepas fallax, Darwin, sp.

(Pl. VII. figs. 10-14; Pl. VIII. fig. 5.)

1850. *Pollicipes maximus*, Sowerby; R. Kner, Haidinger's Naturw. Abhandl. Bd. iii. Abth. 2, p. 35, pl. v. fig. 12.

1850. *Pollicipes glaber*, F. A. Roemer; A. Alth, Haidinger's Naturw. Abhandl. Bd. iii. Abth. 2, p. 198, pl. x. fig. 20.

? 1850. *Pollicipes rigidus*, J. de C. Sowerby; H. B. Geinitz, Das Quadersandsteingebirge, p. 102, pl. ii. figs. 8 a-c.

1851. *Pollicipes fallax*, Darwin, Pal. Soc. Monogr. Foss. Lepadidæ, p. 75, pl. iv. fig. 8.

1854. *Pollicipes fallax*, Darwin, Ray Soc. Monogr. Subclass Cirripedia, Balanidæ, Synop. et Index Systematicus, p. 638.

1854. *Pollicipes fallax*, Darwin; J. Morris, Cat. Brit. Foss. 2nd ed. p. 96.

1857. *Mitella fallax*, Darwin, sp.; J. Bosquet, Notice sur quelques Cirripèdes Terrain Crétacé Duché de Limbourg, p. 17, pl. ii. figs. 1-7 (non pl. ii. figs. 8-12, pl. iii. figs. 1, 2).

1864. *Pollicipes fallax*, Darwin; A. Reuss, Sitz. d. K. Akad. Wiss. Wien, vol. xlix. Abth. i. p. 240, pl. iii. figs. 1-6 (? non figs. 12-15).

1877. *Pollicipes fallax*, Darwin; H. Woodward, Brit. Mus. Cat. Brit. Foss. Crustacea, p. 140.

1880. *Pollicipes fallax*, Darwin; Th. Marsson, Mittheil. naturw. Ver. Neu-Vorpommern und Rügen, xii. p. 20 (non pl. ii. fig. 6).

1886. *Pollicipes fallax*, Darwin; J. Kafka, Sitz.-Ber. k. Böhm. Gesell. Wiss. Prag (1885), p. 571, pl. iii. figs. 2, 3 (partim).
 1887. *Pollicipes fallax*, Darwin; A. J. Fritsch and J. Kafka, Crust. Böhmischen Kreidef. p. 10, fig. 17 (partim).
 1888. *Mitella fallax*, Darwin, sp.; A. Peron, Bull. Soc. Sci. Yonne, vol. xli. (1887) p. 267, pl. iii. figs. 5-9.
 1893. *Pollicipes fallax*, Darwin; A. Fritsch, Arch. naturw. Landesd. Böhmen, Prague, vol. ix. p. 108, fig. 143.
 1902. *Pollicipes fallax*, Darwin; A. Wolleman, Abh. k. preuss. geol. Landesanst. N. F. Heft 37, p. 115.
 1906. *Brachylepas fallax*, Darwin, sp.; H. Woodward, Geol. Mag. dec. v. vol. iii. p. 340, figs. 5-18, 21-22, 24 (non figs. 19, 20, 23).
 1912. *Pollicipes fallax*, Darwin; T. H. Withers, "Cirripedes in the Norwich Museum from the Norfolk Chalk, studied by Darwin," Trans. Norfolk and Norwich Nat. Soc. vol. ix. p. 309.

Diagnosis. Capitular valves ridged transversely, but not longitudinally, or at least very weakly so. Scuta elongately triangular, with a ridge with sloping sides curving from the apex to the basi-lateral angle. Terga with a similar ridge curving from the apex to the basal angle.

Distribution. Upper Senonian, *B. mucronata*-zone: Norwich and Trimmingham, Norfolk; Clarendon, near Salisbury, Wilts; I. of Rugen; Lüneburg, Hanover. *A. quadratus*-zone: East Harnham, near Salisbury, Wilts; Reims, France. *M. coranguinum*-zone: Quidhampton, near Salisbury, Wilts. Upper Senonian: Gehrden, Hanover; ? Plauen, near Dresden; Cibly and Heure-le-Romain, Belgium; Nagorzani, Galicia; near Lhota Úřetická, and Chotzen, Bohemia; Balsberg and Köpinge, Scania.

Type. Of this species Darwin had only scuta and terga; his figured types*, the scutum and tergum from the Chalk of Norwich, are in the Norwich Museum, registered respectively 2153 (lectoholotype), 2153 c.

Material. Further valves, coming from different horizons, have been made known by later authors, but we are indebted more particularly to Bosquet (1857) and H. Woodward (1906) for our knowledge of the species, especially since the valves figured by them are from one horizon.

So far it can be proved that *P. fallax* had a rostrum, paired scuta, paired upper latera, paired terga, and a carina, and all these valves are of the same general type as in *Brachylepas*, except that the carina and rostrum are longer and narrower, just as in the other species included in the new genus *Pycnolepas*; the arrangement of the valves is

* See T. H. Withers, 1912, Norfolk and Norwich Nat. Soc. vol. ix. p. 309.

precisely the same. As to the remaining valves that have been attributed to this species, it is extremely doubtful whether they really belong to it, and, in view of the relationship of this species to *P. rigidus*, there is good reason to believe that it had no lower whorl of valves.

Bosquet (1857) figured as belonging to this species a scutum, tergum, carina, rostrum, subcarina, subrostrum, an upper latus, and seven valves of the lower whorl. H. Woodward (1906) figured corresponding valves, with the exception of the subcarina, but with the addition of two carinal latera, all the valves having been found together in a large pyramidal flint. He referred the species to his genus *Brachylepas*.

Through the kindness of Mr. R. M. Brydone, F.G.S., I have been enabled to examine the whole of his Trimmingham specimens of *P. fallax* that were described by Dr. Woodward (1906). In that paper some carinae, rostra, and a supposed subrostrum were figured, but, in my opinion, fig. 8 is a small carina, and not a rostrum, and the valve figured (fig. 10) as a subrostrum is merely a young and smaller example of a rostrum. Among the valves collected by Mr. Brydone there are small carinae, and there is no reason why there should not be correspondingly small rostra. The two carinal latera figured as belonging to *P. fallax* really belong to *Scalpellum*, fig. 19 being a carinal latus of *S. fossula* and fig. 20 being a similar valve of *S. maximum*; and, although the valve represented by fig. 19 was found attached to a carina of *P. fallax*, it certainly does not belong to that species. It is of almost the same length as the carina, and is consequently much too large to have belonged to the same individual, as suggested by Dr. Woodward, even if it were a valve of the same species. Of the lower latera figured by Dr. Woodward, that in the upper figure (fig. 23) agrees very well with the imbricating plates in *Brachylepas naissantii*, and probably belongs to that species; but the lower figure (fig. 24) represents only the broken apical portion of a rostrum of *P. fallax*, and on the inner surface can be seen the flatly rounded growth-lines typical of the rostrum of *P. fallax* and allied species, the growth-lines indicating the free projection of the apex.

In identifying these valves and referring them to *Brachylepas* Dr. Woodward evidently overlooked the fact that in the type-species there is no subrostrum, and that in his restoration there is no place for such valves or for the comparatively large carinal latera.

With regard to the so-called subcarinæ and subrostra figured by Bosquet (1857), it is highly probable that they also are small examples of carinæ and rostra, and the seven supposed lower lateral plates, of which two show exteriorly a median basal notch, may be referred with more justification to Bosquet's species *Brachylepas lithotryoides*.

There is also much uncertainty with regard to the valves considered by other authors to belong to the lower whorl of *P. fallax*, and, in fact, there is no real evidence that *P. fallax* had a lower whorl of valves, for in the absence of any lower lateral plates one cannot quite see how this species could have had subrostra and subcarina.

Therefore, in default of more precise evidence to the contrary, I prefer to include *Pollicipes fallax* in the new genus *Pycnolepas*, with which it more closely agrees.

According to Mr. Brydone, *P. fallax* is by far the commonest of the Cirripedes in the Trimmingham Chalk. It is met with occasionally in the *mucronata*-zone of Norwich, and Dr. H. P. Blackmore has collected in the neighbourhood of Salisbury a single carina and rostrum from the *mucronata*-zone and a single rostrum from the *quadratus*-zone. The most interesting specimen, one which constitutes the earliest record for this species, is a beautifully preserved rostrum (Pl. VIII. fig. 5) obtained by Dr. Blackmore from the base of the upper third of the *M. coranguinum*-zone at Quidhampton, near Salisbury. Although this valve has a median ridge and is so much incurved that I think it must be a rostrum, it certainly is comparatively narrow for such a valve. It has a rather different appearance, owing to its being more strongly and irregularly ridged than the valves from higher horizons.

Measurements. The valves figured in this paper (Pl. VII. figs. 10-14) measure respectively:—

	Length.	Breadth.
	mm.	mm.
Rostrum.....	14.1	9.2
Scutum.....	18.0	9.2
Upper latus.....	12.5	2.8
Tergum.....	15.8	10.8
Carina.....	17.4	6.5
? Rostrum (Pl. VIII. fig. 5).....	7.7	3.7

Only two valves are known to me from the English Chalk that exceed the above in size, and these are a tergum from the Trimmingham Chalk, said by Dr. Woodward (1906, p. 345) to be 19 mm. long and 11.5 mm. broad, and a carina in the

Norwich Museum (2156 *b*) measuring 22.1 mm. in length and 7.4 mm. in breadth. These measurements, however, are exceeded by two valves in the Geological Department of the British Museum, said to be (H. Woodward, 1906, p. 341) probably from the Ober Quader of Plauen, near Dresden. They are:—

	Length.	Breadth.
	mm.	mm.
Scutum (I. 14050)	20.2	10.7
Tergum (I. 14052)	23.1	10.0

Description of valves. In this species the valves are moderately thick and conspicuously marked externally with rather wide, prominent, transverse ridges, which terminate each zone of growth, but the valves are not ridged longitudinally, or at least only weakly so. The transverse ridges are more prominent at the occludent margins of the scuta and terga and on the lateral margins of the other valves.

Carina (Pl. VII. fig. 14) semicylindrical, slightly or moderately bowed inwards, strongly convex transversely, not carinate; basal margin somewhat concave. Outer surface ornamented with a number of strong but somewhat flattened ridges, which are sometimes fairly regularly spaced, but more often irregularly spaced. The apical half of the valve projected freely, and on the inner surface the freely projecting portion is marked with growth-lines which extend from the basal angles and meet in a flatly rounded angle below the apex.

Rostrum (Pl. VII. fig. 10) semiconical, smaller and proportionally wider than the carina, usually considerably bowed inwards, strongly convex transversely, with a median keel feebly marked in some specimens, but not apparent in others; basal margin concave. Ornamented externally like the carina. The valve projected freely to nearly half of its extent, and on the inner surface this portion is marked with growth-lines, which extend from the basal angles, and on reaching about half the length of the valve turn abruptly inwards and downwards, and meet in a concave curve below the apex.

Scutum (Pl. 11. fig. VII) elongately triangular, with the basi-lateral portion slightly produced, moderately convex transversely, apex acuminate and strongly bowed towards the terga; occludent margin strongly convex; basal margin nearly straight, and at the rostral angle making almost a right angle with the lower part of the occludent margin;

tergo-lateral margin usually concave in its upper part, and convex below. The apico-basal ridge is very prominent, rather broad, about as broad as a zone of growth, slightly rounded at its summit, has steeply sloping sides, and extends in a curved line rather nearer to the tergo-lateral margin. Apico-basal ridge not at all produced where crossed by the prominent transverse ridges; the transverse ridges are strongly raised, equally spaced, and bend downwards and are slightly thickened at the occludent margin. A slight ridge can be seen extending from the apex to the tergo-lateral angle, and from this ridge the valve at the upper part of the tergo-lateral margin is inwardly rounded. On the inner surface the occludent edge is much thickened, broad and flat, is widest adjoining the top of the pit for the adductor muscle, being there more than two-thirds the width of the valve; it is marked with growth-lines. The inner margin of the occludent edge is considerably raised and overhangs the subtriangular depression for the reception of the scutal angle of the tergum.

Tergum (Pl. VII. fig. 13) subrhomboidal, somewhat convex transversely, with a curved ridge like that of the scutum, from which the sides of valve slope steeply, extending from the apex to the basal angle, but not projecting beyond it; apical portion of the valve slightly to moderately curved towards the scuta. The apico-basal ridge is situated almost in a median line, and is not produced where crossed by the transverse ridges. Upper carinal margin usually slightly shorter than the lower, both of which meet in a well-defined angle; occludent margin usually shorter than the scutal margin, and of about the same length as the upper carinal margin. A portion of the valve along the occludent margin is rounded and protuberant, and on its inner margin is bounded by a depression; about midway between the depression and the apico-basal ridge, slight indications can be seen in some specimens of an indistinct ridge, evidently homologous with that seen in the terga of *P. rigidus*.

Upper latus (Pl. VII. fig. 12) shaped like a very acute-angled isosceles triangle. External surface marked with several raised, regularly spaced, and prominent transverse ridges, slightly upturned at the lateral margins; the inner lateral margins have a serrated appearance owing to the prominence of these outer ridges. On the inner surface the growth-lines are obliquely upturned, and meet on a very prominently raised, sharp-edged ridge, which extends to the apex from a point just above one-third the length of the valve from the base.

Pycnolepas brünnichi, nom. nov.

(Plate VII. figs. 5-9; Plate VIII. fig. 6.)

1839. *Pollicipes rigidus*, J. de C. Sowerby; J. Steenstrup, Krøyer's Naturhist. Tidsskrift, Bd. ii. p. 404, pl. v. figs. 24-26 (non *P. rigidus*, J. de C. Sowerby, 1836).
1851. *Pollicipes elegans*, C. R. Darwin (non Lesson), Pal. Soc. Monogr. Foss. Lepadidæ, p. 76, pl. iv. fig. 9.
1854. *Pollicipes elegans*, C. R. Darwin, Ray Soc. Monogr. Subclass Cirripedia, Balanidæ, Synop. et Index Systematicus, p. 639.
1857. *Mitella elegans*, C. R. Darwin, sp.; J. Bosquet, Notice sur quelques Cirripèdes dans le Terrain Crétacé du Duché de Limbourg, p. 14, pl. iii. figs. 3 a, b.
1865. *Pollicipes elegans*, C. R. Darwin; J. W. Salter & H. Woodward, Cat. & Chart Foss. Crustacea, p. 27, pl. i. fig. 9.
1912. *Pollicipes elegans*, C. R. Darwin; K. B. Nielsen, Medd. Dansk geol. Foren. Bd. iv. p. 32, pl. i. figs. 18-20, pl. ii. figs. 1-8, 11, 12 (non figs. 9, 10, 13-18).

Diagnosis. Capitular valves transversely and longitudinally ridged. Scuta subtriangular, with a broad wall-sided ridge, sometimes broader than the tergo-lateral portion, curving from the apex to the basi-lateral angle. Terga with the apical portion only slightly curved towards the scuta, and a similar but narrower ridge extending almost straight from the apex to the basal angle.

Distribution. Danian: Faxe, Denmark; Ignaberga, Scania. Maestrichtian: Bémelen, Duchy of Limbourg, Holland, and Ciply, Belgium.

Type. Steenstrup originally described a scutum, tergum, and carina of this species as *Pollicipes rigidus*, J. de C. Sowerby. Darwin subsequently described the species as new, but inadvertently gave it the name *Pollicipes elegans*, already, as he well knew, used by Lesson (1830, "Voyage de la 'Coquille,'" vol. ii. p. 441; 1831, *Illust. Zool.* pl. xxxix.) for a recent species.

Darwin's material consisted of three scuta, a tergum, and two carinæ received from Prof. Steenstrup, and of two scuta collected by N. P. Angelin. Since Cirripedes have already been named after both Darwin and Steenstrup, I name this after Dr. K. Brünnich Nielsen, to whom we are indebted for our present knowledge of the species.

Dr. J. P. J. Ravn has most kindly searched among the Steenstrup collection in Copenhagen University, and informs me that he can identify neither the valves figured by Steenstrup as *P. rigidus* nor those figured by Darwin as *P. elegans*. Prof. G. Holm also writes to say that the two scuta mentioned by Darwin as collected by N. P. Angelin are not in the Riksmuseum, Stockholm. They were probably in the Steenstrup collection.

It would have been best, perhaps, to have fixed on one of Darwin's specimens as the holotype of the species, but in view of the fact that all the specimens have been lost sight of, I reluctantly fix on the scutum here figured (Pl. VII. fig. 6) as the holotype.

Material. Only the scutum, tergum, and carina were known to Darwin, but Dr. K. B. Nielsen has collected a large number of valves comprising 74 carinæ and rostra, 129 scuta (81 right and 48 left), 126 terga (64 right and 62 left), and 9 upper latera. Some of these which he figured (1912) include a rostrum and an upper latus. Among them are three peduncular plates, which, however, show no signs of prominent transverse and longitudinal ridges as one would expect them to if they belonged to such a highly ornamented species as *P. brünnichi*; they agree more in their ornament with the valves of the species *Scillælepas dorsata*, to which therefore I refer them. The valve figured as a carinal latus is a rostral latus of *S. dorsata* (see p. 193). Dr. J. P. J. Ravn sent me from the Mineralogical Museum of Copenhagen University the three peduncular plates for examination, but, owing to the fact that the "carinal latus" has been lost, he sent other similar valves determined by Dr. Nielsen, and these without doubt are rostral latera of *S. dorsata*. For the specimens of *P. brünnichi* figured in this paper I am indebted to Dr. Nielsen, as also for 42 carinæ and rostra, 43 scuta, 91 terga, and 3 upper latera.

Although Dr. Nielsen records upwards of 300 valves, not a single valve has been found that could be referred to a lower whorl.

Measurements. This species probably attained nearly to the size of *P. paronai*. To judge from the figures given by Dr. Nielsen, the valves measured:—

	Length.	Breadth.
	mm.	mm.
Rostrum	circa 10·0	5·5
Scutum	" 15·5	7·0
Upper latus	" 6·0	1·5
Tergum	" 15·0	8·0
Carina	" 11·5	4·0

The valves here figured (Pl. VII. figs. 5-9), with the exception of the upper latus, are much smaller than the above. Darwin (1851, p. 76) records a scutum as measuring 1·1 inches in length, which is much larger than that figured by Dr. Nielsen.

Description of Valves. The valves of this species have the ridges terminating each zone of growth much raised and with steeply sloping sides, the longitudinal ridges also being raised and prominent.

Carina (Pl. VII. fig. 9) semicylindrical, widening gradually from the apex to the basal margin, moderately bowed inwards, strongly convex transversely, not carinate, basal margin slightly concave. Outer surface ornamented with a number of prominent transverse ridges crossed by longitudinal ridges, which present a goffered appearance where they meet. The apical portion projected freely for more than a third the length of the valve, and this part is marked with growth-lines, which extend from the basal angles and meet in an acutely rounded angle below the apex; the inner lateral edges are somewhat thickened for about one-fourth the width of the valve.

Rostrum (Pl. VII. fig. 5) semiconical, smaller and proportionally wider than the carina, widening rapidly from the apex to the basal margin, considerably incurved, strongly convex transversely, basal margin slightly convex. Outer surface with ornament similar to that of the carina. The apical half projected freely, and on the inner surface this part is marked with growth-lines that extend from the basal angles and meet in a rounded angle below the apex; the inner lateral edges are somewhat thickened to about one-third the width of the valve.

Scutum (Pl. VII. fig. 6; Pl. VIII. fig. 6) subtriangular, strongly convex transversely, apex acuminate and strongly curved towards the terga; occludent margin usually strongly convex; basal margin almost straight, about half the length of the occludent margin, and making with it an angle slightly above 90° ; tergo-lateral margin usually strongly concave in its upper part, and varying from straight to strongly convex in its lower part, which forms nearly a right angle with the basal margin. Basi-lateral angle generally slightly produced and obliquely truncated, the projection being formed by the apico-basal ridge. This ridge is a conspicuous feature, and extends from the apex in a slightly curved line, much nearer to the tergo-lateral margin. It is much raised, flat-topped, has perpendicular sides, is wider in most valves than a zone of growth, in some much wider, and even wider than the tergo-lateral portion of the valve (see Pl. VIII. fig. 6). It is formed of longitudinal ridges varying in number from two to five. An almost imperceptible ridge extends from the apex almost parallel to the upper part of the tergo-lateral margin, and from this ridge the valve is strongly rounded

inwards. Outer surface ornamented with strongly marked, raised, transverse ridges, crossed by well-marked longitudinal ridges. On the inner surface the ocludent edge is very broad and flat, is widest adjoining the pit for the adductor muscle, being more than half the breadth of the valve, and is marked with growth-lines. An elongately-triangular furrow, marked with growth-lines, is situated above the pit for the adductor muscle, and is bounded by the upper part of the inner ocludent edge, and this furrow serves for the reception of the scutal angle of the tergum.

Tergum (Pl. VII. fig. 8) subrhomboidal, slightly convex transversely, with an almost straight, wall-sided ridge, much narrower than that of the scutum, extending from the apex to the basal angle, where it is produced and truncated; apical portion scarcely curved towards the scuta. The apico-basal ridge is situated almost centrally, and where crossed by the transverse ridges is produced into sharp points. Upper carinal margin slightly convex, and the ocludent margin slightly concave, both being about the same length, and shorter than the lower carinal and scutal margins, which also are of about the same length. A portion of the valve is rounded and protuberant along the ocludent margin, to the extent to which the valve was overlapped by the scutum; this rounded margin is followed by a wide depression bounded by a more or less distinct ridge extending from the apex to about the middle of the scutal margin. On the inner surface the upper carinal edge is flat, and the inner ocludent edge rounded and narrower, both edges being marked with growth-lines.

The *upper latus* (Pl. VII. fig. 7) has the shape of a very acute-angled isosceles triangle. Externally it is marked with irregular, undulating, raised transverse ridges, abruptly upturned at the outer margins; these ridges are crossed by prominent longitudinal ridges which give to them a goffered appearance. The growth-lines are continued on the inner surface and meet on a raised, sharp-edged, median ridge, which extends to the apex; this ridge fitted between the scuta and terga, the valve on either side overlapping the scutum and tergum, while the smooth triangular part at the base was covered by the corium or membrane lining the inside of the valves.

Pycnolepas paronai, de Alessandri, sp.
(Plate VII. figs. 1-4.)

1895. *Pollicipes paronai*, de Alessandri, Boll. Soc. Geol. Ital. vol. xiii.
p. 266, pl. 1. figs. 8 a-f.

1906. *Pollicipes paronai*, de Alessandri, Palæont. Ital. vol. xii. p. 248, pl. xiii. figs. 1-9.

Diagnosis. Capitular valves with closely set, somewhat flattened, transverse and longitudinal ridges, the longitudinal ridges on the scuta and terga being fine, wavy, and radiating from the apico-basal ridge. Scuta elongately triangular, with a broad, flattened, steep-sided ridge curving from the apex to the basi-lateral angle. Terga with the apico-basal ridge narrower than that of the scutum, almost straight; the apex not at all incurved.

Distribution. Oligocene (Aquitanian): Chieri, Turin, Italy. Miocene (Helvetian): Colli di Torino, Baldissero, and Sciolze, Turin, Italy.

Type. Prof. G. de Alessandri founded this species on carinæ, scuta, and terga which are in the collection of Count Luigi di Rovasenda, and of these I fix on the scutum (figs. 8 *a*, *b*) as the holotype. Prof. de Alessandri subsequently figured similar valves, but among the carinæ included (1906, pl. xiii. fig. 9) a rostrum of the species.

Material. Count Luigi di Rovasenda and Prof. G. de Alessandri kindly sent me the following valves of this species:—3 scuta, 6 terga, and 2 rostra. I am also indebted to Prof. C. F. Parona for allowing me to borrow the two carinæ and the rostrum (figured, Alessandri, 1906, pl. xiii. figs. 7-9) which are in the Geological Museum of the Royal University of Turin.

Measurements. This is the largest species of the genus, and Prof. de Alessandri gives the following measurements for the valves described by him:—

	Length.	Breadth.
	mm.	mm.
Scutum	24·5	13·0
Tergum	29·5	17·0
Carina.....	22·0	10·5

The tergum here figured (Pl. VII. fig. 3), when complete, must have measured at least 30 mm. in length, and its breadth is 19·2 mm. Prof. de Alessandri (1906, pl. xiii. fig. 9) figures a rostrum as a carina, and this valve is 11·2 mm. in length and 7·4 mm. in breadth. The rostrum here figured (Pl. VII. fig. 1) is broken at the apex, but its length must have been at least 17 mm., and its greatest breadth is 9·2 mm., even though the valve is broken at each basal angle.

Description of Valves. In this species the transverse ridges terminating each zone of growth are closely and irregularly

set, and have their edges somewhat rounded and flattened. The longitudinal ridges are also somewhat flattened, and on the scuta and terga have a wavy appearance and radiate from the apico-basal ridge.

Carina (Pl. VII. fig. 4) semicylindrical, widening gradually from the apex to the basal margin, slightly to moderately bowed inwards, strongly convex transversely, not carinate, basal margin almost straight. Outer surface ornamented with a number of prominent, but somewhat flattened transverse ridges, crossed by fine, rounded, closely set, longitudinal ridges. The apical portion projected freely for less than a third of the length of the valve, and the portion is marked with growth-lines which extend from the basal angles and meet in a rounded angle below the apex; the inner lateral edges of the valve are somewhat thickened for about one-fourth the width of the valve.

Rostrum (Pl. VII. fig. 1) semiconical, smaller and proportionally wider than the carina, widening rapidly from the apex to the basal margin, moderately bowed inwards, strongly convex transversely, basal margin concave. Outer surface ornamented similarly to the carina. On the inner surface the lateral edges of the valve are thickened, the median third of the valve forming a deep hollow between; the apical half of the valve projected freely, and this part is marked with growth-lines which extend from the basal angles and meet in a rounded angle below the apex.

Scutum (Pl. VII. fig. 2) elongately triangular, proportionally narrow, almost flat transversely, apical portion much bowed towards the tergum, narrow, and acuminate; occludent margin strongly convex; basal margin less than half the length of the occludent margin, and forming with it an angle slightly less than 90° ; tergo-lateral margin strongly concave in its upper part, its lower part being rounded and somewhat protuberant. Basi-lateral angle, where the apico-basal ridge slightly projects, is obliquely truncated. The apico-basal ridge extends in a strongly curved line from the apex, rather nearer to the tergo-lateral margin; it is flatly rounded transversely, has steep, but not perpendicular sides, and is more than twice as wide as a zone of growth. Along the tergal margin the valve is inwardly rounded, but there does not appear to be any trace of a ridge. Outer surface ornamented with a number of prominent transverse ridges, the interspaces of which are marked with raised transverse lines; the transverse ridges are crossed by fine, wavy, longitudinal ridges radiating from the apico-basal ridge. On the inner

surface the ocludent edge is very broad and flat, and is widest at a point well above the pit for the adductor muscle, where it is more than half the width of the valve; an almost flat triangular portion of the valve near the tergal margin, bounded by the raised inner ocludent edge, is marked with growth-lines, and this part served for the reception of the scutal angle of the tergum; the adductor muscle pit lies below the inner ocludent edge, but above the pit there is a comparatively wide sloping portion of the valve between it and the triangular portion which received the tergum.

Tergum (Pl. VII. fig. 3) subrhomboidal, moderately convex transversely, with a straight steep-sided ridge, much narrower than that of the scutum, extending from the apex to the basal angle, where it is produced; apical portion scarcely curved towards the scuta. The apico-basal ridge is situated rather nearer to the tergal lateral margin, and where crossed by the transverse ridges is somewhat raised. Upper carinal margin convex, nearly straight, and about the same length as the scutal margin; ocludent margin convex and of about the same length as the lower carinal margin. A comparatively wide portion of the valve along the ocludent margin is slightly raised and rounded, and slightly protuberant at the scutal angle; the raised portion is followed by a depression from which the valve rises to meet an indistinct ridge or fold in the valve extending from the apex to about the middle of the scutal margin. On the inner surface a considerable portion of the valve at the inner ocludent and upper carinal edges is flat and marked with growth-lines, the inner ocludent edge being the narrowest.

Upper latus unknown.

Pycnolepas scalaris, sp. n. (Plate VIII. figs. 7-10.)

Diagnosis. Upper whorl of valves transversely and longitudinally ridged; the transverse ridges are produced into sharp spines, where they are crossed by longitudinal ridges. Scutum triangular, with no apico-basal ridge, and growth-lines not upturned on the tergo-lateral half of the valve. Upper latus long and narrow. Tergum unknown.

Material. A right scutum, two rostra, and an upper latus.

Holotype. The rostrum (Pl. VIII. fig. 7).

Horizon and locality. Cenomanian, Chalk Marl: near Cambridge.

Measurements. This species is one of the smallest of the

known fossil Cirripedes, and its valves are most beautifully ornamented. They measure respectively :—

	Length. mm.	Breadth. mm.
Rostrum (holotype)	1·9	1·3
Rostrum.....	1·1	0·8
Scutum	2·0	1·3
Upper latus	2·4	1·2

Description of Valves. *Scutum* (Pl. VIII. fig. 10) triangular, slightly convex; apical portion inclined from the opposing scutum, acute, and curved towards the terga. Basal margin almost straight; ocludent margin convex; tergal margin concave. Outer surface ornamented with fine transverse ridges which are not upturned on the tergo-lateral half of the valve. Where the transverse ridges are crossed by the longitudinal ridges, they are produced into short sharp spines, which project outwards but not across the transverse ridges. On the inner surface is a shallow pit for the adductor muscle.

Rostrum (Pl. VIII. fig. 7) semiconical, slightly bowed inwards, basal margin semicircular, somewhat concave. Inner surface thickened near the inner margins, and marked by growth-lines which are continued under the apex to nearly half the extent of the valve. Outer surface ornamented with transverse ridges. On the larger specimen these ridges are crossed by about seven longitudinal ridges, and are there produced into short spines, similar to, but more pronounced than, those on the scutum. Two of the longitudinal ridges, which occupy a submedian position, are much thicker than the others. On the smaller example the longitudinal ridges are not so apparent.

Upper latus (Pl. VIII. fig. 9) a very acute-angled isosceles triangle, slightly bowed inwards. The outer surface is ornamented with prominent transverse ridges which bear short spines arranged in longitudinal rows, and these spines are evidently produced by longitudinal ridges crossing the transverse ridges as in the other valves. Except for two strong ridges in a median position, the longitudinal ridges are not apparent between the transverse ridges. On the inner surface the growth-lines meet on a raised, sharp-edged, median ridge, which extends from about the middle of the valve to the apex. The valve therefore overlapped the scuta and terga to about half of its extent.

Structure and Affinities. This species is referred to the genus *Pycnolepas* with some doubt, for, although the rostrum

and upper latus are of the same type as those of the other species of the genus, the scutum is quite unlike that of any of them; the tergum is not known. In the scutum there is no prominent apico-basal ridge, and the growth-lines do not differentiate the ocludent portion from the tergo-lateral portion as in the other species. In fact, if the ornamentation had not been so strikingly similar to that of the other valves, one would doubt its belonging to the same species. Some hundreds of separate valves of different species have been obtained from the Chalk Marl of Cambridge, but none have been found to agree in ornament except the above valves, so the probability is that, despite the different form of the scutum, all these valves belong to the same species. In form the scutum approaches that referred by Bosquet to his *Brachylepas lithotryoides*, but in that species the valve is comparatively thick and massive, is quite different in the structure of its inner surface, and can readily be distinguished by its flat and coarse longitudinal ridges. The rostrum and upper latera are similar in form to those of *P. rigidus*, *P. brünnichi*, and *P. paronai*, but can be distinguished by the much more widely-spaced longitudinal ridges, and the spinose appearance of the valves.

Structure of the Species of Pycnolepas.

In my paper on "*Brachylepas cretacea*" (Geol. Mag. 1912), the species *Pollicipes fallax*, Darwin, which had been referred by Dr. H. Woodward to his genus *Brachylepas*, was left out of consideration. This was done chiefly because it seemed probable that to whatever genus *P. fallax*, Darwin, belonged, the species *Pollicipes paronai*, Alessandri, *P. elegans*, Darwin (= *P. brünnichi*), and *P. rigidus*, J. de C. Sowerby, belonged also. An examination of the known valves of these three species seemed to show that they were related in form, structure, and disposition, and were precisely similar to the corresponding valves in *P. fallax*.

P. paronai, *P. elegans*, and *P. rigidus* were represented by carinae, scuta, and terga, and if similarity in shape and structure were criteria, one would expect to find that these three species had a large rostrum and a long and narrow upper latus, as in *P. fallax*. This conclusion, strengthened by the fact that *P. rigidus* occurred in the Gault clay, made it seem advisable to wash such material as could be obtained, in the hope of finding the rostrum and upper latus of *P. rigidus*, and these valves were eventually found and proved to be similar in shape to those of *P. fallax*. Now

that the rostrum of *P. rigidus* is known, it is easy to see that some of the valves of this species, hitherto considered to be smaller and wider carinæ, are really rostra; several specimens are in the Geological Department of the British Museum. With regard to *P. paronai*, it is clear to me, from an examination of the specimen, that the valve figured by Prof. G. de Alessandri (1906, Palæontogr. Ital. vol. xii. pl. xiii. fig. 9) as a carina of *P. paronai* is not a carina but a rostrum. A further specimen, which leaves no doubt as to its being a rostrum, was among the valves given to me by Count Luigi di Rovasenda; it is particularly like that of *P. rigidus*, and agrees in being wider in proportion to its length than is the carina. Up to the present, however, the upper latus of *P. paronai* has not been found.

There remained, then, *P. elegans*, Darwin, in which the carina, scutum, and tergum only were known, but Dr. K. Brünnich Nielsen has since figured (1912, Meddel. Dansk geol. Foren. Bd. iv. p. 32, pl. ii. figs. 1-3, 11-12) a rostrum and an upper latus of *P. elegans* similar in shape to those of *P. fallax*, *P. rigidus*, and *P. paronai*.

It is therefore proved that in *P. fallax*, *P. rigidus*, *P. elegans*, and, except for the missing upper latus, in *P. paronai* also, the capitular valves agree in number, structure, and disposition.

The most important evidence, however, in connection with these species is afforded by the 15 peduncular plates that were found on three different occasions with valves of *P. rigidus*, and undoubtedly belong to that species. The circumstances in which these plates were found (see p. 172) justify the conclusion that in *P. rigidus*, and by inference in *P. fallax*, *P. elegans*, and *P. paronai*, there were only 8 valves to form the capitulum, and that the peduncle was formed of plates similar to those of *P. rigidus* here figured.

In support of this conclusion, it should be borne in mind that only the smaller examples of carinæ and rostra of *P. fallax* have been mistaken for subcarinæ and subrostra, and therefore elements of a lower whorl; no lower lateral plates have ever been found to substantiate the claim that that species had a lower whorl. It is also of significance that among upwards of 300 valves of *P. elegans*, as has already been pointed out, there was found not a single valve of a lower whorl.

Moreover, no valves of a lower whorl of *P. paronai* have been found. This is the largest species of the genus, the terga attaining nearly $1\frac{1}{4}$ inches in length, and if lower lateral plates had been present they would have been com-

paratively large and less likely to be overlooked. It is true that the upper latus of *P. paronai* has not yet been found, but this probably being long and narrow would be more liable to fracture. Most of the valves of this species are much fractured.

The capitular valves of *Pycnolepas* agree with those of *Brachylepas* in number and disposition, but differ in the far less width of the carina and rostrum. The main difference from *Brachylepas* lies in the plates of the peduncle, for these are all of one type, and could not have formed a series of whorls as in *Brachylepas*. In any case there is a great structural difference from *Brachylepas*, and since the species differ from those of the typical *Pollicipes* in the small number of valves to the capitulum, they are placed in a new genus *Pycnolepas*.

With respect to the scuta, *P. rigidus* is distinguished by the narrow, wall-sided, apico-basal ridge and in the production of the basi-lateral portion of the valve. *P. fallax* is readily distinguished by the apico-basal ridge having a sharp edge with sloping sides, as well as by the absence of longitudinal ridges. *P. paronai* and *P. brünnichi* both have a very broad apico-basal ridge, but while in *P. brünnichi* it is much raised, flat-topped, and with perpendicular sides, in *P. paronai* it is flatly rounded. The scutum of *P. paronai* is further distinguished by the wavy longitudinal ridges radiating from the apico-basal ridge, and that of *P. brünnichi* in being less elongate than that of the other species.

In the terga *P. fallax* is at once distinguished by the apico-basal ridge having sloping sides: this ridge in *P. rigidus* is narrow and has perpendicular sides; in *P. paronai* it is only slightly broader than in *P. rigidus*, but the valve can be distinguished by the straightness of the ridge. *P. paronai* differs from *P. brünnichi* in the presence of wavy longitudinal ridges radiating from the apico-basal ridge.

Seguenza (1876, Atti Accad. Pontaniana, vol. x. p. 395) doubtfully referred *Pollicipes rigidus* and *P. elegans* (= *P. brünnichi*), together with *P. gracilis*, *P. validus*, and *P. dorsatus*, to his genus *Scillælepas*. Alessandri, however (1906, Paleont. Ital. vol. xii. pp. 249, 264), judging mainly by the form of the scuta, considered that *P. elegans* and *P. rigidus* could not be referred to *Scillælepas*, but that they agreed much more closely in the form of the scuta with *Pollicipes*. He therefore referred the species *P. rigidus* and *P. elegans*, together with *P. fallax* and *P. paronai*, which have a precisely similar form of scutum, to the genus *Pollicipes*. In *Scillælepas* the upper whorl consists of 5 valves, namely, carina,

paired scuta, and paired terga. The subsequent discovery, therefore, of the upper latera in the species *P. fallax*, *P. elegans*, *P. rigidus*, as well as a large rostrum in those species and in *P. paronai*, shows quite conclusively that they cannot be referred to *Scillælepas*. These species, for reasons previously given, are now referred to the new genus *Pycnolepas*. *Pollicipes dorsatus*, which was tentatively referred to *Scillælepas* by Seguenza, is now definitely proved to belong to it (see p. 198), and since *P. validus* is evidently an allied form, there now seems to be more justification for its reference to *Scillælepas*. *P. gracilis* is regarded as a synonym of *P. validus*.

Genus CALANTICA.

1875. *Calantica*, Gray, Annals of Philosophy (n. s.), vol. x. p. 101.
 1907. *Calantica*, Pilsbry, Bull. U.S. Nat. Mus. no. 60, p. 8.
 1908. *Calantica*, Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, p. 106.
 1913. *Calantica*, Withers, Proc. Zool. Soc. London, p. 942.

Capitulum with two whorls of valves, the upper comprising paired scuta, terga, and a carina, the terga occupying the whole of the space between the scuta and carina; lower whorl comprising three pairs of latera, a rostrum, and a sub-carina. Umbo in all valves apical.

The Oriental group, called by Pilsbry (1908), *Calantica*, s. str., has the lower whorl low and wide, small, not concealing the bases of the valves of the upper whorl.

Subgenus SCILLÆLEPAS.

1876. *Scillælepas*, Seguenza, Atti Accad. Pontaniana, vol. x. p. 390.
 1907. *Scillælepas*, Pilsbry, Bull. U.S. Nat. Mus. no. 60, p. 9.
 1908. *Scillælepas*, Pilsbry, Proc. Acad. Nat. Sci. Philadelphia, p. 106.

Valves of the lower whorl large, high, and incurved, and overlapping the bases of the valves of the lower whorl. Umbo in all valves apical.

Calantica (Scillælepas) dorsata, Steenstrup, sp. (Plate VIII. figs. 12-23.)

1839. *Pollicipes dorsatus*, J. Steenstrup, Krøyer's Naturhist. Tidsskrift, Bd. ii. p. 411, pl. v. fig. 27.
 1839. *Pollicipes validus*, J. Steenstrup, *tom. cit.* p. 412, pl. v. fig. 30.
 1851. *Pollicipes dorsatus*, J. Steenstrup; C. R. Darwin, Pal. Soc. Monogr. Foss. Lepadidæ, p. 69, pl. iv. figs. 4 a-f.
 1854. *Pollicipes dorsatus*, J. Steenstrup; C. R. Darwin, Ray Soc. Monogr. Subclass Cirripedia, Balanidæ, Synop. et Index Systematicus, p. 638.

1912. *Pollicipes dorsatus*, J. Steenstrup; K. B. Nielsen, Cirripedierne i Danmarks Danien-Alejringer, Meddel. Dansk. geol. Foren. Bd. iv. Heft i. p. 30, pl. i. figs. 1-13, 17 (non figs. 14-16).
1912. *Pollicipes elegans*, Darwin; K. B. Nielsen, *tom. cit.* p. 32, pl. ii. figs. 9, 10.

Diagnosis. Valves smooth, strong, and thick. Scuta approaching in shape an equilateral triangle; ocludent margin exteriorly thickened to form a rounded ridge; basilateral angle widely truncated, equalling half the length of the basal margin; tergo-lateral portion, formed by the upturned growth-lines, extremely narrow. Terga with a straight wide ridge, with steep sides, extending from the apex to the basal angle, which on the scutal side is obliquely truncated. Valves of lower whorl large, subtriangular, high, and incurved.

Distribution. Danian: Faxe, Denmark.

Type. Steenstrup (1839) originally founded this species on a tergum, but included in his *Pollicipes validus* a scutum of the species. Darwin (1851) subsequently figured a scutum, tergum, and carina. All the foregoing specimens should be in the University of Copenhagen, but at present only the carina figured by Darwin (1851, pl. iv. figs. 4 a-c) can be identified, and this is in the Mineralogical Museum.

Material. Dr. K. Brünnich Nielsen has recently collected a number of valves of this species, comprising 18 carinae, 48 scuta, 44 terga, and 37 valves of the lower whorl. Of these he figured (1912) a scutum, tergum, and a carina, together with certain valves of the lower whorl. He included with the latter a carinal latus of a *Scalpellum* (pl. i. figs. 14-16), under *P. elegans* a rostral latus of *P. dorsatus* (pl. ii. figs. 9, 10), and (pl. ii. figs. 13-18) some peduncular plates which I believe to belong to *P. dorsatus*, since they agree more with the ornament of the valves of that species. Through the kindness of Dr. J. P. J. Ravn, I have been able to examine the valves of this species figured by Dr. K. B. Nielsen, together with a series of valves of the lower whorl, all of which are in the Mineralogical Museum of the University of Copenhagen. A further series of seven valves of the lower whorl has been presented by the Copenhagen University to the Geological Department of the British Museum, and these are registered I. 15868-I. 15874. For the specimens here figured, I am indebted to Dr. K. B. Nielsen, as well as for a carina, 3 scuta, 2 terga, and a subcarina.

Measurements. This is a comparatively large species, and,
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to judge from the length of the valves known to me, the capitulum must have attained a length of at least 35 mm. Dr. Brünnich Nielsen (1912, pl. i. fig. 12) gives a figure of a tergum, which measures 30 mm. in length, although the apex of the specimen is slightly broken, and his scutum (pl. i. figs. 4-5) has a length of 19.7 mm. The carina here figured (Pl. VIII. fig. 12) would, if complete, measure quite 30 mm. (it now measures 27 mm.). The valves of the lower whorl and the larger of the peduncular plates here figured (Pl. VIII. figs. 16-23) measure respectively:—

	Length.	Breadth.
	mm.	mm.
Rostrum.....	4.2	3.9
Rostral latus (right).....	3.7	5.0
Median latus.....	3.8	4.3
Subcarina.....	2.6	3.4
Carinal latus.....	2.3	2.5
Peduncular plate.....	1.7	1.1

The largest rostral latus is that figured by Dr. Nielsen (1912, pl. i. figs. 6-8) as a carinal latus, which has a length of 5 mm. and a breadth of 8.5 mm.

Scutum (Pl. VIII. figs. 14, 15) triangular, with the basi-lateral angle widely truncated, considerably convex, breadth about three-quarters the length, apex acute, and only slightly curved towards the terga. Occludent margin slightly convex, forming rather less than a right angle with the slightly convex basal margin. Tergo-lateral margin usually slightly concave; a narrow slip is formed along it by the upturned growth-lines, and this is abruptly bent inwards, the inner margin of it forming a sharp ridge on the inner surface. The margin of the truncated basi-lateral angle is almost half the width of the basal margin in the larger valves. Along the occludent margin a narrow portion of the valve is raised to form a rounded ridge, and two further ridges extend from the apex—one to a point about midway on the basal margin, and the other, which is rather less pronounced, to the lowest point of the truncated basi-lateral angle. On the inner surface there is a deep pit for the adductor muscle; the inner inturned tergal edge is concave, and evidently served for the reception of the tergum; the inner occludent edge is of the same width throughout. Above the pit for the adductor muscle, there is a triangular depression, bounded by the inner edges of the tergal and occludent margins.

Tergum (Pl. VIII. fig. 13) subrhomboidal, elongate, moderately convex transversely; ocludent and upper carinal margins forming together less than a right angle, and they are about half the length of the lower carinal and scutal margins. A flat-topped ridge, much steeper on the carinal side, extends in an almost straight line from the apex, widens considerably towards the basal margin, and its obliquely truncated extremity is almost parallel to the upper carinal margin.

Carina (Pl. VIII. fig. 12) much elongated, slightly bowed inwards or outwards, flatly arched transversely, obscurely carinate, with its basal margin almost rectangular. The apical half of the valve is much thickened, and its inner portion is flat and in line with the lateral margins; a comparatively wide portion of the lower part of the valve at the inner margins is marked with growth-lines, showing that the valve overlapped the terga to some extent.

Rostrum (Pl. VIII. fig. 18) triangular, not quite so wide as high, strongly convex transversely, with the apical half strongly incurved, and a wide, prominent, rounded, median ridge extending from the apex to the slightly convex basal margin, where it is slightly produced. On the inner surface there is a central depression evidently serving for the reception of the rostral angles of the scuta; and a slight ridge extends from each lateral angle to a point about one-third of the length of the valve from the apex, and above this ridge the valve is marked by growth-lines, which show that the valve overlapped the scuta to some extent.

Rostral latus (Pl. VIII. figs. 17, 19) obliquely triangular, about one and a half times as wide as high, strongly convex transversely, with the apical half strongly incurved, basal margin concave in the middle. On the inner surface a well-defined ridge extends from the apex to about half the length of the valve, and is there met by two further ridges extending from each basi-lateral angle; the valve is thus divided into three almost equal portions, of which the basal one is smooth, and the two upper portions are marked with growth-lines and must have overlapped the rostrum and median latus respectively.

Median latus (Pl. VIII. fig. 20) obliquely triangular, slightly wider than high, almost flat transversely, with the apical portion very slightly incurved, and the lateral margins somewhat raised to form flat-topped ridges. On the inner surface the valve is divided off by ridges, as is the rostrum, except that the median ridge extends only one-third the

length of the valve from the apex; the inner portions of the valve are much less concave than in the rostrum.

Carinal latus (Pl. VIII. fig. 16) obliquely triangular, almost flat transversely, with a strong median ridge extending from the apex to the basal margin, apical portion slightly incurved, basal margin convex. On the inner surface a ridge extends from each basi-lateral angle to a point slightly over one-third the length of the valve from the apex, and above this ridge the growth-lines meet on a median ridge which is more strongly marked in this valve than in the other basal latera.

Subcarina (Pl. VIII. fig. 21) triangular, almost symmetrical, without a median keel, not so strongly convex transversely as the rostrum, somewhat constricted near the middle, with the apical portion incurved and the basal margin straight. On the inner surface a slight ridge extends from the apex to a point nearly one-half the length of the valve from the apex, and then to each basi-lateral angle. The upper portions marked with growth-lines must have overlapped each carinal latus.

Peduncular plates (Pl. VIII. figs. 22, 23). These are sub-triangular, with rounded apex and rounded basal margin; slightly convex transversely, and slightly incurved. Outer surface smooth, except for a few flatly rounded, transverse ridges. On the inner surface the lower part of the valve is smooth to a varying extent, the upper portion being marked with growth-lines, showing that this part of the plate overlapped the contiguous plates.

Calantica (Scillalepas) valida, Steenstrup, sp.
(Plate VIII. fig. 11.)

1799. Bec de Sèche (*Loligo calmar*), Faujas de Saint-Fond, B., Histoire naturelle de la montagne de St. Pierre, p. 112, pl. xix. fig. 1.
1802. Bek van *Loligo calmar* (maar van eene onbekende soort), Traduction Hollandaise de Faujas par Pasteur, Natuurlijke Histoire van den St. Pietersberg, p. 150, pl. xix. fig. 1.
1839. *Pollicipes validus*, J. Steenstrup, Krøyer's Naturhist. Tidsskrift, Bd. ii. p. 412, pl. v. figs. 28, 29, 29*, 31, 32 (non fig. 30).
1841. *Pollicipes gracilis*, F. A. Roemer; Norddeutschen Kreidegeb. p. 104, pl. xvi. fig. 14.
1850. *Pollicipes gracilis*, Roemer; H. B. Geinitz, Das Quadersandsteingeb. p. 100.
1851. *Pollicipes validus*, Steenstrup; C. R. Darwin, Pal. Soc. Monogr. Foss. Lepadidæ, p. 68, pl. iv. fig. 2.
1851. *Pollicipes gracilis*, F. A. Roemer; C. R. Darwin, *tom. cit.* p. 69, pl. iv. fig. 3.

1854. *Pollicipes validus*, Steenstrup; C. R. Darwin, Ray Soc. Monogr. Subclass Cirripedia, Balanidæ, Synop. et Index Systematicus, p. 637.

1854. *Mitella valida*, Steenstrup, sp.; J. Bosquet, Monogr. Crust. Foss. du Duché de Limbourg, p. 24, pl. ii. figs. 1-3.

Diagnosis. Valves strong, the scuta and carina being extremely thick. Scutum elongate and strongly bent towards the terga, with a ridge extending from the apex to a point on the basal margin rather nearer to the rostral angle; occludent margin much thickened, and at the rostral angle the valve is produced into a short blunt tooth. Carina steeply arched transversely, the greater part projecting freely, and on the inner side either flat or with a prominent central crest.

Distribution. Danian: Scania, Sweden. Maestrichtian: Petersburg, near Maestricht. Upper Senonian: Cibly, Belgium.

Type. This species was founded by Steenstrup (1839) on some carinæ and scuta from Scania, Sweden, but among them he figured (pl. v. fig. 30) a scutum of *Pollicipes dorsatus*. Some of Steenstrup's specimens are preserved in the University of Copenhagen, the carina (pl. v. fig. 29) being in the Zoological Museum, and the two scuta (pl. v. figs. 31-32) in the Mineralogical Museum. I select the original of fig. 32 as the holotype. Darwin (1851) subsequently figured a carina and two scuta, and of these the carina (pl. iv. figs. 2*a-d*) is in the Zoological Museum, and the scutum (pl. iv. figs. 2*e-f*) is in the Mineralogical Museum, of the University of Copenhagen. Bosquet (1854) also figured a scutum and carina, with the addition of a tergum, but I do not know where these specimens are.

Among the Cirripede valves from Cibly (Belgium) in the Geological Department of the British Museum is a rostrum, registered 38460, which must, I think, belong to this species. It differs much from that of *P. dorsatus*, especially in having the basal margin acutely rounded, and, since the upper margins make a more obtuse angle than in that species, the whole valve approaches more closely to a diamond shape. The ridge extending from below the apex to the lateral angles on the inner surface differs from that of *P. dorsatus* in being much less angular. It is quite possible that this rostrum may belong to some other species, but in the absence of any definite evidence I refer it to *P. validus*.

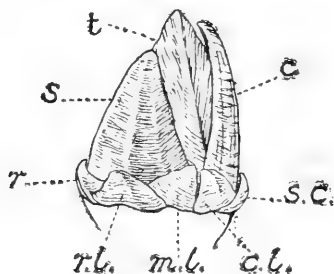
Measurements. This rostrum is 7.9 mm. long, and its breadth is 7.7 mm.

Description.—*Rostrum* (Pl. VIII. fig. 11) subtriangular, basal margin acutely rounded, breadth almost equalling the length, strongly convex transversely, with the apical portion moderately incurved, and a wide, but not very prominent, rounded, median ridge extending from the apex to the basal margin. On the inner surface a gently rounded, delicate ridge extends from the lateral angles to a point nearly one-third the length of the valve from the apex; the portion of the valve above this ridge must have projected freely, but it is not perceptibly thickened, and the growth-lines are not apparent.

*Structure and Affinities of Scillælepas dorsata
and S. valida.*

So long as the species *Pollicipes dorsatus* and *P. validus* of Steenstrup were known only by the disconnected valves

Fig. 1.



Calantica (Scillælepas) dorsata, Steenstrup, sp. Danian: Faxe, Denmark. Restoration of capitulum.

c., carina; c.l., carinal latus; m.l., median latus; r., rostrum;
r.l., rostral latus; s., scutum; s.c., subcarina; t., tergum.

of the upper whorl, it was an open question whether they should or should not be referred to the group of species included under *Scillælepas*, although these valves approached more closely to the species of *Scillælepas* than to those of *Pollicipes*. Dr. K. Brünnich Nielsen's discovery, however, of a number of valves of the lower whorl of *P. dorsatus* in the Danian of Faxe, Denmark, including those here figured (Pl. VIII. figs. 16–21), enables us not only to prove that the species is a true *Scillælepas*, but also to give a restoration of the capitulum (see text-fig. 1). The capitulum is formed of a carina, paired scuta, and paired terga, with three pairs of

basal latera, a rostrum, and a subcarina. In his paper (1912) Dr. K. B. Nielsen figured only two of the basal latera (namely, a rostrum and two rostral latera), but since he still referred the species to *Pollicipes*, he did not realize the significance of these valves. All the valves of the lower whorl of *P. dorsatus* are here figured, and their structure agrees in all respects with the species of *Scillælepas*, especially *S. carinata*, Seguenza, from the Pliocene of Sicily, and the recent *S. superba*, Pilsbry. We are therefore able to prove that a true *Scillælepas* existed in the Upper Cretaceous (Danian), and the importance of this is apparent, since the remaining fossil forms are *S. paronæ*, Alessandri, from the Miocene of Italy, and *S. carinata* and *S. ornata*, Seguenza, from the Pliocene of Sicily.

Since we can prove that *P. dorsatus* belongs to *Scillælepas*, there is little doubt that *P. validus* belongs to *Scillælepas* also, although only the upper series of valves and a single rostrum of the lower whorl are known.

Phylogenetic Considerations.

In considering the phylogenetic position of the pedunculate Cirripedes *Pycnolepas*, *Zeugmatolepas*, *Calantica* (*Scillælepas* and *Titanolepas*), and the sessile Cirripede *Brachylepas*, all represented in the Cretaceous rocks, it is apparent that we are dealing with forms that have been evolved from either *Pollicipes* or a *Pollicipes*-like ancestor, and represent several lines of evolution. All these forms still retain valves of a *Pollicipes*-like character, and, since they are well differentiated in the number, relative position, and structure of the capitular valves, specialization must have begun long before the close of the Jurassic period. A point of special interest is the fact that even so early in the Cretaceous as the Cenomanian, two forms, *Zeugmatolepas* and *Titanolepas*, had independently developed in the scutum a subcentral umbo, a type of valve hitherto known only in the more specialized species of *Scalpellum*, of which the earliest species occur in the Upper Senonian. A similar development in the scutum is exhibited by the genus *Loricula*, which ranges from Turonian to the Upper Senonian.

The new genus *Pycnolepas* includes a series of species, ranging from Albian to Helvetian, in which the capitulum appears to have been formed of eight valves, and the peduncle of comparatively large plates. These capitular valves

agree with those of *Brachylepas* in number and disposition, and, except for the narrower carina and rostrum, in their structure also. The narrowness of the carina and rostrum, however, is of significance, for in this character they agree more with the pedunculate Cirripedes. *Brachylepas* is considered to be a sessile Cirripede, mainly because of the modification of the basal whorls of imbricating plates to form a shelf or platform round the base of the capitulum; and the much wider semiconical carina and rostrum allow of a closer approach of the capitulum to radial symmetry, which is in accord with this interpretation.

The great resemblance between the capitular valves of *Brachylepas* and those of the series of species included in *Pycnolepas* suggests the probability that *Brachylepas* was an offshoot from that line, which by suppression of the peduncle and modification of the lower valves of the capitulum, accompanied by widening of the carina and rostrum, had evolved into a sessile Cirripede.

It is probable that the ancestral species of *Pycnolepas* existed in the Upper Jurassic (Tithonian), for the two recently-described species, *Brachylepas* (?) *fimbriatus* and *B.* (?) *tithonicus* (1912, Geol. Mag. pp. 505-508, pl. xxiii.), each represented by a single carina from Stramberg, Moravia, agree in every way with the structure of the carina in the species of *Pycnolepas*. The relationship of those Stramberg species to *P. rigidus* and *P. fallax* was pointed out at the time, but, since the present evidence with regard to *P. rigidus* and *P. fallax* was not then known, the two Stramberg carinæ were included provisionally in *Brachylepas*, to which *P. fallax* had been referred by Dr. H. Woodward.

When we compare *Brachylepas** (text-fig. 5) and *Pycnolepas* (text-fig. 4) with the recent pedunculate Cirripede *Pollicipes mitella* (text-fig. 2), we see that *P. mitella* has precisely the same arrangement of the upper valves of the capitulum. *Brachylepas*, however, is widely differentiated structurally by the presence of several whorls of imbricating plates at the base of the capitulum, and in this character has a close outward resemblance to the recent sessile Cirripede *Catophragmus polymerus* (text-fig. 3) of the subfamily Chthamalininæ. There is fairly strong evidence, both positive and negative, to support the supposition that *Pycnolepas* has a peduncle with large plates and no lower whorl of valves,

* I have already discussed the relationship of this form with the recent Cirripedes *Catophragmus polymerus* and *Pollicipes mitella* in a former paper (see Geol. Mag. 1912, pp. 356-358).

but when we turn to *Pollicipes mitella* we see that it has a single lower whorl of valves including a subrostrum and subcarina, and with a short peduncle, which is sometimes even considerably shorter than the capitulum.

Fig. 2.

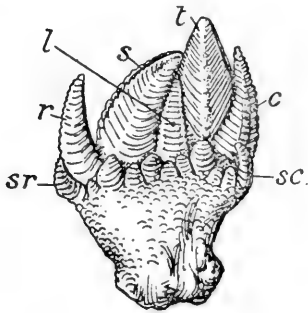


Fig. 3.

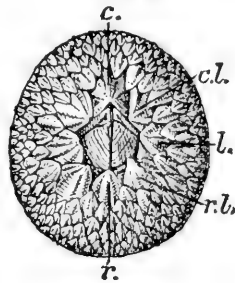


Fig. 4.

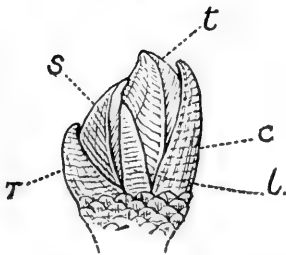


Fig. 5.

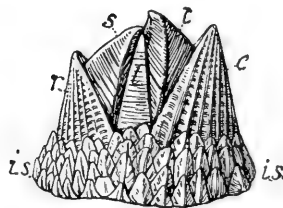


Fig. 2.—*Pollicipes mitella*, Linnaeus. Living: Philippines, China, &c. (After Darwin.)

Fig. 3.—*Catophragmus polymerus*, Darwin. Living: Australian Coast. (After Darwin.)

Fig. 4.—*Pycnolepas rigidus*, J. de C. Sowerby, sp. Albian and Cenomanian, Europe. Restoration.

Fig. 5.—*Brachylepas naissantii*, Hébert, sp. Upper Senonian, Europe. Restoration.

c., carina; c.l., carinal latus; i.s., imbricating plates; l., upper latus; r., rostrum; r.l., rostral latus; s., scutum; s.c., subcarina; s.r., subrostrum; t., tergum.

The blocks for figs. 2, 3, and 5 were kindly lent by the editor of the 'Geological Magazine.'

While it may be supposed that the pedunculate *Pycnolepas* was the ancestral stock which gave rise to the sessile

Brachylepas, it is certainly interesting that *Brachylepas* should show in its structure some relationship to the sessile *Catophragnus* of the subfamily Chthamalinæ. It is much more so when we consider that *Pollicipes mitella*, which is more closely related in the structure and disposition of the upper valves of the capitulum to *Pycnolepas* than to any other Cirripede, has also certain definite characters in common with the Chthamalinæ. Darwin* drew attention to the fact that *P. mitella* is more nearly related to the sessile Cirripedes, especially the Chthamalinæ, than to any others, except perhaps *Lithotrya*, and in his Monograph † states the "The Chthamalinæ, in the structure of the mouth and cirri, and to a certain extent in that of the shell, fill up the interval between the Balaninæ and Lepadidæ; and *Catophragnus* forms in a very remarkable manner the transitional link, for it is impossible not to be struck with the resemblance of its shell with the capitulum of *Pollicipes*."

It would seem, therefore, that the relationship to the Chthamalinæ (*Catophragnus*) of the fossils *Pycnolepas* and *Brachylepas*, and of the recent *Pollicipes mitella*, as deduced by a study of their valves, is supported by the structure of the animal's body in *P. mitella*. One might also reasonably infer that *Pollicipes mitella* is the survivor of the group of species included in *Pycnolepas*, and that it is independently tending to evolve into a sessile Cirripede through the suppression of its peduncle and a modification in the lower valves of the capitulum, just as did the early offshoot *Brachylepas*.

It is indeed probable that the sessile condition has been arrived at independently on several different lines of descent during the evolution of the Cirripedia. In a paper, now in the press, I have shown that the Verrucidæ have a phylogenetic history widely different from that of the Balanidæ (*sensu lato*), and evidence is not wanting to show that the Balanidæ also are at least diphyletic. The Chthamalinæ have almost certainly arisen from some such form as *Brachylepas*, while it is extremely difficult, if not impossible, to derive the Balaninæ from that source or indeed from any form as yet known.

Zeugmatolepas has already been described in a former paper (Proc. Zool. Soc. London, 1913, pp. 937, 941), and it

* See Darwin, C. R., 1851, Pal. Soc. Monogr. Foss. Lepadidæ, p. 48; 1851, Ray Soc. Monogr. Cirripedia, Lepadidæ, p. 324.

† Darwin, C. R., 1854, Ray Soc. Monogr. Cirripedia, Balanidæ, p. 486.

will suffice here to say that in the number of valves of the capitulum it agrees with *Pollicipes*, but differs in the more erect and *Scalpellum*-like shape of the capitulum, in the size and position of the upper latera, and in the specialized form of the scuta, characters seen in the more specialized forms of *Scalpellum*. In fact, it is a *Pollicipes*, which, while retaining the large number of capitular valves, is developing some of the characters of a *Scalpellum*. It probably represents an early attempt at that specialization in the form and position of the upper valves which was subsequently acquired independently by the more specialized forms of *Scalpellum*.

There now remain to be considered the species grouped in the genus *Calantica*. This genus was evidently derived from a *Pollicipes*-like form, and the valves still retain their *Pollicipes*-like character, in consequence of which the fossil forms have been referred mainly to *Pollicipes*. *Calantica* differs from *Pollicipes* in the greater specialization of the capitular valves, and the capitulum is composed of only scuta, terga, and a carina, with but a single basal whorl of valves, the valve which is homologous with the upper latus in other forms being still a member of the lower whorl. There are two groups of recent species, namely, an Oriental group (*Calantica*, s. str.) and a North Atlantic-Mediterranean group (*Scillalepas*). These two groups may conceivably represent two collateral stocks, but at present I am inclined to think that the species included in *Calantica*, s. str., are derived from the more primitive *Scillalepas*, mainly through the weak calcification of the basal whorl of valves. *Scillalepas* is known from the Pliocene and Miocene of Sicily and Italy respectively, and in the present paper has been shown to have existed in the Upper Senonian and Danian, but no fossil has yet been proved to belong to the more typical species of *Calantica*, s. str. The probability is that the ancestral forms of *Scillalepas* occurred in the Jurassic, but although at present there is not sufficient evidence to prove this, it is certain that some of the disconnected valves found in Jurassic rocks have much resemblance to those of *Scillalepas*. It is fairly evident that in *Scillalepas* we have a group of species intermediate between *Pollicipes* and *Scalpellum*, and therefore it is another example of the many forms that have been derived from a *Pollicipes*-like ancestor through the specialization in the number and position of the capitular valves.

The recently-described *Titanolepas**, although ranked as

* 1913, T. H. Withers, Proc. Zool. Soc. London, p. 943.

a subgenus of *Calantica*, differs in the form of the scutum from the other members of the genus. It existed in the Cretaceous (Cenomanian and Turonian), and is considered to be an early specialized form, which branched off from the main *Scillælepas* line and may eventually have given rise to the genus *Oxyaspis*.

Although we can gain some idea of the phylogenetic position of the Cirripedes discussed in this paper, even with the small number of forms and the meagre evidence at our disposal, it is obvious that a knowledge of their Jurassic ancestors would help materially. Unfortunately, the Jurassic species are known in the main only by a few disconnected valves, which give very little idea of the form of the capitulum; and until our knowledge of these forms is considerably extended, our conception of the evolution of the group, as a whole, can make little progress.

In conclusion, I wish to express my indebtedness to the following gentlemen, who have kindly helped me either by the loan or gift of specimens, or in other ways:—Prof. G. de Alessandri, Dr. F. A. Bather, Dr. H. P. Blackmore, Mr. R. M. Brydone, Dr. W. T. Calman, Mr. C. P. Chatwin, Mr. F. Leney, Dr. K. Brünnich Nielsen, Prof. C. F. Parona, Dr. J. P. J. Ravn, and Count Luigi di Rovasenda.

EXPLANATION OF THE PLATES.

PLATE VII.

Pycnolepas paronai, de Alessandri, sp.

Miocene (Helvetian): La Grangia, Colli di Torino, Italy.

Fig. 1. Rostrum.

Fig. 2. Scutum. Imperfect left valve.

Fig. 3. Tergum. With base broken off.

Fig. 4. Carina. $\times 2$ diam. Coll. R. Museo Torino. Origl. figd. G. de Alessandri, Palæontogr. Ital. 1906, vol. xii. p. 248, pl. xiii. fig. 8.

All figures, except fig. 4, nat. size.

Pycnolepas brünnichi, Withers.

Danian, Bryozoa Limestone: Faxe, Denmark.

Fig. 5. Rostrum.

Fig. 6. Scutum. Right valve, with rather narrow apico-basal ridge.

Fig. 7. Upper latus. Apex broken off.

Fig. 8. Tergum. Right valve.

Fig. 9. Carina.

All figures $\times 4$ diam.

Pycnolepas fallax, Darwin, sp.

Upper Senonian, *B. mucronata*-zone: Norwich, Norfolk (figs. 10, 11, 13, 14).

Upper Senonian, *B. mucronata*-zone (upper part): Trimmingham, Norfolk (fig. 12).

- Fig. 10. Rostrum. Norwich Castle Museum (Fitch Colln.), 2156 c.
 Fig. 11. Scutum. Brit. Mus. (Nat. Hist.), I. 14466.
 Fig. 12. Upper latus. R. M. Brydone Colln. Figd. II. Woodward, Geol. Mag. 1906, p. 344, fig. 21.
 Fig. 13. Tergum. Norwich Castle Museum (Fitch Colln.), 2153 c. The original tergum (paratype) of Darwin, 1851, Pal. Soc. Monogr. Foss. Lepadidæ, p. 76, pl. iv. fig. 8 b.
 Fig. 14. Carina. Brit. Mus. (Nat. Hist.), I. 14467.

All figures $\times 2$ diam.

Pycnolepas rigidus, J. de C. Sowerby, sp.

Albian, Gault: Folkestone, Kent.

- Fig. 15. Rostrum. }
 Fig. 16. Scutum. }
 Fig. 17. Upper latus. } *a*, outer view; *b*, inner view.
 Fig. 18. Tergum. }
 Fig. 19. Carina. }

Figs. 15, 16, 18, 19, $\times 2$ diam.; fig. 17, $\times 4$ diam.

PLATE VIII.

Pycnolepas rigidus, J. de C. Sowerby, sp.

Albian, Gault: Folkestone, Kent.

- Fig. 1. Peduncular plate. Outer view.
 Fig. 2. " " Inner view of an incomplete example, showing the median basal socket.
 Fig. 3. " " Inner basal view of another example.

All figures $\times 8$ diam.

Cenomanian, Chalk Marl: near Cambridge.

- Fig. 4. Scutum. Left valve showing very prominent apico-basal ridge, which projects beyond the basi-lateral angle. $\times 4$ diam.

Pycnolepas fallax, Darwin, sp.

Upper Senonian, *M. cor-anguinum*-zone: Quidhampton, nr. Salisbury, Wilts.

- Fig. 5. ? Rostrum. *a*, side view; *b*, outer view. $\times 2$ diam. Dr. H. P. Blackmore's Colln.

Pycnolepas brünnichi, Withers.

Danian, Bryozoa Limestone: Faxe, Denmark.

- Fig. 6. Scutum. Left valve, with very broad apico-basal ridge. $\times 4$ diam.

Pycnolepas scalaris, Withers.

Cenomanian, Chalk Marl: near Cambridge.

Fig. 7. Rostrum. *a*, outer view; *b*, inner view.

Fig. 8. Rostrum. A smaller example in which the longitudinal ridges are not so pronounced.

Fig. 9. Upper latus. *a*, outer view; *b*, inner view.Fig. 10. Scutum. *a*, outer view; *b*, inner view.Figures $\times 8$ diam.*Calantica (Scillelepas) valida*, Steenstrup, sp.

Upper Senonian: Ciplu, Belgium.

Fig. 11. Rostrum. Outer view. $\times 2$ diam. Brit. Mus. (Nat. Hist.), 38460.*Calantica (Scillelepas) dorsata*, Steenstrup, sp.

Danian, Bryozoa Limestone: Faxø, Denmark.

Fig. 12. Carina. (With apex broken.)

Fig. 13. Tergum. Right valve.

Fig. 14. Scutum. Large right valve.

Fig. 15. Scutum. Young left valve.

Fig. 16. Carinal latus.

Fig. 17. Rostral latus. Left valve.

Fig. 18. Rostrum.

Fig. 19. Rostral latus. Right valve.

Fig. 20. Median latus.

Fig. 21. Subcarina.

Figs. 22, 23. Peduncular plates. *a*, outer view; *b*, inner view. $\times 8$ diam.} Outer views. $\times 1\frac{1}{2}$ diam.} *a*, outer view; *b*, inner view.
 $\times 4$ diam.

XXVI.—Description of a new Species of Terrestrial Isopoda from India. By WALTER E. COLLINGE, M.Sc., F.L.S., F.E.S.

[Plate IX.]

I AM indebted to the kindness of Dr. A. D. Imms, of the University of Manchester, for a tube of terrestrial Isopoda containing three specimens, two adult and one young, referable to the genus *Porcellio*, Latreille, collected by him at Allahabad.

During the past few years I have examined a considerable number of terrestrial Isopoda from this region, including many species of *Porcellio*; I cannot, however, find that the present species agrees with any of these or with any that have been previously described.

Porcellio immsi, sp. n.

Body oblong-oval, somewhat depressed; metasome a little narrower than the mesosome, the segments of the latter finely tuberculated, whilst those of the former have a single row of tooth-like tubercles on the posterior margin of each segment. Cephalon (Pl. IX. figs. 1 & 2) with numerous large tubercles; the anterior margin is turned backwards; lateral lobes well developed; median lobe small, formed by the right and left portions of the anterior margin, which do not, however, meet; epistoma convex. Eyes large, sublateral. Antennulæ small, 3-jointed. Antennæ (fig. 3) slender, with the second to fifth joints carinated; the second, third, and fourth are characterized by deep indentations at their distal ends; flagellum 2 jointed, almost equal in length. Mandibles and first maxillæ (fig. 4) typical of the genus. Second maxillæ (fig. 5) thin and plate-like; the inner lobe terminates in a dense mass of setæ, whilst the outer lobe is devoid of setæ, but between the two lobes there are three or four long hair-like setæ. The segments of the mesosome are somewhat depressed; the lateral plates of the first partly surround the head, the remainder are normal and slightly overlap one another. Maxillipedes (fig. 6) with outer palp terminating in a short blunt spine with three smaller ones; the inner palp has a single spine only. Thoracic appendages (fig. 7) comparatively short and thick, the three terminal segments fringed with short spines, and the third and fourth have a series of tooth-like projections on the terminal border, and the fourth a groove on the anterior face lined with fine, short, hair-like setæ. The posterior angle of the lateral plates of the metasome produced backwards (fig. 9). Uropoda (fig. 8) extending beyond the telson; basal plate small and cube-like, with raised portions on the outer and inner sides; exopodite nearly three times the length of the basal plate, carrot-shaped, setose, and articulating at the distal end of the plate; endopodite slightly curved, covered with numerous long setæ, terminating distally with two extra long ones, slightly more than half the length of the exopodite, triangular in section, articulating at the base of a raised portion of the basal plate on the inner side. Telson (fig. 9) short and triangular, terminating in a fine blunt point.

Length 10 mm.

Colour (in alcohol): the mesosomatic segments are a horny brown colour, with yellowish lateral plates, in the middle of which is a patch of deep brown; the metasomatic segments are a uniform dark brown.

Hab. On the surface of the ground, Allahabad, 16. ix. 1907
(*A. D. Imms*).

Type. In the collection of the British Museum (Natural History).

Porcellio immsi is separated from any other known species by a number of minor characters, such, for instance, as the tuberculation of both the mesosomatic and metasomatic segments and the form of the second maxillæ and the maxillipedes. In the form of the antennæ, the head, and the uropoda well-marked differences obtain.

EXPLANATION OF PLATE IX.

Fig. 1. Dorsal view of the cephalon.

Fig. 2. Anterior view of the same.

Fig. 3. Antenna.

Fig. 4. First maxilla, terminal portion.

Fig. 5. Second maxilla, terminal portion.

Fig. 6. Maxillipede, terminal portion.

Fig. 7. Second thoracic appendage.

Fig. 8. Uropod from left side.

Fig. 9. Telson and part of last abdominal segment.

BIBLIOGRAPHICAL NOTICE.

Animal Life by the Sea-shore. By G. A. and G. L. BOULENGER.
London: the Offices of 'Country Life,' Ltd.

Books on "The Common Objects of the Sea-shore" are legion, and some of them have been written by famous men. Gosse and Kingsley are of this number. The authors of the present work are therefore to be congratulated on having produced a volume which must unquestionably rank with the best of its predecessors. Indeed, the names of the authors lead one to expect as much.

While written primarily for the lay reader, these pages will prove no less welcome to trained zoologists, whose everyday work may lie in other fields, and hence may need to refresh their memories.

Every kind of animal that is likely to be found on the beach, in rock-pools, or among beds of seaweed at low tide, from fishes downwards, finds a place in these pages.

The illustrations are not only numerous, but exceptionally good, and hence interesting details of the life-history of the various creatures herein described can be, and are, freely introduced, long and technical notes to enable the reader to identify his "finds" being unnecessary.

We most heartily commend this volume to all who are contemplating a holiday at the seaside; even youngsters will find it a fascinating book.

THE ANNALS

AND

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[EIGHTH SERIES.]

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XXVII.—*On some Oriental Nycteribiidæ* [*Diptera Pupipara*].

By HUGH SCOTT, M.A. (Cantab.), F.L.S., F.E.S., Curator in Entomology in the University of Cambridge.

[Plates X.-XII.]

THIS paper consists of two sections:—(I.) on material recently received from Ceylon and India; (II.) containing a redescription of a species, *Nycteribia parilis*, originally described by Walker from the Moluccas. But before proceeding to the first of these the writer may be excused for inserting some more general remarks.

PRESERVATION AND DESCRIPTION OF NYCTERIBIIDÆ.

The descriptions and redescriptions of species included in this paper were made from specimens preserved in alcohol; the figures also were drawn from specimens lying in that fluid under a low power of the microscope, with the help of a drawing-apparatus. The writer has already pointed out* that Nycteribiidæ are absolutely unfitted for being preserved dry. The most important distinguishing characters often lie in the form and number of the segments of the abdomen. This is particularly the case in the ♀, in which sex the

* Arch. Naturg. lxxix. A, 1913, p. 93.

abdomen consists largely of collapsible connexival membrane. Hence with complete dessication the segments become so shrunk, distorted, and telescoped one under the other that specific characters may be made almost entirely unrecognizable. The same statements apply in a less degree to the ♂. It is practically impossible to determine species from some of the earlier descriptions, which have been rendered incomplete or false by the dried and shrivelled condition of the material from which they were made. Much error and confusion is likely to arise in consequence of this. By a thorough soaking in water old dried specimens can sometimes be induced to reassume in some measure their proper form, and they can then be gradually transferred to weaker, and afterwards to stronger, alcohol.

In studying Nycteribiidæ—even those properly preserved in alcohol—very great allowance must be made for the changes in appearance caused by the varying condition of the abdomen, particularly in the ♀ sex. Descriptions and figures will differ greatly according as they are taken from ♀♀ in an advanced stage of gestation or from specimens with empty shrunken bodies. For the same reason two ♀♀ of the same species may look so different from one another that careful study of the parts of the abdomen is required to establish their specific identity.

For the same cause it is sometimes impossible to include in a single camera-lucida drawing all parts of one aspect of the abdomen. For example, in a dorsal view the basal segments may, owing to curvature, be almost perpendicular to the field of vision. In such cases it may be necessary to make two outline drawings of the specimen tilted at different angles, and to compound them into a single figure showing all the segments. Allowance must be made for this in using the figures on the Plates attached to this paper.

Fault may be found with the great length of some of the writer's descriptions and with the omission of short diagnoses; but it seems at present impossible to avoid making very long and detailed descriptions of these insects. Such important characters are presented by the abdomen that it appears necessary to describe in detail the form of each dorsal and ventral segment in both sexes. Much trouble arises from the inadequateness of earlier descriptions; a number of species have been placed in wrong genera, and this cannot always be discerned from their descriptions alone. Moreover, the writer is uncertain whether the present system of genera is satisfactory. When the generic position of the species is more settled, and those of the same

genus have been more thoroughly compared one with another, it may be possible greatly to shorten specific descriptions.

Stress has been laid on the importance of the form of the abdominal segments. It may be added that in this respect the ♀ ♀ often furnish far more distinctive characters than the ♂ ♂. But, beyond an examination of the form of the ♂ claspers, no study has yet been made of the genital apparatus in either sex. Such a study might considerably modify present views on the species, and might prove that the ♂ ♂, which sometimes appear almost inseparable, really possess distinguishing characters as good as those of the ♀ ♀.

I.—NYCTERIBIIDÆ FROM CEYLON AND INDIA.

The material dealt with here consists almost entirely of a collection made by Mr. J. C. F. Fryer in Ceylon in 1911 and 1912. I have, however, included two species, examples of which were recently collected in India by Mr. T. Bainbrigge Fletcher: one of these, *Cyclopodia roylei* (Westw.), is also contained in Fryer's Ceylonese collection; the other, *Penicillidia fletcheri*, is the only form here described as a new species, and it is represented among the Ceylonese material by a varietal form also described as new under the name *Penicillidia fletcheri*, var. *pumila*.

The subjoined list (p. 212) enumerates the species discussed, showing also their distribution and hosts so far as these are at present known. With the exception of no. 2, the type-form of *Penicillidia fletcheri*, all are now known from Ceylon; and as, to the best of my knowledge, no other species has been recorded therefrom, the list includes the whole Nycteribiid fauna of that island as known up to the present time. The seven forms new to Ceylon are marked with an asterisk. Moreover, *Penicillidia jenynsi* was previously only doubtfully recorded from that island, the only sure record for which appears to have been that of *Cyclopodia sykesi*.

Besides the description of the new species and new variety, previous descriptions of certain other species are amplified and modified, and some forms not hitherto illustrated are figured. Thus, *Nycteribia (Acrochotidia) enæsta* (Speiser) is removed from the genus *Penicillidia*; the abdomen is fully described, and figures are published for the first time. *Cyclopodia ferrarii* has not previously been figured, and earlier descriptions of it are amplified. *Cyclopodia roylei*, formerly placed in *Nycteribia*, is fully described

	DISTRIBUTION.	HOST OR HOSTS.
1. <i>Penicillidia jenkinsi</i> (Westw.)	China, Formosa, Sumatra, Ceylon.	<i>Miniopterus schreibersi</i> .
2. <i>Penicillidia fletcheri</i> , sp. n.	Madras.	<i>Pipistrellus dormeri</i> .
2 a. * <i>Penicillidia fletcheri</i> , var. <i>pamula</i> , var. n.	Ceylon.	<i>Pipistrellus abramus</i> .
3. * <i>Nycteribia</i> (<i>Arrocholidia</i>) <i>euresta</i> (Speiser).	Burma, Ceylon.	{ <i>Hipposideros armiger</i> .
4. * <i>Nycteribia</i> (<i>Listropodia</i>) <i>alotopa</i> , Speiser.	China, Formosa, Sumatra, Ceylon.	{ <i>Hipposideros lankadiva</i> .
5. * <i>Nycteribia</i> (<i>Listropodia</i>) <i>parrula</i> , Speiser.	Formosa, Sumatra, Ceylon.	<i>Miniopterus schreibersi</i> .
6. * <i>Cyclopodia ferrarii</i> (Rondani)	Java, Sumatra, Burma, Ceylon.	<i>Miniopterus schreibersi</i> .
7. * <i>Cyclopodia roylesi</i> (Westw.)	Malay Peninsula, India, Ceylon.	{ <i>Cynopterus brachyotis ceylonensis</i> .
8. <i>Cyclopodia sykesi</i> (Westw.)	India, Ceylon.	{ <i>Scotophilus leathi</i> .
9. * <i>Eucampsipodia hyrtli</i> (Kolenati)	Senegal, Egypt, Comoro Islands, Ceylon, Burma, Sumatra.	{ <i>Scotophilus kuhli</i> .
		{ <i>Tylonycteris wroughthoni</i> .
		{ <i>Tylonycteris pachyptus</i> .
		{ <i>Megaderma tyra</i> .
		{ <i>Pteropus giganteus</i> .
		{ <i>Roussettus egyptiacus</i> .
		{ <i>Roussettus</i> sp. (Comoro Is.).
		{ <i>Roussettus seminius</i> .
		{ <i>Tylonycteris pachyptus</i> .

and figured in the ♀ sex. *Eucampsipodia hyrtli* had only been figured in the ♂ sex; figures of the ♀ are now published.

Remarks on the Hosts.—It will be noticed that three of the species are recorded from more than one species of bat. Of these *Nycteribia* (*A.*) *euresta* has been found on two species of the same genus, *Hipposideros*; *Cyclopodia roylei* has been taken on three closely allied forms of the insectivorous *Scotophilus* and on two other quite distinct hosts, one of which is also an insectivorous form (*TyloNycteris pachypus*), while the other is the bat-eating bat *Megaderma lyra*. Both the other species of *Cyclopodia* have been found only on fruit-eating bats, *C. ferrarii* on *Cynopterus*, and *C. sykesi* on the great Indian "flying-fox" *Pteropus giganteus*. The case of the widespread *Eucampsipodia hyrtli* is remarkable: it appears to infest the large fruit-eating bats of the genus *Rousettus* and the small insect-eating *TyloNycteris pachypus*. With the exception of the fruit-eating *Cynopterus* and *Pteropus*, and of *Megaderma lyra*, all the other hosts are insect-eaters. These remarks were suggested by information received from Mr. Oldfield Thomas, to whom I am much indebted for help. To him also is due the determination of the bats on which Fryer's material was found.

Penicillidia, Kolenati.

1. *Penicillidia jenynsi* (Westwood).

Nycteribia jenynsi, Westwood, ♂, Trans. Zool. Soc. London, i, 1835, p. 291, pl. xxxvi. figs. 29-34.

Penicillidia jenynsi, Speiser, ♂, Arch. Naturg. lxxvii, 1, 1901, p. 28.

Penicillidia jenynsi, Scott, ♂ ♀, Trans. Ent. Soc. London, 1908, p. 360, pl. xviii. figs. 1-8; id. Arch. Naturg. lxxix, A, 1913, p. 95.

This species was originally described from China. Schiner somewhat doubtfully referred to it a single specimen (a ♂, judging from his remarks) obtained in Ceylon ('Novara Reise,' Diptera, 1868, p. 375). Speiser, in his revision of the family, included Schiner's record, but quite rightly queried it (*op. cit.* p. 49). The occurrence of the species in Ceylon is now established by the fact that 2 ♀ were collected at Peradeniya by Fryer. I have already referred to these two specimens in discussing a long series from Formosa (1913, *l. c.*). They present certain variations in detail from the form described as the type ♀ in 1908, variations which are also found in some of the Formosan examples. These variations consist principally in certain

parts being more "bristly" than in the type-form. Thus (i.) the second tergite, instead of having its surface quite bare, has very short scattered bristles in the middle of its disc, covering a roughly triangular area extending forwards from the hind margin; (ii.) the two ventral chitinous areas (Scott, 1908, *op. cit.* fig. 4 *b*) have the stiff erect bristles on their surfaces extending further forwards, instead of only present near their hind margins; (iii.) the transverse chitinous area (*op. cit.* fig. 4 *c*) has short erect bristles scattered over its surface, not only present near its hind margin. Variation of a somewhat like nature has been observed in *Nycteribia* (*Listropodia*) *allotopa*, Speiser (see p. 221).

One of the specimens has a Laboulbeniaceus fungus growing on its abdomen, to which I have already referred (*Arch. Naturg.* lxxix. A, 1913, p. 95).

Loc. China, Sumatra, Formosa, Ceylon.

Fryer obtained his two specimens from *Miniopterus schreibersi* at Peradeniya, x. 1911 and 30. i. 1912.

2. *Penicillidia fletcheri*, sp. n. (Pl. X. figs. 1-4.)

Length circa 2.5 mm.

Head bare, except for a few short bristles in the middle of the vertex in front and along the margins of the cheeks. *Eyes* black-pigmented. *Thorax* beneath (fig. 4) about $1\frac{1}{2}$ times as broad as long, nearly flat (*i. e.* not convex from front to back as in some species of *Penicillidia*), with middle line impressed behind; it has a characteristic fringe of bristles along its hind margin, about four longer ones on either side of the middle line, between each two of which are two or three shorter bristles; the four longer bristles become gradually longer from the one nearest the middle line to the outermost one. *Legs* apparently without noteworthy characters, not strikingly long; metatarsus slightly shorter than tibia.

♂ ABDOMEN (Pl. X. figs. 1, 2).—*Basal tergite* very small, not reaching to the sides of the abdomen, trapezoidal, its posterior margin shallowly and widely sinuate and without bristles in the middle, on either side with 4 or 5 short stout bristles, its disc bearing short bristles towards the sides, almost bare in the middle. *Tergites* 2-6 with surfaces bare except for some extremely short scattered bristles right at the sides, and which are also scantily present across the disc of tergite 2 near its base; hind margins set with long bristles and short thorn-bristles, 1-3 thorn-bristles between each two long bristles; the long bristles are longer in the

middle part of the margin than towards the sides, and in tergites 4, 5, and 6 these median ones become very long; on tergite 5 the marginal series is narrowly, and on tergite 6 widely, interrupted in the middle, but on the other tergites it is continuous. *Anal segment* tapering considerably, with sides slightly curved towards the apex, with short erect bristles on the posterior part of its surface and at the sides, and two moderately long ones at either hind angle.

Basal sternite with a slightly impressed middle line, surface fairly closely covered with bristles; ctenidium close, slightly sinuate in the middle. *Sternites* 2 and 3 have their hind margins set with moderately long bristles of slightly varying lengths, those at the sides rather longer than those in the middle; sternite 2 has two irregular series of very short bristles across its disc, and some longer suberect bristles at the sides of the disc; sternite 3 has one irregular transverse series, some of the lateral bristles of which are considerably longer and suberect. *Sternite* 4 longer; hind margin curved, bearing in the middle about 10 short, stout, thorn-like bristles; on either side of these are bristles of varying length, those at the sides being longer, and immediately in front of these marginal bristles are suberect bristles of varying length; across the posterior part of the disc is a very irregular series of rather short bristles, of which the median ones are nearer the hind margin than the lateral ones. *Anal segment* with rather numerous erect and suberect bristles at the sides; *claspers* nearly parallel, not contiguous, curved only in the dorso-ventral plane towards the apex, tapering, each with two bristles directed outwards in its median third, and other bristles directed inwards in its basal third.

♀ ABDOMEN (Pl. X. figs. 3, 4).—*Basal tergite* of much the same form as in ♂, but with the five bristles at either hind angle longer and stouter. *Tergite* 2 long, of remarkable form; subcordate, narrowed behind, each side being convexly curved in its anterior part and concavely sinuate in the narrower posterior part of the tergite; it is divided into two halves by a median longitudinal line of pale membrane, each half having an obliquely truncate hind margin bearing 4 or 5 long, stout, dark bristles, erect and directed outwards, immediately in front of them being a series of very short dark thorn-bristles; on the disc of the segment, at about $\frac{1}{4}$ its length from the hind margin, each half bears an irregular, oblique, transverse series of very short dark bristles; there are scattered very short bristles near the anterior angles of the tergite, and a few very minute ones

near the dividing-line, otherwise the surface is bare; each side-margin is bare except for 4 bristles at about the middle of its length; each half of the tergite has a streak of darker brownish pigment running from its outer hind angle, broadening and curving outwards in the anterior part, to the anterior angle. On either side of this tergite is pale *connexivum*, bearing extremely short minute bristles in front and longer ones behind; behind the tergite also is pale *connexivum*, bearing moderately long and stout dark bristles rather far apart; this is terminated by two slightly elevated more chitinized areas, separated by a moderately wide gap, and each bearing on its hind margin 3 or 4 very long, dark, stout bristles and a number of short dark bristles. *Anal segment* slightly tapering, its hind margin rather widely emarginate, its surface bare in the middle but with short erect bristles at the sides, its hind angles bearing each a group of 4 or 5 long bristles.

Ventrally (Pl. X. fig. 4) the material has not admitted of details being so clearly discerned. *Basal sternite* as in ♂. *Sternite 2* membranous, bearing short bristles on its surface and a marginal series of moderately long bristles, longer at the sides, and rather spaced out. *Sternite 3* represented only by a very short area of membrane, surface bare, marginal series of bristles similar to the preceding. *Sternite 4* also membranous, but more firmly chitinized near its hind margin, which is widely and rather deeply sinuate in the middle, and which bears moderately long bristles widely spaced, some at the sides being suberect and very long. *Sternite 5* much longer, consisting of two more chitinized halves divided by a median longitudinal streak of pale membrane; each half bears scattered, short, suberect bristles, and the hind margin has bristles of varying length, some (especially at the outer angles) being very long and suberect. *Subgenital plate* in the middle broadly membranous, pale, and bare; at the sides more chitinized, and bearing short suberect bristles; hind margin rounded, without bristles in its median part, on either side with 4 or 5 bristles, those nearest the middle being longest.

Loc. India.

1 ♂, 1 ♀, taken from *Pipistrellus dormeri*, at Coimbatore, Madras, 24. i. 1913, by T. B. Fletcher.

This species belongs to the section of the genus *Penicillidia*, in which the legs are not thickened, and in which "Haftscheiben"—that is, little hard chitinous plates thickly set with chitinous tubercles and situated on the abdomen (ventrally in ♂, dorsally in ♀)—are absent. It is note-

worthy that in *P. fletcheri* the ventral surface of the thorax is not convex from front to back, as it markedly is in several species of the genus. The most remarkable character of *P. fletcheri* as a species is the form of the dorsal abdominal segments of the ♀; their plan recalls that of *Nycteribia (Acrocholidia) fryeri*, mihi, described from Assumption Island, South-west Indian Ocean*. In the complete absence of eyes, the length and slenderness of its legs, the different form of its ventral thoracic plate, and in many other points, *N. fryeri* is entirely different from *P. fletcheri*, but the abdominal tergites of the ♀ are arranged on the same plan, though differing in details. In both species the ♀ has a small basal tergite, with hind margin sinuate or emarginate in the middle and a series of strong bristles at the hind angles; in both there is a large second tergite, longitudinally divided into two halves, each of which is produced behind. *P. fletcheri* is absolutely distinct from any Nycteribiid that I have seen, and I am unable to make it agree with descriptions or figures of any that I have not seen; it is dedicated to its collector, Mr. T. Bainbrigge Fletcher.

2 a. Penicillidia fletcheri, var. *pumila*, var. n.
(Pl. X. fig. 5.)

Length circa 1·5 mm.

Closely resembling the preceding, but very much smaller. Even allowing for the shrunken state of the abdomen in most if not all the specimens, there is a great difference in size; when var. *pumila* is viewed side by side with the type-form, it appears only about half as large.

In the ♂ the only other difference appears to be in the long bristles in the median part of the hind margins of abdominal tergites 4, 5, and 6; these are very long in the small form, proportionately longer than in the large ♂ of the type-form.

In the ♀ there are more decided differences (Pl. X. fig. 5). The narrow posterior part of *tergite* 2 is a little narrower in var. *pumila*; the 4 long bristles on the hind margin of each half are very long, appearing longer in proportion than in the type-form; the side-margin of each half, instead of having only 4 rather short bristles at about the middle, has 4 or 5 longer ones, widely spaced, extending from a little

* At the time of printing this paper my description of *N. fryeri* is not yet published; but it will appear shortly in *Trans. Linn. Soc. London*, ser. 2, Zool. vol. xvii.

before the middle to about $\frac{3}{4}$ the length. The median connexivum behind tergite 2 is bare, instead of having rather long bristles as in the type-form; and instead of being terminated behind by two wide chitinous elevated areas, much bristled, it has only two small tubercular prominences, each bearing three bristles. These last characters are the most important which I have found to separate var. *pumila* from typical *fletcheri*.

I do not consider the differences sufficient for the erection of *pumila* as a distinct species, and therefore place it as a "var." of *fletcheri*.

Loc. Ceylon.

3 ♂, 4 ♀, taken from *Pipistrellus abramus*, at Peradeniya, xi. 1911, by Fryer.

Nycteribia, Latreille.

Subgenus *Acrocholidia*, Kolenati.

3. *Nycteribia (Acrocholidia) euxesta* (Speiser).

(Pls. X., XI. figs. 6-9.)

Penicillidia euxesta, Speiser, Arch. Naturg. lxxvii. 1, 1901, p. 29.

This species was described from 2 ♂ and 1 ♀ from Burma, preserved in the Genoa Museum. Through the kindness of Dr. R. Gestro I have been able to examine these three original specimens, and find that 2 ♂ and 4 ♀ obtained by Fryer in Ceylon agree closely with them. The species, however, cannot be retained under the existing classification in the genus *Penicillidia*, since an examination with a compound microscope has convinced me that eyes are quite absent; it should be referred to the subgenus *Acrocholidia* of *Nycteribia*.

The length of the original specimens was given as 3.5 mm., that of the Ceylon specimens is about 3 mm. Speiser stated that the *thorax* ventrally was longer than broad; in the Ceylon specimens it is about as long as broad; in some specimens, owing to being curved upwards at the sides, it appears a little longer than broad, but measurement with the help of a drawing-apparatus has not shown this to be actually the case (Pl. XI. fig. 7).

The ABDOMEN was not very completely described in the original description. In the ♂ the true *basal tergite* is small, not reaching to the sides of the abdomen, slightly broader behind than at the base, pale and whitish; its surface bare except for a few very short bristles in the middle, its

hind margin bearing slightly longer bristles. *Tergites* 2, 3, and 4 have their hind margins set with moderately long bristles, rather far apart (especially on tergite 4); tergite 2 has its entire surface covered with short fine bristles; tergite 3 has its surface similarly covered, excepting the extreme basal portion; tergite 4 has its surface bare except for the middle posterior portion, where there are about two irregular rows of short bristles just in front of the hind margin. *Tergites* 5 and 6 are more arched and produced backwards in the middle; their surfaces are bare, their hind margins set with long bristles far apart, of which some in the middle are very long. *Anal segment* short and blunt, its apex rather broad, its hind angles rounded; its surface is bare in front, but bears a few erect short bristles in its posterior part; there are 6 long bristles on the hind margin, 3 on either side in the region of the rounded hind angles. Ventrally the *basal sternite* bears two or three irregular rows of short bristles on the posterior part of its surface, and the teeth of the ctenidium are close and fairly long. *Sternites* 2 and 3 are short, their hind margins set with long strong bristles rather spaced out (the space between each two bristles is about equal in breadth to twice the thickness of a bristle at its base); these sternites bear on the posterior parts of their surfaces short fine bristles, which are more marked on sternite 2 than on sternite 3. Behind sternite 3 is a plate (= *sternites* 4 + 5) longer than the two preceding sternites taken together; its margin is nearly truncate in the middle behind, and curves obliquely forward on either side of this truncate portion; the truncate portion bears several rows of very short black thorn-bristles; on either side of these are three very long bristles, and the lateral margins also bear some long bristles; the surface is bare except quite near the margins, where there are some rather long, fine, erect bristles in front of the thorn-bristles, and shorter erect bristles near the side-margins. The *claspers* lie nearly parallel; their apices are blunt, curved upwards, and dark-pigmented; each clasper bears a series of bristles becoming gradually longer towards its base, the one at the base being very long.

In the ♀ (Pls. X., XI. figs. 6, 7) the true *basal tergite* is small, similar to that of the ♂. *Tergite* 2 is of remarkable form: large and transverse, with hind margin slightly arcuate, and set fairly closely with moderately long bristles, those in the middle a little longer than those at the sides; the surface of the tergite has a median longitudinal line of pale connexivum, bare of bristles; on either side of this it is more

firmly chitinized, pale yellowish, and covered with scattered short bristles; in shrunk or dried specimens the tergite sometimes collapses along the median longitudinal line in such a way that it appears to be divided into two separate halves, though this is not really the case. The rest of the abdomen (exclusive of the anal segment) consists of whitish *connexivum*; the middle part of this bears stout bristles covering a roughly triangular area with its apex directed backwards and reaching to about $\frac{3}{4}$ the length of the *connexivum*; the bristles on the front part of this area are rather short, but become gradually longer towards the apex of the area; the lateral parts of the *connexivum* bear exceedingly short minute bristles; the extreme posterior part is quite bare except for one pair of bristles in the middle, at the base of the anal segment. *Anal segment* short and bilobed; each lobe has 4 very long and stout bristles at its apex, and several very short erect ones on its outer side; the position of the lobes varies according to the degree of distension of the abdomen; in the type from Burma they are wide apart (fig. 8), in the Ceylon specimen (fig. 6) they lie close together. Ventrally the *basal sternite* is as in the ♂. Behind it is an area densely set with long and stout dark bristles, the arrangement of which cannot be exactly made out owing to shrinkage of the membrane. Behind this are two nearly similar short *sternites*; each has a median longitudinal pale line, on either side of which it is yellowish and more firmly chitinized; each has a transverse series of erect bristles across its surface; each has a series of rather long bristles on its hind margin, set wide apart, those on the posterior of the two *sternites* standing in a bisinuate line; these marginal bristles are all directed backwards except at the hind angles, at each of which are 3 long bristles directed abruptly outwards. The large *subgenital plate* is longer than the two preceding segments taken together, trapezoidal, slightly narrowed behind, with broadly rounded hind angles; its margin has 3 long bristles at each hind angle; the surface is quite bare except in the posterior part, where there is a group of about 6 erect bristles on either side of the middle line; the plate has a median longitudinal line, pale and more weakly chitinized than the parts on either side. In spirit-specimens the surface of the plate is quite continuous (fig. 7), but in the dried original type this weaker middle line has collapsed into a deep furrow dividing the plate into two halves* (fig. 9).

* To this fact are due Speiser's words (*l. c.*) "am Hinterrande mitten scharf eingezogen und durch eine Längsfurche in zwei Hälften getheilt."

The form of the ♀ abdomen in this species is characteristic, particularly the median longitudinal line of weakness possessed by the second tergite, the long dark bristles covering the median area of the dorsal connexivum, and the form of the subgenital plate. *N. euzesta* does not closely resemble any species which I have seen.

Loc. Burma, Ceylon.

The original specimens from Burma were taken from *Hipposideros* (= *Phyllorhina*) *armiger*. Fryer's specimens were found on *Hipposideros lankadiva* at Peradeniya, Ceylon, on two occasions—vii. 1911, 1 ♂, 1 ♀; 8. v. 1912, 1 ♂, 3 ♀.

Subgenus *Listropodia*, Kolenati.

4. *Nycteribia* (*Listropodia*) *allotopa*, Speiser.

Nycteribia (*Listropodia*) *allotopa*, Speiser, Arch. Naturg. lxxvii. 1, 1901, p. 37.

Nycteribia (*Listropodia*) *insolita*, Scott, Trans. Ent. Soc. London, 1908, p. 364, pl. xviii. figs. 9-13.

Nycteribia (*Listropodia*) *allotopa*, Scott, Arch. Naturg. lxxix. A, 1913, p. 97.

This species was not previously known from Ceylon, but in discussing a long series from Formosa and Speiser's original types from Sumatra, in 1913, I mentioned (*l. c.*) that I had before me specimens from Ceylon. They are considerably smaller than the Sumatran and Formosan examples, but in all structural points agree with them very closely. I also referred to the variability of certain characters. Thus, in the Formosan series the fourth tergite in the ♂ has its surface sometimes quite bare, sometimes bearing scattered short bristles; the series from Ceylon includes only 3 ♂, all of which have short bristles on the surface of this segment. The second tergite in the ♀ varies in the Formosan series in a similar way; in the Ceylon series it again varies in like manner, its surface being quite bare in 5 ♀, but in the remaining 1 ♀ bearing short bristles in the whole middle region from the front to the hind margin, while remaining quite bare towards the sides. Rather similar variation has been observed in *Penicillidia jenynsi* (see p. 213).

Loc. Sumatra, Ceylon, China, Formosa.

The series from Ceylon was collected by Fryer from *Miniopterus schreibersi* at Peradeniya, x. 1911 (1 ♂, 1 ♀), and 30. i. 1912 (2 ♂, 5 ♀).

5. *Nycteribia (Listropodia) parvula*, Speiser.

Nycteribia (Listropodia) parvula, Speiser, ♀, Arch. Naturg. lxxvii. 1, 1901, p. 38.

Nycteribia (Listropodia) sauteri, Scott, ♂ ♀, Trans. Ent. Soc. London, 1903, p. 366, pl. xviii. figs. 14-18.

Nycteribia (Listropodia) parvula, Scott, Arch. Naturg. lxxix. A, 1913, p. 93.

Fryer collected 1 ♂ of this species from *Miniopterus schreibersi* at Peradeniya, 30. i. 1912. It was previously unknown from Ceylon. On the same date and at the same place he obtained *N. (L.) allotopa*, Speiser, from the same host-species, but whether from the same individual bat is not recorded. In any case these two species have on several occasions been found at the same time and place on *M. schreibersi* (see Scott, 1913, *op. cit.*, bottom of p. 93 and p. 100).

Loc. Sumatra, Ceylon, Formosa.

Cyclopodia, Kolcnati.

6. *Cyclopodia ferrarii* (Rondani). (Pl. XI. figs. 10-15.)

Nycteribia ferrarii, ♂, Rondani, Ann. Mus. Genova, xii. 1878, p. 151.

Cyclopodia ferrarii, ♂ ♀, Speiser, Arch. Naturg. lxxvii. 1, 1901, pp. 45, 55.

This species was described by Rondani from a single dried ♂ from Java. The ♀ was described for the first time by Speiser (*l. c.*) from specimens from Burma. Fryer's material from Ceylon (whence the species is now for the first time recorded) includes several specimens, which I have been able to compare with Rondani's type and with 9 ♂ and 6 ♀ (all dried) from Sumatra, these and the type having been all kindly lent by Dr. R. Gestro from the Genoa Museum.

The following amplifications and modifications of earlier descriptions are made principally from the three Ceylon specimens in alcohol, though I have, of course, also examined the dried specimens from Sumatra:—The *thorax* beneath is longer than broad, bluntly rounded in front, with sides diverging backwards so that the greatest breadth is reached just before the middle legs; the median longitudinal line is not excavated behind; the bristles on the hind margin are scarcely any longer than those on the surface, in the middle part they do not project over the margin at all, only at the posterior angles are there some rather longer than those on

the surface. A dorsal view of the ♂ ABDOMEN is shown in Pl. XI. fig. 10. Its *ventral surface* (fig. 11) was not described by Speiser; the basal sternite bears two rather irregular rows of short bristles before the hind margin, and the teeth of the ctenidium are long and strong; the two succeeding sternites bear scattered short bristles on their surfaces and stout moderately long bristles set in a fairly close series on their hind margins; of these two sternites the third is longer than the second; then follows a very long *fourth sternite*, as long as the two preceding together, gradually narrowing to its distal end, with its hind margin slightly bisinuate, bearing scattered short bristles on its surface (except just in front of the hind margin, where there is a bare space), and longer bristles set rather far apart on its hind margin, and standing outwards on its sides. The *claspers* are very remarkable. They are very long and lie in contact with one another throughout their length. At the base each clasper bears one long and two short bristles, otherwise they are almost entirely bare; only in the apical half do they bear some exceedingly fine and exceedingly short bristles, and in one specimen where the actual apices are visible these bear each a short stout black spine (Pl. XI. fig. 12).

♀ ABDOMEN (Pl. XI. figs. 13, 15).—The basal tergite is bare on its surface and bears long stout bristles, not set very close, on its hind margin. This is followed by a long whitish connexivum covered with short bristles. At the posterior end of this connexivum and just in front of the anal segment is a single brown area (see fig. 14), with its anterior margin rounded, its surface bare, and its hind margin bearing about 4 or 5 long bristles. Neither in the ♀ in alcohol from Ceylon nor in the dried Sumatran ♀ ♀ from the Genoa Museum can I see any sign of division in this brown plate or area, and therefore do not understand Speiser's reference (*l. c.*) to "zwei symmetrisch zu beiden Seiten liegende halbmondförmige, dunkelbraune Chitinplatten" lying at the posterior extremity of the penultimate segment; there is no trace of such structures dorsally situated in the material before me. The *anal segment* (Pl. XI. fig. 14) has its brown chitinous surface bare; this brown surface is cleft in the mid-dorsal line behind by a triangular space extending about halfway to the base of the segment; the margins of the brown chitinous portion on either side of this space and at the apical angles bear long stout bristles; the cleft or space itself is occupied by an area of whitish

membrane with very fine and short bristles on its hind margin, and which sometimes collapses in dried specimens so as to make the segment appear distinctly bilobed.

Ventral surface (Pl. XI. fig. 15): the basal sternite as in the ♂; this is followed by a long expanse of whitish connexivum, set with short bristles as on the dorsal surface, and bearing two small brown chitinous areas on its hind margin on either side of the middle line. Behind this is a segment with its surface bare of bristles, composed chiefly of whitish connexivum, but with two much larger brown chitinous areas on either side of the middle line, each of these areas bearing 4 long bristles on its hind margin. The subgenital plate is completely divided from base to apex, by a narrow area of pale membrane, into two brown firmly chitinized portions, each bearing several long strong bristles at and near its apex.

Loc. Java, Sumatra, Burma, Ceylon.

The host on which the type was found in Java is not recorded. The Sumatran specimens (Mus. Genova) are all labelled "Balighe, x. 1890—iii. 1891, E. Modigliani," and one also is labelled "*Cynopterus?*" Ceylon: the three specimens are all from *Cynopterus brachyotis ceylonensis*; all are from Peradeniya, 2 ♂ obtained xi. 1911 and 1 ♀ obtained iii. 1912 (*Fryer*).

7. *Cyclopodia roylei* (Westwood). (Pl. XII. figs. 16, 17.)

Nycteribia roylei, ♂, Westwood, Trans. Zool. Soc. London, i. 1835, p. 290, pl. xxxvi. figs. 35, 36; Kolenati, Horæ Soc. ent. Ross. ii. 1863, p. 87, pl. xiv. fig. 30.

Cyclopodia roylei, ♂, Scott, Trans. Ent. Soc. London, 1908, p. 368, pl. xviii. fig. 19.

Nycteribia (*Aerocholidia*) *chlamydophora*, ♂ ♀, Speiser, Fascic. Malay., Zool. vol. i. 1903, p. 123.

For examination of this species I have had before me the following material:—Westwood's *type* ♂ of *N. roylei*, preserved dry, kindly lent by Professor Poulton from the Hope Museum, Oxford; a co-type ♀ of Speiser's *N. chlamydophora* preserved in alcohol in the Cambridge Museum; 3 ♂ and 1 ♀, unnamed and in alcohol, from Bihar (India); 14 ♂ and 23 ♀, also unnamed and preserved in alcohol, from Ceylon.

My examination of Westwood's *type* ♂ in 1908 showed that it belonged to the genus *Cyclopodia*. Subsequently, on examining the co-type ♀ of *N. chlamydophora*, I saw that this species also is really a *Cyclopodia*, but, having no ♂

specimen of it, I could not tell that it was identical with *roylei*. Having now examined the large unnamed material from Ceylon and India, I find that the ♂♂ agree closely with Westwood's type of *roylei*, while the ♀♀ correspond equally closely with Speiser's co-type of *chlamydophora*; I am therefore convinced that the two species are identical.

The three rings on the *tibiæ* are often indistinct on the dorsal side, but quite distinct on the ventral. In 1908 (*l. c.*) I expressed doubt as to whether the dark-pigmented eyes are composed of one or more ocelli. I have now mounted the head of a specimen in balsam, but even so the number of facets is hard to determine owing to the opacity of the dark pigment beneath; but in this specimen, at any rate, there are certainly at least two facets in each eye*.

In the ♂ *abdomen* the bristles extend in unbroken series across the hind margins of tergites 2, 3, 4, and 5. In the type and in some of the new specimens they form a similar unbroken series on the hind margin of the sixth (*i. e.* penultimate) segment; but in other specimens the series is rather widely interrupted in the middle of this segment, while in some others (intermediates) the bristles become short and scanty in the middle part, but are not altogether absent. Speiser, in his description of *chlamydophora* ♂, refers to sternites 2 and 3 as "auf der Fläche beborstet." In several specimens which I have examined closely sternite 2 has scattered short bristles on its surface, but sternite 3 is nearly bare, having only an irregular transverse series of very short bristles a little behind the middle; in this sternite also the bristles on the hind margin are very short and set far apart, only the 3 or 4 middle ones being rather longer. In other ways the abdomens of the ♂♂ from Ceylon and India correspond with Speiser's description of *chlamydophora*.

The ♀ *abdomen* (Pl. XII. figs. 16, 17) is, as justly remarked by Speiser, characterized by the great length of the basal segment, both dorsally and ventrally. Dorsally, the long *basal tergite* is divided longitudinally into two parts by

* Since writing the above, I have remarked certain particulars in which *C. roylei* differs from all typical species of *Cyclopodia* with which I am acquainted. This is notably the case in the form of the head. Although *C. roylei* has pigmented eyes of more than one facet, yet the head is strongly arched dorsally and compressed laterally, as in *Penicillidia* and *Nycteribia*; while in *C. sykesi* and its allies, and in *C. ferrarii*, the head is broad and flattened dorsally, the compression being in the horizontal, not in the vertical, plane. This and some other points make me feel some doubt as to the final generic position of *C. roylei*. Possibly a new genus may be needed for its reception.

a median line of pale connexivum ; each part is whitish and soft in its basal quarter, brownish and more strongly chitinized in its remaining portions ; each bears short, scattered, suberect bristles in its basal half, in the apical half the bristles are absent towards the outer margin, but scantily present near the median dividing-line ; immediately on either side of the dividing-line the segment is produced into an angular process, more darkly pigmented, and having its margin set with rather longer, stoutish, bristles. Behind this basal tergite is an area of pale *connexivum*, bearing two slightly darker areas, one on either side, about halfway between the middle line and the side of the body ; each of these areas bears several very short bristles at its anterior, and several rather long bristles at its posterior, extremity ; there is also a pair of bristles on the connexivum between the posterior extremities of the dark areas. *Anal segment* very short, with a transverse series of long bristles at about half its length ; this series is widely interrupted in the middle, there being about four bristles on either side.

Ventrally (Pl. XII. fig. 17) the *basal sternite* is of great length, with a dark median longitudinal line, and the short bristles on its surface do not extend quite to the hind margin ; the *ctenidium* does not extend right across the margin, but ends on either side a little way from the angle, the space between it and the angle bearing several marginal bristles. The succeeding *sternites* (2, 3, and 4) are curiously arched and bent forwards in the middle ; the chitinous portions of sternites 2 and 3 are widely interrupted in the middle, so that these sternites are represented by connexivum medially and a chitinous plate on either side ; in sternite 4 the chitinous portion is continuous, and forms a narrow arched strip (see Pl. XII. fig. 17). The surfaces of these sternites are bare, but their hind margins bear moderately long bristles set at regular intervals, which, however, are reduced in sternite 4 to only three or four bristles on either side ; [it is only in specimens with abdomens greatly distended that the median parts of these sternites are visible ; in most they are hidden under the basal sternite]. *Sternite 5* is of peculiar shape ; produced in front into an apex extending into the arch formed by the fourth sternite ; hind margin broadly rounded, without marginal bristles ; the sternite is divided by a pale median longitudinal line ; it has a pair of very short bristles, one on either side of the median dividing-line near its base, a second pair of slightly longer bristles similarly situated at about its middle, and two or three still longer bristles on either side of the median

line near the apex; [some variation is noticeable, *e. g.* the ♀ from Bihar has an extra four bristles situated two on either side of the median line midway between the basal and median pairs, and this specimen also has the apex of the sternite shallowly emarginate, a character not observed in any other]. *Subgenital plate* almost hidden under sternite 5, undivided, with bluntly rounded apex, and several longish bristles on and near its margin on either side.

The form of the ♀ abdomen in *C. roylei* is quite unlike that of any other Nycteribiid known to me. The very great length of the basal segment is highly remarkable, as, too, is the extraordinary arching forwards of the second, third, and fourth sternites. The position of the *spiracles* also appears curious; two pairs are visible dorsally on the connexivum, one pair rather close to the middle line, immediately adjacent to the inner side of the anterior extremities of the lateral dark areas, and another not much posterior to this, but situated quite at the sides of the body. Two other pairs are visible on the connexivum ventrally, close behind the outer angles of sternites 2 and 3.

Loc. Malay Peninsula, Ceylon, India.

Westwood's type of *Nycteribia roylei* was recorded from "India orientalis" without further particulars, and the host was unrecorded. The specimens described by Speiser as *Nycteribia chlamydophora* were from the Malay Peninsula, from Biserat, Jalor, and from Bukit Besar, in both cases on *Scotophilus castaneus*, Horsfield, which Mr. Oldfield Thomas considers to be merely a form of *Scotophilus kuhli*, Leach (see below).

3 ♂ and 1 ♀ were obtained by T. Bainbrigge Fletcher on *Scotophilus heathi*, Horsfield, at Pusa, Bihar, India, vi. 1911. Fryer's material from Ceylon is as follows:— 9 ♂ and 18 ♀ on *Scotophilus wroughtoni*, Thomas, Peradeniya, 1912; 3 ♂ on *Tylonyceris pachypus*, Peradeniya, 9. xii. 1911; 1 ♂ and 3 ♀ on the same host, Peradeniya, 20. xii. 1911; 1 ♂ and 2 ♀ probably from *Scotophilus wroughtoni*, collected i. 1912 at Ambalangoda by Dr. Bugnion and given by him to Fryer.

Also the British Museum contains the following:— 2 dried ♀ ♀, labelled "India: Hardwicke Bequest" (these were referred to as "*N. roylei*?" by Walker, List. Dipt. iv. p. 1148); 1 dried ♀ taken in Madras on *Megaderma lya* (registration number 79. 51); 1 ♀ in spirit taken at Saidapet, Madras, 1. i. 1908, on *Scotophilus kuhli*.

8. *Cyclopodia sykesi* (Westwood).

Nycteribia sykesi, Westwood, Trans. Zool. Soc. London, i. 1835, p. 288, pl. xxxvi. figs. 1-25.

Cyclopodia sykesi, Kolenati, Horæ Soc. ent. Ross. ii. 1863, p. 82, pl. xiii. fig. 27; Speiser, Arch. Naturg. lxxvii. i. 1901, pp. 39, 55.

Loc. India, Ceylon.

Fryer collected 2 ♂ and 2 ♀ from *Pteropus giganteus* (= *medius*), viii. 1911; the exact place in Ceylon is not stated.

100 specimens of this species, 57 ♂ and 43 ♀, were obtained from 11 specimens of *Pteropus giganteus* at Barbeyn Island, Ceylon, in 1907 by T. Bainbrigge Fletcher. This large series was reported on by the present writer in Trans. Ent. Soc. London, 1907, p. 421. It was found that the ♂ ♂ showed practically no variation, while the ♀ ♀ varied in one respect, in the number of big tubercles (normally four) which stand in a group in the middle of the dorsal abdominal connexivum (see *op. cit.* p. 424).

9. *Eucampsipodia hyrtli* (Kolenati). (Pl. XII. figs. 18, 19.)

Nycteribia hyrtli, Kolenati, Paras. d. Chiropt. Brünn, 1856, p. 42.

Eucampsipodia hyrtli, Kolenati, Horæ Soc. ent. Ross. ii. 1863, p. 78, pl. xiv. fig. 26 a-c; Speiser, Arch. Naturg. lxxvii. i. 1901, p. 48; id. in Voeltzkow, Reise in Ost-Afrika, ii 1908, p. 202.

This species has not, to my knowledge, been recorded previously from Ceylon, but Fryer obtained 5 ♂ and 3 ♀, and the Cambridge Museum also possesses 1 ♂ (in a rather shrivelled state) obtained in that island some years ago by H. H. W. Pearson.

The ♂ ♂ differ only in some trifling details from Kolenati's (1863) description and figure. The basal sternite in the Ceylon specimens is bare towards its base, but has two irregular rows of short bristles towards its hind margin. The second sternite is not bare (as shown in Kolenati's fig. 26 c), but has on its surface several irregular rows of short bristles, which become longer and more numerous towards the sides. The third sternite has only a single row of bristles across its disc, and this row is widely interrupted in the middle. The fourth sternite has its surface quite bare in the Ceylon specimens, without a group of several long bristles on either side. (All these remarks apply only to the bristles on the *surfaces* of the segments, not to those on their hind margins.) The form of the *claspers* is characteristic, straight, lying close beside one another, rather

suddenly widened at the base, with short thorn-bristles along their outer margins towards the apex.

Kolenati only figured the ♂, and as I am not aware that the ♀ has been figured, figures of the dorsal and ventral aspects of its abdomen are given here (Pl. XII. figs. 18, 19). Dorsally, the *basal tergite* is bare except for some very short bristles irregularly placed immediately in front of its hind margin and for longer and shorter bristles on the hind margin. The *connexivum* is covered with scattered short bristles, except at its extreme base and in its apical portion, which are bare; behind the middle it bears two groups, consisting each of about 5 very long strong bristles, those of each group placed close together in a series running obliquely backwards and outwards. On the *anal segment* is a transverse series of 10 very long bristles, interrupted—in some specimens, at any rate—by a slight gap in the middle. Ventrally, the *basal sternite* is bare towards its base, but has two or three irregular rows of short bristles towards its hind margin; as in the ♂, the teeth of the ctenidium are strong and close. On the *connexivum* the short bristles are arranged in rather irregular transverse series; the anterior part bears about 6 of these series, and 8 very long bristles, of which those near the middle line are placed further forward than the outer ones; the arrangement is shown in Pl. XII. fig. 19, which is taken from a ♀ with abdomen greatly distended. Behind these anterior series of short bristles is a short gap, an area bare of bristles, extending across the abdomen. Behind this gap are 6 more series of bristles, behind the first three of which is an indication of another gap, though this is much less marked than the anterior one. The hindmost series has several of the bristles longer than the rest, one towards either side of the abdomen being very long. Behind the last series of bristles is a bare area of *connexivum*; under the genital opening is a more or less chitinous brown area, with an indication of a longitudinal division into two halves. Across the middle of it is a series of bristles, while its hind margin is set with longer and shorter bristles, some being very long. The arrangement is not so regular in all specimens as in the one figured; sometimes the bristles on the surface are much more scattered.

Figure 19 also shows the way in which the thorax is narrowed, its sides "cut away," so to speak, in front, which causes the *thoracic ctenidia* to show very conspicuously in a ventral view.

Loc. Africa (Senegal, Egypt); Comoro Islands (Grand Comoro); Sumatra; Burma; Ceylon.

Fryer's specimens were collected at Peradeniya:—from *Tylonycteris pachypus*, xii. 1911, 1 ♂; from *Rousettus seminudus*, xii. 1911, 1 ♂, and iv. 1911, 3 ♂, 3 ♀.

Speiser states in Voeltzkow's 'Reise' that the specimens collected in Grand Comoro were from a species of *Rousettus*. In the same work he remarks on the very wide distribution of *Eucampsipodia hyrtli*. In Arch. Naturg. (*l. c.*) he stated that it has been taken in Egypt on *Cynonycteris ægyptiaca*, and Kolenati (Horæ Ross., *l. c.*) records it from *Xantharpyia ægyptiaca* on the Senegal; I am informed that both these names are synonyms of *Rousettus ægyptiacus*.

II. RE-DESCRIPTION OF *NYCTERIBIA PARILIS*, WALKER.

This species was described by Walker from a single ♂ collected at Batchian (Moluccas) by Wallace and preserved dry in the British Museum. Walker's description is as follows: "*Nycteribia parilis*, n. s. Pallide lutea. Pale luteous. Length of the body $\frac{1}{2}$ line." As it is quite impossible to say from this description even to what genus the species belongs, Speiser, in his work published in 1901, merely included it as a doubtful species in his list. I have carefully examined Walker's type and find that the species belongs to the subgenus *Listropodia* of *Nycteribia*. I also found in the British Museum another ♂, preserved dry, from Australia, belonging to the same species. I have also examined in the British Museum 3 ♂ and 2 ♀, preserved in spirit, collected by Mr. Frederick Muir in Amboyna in 1908, and find these also to be *N. parilis*. These Amboyna specimens, and a number of others of the same species obtained at the same time and place, had previously been examined by Speiser and named by him in manuscript *Listropodia tolisima*. I therefore have to give this name as a synonym of *parilis*, though, as far as I am aware, no description of *tolisima* has been published. Muir, in his paper cited below, dealing with *Ascodipteron* and other Diptera Pupipara found by him in Amboyna, refers several times to "*Lipoptena tolisina*, Speiser," which is probably an error for "*Listropodia tolisima*, Speiser," and may thus have reference to the species under discussion.

Moreover, in 1908 Speiser described a species from Madagascar, *Nycteribia stylidiopsis*. Judging from the description and figures, this must be very closely allied to, if not identical with, *Nycteribia parilis*. Some slight differences are apparent, such as the presence in the figures of *stylidiopsis* of fine short bristles on the surfaces of certain

segments which are bare in the specimens of *parilis* before me. But these differences are no greater than some which have been found to be due to individual variation in certain other species.

I have endeavoured without success to obtain the loan of specimens of *stylidiopsis* for comparison with *parilis*, a comparison which alone could settle the question of their possible identity. I must therefore be content to insert below the name, and a reference to the description of, *stylidiopsis* as a possible synonym of *parilis*.

At all events, it is now possible to give a full description and figures of both sexes of *Nycteribia parilis*, Walker. They are made from the spirit-specimens collected by Muir in Amboyna, in which the characters can be clearly made out, and which correspond closely with Walker's type.

Nycteribia (Listropodia) parilis, Walker.

(Pl. XII. figs. 20-23.)

Nycteribia parilis, Walker, Journ. Linn. Soc. London, Zool. v. 1861, p. 300; Speiser, Arch. Naturg. lxxvii. 1. 1901, p. 52.

? *Nycteribia (Listropodia) stylidiopsis*, Speiser, ♂ ♀, in Voeltzkow, Reise in Ost-Afrika, ii. 1908, p. 200.

Nycteribia (Listropodia) tolisina, Speiser, MS.

? *Lipoptena tolisina*, Muir, Bull. Mus. Zool. Harvard, liv. 1912, pp. 351-366, pl. ii. (larva).

N. parilis is a minute pale-coloured *Nycteribia*, belonging to the subgenus *Listropodia*, that is, having the tibiæ broad and flattened. Its most remarkable feature lies in the form of the ♀ abdomen, in which a greater number of segments are distinguishable than is the case in the ♀ of many Nycteribiidæ. A glance at fig. 22 will show that 4 segments are distinguishable dorsally in addition to the anal segment, the dorsal chitinous portion of which is symmetrically divided in a remarkable manner.

Length of the body 1.25-1.5 mm.

Colour pale, yellowish. *Head* bare, with only two bristles on the front margin of the vertex and a very few more on the margins of the cheeks. *Femora* with their anterior surfaces bearing short bristles in the front pair, nearly bare in the middle and hind pairs; posterior surfaces bare of bristles except in the lower portion towards the base; lower edges bearing some short bristles, and a very long erect one directed forwards, situated at about $\frac{3}{4}$ the length from the base; upper edges bare except for a few short bristles near the apex, and two short erect ones situated respectively at about $\frac{1}{3}$ the length from the apex and immediately on the

through eye to base of caudal; 10 to 12 dark cross-bars; dorsal, anal, and pelvic fins with series of dark spots; caudal dusky.

Three specimens, 30 to 40 mm. in total length.

This species is very closely related to *C. interruptum*, Pellegrin (Bull. Mus. Paris, 1909, p. 151), from Serra d'Estrello, Rio Grande do Sul, in which the lateral line runs on 9 scales to below the origin of the dorsal fin, which has only 11 rays.

Corydoras macropterus.

Depth of body $3\frac{1}{5}$ to $3\frac{1}{2}$ in the length, length of head $3\frac{1}{2}$ to $3\frac{2}{3}$. Diameter of eye 5, interorbital width $2\frac{1}{4}$ to $2\frac{1}{2}$, length of snout 2 to $2\frac{1}{4}$ in the length of head. Suborbital narrow; cheek covered with short bristles, strongest in males; barbels nearly reaching gill-opening. Dorsal I 8; spine about $\frac{1}{2}$ the length of head; fin very elevated, second and third rays longest, when laid back reaching tip of adipose fin (♀) or base of caudal (♂); base of dorsal rather less than its distance from adipose fin, which is preceded by 3 to 5 median scutes. Anal I 6-7. Pectoral very long, extending to origin of anal. Scutes 24-25/21-22; humeral shields wide apart, each separated by 2 scutes from base of pelvic fin. 3 or 4 dark blotches on the back, more or less alternating with others on the lower part of the side, both series connected with an irregular lateral band; dorsal and caudal barred with series of spots; lower fins dusky.

Four specimens, 55 to 65 mm. in total length.

In coloration and in the bristles on the cheeks this species shows relationship to *C. kronei*, Ribeiro, but it differs in the shorter snout and broader interorbital region and especially in the produced dorsal and pectoral fins.

XXIII.—*The Pœciliid Fishes of the Genus Jenynsia.*

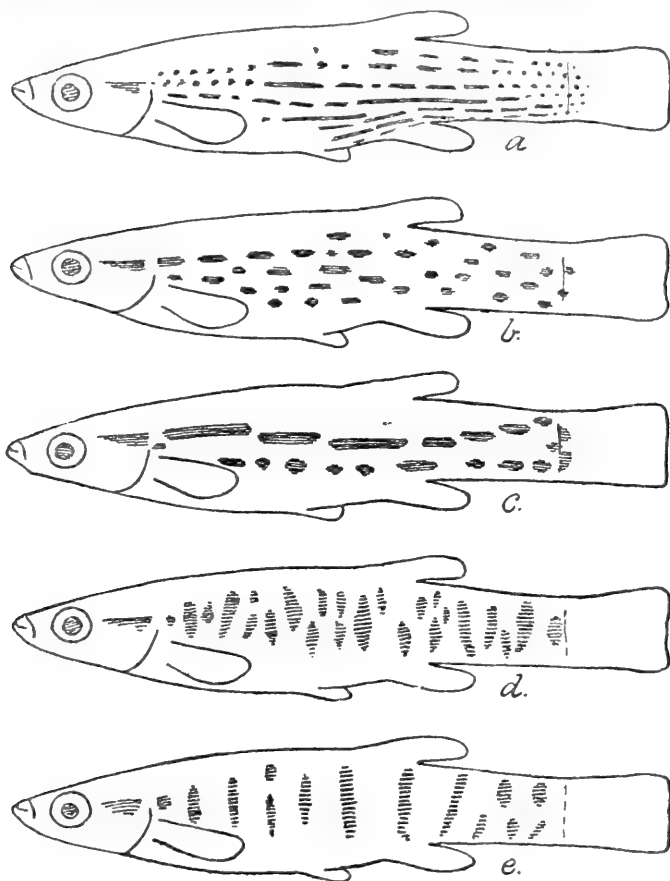
By C. TATE REGAN, M.A.

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FOR many years the only known species of the genus *Jenynsia* was *J. lineata*, Jenyns*, originally described from Maldonado and Montevideo. In 1902 a second species,

* For the synonymy v. Garman, Mem. Mus. Comp. Zool. xix. 1897, p. 69.

J. pygogramma, was described by Boulenger* ; the types come from the Rio Cruz del Eje, Cordova, Argentina, and the species is well distinguished from *J. lineata* by its irregular scaling, the abdomen being naked and the scales on the back much smaller than on the sides of the body.



In 1906 I described *J. maculata* † from Cachi, Salta, Argentina, and quite recently Haseman has added *J. eigenmanni* ‡, a supposed new species from the Rio Iguassu.

* Ann. & Mag. Nat. Hist. (7) ix. 1902, p. 336.

† *Ibid.* (7) xviii. 1906, p. 154.

‡ Ann. Carnegie Mus. vii. 1911, p. 385, pl. lxxxii.

a small area of bare whitish connexivum extending to the hind margin; hind angles produced into short tubercles, each bearing 4 long bristles.

Ventrally (Pl. XII. fig. 23) 6 sternites are distinguishable in addition to the anal segment. *Basal sternite* as in ♂. *Sternite 2* entirely membranous, short, with a transverse series of short bristles on its surface, and its hind margin indicated by a series of long bristles set wide apart. *Sternite 3* longer, also entirely membranous, with a similar series of long bristles on its hind margin, and a series of very short and minute bristles across its disc. *Sternites 4, 5, and 6*: in each the anterior part consists of bare, pale membrane; in the posterior part of each are two chitinous areas, separated in the middle by a narrow space occupied by membrane: the chitinous areas have their hind margins set with alternating long bristles and short thorn-bristles, some of the long bristles being situated on and others immediately in front of the margin, and those furthest from the middle being directed strongly outwards. In front of the *genital opening*, near the middle line, is a transverse series of 4 short thorn-bristles, and behind these two long bristles. *Anal segment* with several short thorn-bristles at the sides and near the hind angles; (as previously mentioned each angle bears 4 long bristles).

Loc. Batchian (Moluccas); Amboyna; Australia; [?Madagascar].

Batchian, 1 ♂ (the type), collected by A. R. Wallace, host unrecorded; preserved dry in British Museum.

Amboyna, a number of ♂♂ and ♀♀ from *Miniopterus schreibersi*, 1908, F. Muir.

Australia, 1 ♂ preserved dry in British Museum, labelled "Australia: presented by Mr. Tomes, 57. 7: on *Miniopterus australis*."

[*Madagascar*, see above, remarks on *Nycteribia styliidiopsis*, Speiser].

NOTE.—One of the ♂♂ from Amboyna has a fungus of the Order *Laboulbeniaceæ* situated ventro-laterally on its anal segment. This adds another species to the list of Nycteribiids on which these fungi have been found: see Scott, Arch. Naturg. lxxix. A, 1913, pp. 96, 97.

EXPLANATION OF PLATES X.-XII.

Penicillidia fletcheri, sp. n.

Fig. 1. ♂, dorsal view of abdomen.

Fig. 2. ♂, ventral view of abdomen.

Fig. 3. ♀, dorsal view of abdomen.

Fig. 4. ♀, ventral view of thorax and abdomen.

Fig. 5. Var. *pumila*, var. n., ♀, dorsal view of abdomen (to slightly larger scale than the preceding figures).

Nycteribia (Acrocholidia) euvesta (Speiser).

Fig. 6. ♀, dorsal view of abdomen.

Fig. 7. ♀, ventral view of thorax and abdomen.

Fig. 8. ♀, anal segment of Speiser's original type (dried), more highly magnified.

Fig. 9. ♀, subgenital plate of original type (dried), to same scale as fig. 8.

Cyclopodia ferrarii (Rondani).

Fig. 10. ♂, dorsal view of abdomen.

Fig. 11. ♂, ventral view of abdomen.

Fig. 12. ♂, apex of claspers, more highly magnified.

Fig. 13. ♀, dorsal view of abdomen.

Fig. 14. ♀, dorsal view of anal segment and of the chitinous plate in front of it, more highly magnified.

Fig. 15. ♀, ventral view of abdomen.

Cyclopodia roylei (Westw.).

Fig. 16. ♀, dorsal view of abdomen.

Fig. 17. ♀, ventral view of abdomen.

Eucampsipodia hyrtli (Kolenati).

Fig. 18. ♀, dorsal view of much contracted abdomen.

Fig. 19. ♀, ventral view of much distended abdomen.

Nycteribia (Listropodia) parilis, Walker.

Fig. 20. ♂, dorsal view of abdomen.

Fig. 21. ♂, ventral view of abdomen.

Fig. 22. ♀, dorsal view of abdomen.

Fig. 23. ♀, ventral view of thorax and abdomen.

XXVIII.—*New Species of Paralastor, Sauss. (Hymenoptera, Fam. Eumenidæ), collected by Mr. R. E. Turner in S.W. Australia.* By R. C. L. PERKINS, M.A., D.Sc., F.Z.S.

THE first five forms of *Paralastor* here described, which were collected by Mr. R. E. Turner at Yallingup, S.W. Australia, from November to January 1913, are almost identical in colour-pattern, the yellow bands and spots differing a little in depth of colour in different species.

All have the following markings in both sexes:—Two spots on the front of the pronotum, one each side on the mesopleura beneath the tegulæ, a pair on the scutellum, and an apical band on the first two abdominal segments yellow,

never whitish nor conspicuously parti-coloured, but sometimes tending to orange.

The first abdominal band is in most cases narrow, occupying less than half of the dorsal (*i. e.* non-declivous) portion of the segment; the second is always narrow and never occupies more than $\frac{1}{2}$ or $\frac{1}{3}$ of the length of the second segment.

With the exception of the ♀ of one species, which has the propodeum marked with yellow, I think all the forms would fall in the section 27-34 of my dichotomous table of *Paralustor* recently sent for publication to the Zoological Society of London.

It is certain that most of these new forms differ little, if at all, structurally from some of those previously described; but as they differ very greatly in superficial appearance, and intermediates are not known, for the present they are better kept apart.

It is almost certain that in Hymenoptera, as in Lepidoptera, a species may assume a totally different appearance in different localities, as it comes in contact with other species of distinct pattern or colour, while specifically it is really unchanged. The material at present collected in Australia is too sparse to allow one to make a satisfactory study of this interesting subject, especially as from large areas no collections at all are available.

The five forms in question may easily be distinguished by the aid of the following table:—

Face with a median yellow spot between the antennæ; clypeus not deeply but distinctly emarginate	1.
Face without this spot; clypeus truncate or hardly visibly emarginate	3.
1. Tegulæ black	<i>auster.</i>
Tegulæ pale, yellow or testaceous, more or less marked with yellow	2.
2. Apical margin of the clypeus distinctly raised, forming a thickened rim; ♂ tibiæ dark; propodeum of ♀ with yellow spots	<i>neochromus.</i>
Apical margin of the clypeus not distinctly raised; ♂ tibiæ pale or rufescent, sometimes more or less marked with yellow; ♀ propodeum immaculate	<i>letus, Perkins.</i>
3. Tegulæ conspicuously marked with yellow; second abdominal segment seen in profile with short erect hairs	<i>æquifasciatus.</i>
Tegulæ dark, at most brownish or testaceous in part; second abdominal segment with thin clothing of long erect hairs all over. (♂ antennæ 12-jointed.)	<i>subpunctulatus.</i>

Paralastor auster, sp. n.

The clypeus of the ♂ is yellow*, of the ♀ wholly black, the medio-frontal spot is elongate, the scutellar spots very widely separated; scape of the antennæ entirely black in both sexes. First abdominal band narrow, but bearing numerous punctures. Legs, including the tarsi, black or nearly so.

Clypeus lightly but distinctly emarginate; in the ♀ the margin is distinctly raised. Antennæ of ♂ 11-jointed. Head and thorax densely and distinctly punctured, so closely as to be subrugose. Second ventral segment above the sulcature strongly angularly prominent or tuberculate. The apical ventral segments of the ♂, seen from the side, all clothed with short erect hairs. The folded wings with distinct violaceous iridescence along the dark costal portion.

Length 8.5–10 mm. The measurement is taken from the front of the head to the apex of the second abdominal segment in all species.

Hab. Yallingup, S.W. Australia, November, Dec.–Jan. 1913 (*R. E. Turner*), 2 ♂, 1 ♀. British Museum.

Paralastor letus, Perkins.

Clypeus of ♂ yellow, of ♀ black, with two yellow basal spots, sometimes connected. Scape of ♂ yellow in front, of ♀ generally black, sometimes with a yellow streak. Medio-frontal spot ovate or roundish, not strongly elongate as in the preceding. First abdominal band rarely occupying half the surface of the posterior non-declivous portion of the segment, but bearing many conspicuous punctures. Tegulæ testaceous and yellow, the scutellar spots separated by less than the width of one of them. Tibiæ and tarsi uniformly ferruginous, sometimes with yellow markings.

Clypeus very distinctly emarginate, but not bordered at the apex, in the ♂ with obscure and copious fine punctures, in the ♀ shining, either with sparse or very irregular larger punctures, and with other finer ones.

Puncturation of head, thorax, &c. much as in *P. parca* &c., the general structure also resembling that species. Erect hairs of the second dorsal abdominal segment of only moderate length, some longer ones at the base. Apical ventral segment of the ♂ somewhat shining, with conspicuous longish erect hairs (in lateral aspect) similar to those on the preceding

* The general pattern of colour, common to this and the four following species, is given at the beginning of this paper.

segments. Antennæ ♂ 11-jointed, the apical ones very small and sunk in the eighth.

Length, ♀, 9-11 mm.

The yellow bands become of a darker shade basally, but are not conspicuously bicolorous, as in *P. vulpinus* &c.

This species closely resembles *P. parca*, but, apart from colour, it lacks the very long hairs of the second abdominal segment. I originally described it from 2 ♂♂ from Fremantle, from which the single ♂ from Yallingup differs in small details.

Hab. Yallingup, S.W. Australia, Nov.-Jan. (*Turner*), 1 ♂, 4 ♀. British Museum.

Paralastor subpunctulatus, sp. n.

Clypeus of ♂ yellow, of ♀ black with a transverse, basal, large yellow spot, which is usually, but not always, lunulate. Scape of antennæ in both sexes black, the medio-frontal spot absent. Tegulæ dark, sometimes with a testaceous spot or suffused with brown, but without yellow markings. Scutellar spots generally larger in the ♀ than in the ♂. Legs generally black or dark.

Clypeus in ♂ either truncate or very feebly emarginate at the apex, in the ♀ truncate, shining. Antennæ of ♂ with twelve distinct joints, the four apical ones curved into a hook, and, if straightened out, together as long as the eighth. In sculpture of head and thorax &c. and in general structure this form differs very little from *P. punctulatus*, Sauss., of Tasmania and the mountains of New South Wales, but is very distinct in appearance by the yellow (not nearly white) bands and spots, and the first abdominal band is considerably wider. The puncturation of its basal abdominal segment is also evidently more dense and serves to distinguish the two. In some details of structure and sculpture both vary in exactly the same manner.

Length 10-12 mm.

Hab. Yallingup, S.W. Australia (*Turner*), 6 ♂ and 5 ♀, Nov.-Jan.

Most of the specimens are considerably abraded, but they bear a long thin pubescence as in *P. punctulatus*.

Paralastor neochromus, sp. n.

Clypeus of ♂ yellow, with a median black spot extending to the apical margin, so that the yellow colour in the middle line is very slightly interrupted there, the raised margin

itself also black. In the ♀ the clypeus is black, with two large, curved, lateral, yellow spots, nearly meeting at the base and not reaching to the apical margin. Probably the colour varies. Scape of ♂ yellow in front, in ♀ with a yellow line. Medio-frontal spot ovate. Scutellar spots nearly meeting, or, at least, not widely separated. In the ♀ there are two small, widely separated, postscutellar spots, and much larger ones on the propodeum. Tegulæ shining, for the most part with very fine and indefinite puncturation, more or less brown or testaceous, with a yellow spot at the hind angle. Size of *P. eriurgus* and *argentifrons*.

This species appears to me to represent in its own locality the *P. eriurgus* of Queensland and *P. argentifrons* of Adelaide, Victoria, &c., from which it hardly differs in structure, though entirely different in appearance from either.

Hab. Yallingup, S.W. Australia, Dec.—Jan. 1913, ♂ & ♀ (*Turner*).

Paralastor æquifasciatus, sp. n.

Female with the clypeus black, with a transverse basal yellow spot or band not reaching the lateral margins and angulately emarginate in front, sometimes divided into two separate spots. No yellow spot between the antennæ. Tegulæ with yellow marking. Scutellar spots rather large, but widely separated.

Clypeus shining, the puncturation largish but not at all close, the apex nearly straightly truncate. Head and thorax with ordinarily coarse and copious punctures, the post-scutellum unarmed. Tegulæ shining, for a large part with very faint surface-sculpture or hardly visible minute puncturation. The abdominal bands are simple and nearly of equal width; that of the first segment bears many conspicuous punctures, but does not occupy half the length of the segment in dorsal aspect. Second ventral segment angulately produced in the middle above the truncation, or tuberculate there, but varying in the strength of the tuberculation. Hairs of head and thorax of about equal length. Wings shining fusco-hyaline, darker along the costa.

Length 12–14 mm.

This species may be placed with *P. carinatus*, Sm., and its allies.

Hab. Yallingup, S.W. Australia, 5 ♀ ♀ in December (*Turner*).

Paralastor eutretus, sp. n.

Female black, the pronotum, tegulæ, two spots on the scutellum posteriorly, most of the postscutellum, the tibiæ and tarsi, the first abdominal segment (excepting its basal declivous portion), an apical band on the second occupying about the apical sixth of its length, as well as a medio-frontal spot and a small one behind each eye red or ferruginous.

Clypeus very slightly emarginate, but the lateral teeth subacute, rather evenly and largely punctured, the punctures shallow. Pronotum truncate and evidently margined in front. Head and thorax with short hairs, very closely, evenly, subrugosely punctured. Wings subhyaline, darker along the costa. Basal abdominal segment extremely densely punctured; second coarsely, closely, and nearly evenly punctured all over, narrow, long, subparallel-sided; beneath, behind the sulcature, well raised above the basal part, but not extremely strongly so, and not at all produced in the middle at the top of the truncation, there being no trace of a prominent tubercle. Dorsally the second segment is strongly convex longitudinally towards the base, but not greatly raised.

This small narrow species may perhaps be best placed next to *P. despectus*, P. It in many respects resembles *P. imitator* structurally, but the tegulæ lack the very coarse punctures, and over a large area they are smooth and shining and almost without puncturation on this area.

Length about 8 mm.

Hab. Yallingup, S.W. Australia, 1 ♀ in December (Turner).

Obs. When describing *P. debilitatus* I made the remark that the unique example bore a MSS. name, *A. pusillus*, Sauss. This was an error, it having been labelled *A. pusillusculus* by Saussure without being described.

XXIX.—*New South-American Rodents.*

By OLDFIELD THOMAS.

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Sciurus griseogena klagesi, subsp. n.

A pale long-haired highland form of *griseogena*.

Fur long and very soft; hairs of back about 16 mm. in

length. General colour finely speckled grey, with practically none of the warm buffy tone suffusing the colour of both *griseogena* and the Merida highland subspecies *S. g. meridensis*. Under surface bright ochraceous buff, a few hairs in the axillæ white. Crown and muzzle grizzled with buffy, paler than in *griseogena*. Ears darker buffy brown, contrasting with the grey of the head; light patches behind them scarcely perceptible. Forearms and hands strong buffy, the olive bases of the hairs showing but little; the feet, however, are rather olive-grey, brightened by the buffy tips of the hairs, especially along the hallucal border. Tail grizzled greyish for its basal half, its next two-fifths washed with buffy neither so deep nor so extended as in *griseogena*, its tip black.

Skull as in *griseogena*.

Dimensions of the type (as measured by collector):—

Head and body 192 mm.; tail 190; hind foot 46; ear 25.

Skull: greatest length 49; condylo-incisive length 44; front of p^4 to back of m^3 9.3.

Hab. Galifaré, Cerro del Avila, near Caracas, Venezuela. Alt. 6500'.

Type. Subadult female. B.M. no. 14. 7. 27. 3. Original number 16. Collected 12th February, 1914, by Mr. S. M. Klages. Presented by the Hon. N. Charles Rothschild.

While the highland subspecies of Merida is of the same warm hue as typical *griseogena*, this form from the mountains near Caracas is distinguishable by its clear greyish colour and the lesser extent of the buffy on the middle of the tail. Osgood's *S. g. tamæ*, from the Upper Tachira River, is said to be paler than *meridensis*, but, as its locality is on the opposite side of *meridensis* from the present, it obviously cannot be the same form as the Caracas squirrel.

Oryzomys albigularis mærex, subsp. n.

A dark form of the *albigularis* group.

General characters of *albigularis*, but colour conspicuously darker. Body-colour near Prout's brown, the sides rather more fulvous, but the whole area of the back darkened with an intermixture of black. Whole of head blackish grey, like the muzzle of *albigularis*. Under surface of the usual slaty washed with creamy white, but no white pectoral patches present (in sixteen specimens). Front of forearms and whole of lower legs dark blackish grey. Tail blackish above, irregularly whitish below.

Skull as in *albigularis*, but the palatal foramina shorter.

Dimensions of the type (measured in flesh):—

Head and body 140 mm.; tail 162; hind foot 34; ear 20.

Skull: greatest length 34·8; condylo-incisive length 31·8; zygomatic breadth 18; nasals 12·5; interorbital breadth 5; breadth of brain-case 14; palatilar length 15·3; palatal foramina 4·6; upper molar series 5·7.

Hab. Mindo, N.W. of Quito, Ecuador. Alt. 4200'.

Type. Adult male. B.M. no. 13. 10. 24. 43. Original number 113. Collected 4th June, 1913, by Gilbert Hammond. Presented by Oldfield Thomas. Sixteen specimens.

While Dr. Allen's *O. pectoralis* from the Cauca and the typical *O. albigularis* are almost precisely like each other in colour, this form from Mindo differs from both by its much darker hue, and especially by its blackened dorsal area. Its very short palatal foramina are also characteristic.

Oryzomys caracolus, sp. n.

A small species allied to *O. meridensis*.

Size decidedly less than in *O. meridensis* and its near relatives *maculiventer* and *tamæ*, but larger than in the Trinidad *velutinus*. Fur soft and fine, hairs of back about 10 mm. in length. General colour greyish brown washed with fulvous on sides, darker brown on median dorsal area. Below grey washed with creamy white, just as in *meridensis*, but there is less tendency to the formation of white pectoral patches, only one specimen of three having such a patch at all, and that a very small one. Head grey, without fulvous intermixture. Hands and feet slender, pale grey colour, the hairs silvery white. Tail very finely haired, grey above, white below, the two colours not sharply contrasted.

Skull smaller than in *meridensis*. Interorbital region flat above, its edges with a greater tendency to have a supra-orbital bead, instead of being rounded, as is usually the case in *meridensis*. Palatal foramina comparatively rather long. Molars smaller than in *meridensis*, much larger than in *velutinus*.

Dimensions of the type (measured in the flesh):—

Head and body 131 mm.; tail 144; hind foot (s. u.) 31; ear 23.

Skull: greatest length 33·2; condylo-incisive length 29·7; zygomatic breadth 17; nasals 12·5; interorbital breadth 5; breadth of brain-case 14; palatilar length 14·5; palatal foramina 6·2; upper molar series 5.

Hab. Galiparé, Cerro del Avila, near Caracas, Venezuela. Alt. 6000'.

Type. Adult female. B.M. no. 14. 7. 27. 5. Original number 12. Collected 9th February, 1914, by Mr. S. M. Klages. Presented by the Hon. N. Charles Rothschild.

Compared with *O. meridensis*, its nearest ally, this rat is distinguished by its smaller size, less deeply fulvous colour, smaller skull, more square-edged interorbital region, longer palatal foramina, and shorter tooth-row.

Melanomys robustulus, sp. n.

A large species, with swollen brain-case and well-developed supraorbital ledges. Size among the largest of the genus. Fur close and crisp, of medium length, hairs of back about 8 mm. in length*. General colour dark coppery brown, not olivaceous, under surface little lighter. Hands, feet, and tail black.

Skull large, heavily built, with large convex brain-case, broad interorbital region, and short muzzle. Supraorbital edges developed into well-marked ledges overhanging the orbits, very much as in *M. chrysomelas*. Zygomatic plate projected anteriorly. Palatal foramina of about the same length as the upper molar series.

Dimensions of the type (measured in flesh):—

Head and body 122 mm.; tail — (in another specimen 92); hind foot 27; ear 16.

Skull: greatest length 31.4; condylo-incisive length 28.6; zygomatic breadth 16.2; nasals 12; interorbital breadth 6.8; breadth of brain-case 14; zygomatic plate 3; palatal foramina 5.1; upper molar series 5.

Hab. Gualaquiza, Oriente of Ecuador. Alt. 2500'.

Type. Adult female. B.M. no. 14. 4. 25. 67. Original number 321. Collected 11th December, 1913, by Gilbert Hammond. Presented by Oldfield Thomas. Two specimens.

This *Melanomys* is distinguishable by its large size, large convex brain-case, broad interorbital region, and overhanging supraorbital ledges, in all of which respects it resembles the distant *M. chrysomelas* of Central America rather than the nearer forms of the *M. caliginosus* group.

* Measured, as usual, to the tips of the underfur, not including the longer piles.

Oxymycterus platensis, sp. n.

Closely allied to *O. rufus*, of which I take a specimen from Goya, Corrientes, as representative. Fur thicker and woollier, hairs of back about 13–14 mm. in length. Colour darker and deeper red than in *rufus*, distinctly darkened along the crown, nape, and middle line of back by blackish, the corresponding area in *rufus* being greyish; cheeks, sides, and rump deep ferruginous; belly dark “cinnamon-buff”; chin white; hands and feet mixed brown and whitish, browner on the metapodials. Tail uniformly dark brown.

Skull, in six adult and old specimens, uniformly shorter than in *rufus*, but nearly equalling it in breadth. Tip of nasals distinctly trumpet-shaped, more so than in *rufus*. Brain-case shorter and proportionally broader. Mesopterygoid fossæ broader anteriorly, markedly narrowing behind. Molar series shorter.

Dimensions of the type (measured in flesh):—

Head and body 140 mm.; tail 111; hind foot 28; ear 16·5.

Skull: greatest length 36; condylo-incisive length 33·2; zygomatic breadth 17·2; nasals 13; interorbital breadth 6·2; breadth of brain-case 14·4; palatilar length 14·8; palatal foramina 8; upper molar series 5·4.

Hab. Ensenada, La Plata. Sea-level.

Type. Old male. B.M. no. 99. 10. 4. 1. Original number 165. Collected 24th June, 1896, by Dr. C. Spegazzini. Seven specimens.

This *Oxymycterus* differs externally by its darker and richer colour and the distinct blackening along its head, nape, and fore back from its near ally *O. rufus*, whose sides are more buffy and whose head and foreback are more greyish. The skull is shorter, with more trumpet-shaped nasals, and the molars are smaller.

The specimens of this animal, in company with those of *Ctenomys talarum*, were brought to me in the flesh on the last day of my stay in La Plata by the well-known botanist Dr. C. Spegazzini, who had shot them under the Tala trees on the Rio Santiago, Ensenada.

The type of *O. nasutus*, Waterh., from Maldonado, on the opposite side of the La Plata estuary, is so young that its full size cannot easily be gauged; but examples from Rio Grande do Sul which I refer to that species are conspicuously smaller than *O. platensis*.

XXX.—Notes on *Fossorial Hymenoptera*.—XII.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

On some new Oriental Species.

THE species described in this paper were sent to the British Museum by the Agricultural College, Coimbatore, S. India, by Mr. G. E. Bryant and by Mr. O. S. Wickwar, of Colombo.

Family **Bethylidæ**.Subfamily *BETHYLINÆ*, Ashm.Genus **PRISTOCERA**, Klug.*Pristocera eironeformis*, sp. n.

♀. Aptera, rufo-ferruginea; abdomine nigro, apice fusco-ferrugineo.

♀. Head subrectangular, slightly narrowed posteriorly, about one-third longer than the greatest breadth, rather deeply punctured, the punctures more or less confluent longitudinally, clypeus with an elevated median carina. Antennæ thirteen-jointed, another very small joint apparently almost concealed in the apex of the scape. Pronotum shining, very sparsely punctured, much narrower than the head, subrectangular, nearly half as long again as broad, the pleuræ finely and sparsely punctured. Median segment a little longer than the head, forked at the base and narrowed behind the fork, then gradually broadened to the apex, smooth and shining, with distinct marginal carinæ on the sides; the posterior slope oblique, finely punctured at the base, from the punctures spring short fulvous hairs. Abdomen smooth and shining. Legs short, the intermediate tibiæ strongly spinose, hind tibiæ without spines.

Length 7 mm.

Hab. Pattikonda, Kurnool District, S. India; September.*Calyzina flavipennis*, sp. n.

♂. Niger; antennarum lamellis 5 apicalibus, tegulis, tibiis anticis subtus, tarsisque anticis brunneo-testaceis; alis flavis, venis flavo-testaceis.

♂. Head rather closely but not coarsely punctured, no longer than broad, strongly rounded at the posterior angles. Lamellæ of the antennæ very long, on the middle joints from three to four times as long as the joint itself. Pronotum

narrowed anteriorly, rather shorter in the middle than the breadth on the anterior margin, shallowly punctured, with a low median longitudinal carina, the punctures a little larger than those on the head. Mesonotum shallowly and rather closely punctured, the parapsidal furrows converging towards the apex, scutellum almost smooth. Median segment a little broader than long, almost vertically truncate posteriorly, the face of the truncation smooth, with a low median carina bordered by a crenulated groove on each side, separated by a carina from the dorsal surface; a carina on the dorsal surface in the middle from the base to the apex, with two carinæ on each side distinctly converging towards the apex, the intermediate spaces finely transversely striated, the lateral margins also raised and forming marginal carinæ. Abdomen smooth, the two basal segments shining; the apical segments very minutely punctured, with a few black hairs. Radius not much bent, reaching about halfway from the stigma to the apex of the wing.

Length 7 mm.

Hab. Mt. Matang, Sarawak, 3000 feet; December (*G. E. Bryant*).

This is near *ramicornis*, Enderl., but differs in the greater length of the lamellæ of the antennæ, in the shape of the pronotum, the sculpture of the median segment, and in colour. To this genus belongs *Calyza rufiventris*, Kieff., from Queensland. Whether the antennal distinctions on which Enderlein relies in founding his genus are sufficient to separate it from *Calyza* is open to question.

Family Scoliidæ.

Subfamily *ELIDINÆ*, Turn.

Genus *ELIS*, Fab.

Elis (Mesa) crassepunctata, sp. n.

♂. Niger; capite, antennis articulis 2 basalibus, prothorace, tibiis tarsisque anticis rufo-ferrugineis; abdomine nigro, cæruleo-iridescenti; alis dimidio apicali fusco-violaceis.

♂. Clypeus with a prominent carina from the base, not reaching the apex. Front coarsely punctured, rugose, vertex shining and rather sparsely punctured. Antennæ short and stout, scarcely as long as the thorax and median segment combined, the prominence above the base of the antennæ very broad and distinctly bilobed. Head slightly narrowed behind the eyes, much broader than the pronotum, which is

longer than the mesonotum and has the anterior margin transverse, with obscure transverse broken striæ on the anterior half and rather sparse punctures towards the posterior margin. Mesonotum, scutellum, and mesopleuræ very coarsely punctured-rugose. Median segment very coarsely reticulate, abruptly truncate posteriorly, with a transverse marginal carina at the apex of the segment before the truncation, the surface of the truncation punctured-rugose. Abdomen shining, sparsely punctured, the basal segment shorter than the second, nearly as broad at the base as at the apex, truncate at the base, with a low transverse carina above the truncation. Seventh segment not incised at the apex; the recurved spine of the hypopygium well developed. Second abscissa of the radius shorter than the third by about one quarter; first recurrent nervure received just beyond the middle of the second cubital cell.

Length 10 mm.

Hub. Coimbatore, S. India; July.

This is very near *E. dimidiaticornis*, Bingham, but differs in the colour of the head, prothorax, antennæ, and anterior legs. The antennæ do not taper towards the apex as much as in *dimidiaticornis* and are rather more widely separated at the base. In *dimidiaticornis* the second abscissa of the radius is fully as long as the third, and the second cubital cell is less strongly produced towards the base on the cubitus. The very long second abscissa of the radius characteristic of *dimidiaticornis* may possibly not be constant, as in the female *E. tricolor*, Sm., there is certainly a tendency to variation in this respect. The present species approaches *E. tricolor*, Sm., more nearly in colour than *dimidiaticornis*. But I feel some doubts as to the specific difference, and think it quite possible that this will not prove to be more than a local form.

Family **Psammocharidæ**.

Psammochares atalanta, Sm.

Agenia atalanta, Sm. Journ. Proc. Linn. Soc., Zool. ii. p. 94 (1857). ♂.

Pseudagenia atalanta, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 42 (1884).

Pompilus cariniscutis, Cam. Journ. Straits Br. Roy. Asiatic Soc. xxxvii. p. 91 (1902).

Psammochares nudatus, Sm.

Pompilus nudatus, Sm. Cat. Hym. B.M. iii. p. 133 (1855). ♀.

Pompilus cassius, Nurse, Journ. Bombay Nat. Hist. Soc. xiv. p. 84 (1902). ♀.

Pompilus horatius, Nurse, Journ. Bombay Nat. Hist. Soc. xiv. p. 84 (1902). ♂.

I think there can be little doubt that these names refer to one species. Smith's type was from Trebizond, but there are specimens in the British Museum from Karachi (*E. Comber*), Mt. Abu (*Nurse*), and also in the present collection from Coimbatore. The specimen marked *cassius*, collected by Nurse and acquired by P. Cameron, is very much smaller than the usual form, and the striæ on the median segment are less distinct, but the latter character varies considerably in the larger specimens.

Psammochares detectus, Cam.

Pompilus familiaris, Sm. Descr. New Sp. Hym. p. 147 (1879, nec Smith, 1855). ♀.

Pompilus detectus, Cam. Mem. Manch. Lit. & Phil. Soc. (4) iv. p. 474 (1891).

Pompilus reflexus, Bingham. Fauna Brit. India, Hym. i. p. 159 (1897, nec Smith).

Bingham was wrong in his identification of this species, though it is nearly allied to *reflexus*, Sm. In *detectus* the third cubital is petiolate; in *reflexus* the third abscissa of the radius is half as long as the second; in *detectus* the posterior ocelli are quite as far from each other as from the eyes, in *reflexus* distinctly nearer together. Bingham's specimens from Tenasserim have the third cubital cell pointed on the radius, not petiolate, and the ocelli as in *detectus*. Smith's type is from Sumatra.

Hab. Palur, S. India; Barrackpore, Bengal; Sumatra.

Family Crabronidæ.

Subfamily PEMPHEDONINÆ.

Stigmus marginicollis, Cam.

Psen marginicollis, Cam. Entomologist, xli. p. 243 (1908).

Passalæcus carinicollis, Cam. MS. ?

This species is undoubtedly a *Stigmus*. I cannot find that the name *Passalæcus carinicollis* has been published, but a specimen bearing that name and marked as the type by Cameron is in the British Museum, where is also the type of *marginicollis*. The species also occurs at Penang. It is very near *S. congruus*, Walk., from Ceylon, but the petiole is rather longer in that species.

Spilomena obliterated, sp. n.

♀. Nigra; antennis, tegulis pedibusque flavo-testaceis; mandibulis flavis, apice nigris; alis hyalinis, venis pallide testaceis; vena transversa cubitali prima obliterated.

♀. Antennæ a little shorter than the thorax and median segment combined, the scape more than half as long as the flagellum, the first joint of the flagellum longer than the second. Eyes converging a little towards the vertex, posterior ocelli about twice as far from the eyes as from each other. Head and thorax very minutely punctured; the head much broader than the thorax; clypeus with a median carina, which is continued on the front, almost reaching the anterior ocellus; antennæ inserted far apart on the sides of the clypeus; front concave in the middle, with a smooth groove on each side of the median carina. Pronotum small and much lower than the mesonotum, the angles reaching to the tegulæ. Median segment very coarsely reticulate; the basal area well defined, large, and broadly triangular, with two short longitudinal carinæ at the base; the posterior truncation almost vertical, with a small tooth on each side near the middle, the surface of the truncation reticulate. Abdomen subpetiolate, smooth and shining. Stigma twice as long on the costa as the greatest breadth, only one cubital cell, the recurrent nervure received at the middle of the cubital cell; the transverse cubital nervure received by the radius distinctly nearer to the stigma than to the apex of the radial cell.

Length 4 mm.

Hab. Penang; October (*G. E. Bryant*).

The neuration differs from typical *Spilomena* in the absence of the first transverse cubital nervure and in the more elongate stigma.

Subfamily AMPULICINÆ.

Ampulex bryanti, sp. n.

♂. Niger; prothorace elongato, rufo; alis hyalinis, ante apicem leviter infumatis.

♂. Clypeus strongly convex, with a median carina, broadly rounded at the apex. Antennæ shorter than the thorax and median segment combined, the second joint of the flagellum as long as the first and third combined. Front longitudinally rugulose, a low frontal carina reaching the anterior ocellus, vertex opaque, almost smooth. Head much produced and narrowed behind the eyes, a circular depression on the vertex close to the posterior margin. Pronotum very narrow, slightly widened posteriorly, more than twice as long as the greatest breadth, punctured, with a deep median sulcus. Mesonotum, scutellum, and mesopleuræ coarsely punctured-rugose. Median segment longer than the breadth

at the base, with the usual carinæ; the spines near the apical angles strong and curved, with a distinct incision at the base, situated a little before the base of the posterior truncation. Basal joint of the hind tarsus half as long again as the petiole; abdomen smooth and shining, the third segment coarsely longitudinally rugose, the second segment a little longer than its greatest breadth. Fourth joint of the tarsi short, not reaching the middle of the apical joint. Two cubital cells, the second transverse cubital nervure joins the radius at a distance from the apex of the radial cell equal to the length of the first transverse cubital nervure.

Length 10 mm.

Hab. Matang, Sarawak; February (*G. E. Bryant*).

Nearest to *ruficornis*, Cam.

Ampulex pilosa, Cam.

Ampulex pilosa, Cam. Ann. & Mag. Nat. Hist. (7) v. p. 37 (1901).

Hab. Assam. Also taken by Mr. Bryant on Mt. Matang in Sarawak.

This species is very near *sybarita*, Kohl, from Java, but differs in the shape of the second dorsal segment, which is distinctly longer than its median breadth in *pilosa*. There is also a slight difference in the sculpture of the pronotum.

Subfamily *SPHECINÆ*.

Genus *CHLORION*, Fabr.

Subgenus *HARFACTOPUS*, Sm.

Chlorion (Harpactopus) subfuscatus, Dahlb.

Hab. S. Europe; N. Africa; N. China; Coimbatore, S. India.

Specimens from Coimbatore differ from the typical form in the deeper longitudinal median and lateral furrows on the median segment, but are certainly not specifically distinct. I do not know that this species has been previously recorded from India.

Chlorion (Isodontia) chrysorrhæus, Kohl.

Sphex apicalis, Sm. Cat. Hym. B.M. iv. p. 253 (1856, nec Harris).

Sphex (Isodontia) chrysorrhæus, Kohl, Ann. naturh. Hofmus. Wien, v. p. 371 (1890).

Sphex (Isodontia) hewitti, Cam. Journ. Straits Br. Roy. Asiat. Soc. xlv. p. 119 (1906).

Hab. Sumatra; Borneo.

Chlorion (Isodontia) maia, Bingham.

Sphex maia, Bingham, Journ. Bombay Nat. Hist. Soc. viii. p. 379 (1893).

Sphex malayanus, Cameron, Journ. Straits Br. Roy. Asiat. Soc. xxxvii. p. 134 (1902).

The localities in the British Museum collection range from Borneo to Sikkim.

Subfamily *GORYTINÆ*.*Gorytes cærulescens*, sp. n.

♀. Nigra, ubique dense punctata; segmento mediano striato-reticulato; abdomine obscure cærulescenti; alis pallide fusco-hyalinis.

♀. Mandibles broad, tridentate. Clypeus broad, the apical margin transverse. Second joint of the flagellum equal in length to the third; the antennæ inserted further from each other than from the eyes. Head finely and rather closely punctured, front and clypeus covered with white pubescence, the inner margins of the eyes parallel. Posterior ocelli much further from each other than from the anterior, a little further from each other than from the eyes. The antennæ are not thickened towards the apex. Pronotum sunk a little below the level of the mesonotum, almost vertical. Thorax rugosely punctured, mesopleuræ longitudinally striated, not separated by a carina from the mesosternum. Median segment about as long as the scutellum, the basal area coarsely longitudinally striated, the dorsal surface outside the basal area coarsely obliquely striate-reticulate, the segment rather abruptly truncate posteriorly, the surface of the truncation slightly concave and irregularly rugose-striate; the sides of the segment indistinctly striated. Abdomen subsessile, the basal segment only two-thirds of the length of the second, only slightly narrowed to the base, much broader than long; the second segment angular at the base beneath, about twice as broad as long; pygidial area narrowly triangular, almost smooth, with a median longitudinal carina; the whole abdomen closely and finely punctured, with sparse white pubescence. Second abscissa of the radius a little longer than the third; both recurrent nervures received by the second cubital cell, the first at two-fifths from the base, the second close to the apex. Cubitus of the hind wing originating far beyond the apex of the anal cell. Hind tibiæ smooth.

Length 12 mm.

Hab. Kandy, Ceylon; November (*O. S. Wickwar*).

In many structural points this species is near the *mystaceus* group, in the form of the second ventral segment, the neurotation of the hind wing, the form of the antennæ, the position of the ocelli, the parallel eyes, and the coarse sculpture of the median segment all showing a close approach to that group. In structural points it is very near *homonymus*, Schulz (*politus*, Bingham, nec Smith), but differs widely in colouring.

Gorytes matangensis, sp. n.

♀. Nigra; pedibus ferrugineis; segmentis dorsalibus 2-4 flavociliatis; alis pallide flavo-hyalinis, area radiali late infumata, venis fuscis, stigmatibus tegulisque testaceis.

♀. Head broad, finely punctured. Inner margins of the eyes sinuate, not distinctly convergent towards the clypeus. Thorax finely rugose, the suture between the mesonotum and scutellum distinctly foveolate; sternum with an indistinct longitudinal carina; mesopleuræ longitudinally striated; postscutellum and basal area of the median segment coarsely longitudinally striated, the apical slope of the median segment coarsely reticulate. Abdomen very minutely punctured and pubescent, the fulvous-yellow pubescence forming short ciliæ at the apex on dorsal segments 2-4. Second ventral segment distinctly angular at the base; pygidial area small and very narrow. Tibiæ without spines, fore tarsi very feebly ciliate. Second abscissa of the radius as long as the third, both recurrent nervures received by the second cubital cell, the first at one-third from the base, the second close to the apex. Cubitus of the hind wing originating far beyond the apex of the anal cell. The first transverse cubital nervure is bent near the base, and sends off a short vein which is continued as a scar to the base of the stigma.

Length 12 mm.

Hab. Mt. Matang, Sarawak, 1000 feet (*G. E. Bryant*); February.

This is very near *stenopygus*, Handl., but in that species the suture at the base of the scutellum is not foveolate, and the clypeus, pronotum, and abdomen are marked with yellow.

Subfamily NYSSONINÆ, D. T.

Genus NYSSON, Latr.

Four species of this genus were included in the collection, but unfortunately only one is represented in both sexes. I give a key to the species described here:—

♂♂.

- | | |
|--|-------------------------------|
| 1. Ventral abdominal segments 2-4 with an apical fringe of long hairs; anal cell of the hind wing terminating far before the origin of the cubital nervure | 2. |
| Ventral segments without an apical fringe; anal cell of the hind wing terminating just beyond the origin of the cubital nervure | <i>N. excavatus</i> , sp. n. |
| 2. Large deep yellow spots on each side occupying most of the dorsal surface of segments 1-5. | <i>N. decoratus</i> , sp. n. |
| Small yellowish-white transverse spots at apical angles of dorsal segments 1-4..... | <i>N. basalis</i> , Sm., var. |

♀♀.

- | | |
|---|------------------------------|
| 1. Basal dorsal abdominal segment red, with large yellow spots at the apical angles | <i>N. dubitatus</i> , sp. n. |
| Basal dorsal segment black, with yellow spots. | 2. |
| 2. Yellow spots on dorsal segments 1-5 very large, only narrowly separated in the middle | <i>N. decoratus</i> , sp. n. |
| Yellow spots on dorsal segments 1-4 not very large, situated at the apical angles..... | <i>N. basalis</i> , Sm. |

Nysson excavatus, sp. n.

♂. Niger; pronoto linea transversa utrinque, scutello linea transversa basali, segmentisque dorsalibus primo secundoque linea transversa apicali utrinque flavis.

♂. Clypeus with two feebly developed tubercles in the middle of the anterior margin, but not produced into teeth. Tenth joint of the flagellum broader than long, eleventh about as long as broad, apical joint a little longer than the eleventh, not perceptibly curved and obliquely truncate at the apex. A short frontal carina broadened triangularly at the base of the antennæ. Eyes separated at the base of the clypeus by a distance equal to nearly twice the length of the scape. Head and thorax very strongly and closely punctured; basal area of the median segment much shorter than the scutellum and distinctly longitudinally striated, the spines at the apical angles of the segment rather short and blunt. Abdomen rather closely and not very finely punctured on all the segments, the seventh dorsal segment very deeply emarginate at the apex. Second ventral segment somewhat angular at the base and deeply separated from the first segment. Second recurrent nervure received at the base of the third cubital cell, almost interstitial with the second transverse cubital nervure; anal cell of the hind wing terminating just beyond the origin of the cubital nervure. Hind tibiæ without spines.

Length 6 mm.

Hab. Coimbatore, S. India, 2000 feet; August 1912.

Described from a single male.

Nysson decoratus, sp. n.

♂. Niger; crasse punctatus; segmentis dorsalibus 1-5 fascia latissima utrinque, segmento sexto macula utrinque flavis; alis fusco-hyalinis.

♀. Mari simillima; clypeo margine antico distincte bidentato.

♂. Clypeus almost transverse on the anterior margin, without teeth. Tenth joint of the flagellum as long as broad, eleventh distinctly longer, apical joint about equal to the penultimate in length and strongly curved at the apex. The frontal carina is present, but not very strongly developed. Posterior ocelli further from the eyes than from each other. Head and thorax coarsely punctured, the thorax more coarsely than the head, a more finely punctured space on which is situated a small yellow spot behind each of the posterior ocelli. Median segment as long as the scutellum, coarsely longitudinally striated on the basal area, the spines at the apical angles long and covered with dense white pubescence. Second ventral segment strongly rounded, not angular at the base, second to fourth ventral segments with a fringe of long grey hairs at the apex. Abdomen very closely and minutely punctured, with sparse larger punctures, the two apical segments more coarsely punctured; seventh dorsal segment broadly rounded at the apex; the sixth and seventh with well-marked longitudinal carinae at the sides produced into short spines at the apical angles. Hind tibiae strongly serrate. Radial cell narrowly rounded at the apex; the cubitus of the hind wing originates far beyond the apex of the anal cell.

♀. Similar to the male, but the clypeus has two distinct teeth near the middle of the anterior margin.

Length, ♂ 8 mm., ♀ 9 mm.

Hab. Coimbatore, S. India; July and August.

The male is the type.

Nysson basalis, Sm.

Two male specimens in the collection correspond fairly well to Smith's description, but in both the wings are clear hyaline, with a faint fuscous apical margin, and in one specimen the legs are fusco-ferruginous. The clypeus is rather feebly bidentate near the middle of the apical margin; the frontal carina distinct. The tenth joint of the flagellum is broader than long, the eleventh longer than broad, the apical joint rather strongly curved. Second ventral segment not very strongly rounded, but not angular at the base;

ventral segments 2-4 with a fringe of long white hairs at the apex. Hind tibiæ serrate, but not very strongly so. Radial cell narrowly rounded at the apex, the cubitus of the hind wing originating far beyond the apex of the anal cell. The two apical dorsal segments are carinated laterally and produced into acute teeth at the apical angles; the apical segment is bluntly produced between the apical teeth, but can hardly be described as rounded, as in Smith's description.

Hab. Coimbatore, S. India; June 1912 (*T. B. Fletcher*).

Both specimens taken on the same day.

There is a female in the British Museum collection from Nasik, W. India, in which the wings are fusco-hyaline.

Nysson dubitatus, sp. n.

♀. Nigra; antennis subtus fusco-ferrugineis, segmento abdominali primo pedibusque ferrugineis; macula parva utrinque post ocellos, segmentisque dorsalibus 1-5 macula magna transversa flavis; mandibulis basi flavis, apice fusco-ferrugineis; alis hyalinis apice leviter infumatis; tegulis testaceis.

♀. Clypeus bidentate near the middle of the apical margin; second joint of the flagellum no longer than the third; the cheeks are not margined. Head rather shallowly punctured, the frontal carina between the base of the antennæ rather indistinct. Thorax coarsely punctured; the median segment a little shorter than the scutellum and longitudinally carinate on the basal area, the carinæ about six in number, the apical angles clothed with whitish pubescence and produced into acute spines. Abdomen closely punctured, the basal segment more coarsely than the others; second ventral segment rounded beneath; pygidial area punctured-rugose. Hind tibiæ serrate, but not strongly. Radial cell narrowly rounded at the apex; cubitus of hind wing originating far beyond the apex of the anal cell.

Length 6 mm.

Hab. Coimbatore, S. India; July.

This species is distinct from *rugosus*, Cam., in which the hind tibiæ are unarmed, the pygidial area different in sculpture, and the distribution of the yellow markings very different. It also appears to be quite distinct from *erythropoda*, Cam. I only know Cameron's two species by the description. *N. violaceipennis*, Cam., is a very distinct species.

Subfamily *LARRINÆ*.Genus *PARAPIAGETIA*, Kohl.*Parapiagetia wickwari*, sp. n.

♂. Niger, albo-pilosus; mandibulis basi, scapo apice, tegulis, tibiis tarsisque testaceis; abdomine segmento primo toto, secundoque lateribus ferrugineis; alis hyalinis, venis nigris, stigmatibus costaque testaceis.

♂. Clypeus produced into an acute spine in the middle of the apical margin; mandibles deeply incised on the outer margin; third joint of the flagellum longer than the second. Head and thorax very minutely and closely punctured, more or less covered with shining white pubescence; eyes slightly divergent towards the clypeus; ocelli situated on a rounded prominence, the posterior pair oval and near together. Median segment longer than broad, minutely punctured and rather sparsely clothed with long white pubescence. Abdomen petiolate, the first segment about one-third longer than the second, very narrow at the base, gradually widened to the apex, where it is about half as wide as the apex of the second segment; apical segment very narrowly rounded at the apex. Radial cell narrowly truncate at the apex; the three abscissæ of the radius almost equal in length. Hind tibiæ with five short spines on the outer margin.

Length 7 mm.

Hab. Colombo, Ceylon; March 1909 (*O. S. Wickwar*).

A female specimen in the British Museum from Karachi (*E. Comber*) is probably of the same species. The clypeus is shallowly emarginate in the middle of the apical margin, the angles of the emargination produced into short teeth. The second joint of the flagellum is only very slightly shorter than the third. The median segment has a few very delicate and indistinct transverse striæ at the base and more distinct oblique striæ on the sides of the segment. The recurrent nervures are distinctly nearer together on the cubitus, and the femora are wholly testaceous, not only at the apex as in the male. The basal joint of the fore tarsus has six spines on the outer margin, each spine about one-quarter as long as the joint, and there are two or three spines on the hind tibia in excess of the number in the male.

The clypeus is quite distinct from *P. odontostoma*, Kohl. The genus does not seem to have been previously recorded from the Indian region. Cameron states that his genus *Odontolarra* is near *Parapiagetia*, but a specimen of *O. nigra*, Cam., labelled by him "type," is undoubtedly a *Lyroda*, the

ocelli being normal. The name *Odontolarra* must therefore sink.

Liris ducalis, Sm.

Larrada ducalis, Sm. Journ. Proc. Linn. Soc., Zool. iv. p. 84, Suppl. (1860).

Liris nigripennis, Cam. Mem. Manch. Lit. & Phil. Soc. (4) ii. p. 131 (1889).

These seem to me to be identical. A specimen from Camerons collection taken at Poona, and marked by him as the type *violaceipennis* (probably an error for *nigripennis*), is only a male of *ducalis*.

XXXI.—*Some Further Notes on Lamellicorn Beetles of the Subfamily Dynastinae*. By GILBERT J. ARROW.

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[Plate XIII.]

M. SEMENOV (Rev. Russe Ent. xii. 1912, p. 499) has objected to my treatment of his generic name *Crator* as a synonym of *Podalgus*, Burmeister, on the ground that the first species attributed to the latter by Burmeister is its proper type, and that Lacordaire was wrong in restricting it to the second species. Happily, such a rule as this has never been accepted, or many well-established genera would fall. Burmeister himself began the process of dismembering his composite genus, but without re-defining it, and Lacordaire, in doing this, was entitled to take as its type any of the species left in it by its author, and naturally selected the African one indicated, although not named, as the type by Burmeister.

By an unfortunate coincidence, my paper upon the Madagascan genus *Lonchotus* was printed without the knowledge that Herr Sternberg had, a short time previously, published descriptions of several species of the genus. Herr H. Prell has kindly sent me Sternberg's types for comparison with mine, and I have found that *L. rugosicollis*, Sternb., is *L. borealis*, Arrow, while *L. splendens*, Sternb., is the species I regard as *L. lentus*, Burm. The name *curticollis*, Sternb., must be dropped, being based upon a deformed specimen (apparently a female of *L. lentus*), whose thorax shows exactly the same abnormal condition as the specimen of *Bothynus simplicitorsus*, Burm., described as *B. monstrosus*

by Bates. I have seen similar individuals of various other species.

The *Geotrupes dentatus* simultaneously described in 1801 by Fabricius and Weber has since remained unrecognized, although placed by Burmeister (and by the Munich Catalogue, in consequence) in the genus *Oryctes* on account of its comparison by Weber to *O. nasicornis*. If the two original descriptions are compared with a female specimen of *Xylotrupes gideon*, L., I do not think it will be doubted that that is the insect referred to.

Oryctes faunus, Billb., although supposed to inhabit "Barbary," is evidently a female *Strategus*, probably *S. validus*, F.

In his 'Catalogue of the Lamellicorn Coleoptera of Argentina' (part iv., 1911) Mr. Carlos Bruch has included the name of *Thronistes rouxi*, Burm., a very rare and peculiar insect found in Chili (according to Reiche); but from a specimen he has kindly sent to me I have been able to ascertain that the Argentine beetle is not *Thronistes*, but a small female *Golofa*, apparently that of *G. cochlearis*, Ohaus. In describing the front tibiæ of this species Dr. Ohaus seems to have reversed the sexes, for a male co-type presented to the British Museum by Mr. Bruch has only three distinct teeth.

The name *Ceratocrates*, introduced by Dr. Ohaus for a new genus, is preoccupied. I have therefore substituted *Gnathogolofa* (nom. nov.).

Palmerstonia minor, Blackb., is the female of *Horonotus optatus*, Sharp (*Dipelicus*). *P. bovilli*, Blackb., is also a female of a species related to *D. montrouzieri*, Reiche, and *nosutus*, Bates.

Pseudopimelopus lindi, Blackb., appears to me to be *P. nothus*, Burm.

Phileurus senegalensis, Cast. (*cariosus*, Burm.), is a species of *Pseudosyrichthus* closely related to *P. clathratus*, Gerst.

Trionychus strigipennis, Fairm., appears to have been described from a small specimen of *Hovophileurus sulcipennis*, Arrow, which specific name is therefore superseded.

Heteronychus nigrifrons, Fairm., is evidently *H. arator*, F. *Semanopteris dentatus*, Blackb., the type of which is now in the British Museum, is a species of *Eophileurus*.

The members of the latter genus, although remarkably alike in external appearance, are rather numerous. The examination of the aedeagi of the males reveals a striking diversity of forms, and renders inevitable the separation of what, apart from this criterion, I should consider to have at

most the value of local races. In describing the following new species I have therefore sketched these organs, which provide the most essential means for their determination. The genus has the closest relationship with the South-African *Rhizoplatodes*, of which only a single species, *R. castaneipennis*, Boh., is known. The mentum of that species has a slightly different shape, the male has a curious pit at the back of the head which is not found in *Eophileurus*, and its pygidium is not bent under the body as in the Oriental genus.

Eophileurus celebensis, sp. n. (Pl. XIII. fig. 1.)

Niger, nitidus, glaber, capite rugoso, prothorace postice cum scutello parce et minute, antice rugose, punctato; elytris fortiter sed haud crebre seriato-punctatis, interstitiis haud perspicue punctulatis, marginibus externis postice laevibus, parum punctatis; pygidio apice laevi, medio vix punctato, basi et lateribus fortiter punctatis; metasterni medio fere laevi, lateribus rugose punctatis:

♂, fronte breviter cornuto, vertice transverse impresso, impressione laevi; prothoracis margine antico medio minuto tuberculato, dimidio antico impresso, postice utrinque leviter elevato, dimidio postico medio longitudinaliter sulcato.

Long. 23 mm.; lat. max. 11.5 mm.

Hab. CELEBES.

There is a single male specimen in the British Museum, and I have seen two others in M. René Oberthür's collection. The species has the closest resemblance to *E. planatus*, Wied., but differs in the less close puncturation of the elytra, their smooth shining outer margins, the absence of minute punctures in the interstices, and, in the male, by the rugose head and slight marginal tubercle of the prothorax. The aedeagus of the male, represented in fig. 1, is entirely different from that of *E. planatus*, which, as shown by fig. 5, is asymmetrical.

Eophileurus javanus, sp. n. (Pl. XIII. fig. 2.)

Niger, nitidus, glaber, capite rugoso, pronoto antice fortiter et rugose, postice sat minute, punctato; scutello fere laevi; elytris striato-punctatis, interstitiis parce minutissime punctulatis, lateribus postice crebre sat minute punctatis; pygidii medio fortiter punctato, apice laevi, basi et lateribus rugosis; metasterni medio minute, lateribus rugose, punctatis:

♂, fronte breviter cornuto, vertice transverse impresso, impressione laevi; prothorace antice impresso, margine antico medio minute tuberculato.

Long. 21-24 mm.; lat. max. 10.5-11 mm.

Hab. JAVA: Buitenzorg (*J. Z. Kannegieter*, Feb. 1890), Sengoro (*A. Koller*, 1899).

This greatly resembles *E. celebensis*, with which it agrees in the rugose head and the slight tubercle at the front margin of the pronotum. It differs in the more closely punctured elytra, finely punctured interstices, and closely and roughly sculptured posterior lateral margins. These two species, as well as those I have previously described, may be distinguished at once by the examination of the ædeagus of the male. That of *E. javanus* is shown in fig. 2.

There are two males of *E. javanus* in the British Museum, and several females from Borneo and Singapore probably belong to the same species, but until the two sexes occur together this must remain a little uncertain.

Eophileurus quadrigeminatus, sp. n. (Pl. XIII. fig. 3.)

Niger, nitidus, elytris haud grosse sat crebre punctatis, singulo seriebus punctorum 4 duplicibus lineaque suturali ornato, intervallis sat latis, irregulariter punctatis, marginibus posticis subopacis, subtiliter punctatis; pygidio politissimo; metasterno densissime punctato et rufo-hirto:

♂, pronoto medio late excavato, cavitate postice lato, multo post medium producto, ab hac ad basin profundo sulcato.

Long. 24 mm.; lat. max. 12 mm.

Hab. TONKIN: Chapa, Lao Kay, 3600 feet.

A single male specimen was found by M. R. Vitalis de Salvaza, and presented by him to the British Museum. It is exceedingly similar to *E. chinensis*, Fald., but may be distinguished by the finer and less uniform puncturation of the elytra, upon which there are four double rows of punctures, with wide and irregularly punctured intervals. These are traceable, but much less distinct, in *E. planatus*, Wied., from which the new species can be also distinguished by its very densely punctured and thickly hairy metasternum and the cavity of the thorax of the male extending considerably past its middle.

Eophileurus pectoralis, sp. n. (Pl. XIII. fig. 4.)

Niger, nitidus, elytris grosse et confluer lineato-punctatis, lateribus similiter, haud irregulariter, punctatis, marginibus posticis solum confuse punctatis; pygidio parce et minute punctato; metasterno toto rufo-hirsuto, lateribus densissime rugosis et vestitis:

♂, pronoti medio late excavato, cavitate fere circulari, multo post medium producto.

Long. 24 mm.; lat. max. 12 mm.

Hab. ASSAM: Manipur (*W. Doherty*).

The unique male type-specimen is closely similar to *E. chinensis*, Fald., but differs in the strong and regularly serial puncturation of the elytra, which does not change its character at the lateral margins. The finely and densely rugose sides of the metasternum and their thick clothing of red hair are also characteristic of the species. Fig. 4 shows the aedeagus of this species.

Eophileurus andamanicus, sp. n. (Pl. XIII. fig. 6.)

E. planato affinis, sed minor, magis elongatus, elytrorum punctis majoribus et crebrioribus; metasterno parce punctato, vix hirsuto:

♂, pronoto antico leviter impresso, cavitate usque ad medium haud producta.

Long. 19-21 mm.; lat. max. 9.5-11 mm.

Hab. ANDAMAN IS. (*Capt. Wimberley*), NICOBAR IS. (*Roepstorff*).

The form and sculpture are almost identical with those of *E. planatus*, Wiede., but it is a smaller and rather narrower insect, with less hairy metasternum and slightly coarser and closer puncturation upon the elytra. Feeble as are the apparent differences between the two forms the aedeagus of the male (shown in fig. 6) is strikingly different.

Eophileurus siamensis, sp. n. (Pl. XIII. fig. 7.)

Niger, nitidus, sat latus, elytris grosse et crebre punctatis: *E. planato* proxime affinis, sed minor, elytrorum punctis majoribus et crebrioribus, marginibus externis antice magis reflexis; metasterni lateribus parce punctatis, distincte rufo-hirsutis.

Long. 20 mm.; lat. max. 10 mm.

Hab. SIAM: Bangkok, Chantabon (*S. S. Flower*).

E. siamensis has the small size and feebly developed male characteristics on head and thorax, and also the coarse and close elytral puncturation, of *E. andamanicus*, but it is less elongate and the metasternum is more hairy, in which it more nearly resembles *E. planatus*. The aedeagus is shown at fig. 7.

The aedeagi of a few other species of *Eophileurus*, in addition to the six new forms here described, will be found represented upon Plate XIII., which, owing to a misadventure, has had to be deferred to a later part.

Cyphonistes sublævis, sp. n.

Castaneco-rufus, capite marginibusque omnibus anguste infuscatis :

C. vallato similis, sed clypeo paulo breviori, canthis antice acutis, elytris sublævibus, punctis paucis et subtilibus, pygidio basi flavo-hirto.

Long. 24-27 mm. ; lat. max. 14-15.5 mm.

Hab. BRIT. E. AFRICA: Nandi Plateau, 5700-6200 feet (S. A. Neave, June 1911).

Amongst the exceedingly similar species of this very difficult genus *C. sublævis* is nearest to *C. arrowi*, Prell, but it is broader and more lightly punctured, the antecular lobes are more sharply pointed in front, and the pygidium is fringed with tawny hair at the base, from the angles to near the middle. The paramera of the ædeagus of the male are barbed near the middle of the outer edge, but quite destitute of the spiny processes from the inner edge found in the allied species. The last ventral segment of the female has a double emargination, as in *C. vallatus* and *arrowi*, but the median tongue, instead of being slender and sharp as in those species, is short and very blunt.

Professor Kolbe has assigned *Heteronychus latiusculus*, Fairm., to his genus *Heteroligus*, but the description mentions various features inconsistent with that view. The immarginate pronotum and thickened outer edges of the elytra suggest a female of *Cyphonistes* or allied genus.

IDIOSCHEMA, gen. nov.

Corpus elongatum, depressum. Caput parvum, late triangulatum, utrinque ante oculos extus productum, acutum, clypei apice recurvo, acuto, fronte tuberculis duobus parvis transversim positis, sat remotis, instructa. Prothorax antice minute tuberculatus. Antennæ minutæ, stipitis atque clavæ articulis brevissimis. Mandibulæ late detectæ, concavæ, margine externo integro, rotundato. Pedes validi, tarsis omnibus brevibus unguibusque minutis. Tibia antica crassa, fortiter sed obtuse tridentata, dente supero remoto, post medium posito. Tibiæ quatuor posteriores extus fortiter spinosæ, posticæ extremitate sat latæ, recte truncatæ, calcaribus validis, latis, longiori apice flexo. Propygidium medio late sat regulariter transversim striolatum.

♂. Tarsus anticus contractus, articulo ultimo globoso, ungue majori lato, valde inflexo, minori fere obsolete. Propygidium medio late sat regulariter transversim striolatum. Pygidium fortiter recurvatum.

Idioschema karruensis, sp. n.

Obscure rufa, supra nitida, subtus sat dense fulvo-villosa, capite grosse rugoso; pronoto fortiter punctato, lateraliter paulo densius, marginibus fortiter arcuatis, antice approximatis, angulis anticis acutis, posticis rotundatis; scutello paulo punctato; elytris grosse ocellato-punctatis, linea suturali fortiter impressa lineisque punctorum 4 discoidalibus; pygidio minute coriaceo et setoso, apice grossius rugoso, nitido.

Long. 16 mm.; lat. max. 8 mm.

Hab. CAPE COLONY: Karroo (Oct. 1913).

A single male specimen was found at Mortimer by Mr. W. R. White-Cooper.

This interesting insect is nearly allied to the genus *Pycnoschema*, but differs in many rather important features. The clypeus is triangular, and not produced into a narrow rostrum as in *Pycnoschema*, and the horn of the male is absent and replaced only by two slight tubercles. The form of the front tibia is also quite different. The antennæ are very short and the club not elongate in the male. The mandibles have the rounded outer edge of those of *Pycnoschema*, and there is the same angular process in front of the eye. The outer claw of the front foot is reduced (no doubt in the male alone) to a minute vestige. The propygidium is furnished with moderately fine and close stridulatory ridges.

Aphonoproctus vagabundus, sp. n.

Niger, parum nitidus, breviter ovalis, convexus, corpore subtus haud dense rufo-hirsuto; capite punctato-rugoso, antice angustato, truncato, fronte bituberculata, tuberculis vix connexis; pronoto ubique crebre et fortiter punctato, linea angusta lævi mediana, lateribus regulariter arcuatis, angulis posticis obsoletis; scutello lato, punctato; elytris fortiter punctatis, singulo linea suturali incisa punctorumque seriebus quatuor geminatis prædito; pygidio subtiliter rugoso; tibiis anticis acute 4-dentatis:

♂, tuberculis frontalibus longioribus, pygidii apice incurvo.

Long. 18.5-21.5 mm.; lat. max. 10.5-12.5 mm.

Hab. UGANDA: Msozi, 4300 feet (*Col. Delmé Radcliffe*), Entebbe (*C. C. Gowdey*). NYASALAND: Mlanje (*S. A. Neave*).

According to the description of the typical species, *A. pentodontinus*, Kolbe, this is a larger insect, more coarsely punctured and less shining. The tubercles upon the head are not united by a carina and there are none behind the front margin of the pronotum, although traces of these appear in two

specimens in our collection which do not differ in other respects.

Five species of Dynastinæ from Woodlark Island were described by Montrouzier under the name of *Scarabæus* (Ann. Soc. Agric. Lyon, (2) vii. 1855, p. 20), and four of them were omitted from Gemminger and Harold's Catalogue, no doubt owing to the compiler's inability to locate them. Two of them (*S. woodlarkianus* and *excavatus*) seem to me to belong to my genus *Papuana*, and the first I believe to be the insect I called *Papuana semistriata*. Herr Prell is probably correct in regarding *P. lævipennis*, Arrow, as a variety of the same species.

Of the other species of Montrouzier, *Scarabæus macleayi* is undoubtedly *Xylotrupes gideon*, L., *S. triangularis* is a *Dipelicus*, and *S. dubius* is doubtful. The description suggests a female *Trichogomphus* (although said to be taken from a male), but the four-toothed front tibiæ, coupled with the size, agree with no known genus except *Oryctes*.

Herr Prell has treated as a subspecies of *Papuana lansbergei*, Schauf., an insect from Java which seems to me to be a perfectly distinct species. Examples of both forms from the same sources (Fruhstorfer's captures) as those before Prell are in the British Museum. The Javan *P. badia*, in addition to its different colour, is smaller and much less elongate than *P. lansbergei*, the pygidium is less closely punctured, and, in the male, the slight depression at the front of the pronotum is limited behind by a definite ridge of which there is no trace in the other species.

These two forms with simplified armature are the only known Malayan species, all the others inhabiting islands farther to the east. The following is another new species from New Guinea:—

Papuana angusta, sp. n.

Nigra, nitida, elongata, supra lævissima, parum convexa, clypei lateribus fere rectis, convergentibus, apice profunde emarginato, utrinque acute dentato; pronoto cum scutello lævissimo, illius lateribus regulariter arcuatis, anguste marginatis, angulis anticis acutis, posticis rotundatis, elytris punctato-sulcatis, punctis ocellatis, apicibus irregulariter haud fortiter punctatis; pygidio dense subtiliter punctato, medio et apice lævigato; tibiis anticis tridentatis, dente supero sat remoto:

♂, capite breviter cornuto, cornu postice planato, apice minute

bituberculato; pronoto antice utrinque paulo excavato et supra processu horizontali brevi, antice truncato, munito:

♀, capite bituberculato, pronoto antice transverse carinato.
Long. 22·5–28 mm.; lat. max. 11·5–14 mm.

Hab. DUTCH NEW GUINEA: Utakwa R. (*A. F. R. Wolleston*); Mt. Goliath (5000–7000 feet—*A. S. Meek*).

Like *P. trinodosa* and *uninodis*, Prell, this is a narrow-bodied species, but it is considerably larger than either and quite different in its armature. The head is very smooth and the clypeus sharply bidentate in front, but the teeth do not diverge, the sides of the clypeus are almost straight and uniformly convergent, and its front margin strongly excised. Upon the clypeal suture, which is strongly bent forwards, the female bears two sharp conical tubercles placed close together, and the male a short horn, broad at the base, flattened or slightly excavated behind and slightly bifid at the end. The pronotum, like the head, is almost impunctate, its sides are strongly rounded and finely margined, the front angles acutely produced, and the hind angles rounded off. In the male there is a horizontal process anteriorly, truncated in front, nearly vertical in the middle, and not reaching beyond the front margin. Just within the latter there is a slight rugose excavation on each side.

In the female the thoracic process is represented by a transverse carina a little behind the front margin, the intervening space being finely punctured. The scutellum is smooth and the elytra are broadly sulcate, with ocellated punctures in the sulci. The latter do not reach the end of the elytra, the posterior outer margins of which are finely punctured. The pygidium is finely and densely punctured except at the middle and apex. The front tibiæ bear three strong teeth, the uppermost one rather remote from the other two, which are close together.

ONYCHIONYX, gen. nov.

Corpus elongatum, parallelum, nudum, pedibus absque spinis, sed tibiis omnibus extus dentibus tribus fortibus calcaribusque validis, acutis, armatis, tibiarum anticarum dentibus obliquis, collocatis, tarsis moniliformibus, articulis basalibus haud spinosis, unguibus valde curvatis, haud divergentibus, onychio longo, curvato, haud setoso. Clypeus transversus, margine antico medio bidentato, tuberculisque duobus in carina frontali. Mentum convexum, antice angustatum, truncatum, palpis crassis. Maxillæ acute 6-dentatæ, dentibus 3 inferis connatis. Mandibulæ intus et extus dense setosæ, apice subito intus inquinato. Prosternum antice et postice productum.

♂ et ♀ vix dissimiles.

Onychionyx opacipennis, sp. n.

Piceus, subcylindricus, nitidus, elytris opacis, humeris exceptis; clypeo sat crebre punctato, fronte minus crebre; pronoto convexo, minute et parce inæqualiter punctato, lateribus paulo fortius, angulis obtusis, lateribus medio paulo contractis; scutello elytris-que irregulariter annulato-punctatis; pygidio nitido, modice crebre punctato:

♂, pygidio subtus reflexo.

Long. 29-33 mm.; lat. max. 15-17 mm.

Hab. DUTCH NEW GUINEA: Mt. Goliath, 5000-7000 feet (A. S. Meek).

This is another of the curiously isolated but yet inter-related forms of *Dynastinae* which characterize the Papuan Region, and of whose probably peculiar habits we as yet know nothing. It is remarkable in the absence of hair, and especially of the bristly hairs upon the legs which form a rather constant feature of the subfamily. The two sexes are almost identical, there are no elevations or depressions upon the head or thorax, and the front feet are neither elongated nor thickened in the male. The front tibia bears three sharp external teeth placed close together, and each of the four posterior tibiæ also bears three sharp spines externally, the last at the extremity. The tarsi are simple and similar on all the legs, and neither spinose nor bristly, and the claws are strongly curved and not at all divergent, so that the two tips are close together. The onychium is strongly developed, not setose at the end, and has a corresponding curvature to that of the claws, so that the extremities of all three are almost in contact, an arrangement which I have seen in no other beetle.

It is more nearly related to *Hatamus* than to any other known genus, but differs greatly in its massive build, the absence of hair from the legs and lower surface, the abnormal claw-structure, the form of the tibiæ and tarsi, the similarity of the sexes, and other important points.

The Australian *Dynastinae* are very imperfectly known at present. Many species described by Boisduval, Guérin, Macleay and others, are still unrecognizable, and Blackburn has trusted to very speculative determinations of them in describing the numerous species for which he is responsible, and of which some are based upon female specimens or males of poor development. The fixation of many of the earlier-described forms is likely to remain long a matter of uncertainty, but, Blackburn's types having now become part of

the British Museum Collection, I am able to give here a few notes upon the correct nomenclature of the species.

Blackburn himself called attention (Trans. Roy. Soc. S. Austr. xix. 1895, p. 41) to the great variability of the species of the genus *Semanopterus*; but he proceeded to describe a considerable number of new forms from minute differences, as though the range of variation had been exceptionally small. After a very careful comparison of his types in conjunction with all other available specimens, and in particular a study of the genitalia of the males, I have been driven to the conclusion that the genus consists of only a few species of great variability. The excision of the hind angles of the prothorax, upon which Blackburn relied for the primary subdivision of the genus, is found in every degree of development; the puncturation, the sculpture and pubescence of the pygidium, and even the shape of the prosternal process, are highly inconstant. I have already expressed my opinion that the three names bestowed by Hope (*adelaidæ*, *subæqualis*, and *depressus*) refer all to one species. To this species *depressiusculus*, MacL., and *meridianus*, Blackb., also apply, and it should be called *S. subcostatus*, Cast. *Semanopterus leai*, Blackb., and *S. tricostatus*, Blackb., are two species apparently confined to West Australia; while all the other names introduced by Blackburn (except *dentatus*, which I have already referred to *Eophileurus*) belong, in my opinion, to a single variable insect, which ranges right across the continent from Perth to N. Queensland. It was first described by Macleay as *S. convexiusculus*. The only other known species is *S. solidus*, Burm.

The species of *Dasygnathus* have also been tabulated by Blackburn by the use of characters which seem to me to have little or no importance. An accidental separation of the elytra in some specimens apparently misled him into describing these as dilated behind the middle. Thus, he has admitted that this and the shape of the horn of the male are all he could find to distinguish *D. trituberculatus* and *recticornis*. With regard to the first point, the only difference perceptible to me between the type-specimens is that in *D. trituberculatus* the elytra are slightly parted, while, as to the second, variation in the most variable of all features must be assumed to be merely individual until it is proved common to a group. In my opinion, *D. trituberculatus*, *recticornis*, and *majer* are indistinguishable. Blackburn has overlooked the fact that the median thoracic tubercle mentioned by him as the chief differential character of the first is similarly present in the other two. It is also found in the

form with anterior lateral tubercles called *mastersi* by Macleay, which may be an extreme development of the same species.

The three following species, like *D. inermis*, Blackb., are hornless in the male. It is probable that there are many related forms, which, if known, have been supposed to be females only.

Dasygnathus globosus, sp. n.

Castaneus, capite prothoraceque obscurioribus, breviter ovatus, convexus, capite parvo, pronoto nitido, parcissime minute punctato, ad latera angusto ruguloso, his omnino rotundatis, angulis posticis fere obsoletis; elytris irregulariter seriato-punctatis:

♂, capite ubique grosse punctato, clypeo brevi, reflexo, antice recte truncato, lateribus rectis, multo convergentibus, postice angulatim carinato et ad angulum minute sed acute tuberculato; prothoracis antice medio breviter impresso, basi haud marginato; pygidio convexo, omnino crebre ruguloso.

Long. 25 mm.; lat. max. 15 mm.

Hab. QUEENSLAND: Moreton Bay.

This has a short rounded shape, quite different from that of all the other species, and in the great reduction of the external male characters is comparable only with *D. inermis*, Blackb. From that it differs entirely, not only by its globose form, but in the shape of the head, of which the clypeus is very short and the front angles very obtuse, but not at all rounded. The marginal line at the front of the pronotum is not angulated in the middle.

In a second specimen (from Andrew Murray's collection, but without precise locality), which I believe to be the female of *D. globosus*, the head is larger, the clypeus almost semicircular and without carina or elevation of any kind, the pronotum has an almost continuous posterior marginal stria, but no anterior depression, and the pygidium is rather flat, shining, and very thinly punctured.

Dasygnathus impotens, sp. n. (Pl. XIII. fig. 11.)

Castaneus, capite pronotoque fere nigris; nitidus, convexus, clongatus, postice ampliatus; capite rugose punctato, clypeo mediocri, lateribus convergentibus, margine antico reflexo, leviter arcuato; pronoto parcissime minute punctato, ad latera anguste ruguloso, his fortiter arcuatis, angulis anticis acutis, posticis obtusissimis, basi trisinuato, immarginato; elytris dorso fortiter sulcatis, sulcis vage punctatis, spatio sublaterali inæqualiter punctato; pygidio parce punctulato, angulis anticis rugulosis, basi parce fulvohirsuto:

♂, capite haud carinato, fronte tuberculo minuto retrorsum inclinato medio instructo; pronoto antice leviter transversim impresso, linea submarginali, medio vix angulata, inciso.
Long. 19 mm.; lat. max. 10.5 mm.

Hab. N. AUSTRALIA: Carpentaria.

A male specimen in the Museum was obtained by the late Alexander Fry.

The species resembles *D. inermis*, Blackb., but is smaller; the clypeus is rounded in front, and has a minute backward-pointing tubercle, but no carina; the incised line behind the front margin of the pronotum has no diverticulum in the middle, and the base is not margined. The maxillæ are armed only with minute and feeble tubercles instead of the strong teeth found in the typical species of the genus.

Dasygnathus hospes, sp. n. (Plate XIII. fig. 12.)

Castaneus, nitidus, subtus fulvo-hirsutus; modice elongatus, convexus, elytris subglobosis, post medium ampliatis; capite transversim rugoso, clypeo medioeri, antice reflexo, leviter arcuato; pronoto parce sat minute punctato, ad latera anguste ruguloso, his fortiter arcuatis, angulis anticis sat acutis, posticis fere obsolete, basi immarginato; elytris fortiter sulcatis, sulcis vage punctatis, spatio sublaterali irregulariter punctato; pygidio crebre punctato:

♂, capite vix carinato, fronte tuberculo minuto reclinato medio instructa; pronoto antice vix impresso, linea submarginali, medio breviter acute angulata, inciso.

Long. 17 mm.; lat. max. 10 mm.

Hab. QUEENSLAND.

A single male was taken during the 'Challenger' Expedition.

It is like *D. impotens*, but less elongate, more convex, with the elytra shorter, narrowed at the shoulders, and broader and more rounded behind. The clypeus is a little wider, the pronotum more convex, less produced in front, and the front marginal stria is sharply angulated in the middle.

Blackburn, in reviewing the species of *Isodon*, admitted himself unable to identify *I.* ("*Heteronychus*") *lucidus* and *I. picipennis*, of Macleay, but the latter's descriptions exactly fit the female and male respectively of *I. pecuarius*, Reiche, the most widespread member of the genus. The head and pronotum are not uncommonly almost black in the male of that species, and in the female a minute tubercle may or may not be visible upon the pronotum. Mistaking the real sexual differences for generic, Macleay looked for both sexes amongst

his females, and not unnaturally supposed the presence or absence of this tubercle to denote the male and female of his "*Heteronychus lucidus*."

The two following West Australian species are quite distinct from any hitherto described:—

Isodon glaber, sp. n.

Piceus, capite et elytris, vel superficie dorsali tota, sæpe nigris, pectore et pedibus longe fulvo-pilosis; brevis et latus, parum convexus, glaber, vix punctatus; capite attenuato, apice anguste truncato, fortiter reflexo, carina suturali fere recta; pronoto fere duplo latiori quam longiori, lateribus fortiter arcuatis, angulis anticis fere rectis, posticis toto obsoletis, antice medio breviter impresso et tuberculato, basi utrinque impresso; scutello lato, obtuse angulato; elytris stria suturali profunda aliisque indistinctis, punctis nonnullis subapicalibus; pygidii medio nitido, lateribus dense punctulatis; utriusque sexus pedibus simplicibus:

♂, tarsis et unguibus simplicibus, pronoto medio fortius impresso; pygidio valde convexo:

♀, corpore minus parallelo, pronoto antice angustato; pygidio parum convexo.

Long. 9·5–12 mm.; lat. max. 5·5–7 mm.

Hab. W. AUSTRALIA: Perth, Cannington, Cottesloe Beach.

Specimens in the British Museum were taken long ago by Duboulay, and it has more recently been found by Mr. G. E. Bryant.

It is a small insect closely resembling *I. lævigatus*, Burm., but rather smaller and still smoother above. The head is almost or wholly smooth, the clypeus is strongly produced in front, with concave sides, the clypeal carina is straight and sharply elevated, and the elytral striæ have almost entirely disappeared, except the deeply impressed one on each side of the suture.

Isodon subopacus, sp. n.

Supra toto niger, parum nitidus, subtus piceus, pectore et pedibus dense fulvo-pilosis; brevis, latus, sat convexus; clypeo fere impunctato, attenuato, antice anguste truncato, reflexo, carina suturali recta, valde elevata, fronte leviter punctato; pronoto impunctato, antice medio minute tuberculato, longitudinaliter impresso, lateribus fortiter arcuatis, antice approximatis, angulis anticis acutis, posticis obsoletis, basi utrinque fortiter impresso, scutello lævi; elytris fortiter seriato-punctatis, stria suturali profunde incisa; pygidio nitido, basi crebre minute punctato; utriusque sexus pedibus simplicibus:

♂, pronoti sulco antice paulo dilatato, pygidio convexo.

Long. 11–13·5 mm.; lat. max. 6·5–7·5 mm.

Hab. W. AUSTRALIA: Perth, Israel Bay.

Specimens have existed in the British Museum for over seventy years, and others have recently been taken at Perth by Mr. G. E. Bryant. The peculiar lustreless upper surface, of the pronotum especially, distinguishes the species from all others known to me. It is of an intense coal-black colour, with a broad pronotum entirely devoid of punctures, and the elytra are rather evenly and uniformly punctured in rows. The shape of the thoracic cavity is also peculiar, being longitudinal, with an anterior dilatation in the male which gives it a triangular outline.

Novapus rugicauda, sp. n.

Rufo-piceus, pectore dense rufo-hirsuto; scutello punctato elytrisque fortiter punctato-lineatis, punctis annulatis, stria crenata suturali integra, striis discoidalibus postice abbreviatis, intervallo subsuturali lateribusque fortiter haud crebre irregulariter punctatis, interstitiis minute punctulatis; pygidio crebre rugoso, haud ciliato:

♂, capite rugoso, clypeo angustato, recurvato, vertice cornuto, cornu sat gracili, apice minute bicuspidato; pronoto quam elytra vix latiori, late et profunde excavato, lateribus subtiliter punctatis, fossa transverse haud crasse rugosa.

Long. 20 mm.; lat. max. 11 mm.

Hab. S.W. AUSTRALIA: King George's Sound (*J. A. Brewer*).

A single male specimen has been in the British Museum since 1870.

The species of *Novapus* are remarkably alike in general appearance, especially the males, but the examination of the pygidium shows differences of sculpture and clothing, which seem to be sufficient for the separation of most of them. The present species is the only one known in which that part of the body is closely rugose, the others having it punctured or smooth, often with a close fringe of hair at the base. Although Blackburn has not mentioned the pygidium of *N. striatopunctulatus*, which appears to resemble the new species, his type is a much larger insect, and, as its prothorax is less excavated, the difference of size is evidently not due merely to variation.

Pseudoryctes sulcatus, sp. n.

Ferrugineo-rufus, latus, nitidus, subtus fulvo-hirsutus, elytris fortiter punctato-sulcatis, punctis grossis et confluentibus; pygidii circumferentia longissime ciliata, medio lævi; pedibus anticis sat gracilibus, tibiis longissime tridentatis, posterioribus quatuor crassis, tibiis brevibus, postice latis:

♂, clypeo sublævi, fere verticali, margine toto elevato, antice

medio minute exciso, antennarum flabello quam stipite multo longiori; prothorace quam elytris multo laeviori, tricornuto, supra toto excavato, fossa rugosa, haud pilosa, medio longitudinaliter divisa, cornu antico antrorsum producto, apice dilatato, bifido, lateralibus verticalibus, acuminatis, singulo dente obtuso antico minuto; scutello rugoso; elytris ad medium fere parallelis, deinde angustatis; pygidio subtus inflexo:

♀, clypeo obliquo, parabolico, fortiter punctato, prothorace quam elytris angustiori, medio cum scutello haud fortiter punctato, elytris ab humeris ad post medium dilatatis; pygidio magno, porrecto.

♂. Long. 18 mm.; lat. 9.5 mm. ♀. Long. 16 mm.; lat. 10 mm.

Hab. S. AUSTRALIA: Hermansburg (near Lake Eyre).

Three males and a female of this striking species have been collected and presented to the British Museum by Mr. H. J. Hillier. It differs from all other known species by the deep coarsely-punctured grooves of the elytra. In its armature it seems to agree with *P. tectus*, Blackb., the very incomplete description of which omits all reference to the elytra, which must therefore be supposed to be like those of the species previously described. Blackburn's insect is also considerably larger and has the thoracic cavity filled with hair, which is quite absent in *P. sulcatus*. The mentum, the form of which is the only real distinguishing feature between *Pseudoryctes* and *Cavonus*, is swollen in two of the specimens of *P. sulcatus* in the manner characteristic of *Pseudoryctes*, and in the other two is collapsed and nearly flat. The former condition must, of course, be regarded as the normal one, but it is evident that this character is of less importance than has been supposed.

Aneurystypus levis, sp. n.

Rufo-ferrugineus, parvus, corpore subtus longe et dense flavo-piloso; supra nitidus, sat latus, clypeo postice carina recta delimitato, fortiter punctato, illius longitudine fere ad latitudinem æquali, margine antico valde arcuato et reflexo, fronto rugose punctata, vertice utrinque lævigato; pronoto parum convexo, haud excavato aut tuberculato, subtiliter punctato, lateribus leviter arcuatis, angulis anticis haud acutis, posticis valde obtusis; scutello fere lævi; elytris obsolete seriatim punctatis; pygidio nitido, parce minute punctato; pedibus gracilibus, tarsis parum longis.

Long. 11-12.5 mm.; lat. max. 7-7.5 mm.

Hab. QUEENSLAND.

As is usually the case in this group only the male is known.

It is similar in size and colour to *A. pauvillus*, Blackb., as well as in its general appearance, but there is no trace of thoracic depression or tubercle, while the very feeble puncturation of the pronotum, elytra, and pygidium also distinguish it immediately. The clypeus, on the other hand, is more strongly punctured and of different shape, being rather long, narrow, and strongly rounded in front. The pronotum is less convex, less deeply sinuated at the base, with the front angles less sharp and the hind angles distinctly indicated.

I have received specimens from Messrs. Staudinger and Bang-Haas.

Ligyris amazonicus, sp. n.

Nigro-piceus, vel supra toto niger, nitidus, elongato-ovalis, capite transverse rugoso, clypeo antice acutissime bidentato, postice bituberculato; pronoto fortiter sat crebre punctato, antice ad marginem minute tuberculato et impresso; scutello subtiliter punctulato; elytris undique fortiter et crebre punctatis, punctorum lineis nonnullis geminatis; pygidio haud fortiter punctato, angulis anticis rugulosis; utriusque sexus pedibus omnibus simplicibus.

Long. 23-26 mm.; lat. max. 12.5-14 mm.

Hab. AMAZONS: Manaos, Obydos (*E. E. Austen*), Ega (*H. W. Bates*), Serpa, Teffe.

Ligyris ebenus, *maximus*, and *amazonicus* have been found all together in various localities in the Amazons region. They are closely related and exceedingly similar in shape and sculpture. In the last two the front tarsus of the male is not thickened, the clypeus is much more sharply bidentate and the pronotum more strongly punctured than in *L. ebenus*, Deg. From *L. maximus*, Arrow, the new species is easily distinguished by its smaller size and the very feeble depression at the front edge of the pronotum.

Ligyris latus, sp. n.

Nigro-piceus, vel supra toto niger, nitidus, robustus, late ovalis, capite transverse rugoso, clypeo antice acute bidentato, postice bituberculato; pronoto fortiter sat crebre punctato, margine antico medio minute tuberculato et longitudinaliter impresso, lateribus regulariter arcuatis, angulis posticis toto obsolete, basi medio fere exciso; scutello perpaulo punctulato; elytris undique fortiter et crebre punctatis, punctorum lineis nonnullis geminatis; pygidii basi subtiliter rugoso, apice parce punctulato; utriusque sexus pedibus omnibus simplicibus.

Long. 27-31 mm.; lat. max. 15-17 mm.

Hab. VENEZUELA : Caraccas. COLOMBIA.

This species has a very close resemblance to the last, but is relatively broader than that or any other of the species nearly related to it. It is larger than *L. amazonicus*, and differs from it also in the complete obliteration of the hind angles of the prothorax, the curve of the lateral margin being uniformly continued. The sculpture of the pygidium is also different, about a third of its length from the base being finely rugose. These two species differ from *L. maimon*, Er., in their more punctured elytra, and from *L. ebenus*, Deg., and *gyas*, Er., in having the pronotum much more closely punctured.

Cyclocephala longiceps, Kirsch, seems to me to be *Anco-gnatha humeralis*, Burm., Kirsch having possibly mistaken for the latter the species I have named *A. vulgaris*.

Kirsch's description of *Cyclocephala atacazo* suggests a species of *Anco-gnatha* or *Barotheus*.

Cyclocephala pugnav, sp. n.

Nigro-fusca, elytris fulvis, sutura signaturisque duabus valde angulatis nigris; elongato-ovalis, nitida, clypeo antice arcuato; pronoto cum scutello minute punctato; elytris fortiter punctatis, punctorum seriebus duplicibus tribus discoidalibus:

♂, clypeo paulo producto, subtiliter punctato; pedibus anticis crassis, tibiis acute tridentatis, tarsis brevissimis, articulo ultimo magno, intus late lobato, articulo penultimo etiam lobato et longe ciliato; pygidio opaco, minute ruguloso:

♀, clypeo semicirculari, sat grosse rugoso; pedibus simplicibus, tibiis anticis haud acute tridentatis, posticis brevibus, elytrorum marginibus externis postice angulatis et incrassatis; pygidio nitido, grosse punctato.

Long. 16-18 mm.; lat. max. 8.5-9.5 mm.

Hab. GUIANA; BRAZIL: Para, Ega, Teffe.

It is a dark-coloured species, of which the elytra only are pale, with dark markings, which are sometimes reduced to a sutural line and a few dark marks at the shoulders, but may spread into two transverse zigzags, which occasionally unite. A feature which I have seen in no other species is found in the peculiar modification of the front tarsus of the male. The three terminal joints are dilated and finely striated on their inner face, the penultimate one has a fringe of six or seven very strong bristles at its outer edge, and the last joint has a broad lateral process curving backwards to meet the tips of these bristles, the whole forming a rather elaborate grasping apparatus. The inner claw is very large,

strongly bent, and minutely toothed near the middle of its outer edge.

Cyclocephala flavipennis, sp. n.

Læte rufa, clytris flavis, vertice nigro; lævis, nitida, elongato-ovalis, capite parvo, clypeo sat longo, antice arcuato, subtiliter rugoso, fronte leviter punctato; prothorace cum scutello minute et parcissime punctato; elytris leviter punctatis, lineis nonnullis geminatis indistinctis:

♂, pedis antici ungue interno magno, valde flexo, basi lobato; pygidio convexo, nitido, vix punctato; mandibulis extus angulatis:

♀, elytrorum margine externo post medium perspicue angulato; pygidio parum convexo, minute et parce punctato.

Long. 16-18 mm.; lat. max. 9-10 mm.

Hab. ECUADOR: Balzapamba (*R. Haensch*).

This has a very close resemblance to *C. gravis*, Bates, *C. atricapilla*, Mann., and other species identical in shape and colouring, but the clypeus is longer, narrower, and gently rounded in front, instead of being emarginate, the pygidium is smoother, and the elytra of the female have a marked angulation behind the middle of the outer margin.

Cyclocephala erotylina, sp. n.

Rufo-testacea, elytris læte flavis, sutura, linea submarginali, maculisque quatuor nigris, duabus pone basin elongatis, una mediana magna lineolaque parva subapicali; corpus elongato-ovatum, nitidum, clypeo attenuato, dense punctato, apice suaviter recurvo, fronte, pronoto scutelloque subtiliter punctatis, pronoto antice angustato, angulis anticis acutis, posticis obsolete; elytris irregulariter haud fortiter punctatis; pygidio corporeque subtus minute fulvo-setosis:

♂, pedum anticorum tarsis crassis, ungue interno dilatato, apice minute fisso, tibia dentibus duobus fere transversis armata, tarsis quatuor posterioribus longis:

♀, pedum anticorum tarsis simplicibus, tibia dentibus tribus obliquis armata, elytrorum marginibus externis paulo ante apicem obtuse angulatis.

Long. 14 mm.; lat. max. 7.5 mm.

Hab. MEXICO.

Received from Messrs. Staudinger and Bang-Haas, without more precise locality. I describe it only because it is so highly distinctive as to be unfailingly recognized when seen. It is exactly similar in coloration and general appearance to *C. liomorpha*, Arrow, but with the clypeus produced and attenuated, the pronotum rather longer and more strongly

punctured and the elytra less smooth and shining. The elytral spots are entirely black, the two basal ones elongate, and the black sutural line is not produced round the outer margin as in *C. liomorpha*, but there is instead a narrow black line within the outer edge. In the female the elytral margin is not angulated near the middle, as in the allied species, but towards the extremity.

It is highly interesting to find two species living so far apart as the Amazons and Mexico with important structural differences, but almost identical pattern and general appearance. They are evidently mimetic forms, strongly suggesting various conspicuously marked species of Carabidæ, Erotylidæ, and Chrysomelidæ. Probably the resemblance is general rather than particular, for the closest similarity I have noticed to any individual species of another family is to *Morphoides 10-notatus*, Duponch., an Erotylid inhabiting South Brazil, a third region very distinct faunistically.

Agaocephala inermicollis, sp. n.

Cuprea, elytris testaceis, marginibus callisque humeralibus et apicalibus infuscatis; sat convexa, nitida, clypeo rugoso, fronte fere lævi; pronoto igneo-cupreo, inæqualiter punctato, punctis disci parvis, et minutis, lateribus subtiliter rugosis, marginibus valde arcuatis, angulis omnibus obtusis, posticis fere obsoletis; scutello parce punctato; elytris ab humeris apicem versus paulo ampliatis, fortiter, irregulariter sat crebre punctatis, callis humeralibus et apicalibus prominentibus, lævibus:

♂, capite bicornuto, cornubus antrorsum fere recte productis, apice acuminatis, leviter recurvatis; pronoto valde convexo, toto inermi; pygidio valde incurvato, subtiliter punctato, lateraliter minute rugoso; antennarum clava magna.

Long. (absque cornubus) 30–31 mm.; lat. max. 16·5–17·5 mm.

Hab. S. BRAZIL: Rio Grande.

Two males were contained in the collection of the late Alexander Fry, now forming part of the British Museum collection.

The species is allied to *A. duponti*, Cast., but differs from that and all other species in its smooth and shining surface, that of the pronotum especially. Like that species and *A. melolonthoides*, Thomis., the male has no trace of a thoracic process, and another interesting feature is the elongate club of the antenna in this sex. This is common to the three species with unarmed thorax, whilst all those in which a thoracic process is found have the club small and scarcely different from that of the female.

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[EIGHTH SERIES.]

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XXXII.—*Three new Species of Ceriagrion from West Africa*
(Order Odonata). By HERBERT CAMPION.

As it stands at present, the genus *Ceriagrion* contains seven species, all but one of which have an exclusively Oriental distribution. Two of this number have been described during the present year, namely *C. fallax*, Ris, from South China (Entom. Mitteilungen, iii. p. 47, 1914), and *C. olivaceum*, Laidlaw, from Upper Burma (Rec. Ind. Mus. viii. p. 345, 1914). Isolated females are still difficult to determine, but the identification of the males of the five older species has been greatly facilitated by the publication of a very useful table by Dr. F. Ris (Abh. Senckenberg. Gesell. xxxiv. p. 519, 1913).

The only extra-Asiatic species made known so far is the African *C. glabrum*, Burm. This species occurs throughout the African continent, excepting the Mediterranean region, as well as in Madagascar, Mauritius, and the Seychelles. In general appearance there is a striking similarity between *C. glabrum* and *C. erubescens*, Selys, known from Siam, South China, Formosa, Malacca, Sumatra, Java, New Guinea, Aru, and North Australia. Indeed, Queensland specimens have been sometimes referred to under the name of *glabrum*; but examination in detail has shown that the two forms are really distinct from each other.

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Three species from West Africa which have come before me recently I now propose to describe as new. That from Southern Nigeria is represented by a single male which has been in the British Museum for several years. The remaining species were contained in collections received by the Imperial Bureau of Entomology, one from Dr. James J. Simpson while visiting Sierra Leone on behalf of the Bureau, and another from Mr. W. H. Patterson, the Government Entomologist in the Gold Coast.

The new species all exhibit the interesting structure, characterizing the genus, to which Dr. Ris has drawn attention in the first of the papers cited above (p. 45). This structure consists of a sharply-defined ridge crossing the frons transversely, just in front of the antennæ, and parallel with the more anterior ridge separating the anteclypeus from the postclypeus. The frons is thus divided into a horizontal portion lying on the summit of the head and a vertical anterior portion placed almost at a right angle with it.

The males of the four African species now under consideration may be tabulated thus:—

- I. The vein A* arising exactly at the level of the cubito-anal cross-vein. Two black teeth on the apical margin of segment 10, one on each side of the excision.
- A. Wings conspicuously yellow.
- a. Thorax rusty brown above; abdomen orange-red; largest species (abdomen 29·5–33 mm., hind wing circa 20 mm.) *glabrum*, Burm.
- II. The vein A* arising a little before the level of the cubito-anal cross-vein. Apical margin of segment 10 not toothed.
- B. Wings conspicuously yellow.
- b. Thorax dark greenish yellow above; abdomen for the most part pale lemon; species of intermediate size (abdomen 25·5 mm., hind wing 16·5 mm.) *citrinum*, sp. n.
- C. Wings entirely hyaline.
- c. Thorax dark green above; abdomen light red; species of intermediate size (abdomen 26 mm., hind wing 17 mm.) *corallinum*, sp. n.
- d. Thorax dark chocolate-brown above; abdomen crimson; smallest species (abdomen 24 mm., hind wing 15 mm.) *ignitum*, sp. n.

Ceriagrion citrinum, sp. n.

♂ adult (holotype).—Length of abdomen, including anal appendages, 25·5 mm.; length of hind wing 16·5 mm.

Labium, labrum, genæ, anteclypeus, and back of head yellow. Postclypeus, frons, and upper surface of head dark

greenish yellow. Antennæ yellow at base, then reddish brown. Prothorax dark greenish yellow. Upper surface of thorax proper also dark greenish yellow, with an antehumeral golden stripe, not reaching to the anterior margin of the thorax. (On the right side this antehumeral stripe is not well developed.) Sides and under surface of thorax pale greenish yellow. Legs yellow; spines and apex of tarsus and of claws black. Wings conspicuously yellow; reticulation for the most part reddish. Pterostigma greenish yellow, bounded by black nervures. Arculus in all wings a little distal to the second antenodal. A* in all wings originating a little before the level of the cubito-anal cross-vein. 10 postnodals in fore wings and 8 in hind wings. Abdomen: segments 1 to 5 and nearly the whole of 6 pale lemon; from the apex of segment 6 to the end of the abdomen reddish brown, tending to black on 8. Excision in the apical margin of 10 V-shaped, deep, reaching to about the middle of the segment. The upper anal appendages blackish, stout, pointed, curving abruptly downwards, and conspicuously shorter than the lower, which they touch. The lower appendages reddish brown; viewed in profile wide, longer than segment 10, directed upwards, produced into a black-tipped point above; in dorsal aspect conical, directed backwards.

In general appearance this species resembles *Ceriagrion coromandelianum*, Fabr., from India, but may be readily distinguished from it by its smaller size and the yellow coloration of the wings.

SOUTHERN NIGERIA: 1 ♂, Lagos (*Dr. H. Strachan*), British Museum, no. 98-165.

Ceriagrion corallinum, sp. n.

♂ adult (holotype).—Total length of abdomen 26 mm.; length of hind wing 17 mm.

Labrum, anteclypeus, and anterior portion of frons greenish yellow. Genæ pale green. Postclypeus, posterior portion of frons, and superior surface of head reddish brown. Back of head ochraceous. Antennæ yellowish brown at base; the bristle black. Prothorax yellowish, variegated with greenish. Thorax: mid-dorsal carina dark green, with a rather broad stripe of golden yellow on each side; between this stripe and the humeral suture a broader band of dark green; sides of thorax pale green; under surface whitish. Legs brownish yellow; spines, apex of tarsi, and tips of claws black. Wings entirely

hyaline, with black veins. Arculus a little distal to the second antenodal. A* arising slightly proximal to the cubito-anal cross-vein. 11-12 postnodals in fore wings and 10 in hind wings. Pterostigma greenish brown, bounded by black nervures. Dorsum and sides of entire abdomen light red, a little darker on the terminal segments; under surface pinky yellow. Excision in apical margin of segment 10 wide, U-shaped rather than V-shaped, rather shallow. Anal appendages reddish; the upper ones somewhat shorter than the lower, stout, curved inwards and downwards; the lower appendages shorter than segment 10, broad laterally, curving gently upwards and backwards, and terminating in a rather long acute point above and a shorter blunter point below.

The antebumeral stripe of golden yellow, when present, varies a good deal in width in different individuals, and may be developed unequally on the two sides of the dorsal crest in the same specimen. Sometimes it is absent altogether, and the dorsum of the thorax may be of a more or less unicolorous brownish tint.

There is also a considerable amount of variation in the relation of the arculus to the second antenodal. This is the case even in the different wings of the same individual; but in the fore wings the arculus shows a greater tendency to migrate outwards than it does in the hind wings, where the coincidence with the second antenodal is occasionally exact.

Similarly, the point of separation of A* is far from being constant. Rarely, in hind wings, it coincides exactly with the cubito-anal cross-vein, but more commonly the longitudinal vein arises some little distance before the level of the cross-vein.

♀ (allotype).—Length of abdomen to apex of segment 5 16 mm. (remaining segments lost); length of hind wing 18 mm.

Mouth-parts and head coloured as in holotype. Prothorax dark brown. Dorsum of thorax greenish gold, with a narrow stripe of dark green on the mid-dorsal crest, and a similar stripe on each humeral suture; rest of thorax as in holotype. Legs as in holotype. Wings as in holotype, except that the arculus coincides with the second antenodal in all wings. 11 postnodals in fore wings and 10-11 in hind wings. Abdomen to end of segment 5 yellowish brown.

SIERA LEONE: 1 ♂, Kamakoni, 22. iv. 1912; 1 ♀ (allotype), Rowerre, 28. iv. 1912; 3 ♂ (including holotype), Port Lokko, 1. v. 1912; 2 ♂, Port Lokko, 10. v. 1912; all collected by Dr. James J. Simpson.

BELGIAN CONGO: 1 ♂, 1 ♀, Dima, 25. ix. 1908, A.

Koller (Congo Museum, Tervueren, Brussels). I owe this record to the kindness of Dr. Ris, who has compared the Congo pair with Dr. Simpson's series from Sierra Leone, and found them to be identical.

Ceriagrion ignitum, sp. n.

♂ adult (holotype).—Length of abdomen (including anal appendages) 24 mm.; length of hind wing 15 mm.

Labium brownish white. Labrum and anteclypeus reddish brown. Postclypeus and frons above dark brown. Genæ and anterior portion of frons greenish. Antennæ, upper surface of head, prothorax, and most of thorax proper dark chocolate-brown, tending to copper colour in places. A broad golden-brown band below the humeral suture. Under surface of thorax and bases of legs with bluish-white pruinosity. Legs pale brown, with black spines and a little black on the tarsi and claws. Wings entirely hyaline; reticulation black. Arculus a little distal to the level of the second antenodal in all wings. A* separating at (hind wings) or a trifle before (fore wings) the level of the cubito-anal cross-vein. Postnodals 10–12 in fore wings, 9 in hind wings. Pterostigma greenish brown, paler round the edges. Segment 1 of abdomen yellowish; 2 to 6 crimson, passing to orange-red on segments 7 to 10; intersegmental sutures black; ventral surface for the most part orange-red. Apical margin of 10 not deeply excised, the emargination with a somewhat elevated border. Anal appendages brownish red, viewed in profile slightly convergent; the upper pair a little shorter than the lower, rather slender and sharply pointed, and curved inwards and downwards. Lower appendages about as long as segment 10, stout, curving inwards and upwards, and ending above in a long black claw.

Much like the male of the European *Pyrrhosoma tenellum*, Vill., but the abdomen is more richly coloured and the wings are narrower and more hyaline than in that species.

♀ adult (allotype).—Length of abdomen 22 mm.; length of hind wing 16 mm.

Labium yellowish. Labrum yellowish, with a trace of red. Genæ pale green. Anteclypeus, postclypeus, and anterior portion of frons dark green. Frons above, antennæ, prothorax, and upper surface of head dark chocolate-brown. Dorsum of thorax proper dark chocolate-brown, with an ill-defined golden-brown line on each side of the mid-dorsal crest. A broad golden-brown band below the humeral suture. Sides of thorax greenish. Under surface of thorax,

as well as the legs and wings, coloured as in ♂. Arculus at or a little distal to the second antenodal. A* separating at or a little before the level of the cubito-anal cross-vein. Postnodals 11 in fore wings, 10 in hind wings. Dorsum of abdomen dark brown, approaching to black on the terminal segments; intersegmental sutures black; sides of abdomen dark brown; venter black. Anal appendages about as long as segment 10, blackish, pointed. Palps of ovipositor black. This specimen has a strong supernumerary cross-vein in the right hind wing, traversing the space between A* and the posterior margin of the wing, about midway between the cubito-anal cross-vein and the first normal cross-vein.

The two paratype females differ somewhat from the allotype and from each other in details of coloration of the head and thorax, but the foregoing description will probably be sufficient to ensure the recognition of any further specimens which may be obtained.

The position of the arculus in relation to the second antenodal varies a good deal in the three males and three females examined. In some wings the arculus coincides very nearly with the antenodal, while in other wings it is placed well beyond it. A* is likewise variable in its point of origin, and may arise either at or conspicuously before the level of the cubito-anal cross-vein.

GOLD COAST: 3 ♂, numbered by the collector 625, 626, and 628 (holotype); 3 ♀, numbered 624, 627, and 629 (allotype), respectively: all from Aburi, 1912-13, Mr. W. H. Patterson.

The types of all the new species are in the British Museum (Natural History).

Most of the material discussed in this paper has been examined by Dr. Ris, to whose unfailing courtesy and kindness I am again indebted for much valuable advice.

XXXIII.—*A new Cinetus from New Guinea.*
By J. J. JOICEY, F.L.S., and A. NOAKES, F.E.S.

[Plate XIV.]

Charagia hamptoni.

Male.—Fore wings: ground-colour dark green, the whole wing being let in with xxx of a bright yellow at equal

distances between the veins; costal margin with brown triangular marks, the whole surface being covered with small black spots, and the fringe with a continuous row of the same.

Lower wings pale green, with indistinct yellow $\times \times \times$.

Abdomen green.

Expanse $6\frac{1}{2}$ inches.

Female.—Fore wings darker green than the male, the yellow $\times \times \times$ more indistinct; veins dark brown, with same-coloured spots placed zigzag along the whole length; costal margin with yellow and brown triangular marks; from the apex round to the base of thorax a row of bright silver $\times \times$, and from the costa to lower margin of wing four rows of larger silver $\times \times$.

Lower wing light brown, with a few indistinct silver $\times \times$ at apex.

Expanse 7 inches.

Hab. Angi Lakes, Arfak Mts., Dutch New Guinea, 6000 ft. (*Pratt*, Feb. 1914).

3 ♂ ♂ and 3 ♀ ♀ in the Joicey Coll.

XXXIV.—On new Species of Histeridæ and Notices of others.

By G. LEWIS, F.L.S.

[Plate XV.]

AS in the last paper published in February, I again give a Plate to facilitate the identification and call attention to a few peculiar forms. I have also introduced three more descriptions by other authors for aiding references. This paper is the forty-second of the series, which must necessarily be near the close.

The following species of the genus *Hister* have prosternal striæ, viz.:—*belti*, *criticus*, *defectus*, *gibberosus*, *indistinctus*, *levimargo*, *meridanus*, *planimargo*, *sallei*, *servus*, and *striatipectus* of the New World, and *Hister sordidus* of Europe. I do not propose to include any of these species in *Grammostethus*, as the species of the latter genus are Oriental, and have, in addition to the prosternal striæ, several other notable characters, such as the rudimentary stria at the base of the fourth dorsal stria (*Ann. Mus. Civ. di Genova*, xxxii. p. 28, 1891). Dr. G. H. Horn has a note on the striation of the prosternum in the genus *Hister* (*Trans. Amer. Soc.* vii. p. 1,

1878), and I have noticed (Ann. & Mag. Nat. Hist. ser. 7, vol. xx. p. 96, 1907) that in some genera the character is simply specific.

List of Species, arranged generically.

Plæsius ruptistrius, <i>Lew.</i>	| Hister togooi.
Platysoma comptum.	| Paromalus filum, <i>Reitt.</i>
Chronus, gen. nov.	| Pachycærus scitulus.
— socialis.	| — minor.
Omalodes gagarinus, <i>Er.</i>	| Heterius gratus, <i>Lew.</i>
Hister montenegrius, <i>Müller.</i>	| Saprinus cæruleatus, <i>Lew.</i>

Plæsius ruptistrius, *Lew.*, 1906.

Originally I had three examples of this species, all agreeing in having the thoracic stria interrupted behind the head; apparently this is the usual form, but I now have a fourth specimen in which the stria is complete. In other respects the specimens are exactly similar.

Platysoma comptum, sp. n.

Oblongum, parum convexum, nigrum, nitidum; fronte stria integra antico recta; pronoto parce et minutissime punctulato, stria laterali integra; elytris striis 1-3 integris, 4-5 dimidiatis, suturali utrinque abbreviata; propygidio pygidioque immarginato distincte punctatis; prosterno inter coxas marginato; mesosterno sinuato antico haud marginato, stria transversa arcuata, tibiis anticis 4-dentatis.

L. $2\frac{1}{2}$ mill.

Oblong, somewhat convex, black and shining; the head sparingly punctulate, feebly impressed anteriorly, stria complete, straight in front, rounded off laterally; the thorax also sparingly and microscopically punctulate, the marginal stria is extremely fine, inner stria also fine and the interstice laterally very narrow, but behind the head it widens, and the stria at the basal angle turns inwards; the elytra, striæ 1-3 clear and complete, 4-5 dimidiate and apical, 5 slightly the shortest, sutural longer, but discal being shortened before and behind; the pygidia are distinctly not very closely punctured, neither are marginate, but there is a shallow fovea on each side of the pygidium at its base; the prosternum is margined with a stria meeting at both ends in the intercoxal area; the mesosternum is widely and feebly sinuous, not marginate, but it is striate on either side and has a wide median arched stria; the first segment of the abdomen has a

longitudinal impression on the posterior edge, and the second has a lateral stria; the anterior tibiæ are 4-dentate.

The species is not similar to any known.

Hab. Shembaganur, Mandura, India.

CHRONUS, gen. nov.

Body oval in outline, microscopically punctulate above and below; head flat above, not impressed, frontal stria arched and complete, scape of the antenna angulate on the outer edge, mesosternum marginate and sinuous anteriorly; anterior tibiæ with tarsal groove straight, not curved. The superficies of the species is similar to a small *Platysoma*, but the tarsal grooves agree better with those of *Phelister*. The very fine surface punctuation is almost identical in the two species known and is an exceptional character. The two species to be included in the genus are *Platysoma exortivum*, Lew. (1888), and *socialis*, described below.

Chronus socialis, sp. n.

Ovatus, parum depressus, undique tenuissime punctulatus; fronte subplana, stria integra antice late arcuata; pronoto stria laterali basi vix abbreviata, interstitio modice dilato; elytris striis 1-3 integris, 3 internus subæqualibus; propygidio pygidioque sat dense punctulatis hoc immarginato; mesosterno sinuato marginato; tibiis anticis 5-denticulatis.

L. $3\frac{1}{2}$ mill.

Oval, somewhat depressed, black and shining, surface above and below microscopically punctulate; the head not impressed, frontal stria well marked and widely arched; the thorax, marginal stria very fine, inner stria obscurely crenulate and fine behind the head, stronger and not crenulate at the sides, and the interstice a little widened, the stria is very slightly shortened at the base (in *exortivus* it just passes the angle); the elytra, dorsal striæ 1-3 complete, sutural dimidiate, 4-5 a little shorter and almost coequal; the pygidia are not margined but rather closely punctulate, the points somewhat varying in size; the mesosternum is sinuous and the stria complete; the anterior tibiæ 5-dentate, tarsal grooves not curved.

This species is very similar to *exortivus*, but the frontal stria is more marked, the thoracic lateral interstice is wider and the stria does not reach the basal edge, and of the three

inner dorsal striæ the sutural is the longest. In *exortivus* the fourth stria is the longest.

Hab. Montes Mauson, 2000 feet, Tongking.

Omalodes gagatinus, Erichs. Wieg. Arch. i. p. 90 (1847).

“Oblongus, subdepressus, fronte leviter impressa; elytris striis interioribus nullis, exterioribus tribus subtilissimis abbreviatisque; abdominis segmento penultimo utrinque punctato; pygidio æquali crebre punctato, apice lævi; tibiis anticis quadridentatis. Long. 3'''.”

Hab. Peru.

Hister montenegrius, Müller, Wien. ent. Zeit. xix. p. 137 (1900); Münch. Kol. Zeitschr. iii. p. 337 (1908).

“Ovalis, nitidus, clava antennarum fulva; mandibulis supra lævibus, margine exteriori obtusis; stria frontali integra, recta; pronoto striis lateralibus 2, externa fortiter abbreviata, interna integra; elytris striis subhumeralibus nullis, dorsalibus 1-3 integris, 4 obsoleta, 5 fere nulla, 6 abbreviata; propygidio dense fortiter, pygidio paulo lævius punctato; processu antico prosterni stria laterali interna postice a margine valde remota, prosterno striis longitudinalibus nullis; mesosterno antice mediocriter emarginato; tibiis anticis extus 3-4 dentatis, dente ultimo dilatato, apice truncato vel parum emarginato.

“Long. 4-5 mm.”

Said to be “near *sordidus*,” which, as stated in the preamble, has prosternal striæ.

Hab. Europe.

Hister togoii, sp. n.

Ovalis, convexiusculus, niger, nitidus; fronte impressa, stria integra; pronoto stria laterali interna integra, externa basi abbreviata; elytris striis 1-3 integris, 4 punctiformi, 5 apicali, suturali dimidiata, humerali sulciformi; propygidio parce et grosse punctato; pygidio vix dense punctato; tibiis anticis 5-dentatis. L. 4½ mill.

Oval, little convex, black and shining; the head transversely impressed behind the stria, stria sinuous and somewhat cariniform and crenulate, surface sparingly punctulate, mandibles not rugose; the thorax, inner stria complete, outer stria shortened at the base; the elytra, striæ 1-3 complete, 4 punctiform and indistinct, 5 apical, sutural dimidiate, outer humeral short and sulciform; the propygidium with

rather large punctures not closely set; the pygidium punctures rather smaller and closer; the mesosternum is feebly sinuous and marginate; the anterior tibiæ 5-dentate.

This species is similar to *sedakovi*, Mars., a species Marscul figures with the fourth dorsal stria broken; but his description says that it is complete, and it is so in a long series of specimens in my collection.

Hab. Tsushima, Japan.

Paromalus filum, Reitter, Deutsche ent. Zeitschr. xxviii.
p. 256 (1884).

“Tenuis, elongatus, parallelus, leviter, convexus, piceus, antennis pedibusque ferrugineis, illis clava testacea undique punctatissimus, prothoraco leviter transverso, antrorsum minime angustato; striola marginali antice vix interrupta, elytris prothoracis latitudine, parallelis, cylindricis, stria laterali interna subintegra, vel 2 dorsalibus basi obliquis valde abbreviatis et obsoletis; metasterno late sulcato, subtiliter punctato, abdomine segmento primo antice fortiter punctato, linea antica metasternali vix biangulata antrorsum subsemicirculari; tibiis anticis dilatatis, subtiliter 4-denticulatis, intermediis et posticis angustatis; his 1-, illis 3-spinulosis. Long. fere 2 mill.”

Hab. Bulgaria.

By an unfortunate error, probably by a misplacement of a sheet in the manuscript, the above was wrongly represented on page 347 (*Ann. & Mag. Nat. Hist. ser. 7, vol. xx. 1907*).

Pachycærus scitulus, sp. n.

Oblongo-ovatus, subconvexus, cyaneus, nitidus; fronte impressa, parce puncticulata, stria antice interrupta; pronoto utrinque punctato, stria marginali integra; elytris striis, subhumerali externa integra, interna basali dimidiata, 1-3 integris, 4 basi abbreviata, 5 apicali, suturali dimidiata; propygidio grosse punctato; pygidio basi punctato, postice lævi.

L. $5\frac{1}{2}$ mill.

Oblong-oval, little convex, clear blue and shining; the forehead impressed, finely and sparsely punctulate, stria narrowly interrupted in front; the thorax broadly and rather coarsely punctate in the region of the anterior angle, less widely punctate towards the base, and the scutellar area is smooth, behind the head and towards the disc there are a few punctures, the marginal stria is complete; the elytra, striæ, external humeral complete, internal basal and dimidiate, 1-3 dorsal complete, 4 shortened anteriorly, 5 short and

apical, sutural apical and dimidiate; the propygidium is coarsely punctate, with the posterior edge very narrowly smooth; the pygidium is similarly punctate, with the posterior margin smooth; the prosternum, keel rather narrow, striae parallel to each other and not apparently quite meeting in front, but distinctly separate at the base; the mesosternum is minutely punctulate, with the marginal stria complete; the anterior tibiæ 4-5-dentate.

The general facies of the species agrees with that of *P. chorites*, Lew.; the form of the inner subhumeral stria is exceptional in the genus.

Hab. Congo River.

Pachycærus minor, sp. n.

Subcylindricus, æneo-niger, nitidus; fronto punctulata, stria late interrupta; pronoto stria laterali antice interrupta; elytris striis 1-3 integris, 4 dimidiata, suturali antice abbreviata; mesosterno stria late interrupta; tibiis anticis 5-dentatis.

L. 2 mill.

Somewhat cylindrical, black with a brassy tinge; the forehead clearly and evenly, not closely punctulate, stria straight above the eyes, oblique anteriorly and widely interrupted; the thorax very irregularly punctured, some points rather large, others extremely fine, lateral stria fine and not continued in front; the elytra, dorsal striæ fine, 1-3 complete, 4 basal and nearly dimidiate, sutural shortened before the base, outer subhumeral complete, inner apical and dimidiate; the pygidia are punctured like the thorax; the prosternum, anterior lobe microscopically strigose, keel rather narrow, striae widen out a little at the base and rather more so anteriorly, not joining at either end; the mesosternum has a few irregular and inconspicuous punctures, the lateral stria is not close to the edge, straight at the sides and oblique in front, and distinctly terminates without passing behind the acumination, the suture is scarcely visible; the metasternum, the lateral stria is well marked and almost straight; the anterior tibiæ are 5-dentate.

This and *P. nanus* are the two smallest species known in the genus.

Hab. Umbelosi River, Delagoa; found under Mimosa-bark.

Heterius gratus, Lew. Ann. & Mag. Nat. Hist. ser. 5,
vol. xiii. p. 137 (1884).

I found this species in a nest of *Formica fusca*, L., on the Wada-togé in Central Japan. The ant is also a native of Britain and the host of *H. ferrugineus*, Oliv.

Saprinus cæruleatus, Lew., 1905. (Pl. XV. fig. 9.)

I give a figure of this species, as there are not many species in the genus in which the dorsal striæ are almost obliterated by the surface-sculpture.

EXPLANATION OF PLATE XV.

- Fig. 1.* *Petalosoma hirtipes*, Lew.
Fig. 2. *Plesius asperimargo*, Lew.
Fig. 3. *Coptosternus tarsalis*, Lew.
Fig. 4. — — —. Underside. 4 a. Tarsus.
Fig. 5. *Platysoma dorsalis*, Lew.
Fig. 6. *Paromalus submetallicus*, Lew.
Fig. 7. *Hister sessilis*, Lew.
Fig. 8. *Monoplius braunsi*, Lew. 8 a. Surface-sculpture.
Fig. 9. *Saprinus cæruleatus*, Lew.

XXXV.—*Report on the Annelida Polychæta collected in the North Sea and adjacent parts by the Scotch Fishery Board Vessel 'Goldseeker.'*—Part III. Syllidæ to Eunicidæ. By JAMES W. PRYDE, M.A., Walker Trust Research Scholar, Gatty Marine Laboratory, St. Andrews.

[Plate XVI.]

THIS report is the third issued in connection with the Annelida Polychæta collected in the North Sea by the 'Goldseeker' and includes the families Syllidæ, Nereidæ, and Eunicidæ. Of the Syllids only one genus, viz. *Syllis* occurs, and of the twelve species accounted British, only three are present in this collection. The Nereidæ have three representatives of the nine common to British waters, and probably the absence of the others is accounted for by the fact that they are more littoral than deep-sea forms. Although the Eunicidæ are only represented by five genera, yet the members of one species alone, viz. *Hyalinœcia tubicola*, O. F. Müller, outnumber all the others taken together.

This annelid occurs at thirty-one stations, was found at various depths with different apparatus, and the 649 examples were taken along with 755 tubes. There are young, half-grown, adult, and mature female forms; while the tubes, most of which are entire, show their valvular condition very well. There is, indeed, a wonderful abundance of this species in the North Sea, and the records outclass those of the German North Sea investigations, whose representative, so far as number is concerned, is *Onuphis conchylega*, another Eunicid.

Again, no lists of Synonyms have been given, but they can be obtained from Prof. M'Intosh's 'Monograph' (vol. ii. part i. 1908, and vol. ii. part ii. 1910) under the heads of the various species. The specimens were those belonging to the collection handed over to Mr. W. Small, M.A., B.Sc., by Prof. D'Arcy Thomson, a prominent member of the Scotch Fishery Board. In addition, I have to thank Prof. M'Intosh for his kindness in giving me, from his own collection, a typical series of slides of each group.

Family Syllidæ.

Genus SYLLIS, Savigny, 1820.

Syllis cornuta, H. Rathke, 1843.

One entire specimen and one anterior fragment were dredged at Station 7, lat. $61^{\circ} 06' N.$, long. $2^{\circ} 1' E.$, in 15 fathoms. It has been found off the Hebrides, in St. Magnus Bay, Shetland, off St. Andrews in deep water, off Bundoran, Donegal, and Berhaven, and extends to the Mediterranean shores of France, Spitzbergen, Madeira, and South Africa, but it is not recorded from Japanese waters. As details of the German North Sea Investigations regarding this family have not yet come to hand, no comparison can be drawn.

The head corresponds with the characters entered in the Monograph.

The body of the complete annelid measures a little over three-fourths of an inch in length and has about 70 segments. Other writers give the body about one inch long, and having about 100 segments. The colour is yellowish white and dark brown bands appear at the junction of the segments. Along the dorsum there is a pale yellow line in the median region, the line being more distinct in the tail. The ventral surface is much lighter in hue than the dorsal.

The feet are characteristic of the species and agree with

the description as laid down in the Monograph*. The dorsal cirri are long and articulated, but the articulations diminish from before backward until, in the caudal region, only twelve or less are found. These organs all taper distally and are quite distinct from the ventral cirri, which likewise taper distally, but which are sausage-shaped throughout. In certain varieties, however, it is noteworthy that the ventral cirri are often elongate.

The proboscis, which is extruded in the complete specimen, appears to be divided into a basal and a distal region by a deep furrow. The basal region is the larger and is uniform except at the base, where several small grooves occur. The distal region is more rounded and swollen, but is smooth in appearance. The organ is about the length of five body-segments and resembles the body in colour except where here and there little patches of white appear. None of the specimens were mature.

The last body-segment is not so broad as the segments in front, but is much longer. It is somewhat oblong in outline and ends in two cirri, which are about half the length of the dorsal cirri of the second last segment. The cirri are indistinctly articulated, the articulations being irregular in size. At the anterior region of the last segment there are many sausage-shaped papillæ, which dwindle in size towards the posterior end. The anus is ventral in position, and close to it there is a small papilla intermediate in position between the anal cirri.

Syllis armillaris, Örsted, 1842-3.

This species is represented by a single fragment which was found in a dredge at Station 7, lat. $61^{\circ} 06' N.$, long. $2^{\circ} 1' E.$, at a depth of 15 fathoms. It is common, however, in the littoral regions of our coasts and has been found in débris from deep-sea fishing. It extends to Farøe channel, shores of Norway and Sweden, Greenland, and has been found by Marenzeller in the Behring Sea.

The head is typical and agrees with the characters in the Monograph.

The body is slightly wedge-shaped and there are about forty segments in this fragment. In the Monograph it is stated: "Body two or three inches long and of sixty to seventy segments, slightly diminished in front, tapering to a lanceolate point posteriorly and furnished with two cirri." It is yellowish brown, but the lateral and central bars are

* Vide 'Monograph,' vol. ii. part i. p. 201.

very much faded owing to the preserving fluid. The proboscis was not extruded, but, when examined, had a single conical tooth in the anterior margin. The feet were typical of the species.

The writer of the Monograph states that the animals are hard and stiff, comparatively sluggish, hiding under débris in a vessel or crawling slowly over the bottom.

The sexual form of this species is known as *Ioida macrophthalma* and is described by Prof. M'Intosh*.

Syllis krohnii, Ehlers, 1864.

Unfortunately the only example of this species suffered in the Laboratory fire and, consequently, it is now somewhat dried and shrivelled in appearance, besides being black in colour. The label, moreover, has been lost and so no locality nor depth can be given. It is more a littoral than a deep-sea form and has been found in the Adriatic (*Ehlers*), Mediterranean, Canaries (*Langerhaus*), off the shores of France (*De St. Joseph*), and in the Outer Hebrides.

The specimen is complete, measuring about an inch in length. The head is conspicuously notched in front, but narrows behind. The eyes are four in number, reddish in colour, placed obliquely in pairs, the anterior being the wider apart (*M'Intosh*). The palpi are fairly long and taper towards their tips. They are ciliated in perfect specimens. The median tentacle arises between the eyes and projects upward. It is longer than the laterals, which resemble it. All pigment-spots are obliterated in this specimen.

The body tapers towards the tail, which ends in two fairly short, slender cirri, between which is a median papilla which is somewhat bulbous in appearance. The anal cirri have only four or five articulations, which are somewhat longer than those of the dorsal cirri. All the natural colour of the animal has been destroyed, but from the account given in the Monograph † it is as follows:—"Dorsum pale anteriorly, marked transversely by more than a dozen madder-brown bands, the anterior being double. The rest of the dorsum is opaque yellowish white (from the viscera), paler at the sides and posteriorly. The under surface is pale anteriorly, pale orange throughout the greater part of its length, and translucent towards the tail." Each segment is distinctly marked off from its neighbours and the dorsal cirri are

* *Vide* 'Monograph,' vol. ii. part i. pp. 190-1.

† *Vide* 'Monograph,' vol. ii. part i. p. 193.

alternately long and short. In life the long cirri curl upwards at the tips, and thus add grace to the appearance of the animal. The short cirri jut horizontally outwards and taper towards the tips. The articulations are well marked and diminish in number from before backward. The ventral cirri are not very long, being smooth in appearance and bluntly conical in outline. The feet are dried up, and identification was based chiefly on the bristles, which are quite typical of the species.

At the reproductive season, buds are developed at the posterior end and become detached. They are salmon-tinted, distended with ova, and are much wider than the nurse-stocks. They possess small heads, with four large red eyes, only two of which are visible from the dorsum. The cirri of the buds are nearly equal in length.

Family Nereidæ.

Genus NEREIS, Linnæus, 1731.

Nereis pelagica, Linnæus, 1756.

Very few specimens of this well-known and somewhat common form occur in this collection, and perhaps the reason is that the animals prefer a littoral to a deep-sea habitat. The following were the stations where the animals were obtained:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
10-8-1907	116	...	60° 23' N., 1° 37' W.	102 m.	Sm. Trawl.	1 (small specimen).
24-8-1907	133	...	Standburgh Ness, Shetland.	97 m.	Sm. Trawl.	2.
15-4-1908	...	...	8 miles north of Fair Isle.	24 fath.	Trawl.	1 (mature with ova).
9-6-1908	88	16 A.	61° 49' N., 5° 36' W.	...	Sm. Trawl.	4 complete and 1 fragment.
14-9-1909	11844	4	59° 26' N., 0° 20' W.	102 m.	Fry Net.	1 (incomplete).

Several of the specimens were trawled with *Hyalinæcia tubicola*, O. F. M. The largest measured $3\frac{3}{4}$ inches long and has 75 segments, but no tube is present. From the Monograph this form is found "abundant in tubes under stones between tide-marks on both shores of Britain and Ireland; under layers of slaty rocks, in fissures of sandstone, in sandy mud, and under old limpets. It is less common in

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the Channel Islands, where medium or small examples are found only in chinks of rocks and under *Balani* and Ascidians in the Gouliot Caves, Sark—a single small example of *N. cultrifera* and one or two of *N. dumerilii* accompanying them. Occasionally, the tube formed by it in fissures of sandstone is not half the length of the body. Many young forms occur on the tangle blades, to the surface of which their tubes are attached. It extends to the coralline ground off the East Coast, and now and then takes possession of an empty tube of other forms, such as *Thelepus*." De St. Joseph found it off the shores of France, but it stretches to the south of Halifax, Nova Scotia; Marenzeller obtained it in the Behring Sea and in Japanese waters; Izuka records it from many stations and in Sagami Bay at a depth of 63 fathoms; Grube found it near Amon on the eastern shores of Siberia, while Ehlers obtained var. *lunulata* in the Strait of Magellan. The 'Valorous' Expedition procured several large specimens from the Arctic seas, and Prof. Dickie, Aberdeen, found it on floating seaweed off Gough's Island, South Atlantic. One specimen is recorded in the 'Challenger' Reports, having been obtained south of Halifax at a depth of 85 fathoms; but this specimen differs from a British one of the same size by a marked diminution of the superior lobe, a feature which is common to Canadian examples. Heinen obtained this species at seven stations, the most northerly one being lat. 58° 41' N., long. 1° 40' E.

The colour of the body is iridescent reddish brown, the dorsum being darker in hue than the ventrum. The segments are large anteriorly and small posteriorly, while on the ventral surface at the posterior end there is a slight median groove. The body terminates in a prominent vent, beneath which are two long anal cirri, the cirri being about the length of last eight segments taken together. In many of the larger specimens there are calcareous deposits in circular patches in the skin of the dorsum*. The proboscis was not extruded in any of the specimens, but is armed with jaws and paragnathic which are well seen when living specimens are irritated by adding some acetic acid to the sea-water in which they are living.

During the reproductive season the males and females enter the "Heteronereid" phase, and thus the epitokous forms are arrived at. "In the males, which are found from January to June, the head is wide and the eyes are larger; the dorsal cirri of the first seven feet are thickened throughout

* Vide 'Monograph,' vol. ii. part ii. p. 272.

the greater part of their length, the short tip being filiform. The ventral cirrus in the first four or five feet is also enlarged. At the seventeenth foot the change from the nereid to the heteronereid condition commences with increased vascularity—a dorsal lamella, a ventral, a large inferior setigerous lamella, and a superior subsetigerous lamella all being developed, with fan-like groups of swimming bristles. The dorsal cirrus has a row of prominent papillæ along its lower edge. Sperms extend far forward to the anterior or nereid region. The colour is greenish anteriorly, posteriorly pale or cream-coloured from the sperms, except in those first mentioned, which are pale anteriorly. The tip of the tail is pinkish in colour, which is derived from the vessels underneath.

“The females are deep russet-brown and iridescent in February, from the ova which are of a faint salmon-colour. The tips of the palpi are dull brownish orange like the proboscis. In September the feet become very vascular, so as to give a deep red aspect to the sides, whilst their tips are pale”*. The writer also says that St. Andrews is the only British locality at which pelagic females have been observed.

Nereis cultrifera, Grube, 1840.

This annelid was obtained at the following four stations:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
16- 3-1905	...	...	Weather Holm, S.W. × W. 1½ miles.	...	.....	2 and several fragments.
22-11-1905	...	...	Burghhead Bay.	11 faths.	Sm. Trawl.	1 and 3 fragments (1 epitokous).
25- 8-1906	51	16	62° N., 6° 12' W.	120 m.	Sm. Trawl.	1.
21- 8-1908	9846	16 A.	61° 49' N., 5° 36' W.	218 m.	Fry Net.	2 (incomplete).

However, this form, like *N. pelagica*, is found between tide-marks on both eastern and western shores of Britain, under stones and in tunnels in masses of peat; on both shores of Ireland; Mediterranean shores of France (*De St. Joseph*); Canaries (*Langerhaus*); Black Sea (*Bobretsky*); Japan (*Izuka*); Formosa (*Oshima*); Bonin Islands (*Hirota*); Skagerrak and Kattegat (*Heinen*). The ‘Challenger’ Report contains no record of this species, and, concerning the

* *Vide* ‘Monograph,’ vol. ii. part ii. p. 268.

German Investigation Ship 'Poseidon,' Heinen adds "Im 'Poseidon' Material nicht vertreten" *.

The head agrees with the account in the Monograph. It differs from that of *N. pelagica* by having a distinct median furrow, while the dorsal of the second pair of tentacular cirri is almost twice as long as that of the anterior pair. The proboscis is strong and stout and resembles that of *N. pelagica*, but differs in the basal region, however, which bears several large paragnathi which are bluntly conical and black in colour. The jaws are large and powerful, and each has five teeth. The right jaw passes over the left, but, according to the Monograph, the opposite condition may also be found.

The body is more elongated than that of *N. pelagica* and tapers towards the tail, where it ends in two long, slender, pale cirri. The peristomium is broader than any of the other segments, but it is only about two-thirds the breadth of a *N. pelagica* of corresponding size. The feet are typical of the species, but the colour has changed to a dusker hue owing to the preservation.

The epitokous specimen has nineteen feet in the nereid or anterior region and forty-nine feet in the posterior or heteronereid region. The eyes are large, convex in shape, and are intensely black in colour. The first seven feet resemble the condition found in *N. pelagica*, only the ventral cirri have a slighter enlargement, which, according to the Monograph, ceases sooner. The swimming-bristles and swimming-feet are characteristic. The heteronereid example in this collection was found on the 22nd day of November, but on the shores near Cherbourg, M. Fauvel obtained several in April and May; while Prof. Izuka observed a large swarm on the 1st day of September, 1896, in Misaki harbour.

The gut was empty, but the animal usually feeds on very fine branching algæ. In Guernsey the fishermen use this animal for bait, and dig for them with pointed instruments resembling spears †.

Nereis fucata, De Blainville, 1825.

The following are the stations at which this species was procured:—

* Vide 'Die Nephthydeen und Lycorideen der Nord und Ost-See' (Heinen).

† Vide 'Monograph,' vol. ii. part ii. p. 289, fig. 70.

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
15- 9-1903	339	.....	Coast, Caithness.	15 fath.	Trawl.	2.
19- 1-1905	...	.....	S. edge Smith Bank.	.....	.....	1.
22-11-1905	...	.....	Burghead Bay.	11 fath.	Trawl.	4-3 fragments (1 epitokous).
11- 7-1906	43	53	58° 44' N., 4° W.	105 m.	Sm. Trawl.	2 fragments.
20- 7-1908	156	.....	Noss Head, N.W. ½ W. 3 miles.	.....	Dredge.	2.
.....	...	.....	No label.	.....	.....	2.

The annelids are small, the largest measuring about four inches long and having 80 segments. The Monograph states "body 4-9 ins. long and segments 95 to 110," while Heinen, the German investigator, gives 60 to 80 as the general number. As far as can be ascertained, all the hauls were made beyond 58° N., and the greatest depth recorded is 105 m. This species, however, abounds all round the shores of Great Britain and Ireland, and off St. Andrews it is very plentiful in deep water. It has often been found entering into symbiotic relationship with *Pagurus bernhardus* in *Buccinum*, both the large and the smaller varieties, and in *Fusus islandicus*, according to Prof. McIntosh, "part of the animal is inserted within the shell and the anterior region lies along the lip." Dr. Johnston found several of his specimens in the same or allied shells with hermit-crabs. The stomachs of the cod and the haddock often yield large quantities of this annelid, which may be half digested, but yet is easily recognized by the structure of its feet and bristles. Off Montrose Dr. Howden obtained very large specimens in deep water, while J. G. Jeffreys obtained this species 18 miles west of Skellig, Ireland, in 80 fathoms of water. Elwes found it at Torquay; Andouin and Edwards around the shores of France; Ehlers, Levinsen, and others in the North Sea, and Verrill off the eastern shores of America. Neither Izuka nor the 'Challenger' records any of this species. Heinen, in his North Sea Investigations, records this annelid from many stations and obtained it at a depth of 290 m.—"Exemplare dieser Spezies (*N. fucata*) wurden in Tiefen bis zu 290 m. meist auf Sand- oder Schlickgrund gefangen." His most northerly station is lat. 60° 20', long. 2° 20' E.*

* No latitude or longitude is given in Heinen's report, but those recorded here have been taken as accurately as possible from his maps.

The head is typical and bears two pairs of black-coloured eyes, which are obliquely placed, while the anterior pair are somewhat wider apart. The peristomial segment is broader than the succeeding, but is not so broad as that of *N. pelagica* or *N. cultrifera*. The body increases in breadth to the anterior third and then gradually tapers posteriorly, where it ends in an anal segment which bears two long slender cirri. The body is thus fusiform, but this is not so noticeable as in the Hesionidæ, which, in the adult condition, are not so large in size as the Nercidæ. The dorsum is deep brown in colour, while the ventrum is of a slightly lighter hue. Along the dorsum run two white streaks with the dorsal blood-vessel between them, while a dotted white line runs along each side. Some of the other markings which can be easily observed in living specimens were not present, and their absence is no doubt due to the mode of preservation, thus the white median lines which are seen on the head were very much faded.

The first foot bears a large dorsal cirrus, but otherwise the feet are typical of the species. No specimen showed an extruded proboscis, which has, however, two strongly curved jaws, each having thirteen to sixteen teeth. One fragment, a female, showed the epitokous condition*.

Nereis dumerilii, Audouin and Edwards, 1833.

No specimen of this species occurs in this collection, but it is common on the west coast of Britain in the laminarian region at a depth of 4–6 fathoms. One cannot pull up the tangles without finding one or more specimens of this annelid with tubes attached. It is also found at greater depths. The Monograph says that it is found on the east coast in deep water off St. Andrews, and that the tubes are cast up on the shore after storms †. Its absence is, therefore, probably accounted for by the fact that the investigations of the 'Goldseeker' were confined to the northern area of the North Sea, while this species is partial to the south. Heimen did not find any in his North Sea collection, although he describes this species from museum examples which were obtained in Kiel Bay ‡. It is found in abundance around the shores of Japan, and two small and imperfect specimens were procured at St. Vincent, Cape Verde Islands, July 1873, by the 'Challenger.'

* Vide 'Monograph,' vol. ii. part ii. p. 340; pl. lxxiii. figs. 3 a, b, & c.

† Vide 'Monograph,' vol. ii. part ii. p. 304.

‡ Vide 'Die Nephthydeen und Lycorideen,' p. 53.

Family Eunicidæ.

GENUS LUMBRICONEREIS, De Blainville, 1828 (char. emend.).

Lumbriconereis fragilis, O. F. Müller, 1788.

Only at the following three stations was this species obtained:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
25-8-1906	57	16	62° N., 6° 12' W.	120 m.	Sm. Trawl.	1 (a female).
8-8-1907	108	.....	Muckle Holm, W. × S. Sandwich Holm, S. × E. $\frac{1}{2}$ E.	88 m.	Dredge.	1 with ova.
17-6-1908	205	.....	Tresta, Wick.	57 m.	Dredge.	1.

All the three specimens are large, the largest being 7 inches in length and having about 234 segments. In 1869 the 'Porcupine' Expedition found this form at various stations off the British coasts, and the depths at which they were found ranged from 15 to 1380 fathoms. From the habitat ascribed to this species by various writers, one must conclude that the animals are northern as well as deep-water forms, for they have not yet been found as far south as the Mediterranean. In the 'Challenger' Reports *L. peltigrewi* is mentioned as resembling this species in outline, while *L. neo-zealandie* resembles it in the feet, but in the structure of the bristles a marked difference is apparent. In Izuka's work there is no mention of this species.

Two of the specimens contained ova, and all were more or less in a spirally coiled condition. When alive they are very active and graceful in their movements. There was nothing of outstanding interest in any of the animals, and a full description of the species will be found in Prof. McIntosh's 'Monograph,' vol. ii. pt. ii. pp. 373-4.

Lumbriconereis gracilis, Ehlers, 1868.

Several fragments of apparently small specimens of this annelid were dredged in 16 fathoms, one-quarter mile N.W. of Glass Island, close to Colla Firth in Shetland. This is the only station at which it was found, but from recent accounts it is abundantly obtained off the west coasts, especially the west coast of Ireland. Its distribution, however, is wide, for it extends to the Mediterranean, Adriatic

(Ehlers), Madeira (Langerhaus), and to Norway. In the 'Porcupine' Expedition of 1870 it was dredged in 81 fathoms off Cape Finisterre, but in the same expedition of the preceding year it was dredged in 370 fathoms off Ireland.

The head, which was present on one fragment only, was bluntly conical, and when viewed laterally was ovoid in outline. The dorsal process, present in fresh specimens, was missing. The body, which was slender, tapered posteriorly, but unfortunately none of the animals had the caudal region present about the number of cirri, of which there is still some doubt. Ehlers worked from incomplete examples, and the writer of the Monograph obtained one with this region present, but the cirri were absent. No specimen showed an extruded proboscis which is armed with a dental apparatus consisting of a pair of curved jaws and a pair of great dental plates, each of which bears four strong teeth*.

Living examples have an iridescent buff colour, but the preserving fluid has considerably bleached the specimens of this collection. The foot resembles the type-foot, but the hooked bristles bear terminal pieces which are slightly larger. The winged bristles are slightly curved and taper to very fine points. Moreover, the wings on the bristles in the posterior region are somewhat broader than those in the anterior.

The Monograph states that *L. coccinea* of Renier, Nardo, and Grube comes near to this species.

Genus EUNICE, Cuvier, 1817.

Eunice norvegica, Linnæus, 1766 (= *pennata*, O. F. M.).

Most of the examples of this form are small, and have suffered from the fire in the laboratory which was mentioned in the introduction to Part II. The following are the stations where the annelids were procured:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
17-8-1905	3609	38	58° 34' N., 0° 47' E.	137 m.	Mesh Net.	1 fragment.
27-8-1906	51	16	62° N., 6° 12' W.	120 m.	Sm. Trawl.	3.
9-6-1908	88	16 A.	61° 49' N., 5° 36' W.	.....	Sm. Trawl.	3, 1 with ova.
9-6-1908	201	16	62° N., 6° 12' W.	112 m.	Dredge.	1 with ova.

* Cf. 'Monograph,' vol. ii. part ii. p. 386.

From these data it appears that the species is a northern as well as a deep-water form. At Station 34 in the 'Porcupine' Expedition of 1869, this form was found in 725 fathoms on mud and sand, and in the expedition of 1870 a variety was found in 539 fathoms in grey mud. J. G. Jeffreys, too, dredged it 55 miles west of Valentia, Ireland, in 60 fathoms. Canon Norman obtained it amongst coral and mud in Norway, Marenzeller at Adria, while the Monograph records its extension to Canada*. Neither Izuka nor the 'Challenger' Report makes mention of this species.

The head bears five fairly long tentacles, the median being more posterior and longer than the others. The tips are articulated, but the articulations are best seen in the external pair for more than half their length. The eyes are moderately large, black in colour and lie between the two lateral tentacles. The palpi are stout, short, and fused together, having a deep notch in front and a deep groove ventrally. The dorsal pits mentioned in the Monograph † are not present.

In well-grown specimens the body measures 6-8 inches long, but the largest specimen of this collection measures only a little over 3 inches. It is very little tapered anteriorly, but posteriorly the body diminishes gradually to the tail, where it ends in two long slender caudal cirri, which are situated below the anus. The first segment is very broad, with well-marked lateral notches on each side and having its front edge concave from side to side ventrally. The second segment, however, is very narrow and bears the tentacular cirri, which are two in number and which, slightly crenulated in appearance, are tapered, but are not so long nor so strong-looking as the tentacles.

None of the annelids show an extruded proboscis which, as elsewhere shown, has a strong pair of maxillæ, each of which articulates with a spatulate process posteriorly. Moreover, the dental plates are powerful and each has seven teeth, the largest in front. The mandibles also are strong, the anterior edge being denticulated and the oral plate which, as usual, is most extensive ventrally, is white ‡.

The colour is pale brown, the dorsum being darker in hue than the ventrum, while at the sides the branchiæ, bleached in the spirit-specimens of this collection, appear as bright

* *Vide* 'Monograph,' vol. ii. part ii. p. 436.

† *Vide* 'Monograph,' vol. ii. part ii. p. 436.

‡ *Vide* 'Monograph,' vol. ii. part ii. p. 437.

red patches in the living forms. The branchiæ have divisions which vary with the body-segments, but various abnormalities occur from injury and subsequent partial reproduction. The spines on the feet in adult examples are black, but in young forms they may be yellow or brown. They are tapered gently from the base to the tip, which is slightly hooked. The tips also are often abraded. The specimens containing ova were obtained in June and July.

Eunice floridana, Pourtales, 1869.

Only three fragments having the anterior region are present in the collection. They were trawled in September 1906 at Station 9, lat. $61^{\circ} 34'$ N., long. $2^{\circ} 4'$ E., but, unfortunately, no depth appears on the label. However, from other accounts this species is found in deep water, for in 1869 the 'Porcupine' dredged large examples in 173 fathoms between Galway and the Porcupine Bank, and F. Buchanan obtained examples at 200 fathoms 50 miles off Bolus Head, Kerry. It ranges to Sand Key, Florida, Gulf of Gascoigne, south of Cap St. Maira di Leuca, Norway; but no mention of it is made by Izuka in his 'Errantiate Polychæta' of Japan.

The palpi are massive, separated by a notch in front, and have a deep ventral groove which is more distinct than that of *E. norvegica*. The tentacles, too, are much stouter than those of *E. norvegica*, but the articulations are not so distinct. The median tentacle is well marked, being much longer than the lateral tentacles, the outside pair of which are somewhat short in all three examples. The eyes are intensely black and easily seen.

As no specimen is entire, no length can be given for body-measurement; but the Monograph states:—"Body 6-8 ins. long and about 4 mm. broad in front, very little tapered anteriorly, but posteriorly diminishing to a slender tail with two cirri. Segments 100-150." The first segment is very broad, but the second is narrower than the third and bears two tentacular cirri, which are finely pointed and which reach forward to the base of the palpi. The tips have no crenations.

One of the specimens is laden with ova, which appear at three different places—(a) segments 11-17, (b) segments 29-38, and (c) segments 85-91—which have a dark purplish iridescent colour, not unlike that of some of the Hesionidæ. The species, according to the Monograph, inhabits parch-

ment-like tubes often on *Lophohelia* and *Amphihelia*; but no tubes were taken in the trawl in which the present specimens were obtained.

Eunice fasciata, Risso, 1826.

At Station 23 A, lat. 59° 51' N., long. 1° 12' E., and at a depth of 115 m., three incomplete specimens of this species were trawled in the month of July 1906. This annelid, however, is found in the neighbourhood of Guernsey *, off the Hebrides, off Inverary. J. G. Jeffreys found it in 160 fathoms 55 miles west of Valentia, Ireland. It was obtained in the 'Porcupine' and 'Challenger' Expeditions, and was procured by De Quatrefages and De St. Joseph off the shores of France. There is, however, no record of it having been found in Japanese waters.

The head is small when compared with that of *E. norvegica* or *E. floridana*, and bears two massive palpi, which are fused at the base and are separated by a deep notch in front. The tip and the ventral surface, which has a deep groove, are much lighter in colour than the rest of the body. There are five tentacles, which are fairly long, taper very slightly towards the tip, and have transverse bars where the crenations appear. The longest is the median one, and behind it are two pale-coloured spots, while in front there is another spot; but those mentioned by the Monograph as occurring at the base of the lateral tentacles are absent. The eyes are at the base of inner (posterior) paired tentacles.

The adults of this species attain a length of from 6 to 9 inches, and are russet-brown in colour, which is deeper on the dorsum than on the ventrum. The dorsal blood-vessel appears as a very dark streak, and white patches occur near the bases of the feet. None of the present specimens show iridescence. The body tapers to the posterior end, where it terminates in two moderately long anal cirri, which, like the tentacles, have transverse bars and are somewhat crenated in appearance. On the second segment the tentacular cirri arise, and reach forward to the bases of the palpi. The cirri are more finely tapered than the tentacles, but in the specimens of this collection there are no transverse olive-coloured bars as are mentioned in the Monograph †.

The proboscis is not extruded in any, but is armed with strong chocolate-coloured maxillæ. Prof. McIntosh adds:

* *Vide* 'Monograph,' vol. ii. part ii. p. 440.

† *Vide* 'Monograph,' vol. ii. part ii. p. 426.

"The left maxillary plate has seven teeth, the right six." The mandibles, too, are powerful. The feet are in agreement with the typical foot*, and the specimens were not mature.

Eunice vittata, Della Chiaje, 1829.

Specimens of this annelid were taken along with *Hyalinæcia tubicola* at the following two stations:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
25-8-1906	59	16	62° N., 6° 12' W.	195 m.	Sm. Trawl.	1.
9-6-1908	202	16 A	61° 49' N., 5° 36' W.	195 m.	Sm. Trawl.	1.

It has a wide distribution, but is chiefly a southern form. It has been found in Guernsey in 15 fathoms, off the shores of France (*De St. Joseph*), at Madeira (*Langerhaus*), Mediterranean (*Delle Chiaje, Grube, Claparède*) Japan (*Moore & Izuka*), Adventure Bank ('Porcupine,' 1870), and at Cape Verde Islands (*Ehlers*).

The head is fairly large and is evenly rounded in front, due to the fusion of the palpi, which have a deep ventral groove. There are five tentacles, which are given in the Monograph as smooth, but which are crenated near the tips in both the present specimens. The median is very much longer than the other four, whilst the infero-laterals are a little more than half the length of the superior. The eyes are large and black and occupy the same position as those of *E. fasciata*.

The body is about 2-3 inches long, and is very slender and tapers towards the tail. The first two segments are devoid of feet, and the first segment is about five times the breadth of the second, which is narrower than the succeeding and bears two fairly long, slender, tentacular cirri. The cirri, unlike the tentacles, have no crenations. Posteriorly the body-walls are very thin, and the intestine and its contents can be seen quite distinctly. The contents appear to be in the form of little faecal packets which are discharged from the anus. Prof. McIntosh thinks that the thin walls probably aid in respiration. The specimens have a pale reddish-brown colour, which deepens at the anterior border of each

* *Vide* 'Monograph,' vol. ii. part ii. pl. lxxiv. figs. 7-7b.

segment, and thus dark brown transverse dorsal streaks appear at regular intervals. Behind these streaks, which are very narrow, there are others which are white. Towards the tail region the colour is of a pale flesh hue, which is enlivened by the dark green faecal packets.

The foot is quite typical, and good drawings may be seen in pl. lxxiv. figs. 10-10 (*b*) of vol. ii. part ii. of the 'Monograph.' The bristles, too, are characteristic of the species, but had nothing of peculiar interest. The specimens were not mature, and one of them had a small portion of a tube attached to it. The tube appeared to have been formed from a mucous secretion which had been covered with very fine sand-particles, amongst which were very minute portions of shells.

From the Monograph * Lo Bianco gives September as the month in which Neapolitan examples are mature.

This annelid resembles many of the Hesionidæ in being very irritable and vivacious, and breaks when much interfered with.

Genus *MARPHYSA*, De Quatrefages, 1865.

One specimen of *Marphysa belli*, Audouin & Edwards, was obtained at Station 18A, lat. 60° 57' N., long. 5° 47' W., and at a depth of 384 m., along with several fragments of *Marphysa sanguinea*, Montague; but unfortunately the examples were lost when the laboratory took fire. A full account of both, however, can be had from Prof. McIntosh's 'Monograph,' vol. ii. part ii. pp. 442-451.

Subfamily *ONUPHIDIDÆ*.

Genus *ONUPHIS*, Audouin & Edwards, 1834.

Onuphis britannica, McIntosh, 1903.

This species, when compared with *O. conchylega*, Sars, and *Hyalinocia tubicola*, O. F. M., occurs in very small numbers, and the following table gives the details of the hauls:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
9-7-1908	9537	9	61° 34' N., 2° 4' E.	293 m.	Fry Net.	5 fragments.
13-7-1908	147	...	Loch Aber.	149 m.	Dredge.	22 plus fragments.
			No label.			4 young forms.

* Vide 'Monograph,' vol. ii. part ii. p. 434.

It has also been found off S.W. Ireland, North Unst, Shetland, Valentia, in Donegal Bay, and at Plymouth. Examples found in Ceylon and given as *O. conchylega* by Dr. Willey are found to resemble those at Plymouth, and so should more correctly be called *O. britannica*. No record of this annelid is given in 'Challenger' Reports, in Izuka's 'Errantiate Polychæta of Japan,' nor in Friedrich Eulenstein's 'Ueber Onuphiden der Nordsee.'

The head bears in front two lobate tentacles, which are hardly as long as those of *O. conchylega*. Behind are situated five long tapering tentacles which arise from ringed cirrophores. The median, situated on the dorsal mid-line, is the longest and is most posterior in position. In front of it in several specimens is a well-marked black spot. On each side and a little in front of it are two lateral tentacles, of which the inner are the longer, and at the bases of which are the eyes, which are fairly large and black in colour. The palpi, ventral in position and considerably flattened, are separated by a median fissure, which widens as it extends from the base to the tip of the palpi.

In some of the smaller forms the body resembles that of the Hesionidæ. It tapers anteriorly, but more so posteriorly, and has about forty segments. The peristomial segment, carrying the tentacular cirri which arise from the centre of the segment, is very narrow and has two black specks at the bases of the cirri, which are not ringed and are slender when compared with the tentacles. The black specks continue to the tenth feet, but gradually fade after the commencement of the branchiæ, which continue as single filaments almost to the tip of the tail. The body is rounded dorsally, especially in the anterior region, and flattened ventrally, while a fairly deep median groove runs from head to tail on the ventral surface. When this groove is examined under a microscope the nerve-cord is found beneath it, and near the posterior end of the segment the cord swells out and forms little ganglia. In colour the ventral surface is lighter than the dorsal, and between the ganglia and at the bases of the feet there are whitish patches. The general colour is pale brownish, with an iridescent lustre, but posteriorly this colour is lost owing to the faeces which appear under the thin body-wall as dark green masses. The body ends in two caudal cirri which arise beneath a dilated anus which is present in only a few specimens.

The proboscis with its armature, the feet taken from various parts of the body, and the typical bristles of the species are well shown and described in vol. ii. part ii. of the Monograph*.

The faeces were found to be in packets, and the masses contained pieces of tissue, sponge-spicules, and vegetable matter, which probably gives the green colour to the packets. In the gut of those examined no trace of sand was found.

Several were females and contained ova which are fairly large. The ova were single, and each had a thick transparent zona, which, when examined under the high power of a microscope, was studded with an infinite number of small pores. The contents of the cases were yellow in colour (Pl. XVI. fig. 1).

This annelid is a tubicolar form, and each tube differs from its neighbour in design, but all are composed of the tough translucent secretion of the glands, strengthened by pieces of shell, or sometimes attached to an entire valve of *Pecten*. According to Mr. Arnold Watson, the animals carry about their tubes in caterpillar fashion.

The first foot of the young form resembles that of the adult, and both cirri are well developed, the dorsal being much stouter than the ventral. Numerous strong yellow spines support the foot, and four or five falcate bristles with bifid tips project beyond the skin. In reference to the first foot of the adult, the Monograph states: "though the tip of only one bristle projects beyond the skin, others are included in the tissues." The bristles are winged and the folds of the two wings unite, forming a complete tip.

When the tenth feet are compared very little difference is seen. The foot of the adult has cirri, branchiæ, spines, and bristles more strongly developed than those of the young form; but in both the brush-shaped bristles are almost identical in size. The same applies to the feet in the posterior regions of both young and adult. One young *Nephtys ciliata* was taken along with this species.

* 'Monograph,' vol. ii. part ii. pl. lxiii. figs. 7-7 d, pl. lxxv. fig. 13, pl. lxxv. fig. 5, and pl. lxxxiv. figs. 3-3 c.

Omuphis conchylega, Sars, 1835.

This species was found abundantly at many stations, as the following table shows:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
20-7-1905	3439	38	58° 34' N., 0° 47' E.	112 m.	Fry Net.	6 and 1 fragment.
17-8-1905	3609	38	58° 34' N., 0° 47' E.	137 m.	S. mesh Net.	13 and sev. frags.
27-7-1906	45	23 A	59° 51' N., 1° 12' E.	115 m.	Sm. Trawl.	11.
4-9-1906	61	7	61° 06' N., 2° 1' E.	134 m.	Sm. Trawl.	59.
28-8-1907	8224	7	61° 06' N., 2° 1' E.	131 m.	Fry Net.	45 and 52 tubes.
13-7-1908	147	...	Loch Aber.	148 m.	.....	46 and sev. frags.
			Tube with no label.			27 and 31 tubes.
			Tube with no label.			23.
			Tube with no label.			5 and 1 fragment.

It was dredged by H.M.S. 'Triton' in 608 fathoms in the Atlantic, and obtained off Tynemouth in 40 fathoms by Prof. G. S. Brady. It ranges to Norway, Greenland, Finmark, Nova Zembla, and the American coast. Numerous examples have been found from 98 to 325 fathoms off Florida. Prof. Izuka records it in Japanese waters, having procured it at Yodomi in Sagami Bay and in Suruga Bay ('Albatross'). The 'Challenger' dredged it off Cape St. Vincent in 900 fathoms, and also south of Halifax in 85 fathoms. From the tables given by Eulenstein this annelid is very abundant in the northern latitudes of the German North Sea, as well as in the North Sea waters off the east coast of Scotland.

The head resembles that of *O. britannica* in outline, but the frontal tentacles are more rounded and have pigment behind them. The eyes, too, are smaller and lie exterior to the bases of the posterior lateral tentacles, which, like those of *O. britannica*, are larger than the anterior laterals. The median tentacle is the longest, and at its base in several examples there is a dark pigment speck. All the tentacles

arise from ringed cirrophores, which are not so large as those of *O. britannica*. The palpi are flattened, but have more rounded tips than those of *O. britannica*. They are separated by a median fissure.

The body is like that of *O. britannica*, but in many cases is not so broad. There are from 50-70 segments, and the narrowest is the peristomial segment, which bears the tentacular cirri towards its anterior dorsal border. The tentacular cirri are very short and translucent in appearance. None showed an extruded proboscis, a full description of which will be found on p. 412, vol. ii. part ii., of the Monograph. The segment following the peristomium is also narrow and carries the first pair of feet, which do not reach so far forward as those of *O. britannica*. The feet of the specimens of this collection agree with those described by Prof. McIntosh. In most the branchiæ arise on the twelfth foot, but in several, however, they arise on the eleventh foot. They are simple processes, with an occasional accessory filament, and continue backward almost to the tail. When contrasted with those of *O. britannica*, the branchiæ are smaller and the dorsal cirri are more conical in outline and diminish from before backward.

Most of the tubes in this collection are formed from coarse gravel and minute stones of all colours fixed to a lining of the secretion, which becomes white and hard as an inner coating of the tube. The tubes are in many cases very much longer than the annelids, and often the posterior aperture is closed. Some specimens, however, have tubes which resemble those of *O. britannica*, but, instead of whole shells being used, only fragments are taken along with small stones or gravel.

In no case were parasites, external or internal, found, and the faeces when examined were similar to that of *O. britannica*.

Hyalinæcia tubicola, O. F. Müller, 1788.

This annelid is by far the most numerous in this North Sea collection, and outnumbered all the others taken together. Many forms of interest occur, some with eyes, some without eyes, and some whose eyes are, as it were, in an intermediate state. Again, many young forms scarcely three-fourths of an inch long are included in the collection, and these contrast in no small degree with others which measure about 6 inches long. The following is the data showing the hauls:—

Date.	Haul.	Station.	Locality.	Depth.	Apparatus.	Number obtained.
23- 9-1905	3823	...	Between St.10&11.	110 fms.	Trawl.	5 with tubes.
23- 9-1905	3824	...	Between St.10&11.	110 fms.	S. Net Trawl.	14 with tubes.
4- 5-1906	63	6	60° 35' N., 0° 29' E.	134 m.	Sm. Trawl.	6 with tubes.
17- 6-1906	30	21 A	60° 02' N., 3° 10' W.	160 m.	Sm. Trawl.	11 with tubes.
19- 6-1906	30	21 A	60° 02' N., 3° 10' W.	160 m.	Sm. Trawl.	11 and 12 tubes.
21- 6-1906	31	Buchan Deep.	57° 31' N., 1° 12' W.	106 m.	Sm. Trawl.	29 and 31 tubes.
21- 6-1906	31	Buchan Deep.	57° 31' N., 1° 12' W.	106 m.	Dredge.	10 and 16 tubes.
6- 7-1906	33	50	59° 21' N., 5° W.	125 m.	Dredge.	7 with tubes.
11- 7-1906	39	56	58° 44' N., 6° W.	115 m.	Sm. Trawl.	11 and 13 tubes.
12- 7-1906	41	54	59° 10' N., 7° W.	182 m.	Sm. Trawl.	19 and 18 tubes.
25- 8-1906	59	16	62° N., 6° 12' W.	195 m.	Sm. Trawl.	23 and 35 tubes.
4- 9-1906	61	7	61° 06' N., 2° 1' E.	134 m.	Sm. Trawl.	13 and 16 tubes.
20- 9-1906	...	...	Broad Bay.	11 m.	Sm. Trawl.	3 and 3 tubes.
10-12-1906	6321	34	59° 18' N., 1° 03' W.	97 m.	Fry Net.	103 and 121 tubes.
10- 8-1907	116	...	60° 23' N., 1° 37' W.	102 m.	Sm. Trawl.	8 and 27 tubes.
16- 8-1907	128	Farøe Channel.	59° 4' N., 7° 4' W.	195 m.	Dredge.	10 with tubes.
23- 8-1907	131	...	Lunna Holm W. 2 miles.	99 m.	Dredge.	5 with tubes.
24- 8-1907	133	...	Stanburgh Head S.W. $\frac{1}{2}$ S.	97 m.	Sm. Trawl.	46 and 53 tubes.
24- 8-1907	8162	...	Stanburgh Head S.W. $\frac{3}{4}$ S.	97 m.	Fry Net.	24 and 32 tubes.
27- 8-1907	134	10	61° 35' N., 0° 47' E.	200 m.	Dredge.	4 and 2 fragments.
27- 8-1907	8191	10	61° 35' N., 0° 47' E.	200 m.	Fry Net.	5 and 10 tubes.
9- 6-1908	202	16 A	61° 49' N., 5° 36' W.	195 m.	Sm. Trawl.	124 and 120 tubes.
18- 6-1908	208	...	.....	118 m.	Sm. Trawl.	42 with tubes.
9- 7-1908	9537	9	61° 34' N., 2° 4' E.	293 m.	Fry Net.	39 with tubes.
12- 8-1908	165	...	Moowick Head N.W. $\frac{1}{2}$ W. Shet.	99 m.	.....	11 and 20 tubes.
15- 8-1908	169	...	60° 23' N., 0° 14' W.	110 m.	Sm. Trawl.	40 with tubes.
15- 8-1908	170	...	60° 23' N., 0° 14' W.	100 m.	Sm. Trawl.	7 and 15 tubes.
21- 8-1908	9846	16 A	61° 49' N., 5° 36' W.	218 m.	Fry Net.	3 and 9 tubes.
14- 9-1909	11844	4	59° 26' N., 0° 20' W.	102 m.	Fry Net.	4 and 6 tubes.
.....	3904	40	57° 34' N., 0° 01' W.	...	.....	6 and 8 tubes.
			Tube with no label.			1 and 7 tubes.

Eulenstein, in his 'Ueber Onuphiden der Nordsee,' records this species from eight stations only, and the numbers obtained at the separate stations never exceed twenty. At four of his stations only one or two tubes were taken, while at Station 6 his greatest number, twenty, was obtained at 182 m. On the other hand, his greatest depth is 300 m., at which one tube was dredged, while in our investigations 293 m. is the greatest depth, but 39 annelids with tubes were obtained. The greatest haul in this collection was made at Station 16 A, when 124 specimens and 120 tubes were brought to the surface from a depth of 195 m. Again, it is noteworthy that Eulenstein's most northerly record is

61° 10' N., 2° 20' E., while the 'Goldseeker's' corresponding one is 62° N., 6° 12' W., and the hauls at these stations are 20 and 23 with 35 tubes respectively.

This species is common in British waters as well as in the Atlantic and Mediterranean. In 1870 the 'Porcupine' found it in 795 fathoms in the Atlantic, and in 1876 the 'Challenger' dredged the same form off Buenos Ayres coast, South America, in 600 fathoms. Marion, one of the French investigators, thought it both rare and small at Marseilles. It, however, extends to the shores of France, Siberia, Norway, Azores, South America, New Zealand, Torres Straits, and Canary Islands, while Moore and Izuka both record it in Japanese waters.

The outline of the head agrees with that of *O. conchylega*, but the frontal tentacles are somewhat longer, contracted at the base, swollen in the mid-region, and more pointed at the tip. Behind are five long tentacles, which arise from ringed cirrophores and which are smooth and taper to fairly fine points. The median again is longest. In many specimens there is a pair of eyes situated at the bases of the more posterior lateral tentacles. Eulestein remarks, "Ausser bei jungen Exemplaren war am Grunde der hinteren paarigen Tentakeln je ein Auge zu erkennen"; but not only are the eyes absent in young examples, but most of the adult specimens of this collection do not possess them. Prof. McIntosh, however, states in his description of this species "No eyes," and yet pl. lxiv. figs. 5 & 5 a show specimens with eyes present. The palpi are bulbous and have a ventral median furrow.

The body is typical and is composed of about 130-140 segments in the adult condition, while in several young forms the number of segments only reached about 50. The dorsum is rounded, while the ventrum is flatter and is traversed by a median groove which is deeper in the anterior region than in the posterior region. The colour is iridescent reddish brown, the hue becoming lighter from before backward. In several examples which are laden with ova the posterior region from the thirty-sixth bristled segment is yellow in colour, due to the masses of ova underlying the thin body-wall. The first segment is narrower than the succeeding and is smoothly rounded from side to side. The body ends in a somewhat flattened tail, the last segment of which is ovoid, with the anus dorsal in position, and from its hind edge arise two long, slender, anal cirri.

The proboscis is identical with the description given in the Monograph and agrees with the British rather than with

the 'Challenger' forms. The second segment is broad and bears the first pair of feet, which are much stouter than those of *O. britannica* or *O. conchylega*. They are directed forwards and in some specimens reach almost to the frontal tentacles. Their tips have disc-like processes, which are poorly developed in many of the young forms. The first feet in the young forms are broad in comparison with their length, and the cirri are relatively longer than in the adult specimens. The posterior subulate papilla which springs from behind the disc-shaped flap at the tip of the foot in the adult examples is very rudimentary, and in some cases absent in the young forms. The feet in both are supported by three or four stout yellow spines, while the bristles, only one or two appearing above the surface in the young specimens, are strongly hooked at the tips, beneath which are well-developed secondary processes.

The tenth foot is very much smaller than the first, and toward the tail the feet become smaller still. The dorsal cirrus, however, is very large, fusiform in shape, and tapers toward the tip, while the ventral cirrus only appears as a ventral pad. The same condition holds good for the young forms. Three or four spines again support the setigerous region of the feet, from which dorsally there project one or two long bristles with winged and tapering tips, besides a group of brush-shaped ones. The papilla at the posterior border of the tip is lanceolate and in the young form is just a mere excrescence. The terminal process has now become smaller, the disc-shape having become more conical. The same applies to the young examples.

When the thirtieth foot is reached the dorsal cirrus has become very slender, and from the inner edge of its base arises a branchia which is more than twice its length. Prof. M'Intosh says that this organ is slightly fusiform in outline, but in the present examples it presents a somewhat constricted appearance. The setigerous region is almost round, and in none is there a papilla present at the tip. Posterior to this foot the branchiæ diminish in size; but, as the Monograph remarks, "the arrangement of the bristles and hooks remain the same."

The tubes are translucent horny objects resembling quills, which, according to recent investigations, the animals drag after them. Their composition has not yet been definitely agreed upon, but some eminent chemists think that the substance is allied to mucin. At both ends of the tubes there are apertures which are closed by valves and which do not allow the contained fluid to escape until they

are forcibly pressed or cut open. Arnold Watson says that the valve at the anterior end is V-shaped, and this I find to be correct in all the tubes of this collection. Sometimes, however, this anterior valve may be double, and where this is so the valves do not appear so strong and tough as when they are single—that is, when there is only one pair present, for each valve is composed of two parts. The posterior valve, however, varies in shape, and in many adults is seen as a series of single valves which form one large zigzag valve (Pl. XVI. figs. 5–6). In some (and especially young) forms it appears as a double V-shaped valve, similar to that found in the anterior region of the tube (Pl. XVI. fig. 4). The double V-shaped valves are very thick and much more opaque than the rest of the tube and other valves. The valves, as Watson remarks, are no doubt for protection and are automatically closed by the inrush of sea-water. If there were no valves the animal would be open at front and rear to attacks from its enemies, and although it might be able to defend itself from frontal onslaughts, yet from attacks in the rear it would be defenceless, owing to its inability to turn in its tube and owing to the stiffness of the tube itself. Possibly this is why the valve system at the posterior end is much more complicated than at the anterior end. As Watson and others have ascertained from living examples kept in captivity, the tubes are elongated at the anterior end as the animals grow. Again, Izuka remarks on the thinness of the anterior in comparison with the posterior end, but this is due to the former being lengthened, while the latter is thickened and strengthened. The tubes are V-funnel-shaped, the anterior opening being much larger than the posterior one, and in adult specimens and often in fairly large young forms the tubes are beautifully ornamented, the ornamentations being the marks left by the pre-existing valves, which are removed by the animals when they increase their tubes. Watson, moreover, found from his experiments that the animals could renew and even replace the valves when damaged or cut off. However, when the valves are entirely removed more than once, the animals take longer each time to replace them, and often the task is too great and proves fatal. It is said that a tube can be secreted in a day, but Watson found that it took twelve hours to repair the damage done to the valves alone. In the young forms the valves and tubes are very thin and quite transparent.

As regards reproduction, many ripe females were taken in the month of June, but no ripe males occur. The ova are fairly large, 0.24 mm. (*De St. Joseph*), have a porous zona

radiata, are shed singly and not in masses, and each is encased in a thick semitransparent horny or chitinous case. The cases, when viewed under high power, have a pitted appearance, which is possibly due to the presence of small apertures (Pl. XVI. fig. 1). The egg-contents are yellow and heterogeneous in appearance, and the disposition of the ova is better seen in the posterior region, where the body-walls are much thinner, and consequently more transparent. From the thirty-sixth segment backward they are densely massed together and impart a yellowish hue to the posterior region, which is slightly stouter than the anterior. Along the dorsal surface in many specimens the ova are arranged in three dense lines, the middle occupying the median dorsal line and the laterals taking up position immediately above the dorsal portion of the feet; but toward the tip of the tail this formation is lost. When the ventral surface is examined the ova are found to be much more scattered, but in the caudal region they are more compactly packed together. At the bases of the feet, from the thirty-fourth or thirty-fifth backward, on the ventral surface the segmental openings are increased in size and become cup-shaped in appearance. The openings are large and conspicuous, and a needle can be inserted into them quite easily; but near the extreme posterior end of the body the openings diminish in size and are only seen with difficulty. When the body is slightly stroked from before backwards and pressed in the middle region the ova burst forth in abundance from these aforesaid openings. As this condition of the segmental openings only occurs in mature specimens, and as the ova when the body is pressed burst from these openings, one must conclude that it is by their means that the ova are shed into the exterior world. Moreover, in no instance were the body-walls found to be ruptured, although several writers are inclined to think this occurs when the ova are being shed.

No internal nor external parasites were found. Along with many of the examples of this species were dredged several examples of *Sagitta*.

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EXPLANATION OF PLATE XVI.

- Fig. 1. Ovum and zona of *Onuphis britannica*. Zeiss obj. D, oc. 2.
- Fig. 2. Peculiar falcate bristle from first foot of young form of *Hyalinæcia tubicola*. Enlarged.
- Fig. 3. Winged bristle from tenth foot of *Hyalinæcia tubicola*. Enlarged.
- Fig. 4. Posterior end of tube of *Hyalinæcia tubicola*, showing double V-shaped valve. Taken from young form.
- Fig. 5. Diagram showing action of the protective valves, *v*, *v'*, *v''*, at the posterior end of tube of *Hyalinæcia tubicola*. The arrow indicates the inrush of sea-water closing the valve. (After Watson.)
- Fig. 6. Diagram showing position of the same valves when the worm emerges in the direction of the arrow. The valve-membrane bulges in the opposite direction. (After Watson.)

XXXVI. — Notes on Coleoptera of the Genus *Azarelius*, Fairm. (Tenebrionidæ), with Descriptions of new Species. By K. G. BLAIR.

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Azarelius tenuicornis, sp. n.

Castaneous, subnitid; the antennæ are rather slender, their length about equal to that of the thorax together with twice the length of the head; joints 8–10 feebly transverse; the joints are obconical, feebly punctate, and with few setæ. The thorax has the costæ moderately prominent and conspicuously punctate; the interstices very coarsely and closely punctate. The elytral costæ are punctate, as the thoracic costæ, the fourth is very short, the rest all extending well on to the declivity; the seventh and eighth are united just before the apex, and the sixth and second enclose the rather shorter fifth and third.

Length 4 mm.

Hab. BURMA: Karen Mts. (*Doherty*). Two specimens in the British Museum.

This species is very close to *sculpticollis*, Fairm., from Sumatra. It differs in its smaller size, its longer and more slender antennæ (in *sculpticollis* the latter are scarcely longer than the head and thorax together, and all the joints except the first and third are more or less transverse), and these two differ from the other described species in their less compact antennæ, the joints of which are plainly punctured and sparsely setose, in their subopaque surface, with the carinæ, both thoracic and elytral, plainly punctate, as well as in the densely rugosely punctate intervals of the thorax.

Azarelius oberthüri, Wasm.

Of this species the British Museum possesses one of the original examples taken by Fea at Palon, Pegu, Aug. and Sept. 1887. It possesses characters not noticed by Wasmann either in his figure or description, viz., the fifth costate interstice is abbreviated a little beyond the middle of the elytron, and the seventh and eighth costæ are confluent and continued together for some little distance before the apex. A specimen from the Shan States, 1888, otherwise similar, has the fifth costa continued on to the declivity and the seventh and eighth not confluent before the apex. Having only the two specimens before me, I hesitate to describe this as new, since the peculiarities of the Palon specimen may possibly be merely individual.

Azarelius bryanti, sp. n.

Very similar to *oberthüri*, Wasm., but much more nitid. The thoracic costæ are more tumid, the interspaces in the anterior half shining and almost free of punctures, but in the posterior half they have a few large indistinct punctures. The antennæ are very nitid, stouter than in *oberthüri*, joints 7-10 more strongly transverse. The costæ of the elytra are more strongly raised, more nitid, and nos. 7 and 8 are united for about the last quarter of their length; the fourth costa is extremely short, not extending beyond the second puncture of the fourth interstice.

Length 5 mm.

Hab. SARAWAK: Matang, 3. xii. 13 (*G. E. Bryant*).

A single specimen was brought back by Mr. Bryant from his recent trip to Borneo, and this he has generously presented to the British Museum.

XXXVII.—Two new Species of Pyrochroidæ (Coleoptera)
from Borneo. By K. G. BLAIR.

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IN a collection of Coleoptera recently brought back by Mr. G. E. Bryant from Borneo are two new species of Pyrochroidæ; and since only three species of this family, including the doubtful genus *Ischalia*, have hitherto been known from the island, it may perhaps be as well to describe them. The types have been generously presented by Mr. Bryant to the British Museum.

Pseudopyrochroa moultoni, sp. n.

Black, with the exception of the elytra, of which the basal two-thirds are red. The junction between the black and red is rather suffused, but the black patch extends forwards as a narrow costal strip beyond the middle of the elytron. The elytra are separately rounded at the tips and strongly costate or striped.

The head of the male is deeply excavate between the eyes, the sides of the excavation being almost parallel and slightly curved, and its cavity filled with dark brown hairs. The antennæ have the first two joints rather shiny, the rest opaque and velvety. The first joint is strongly incrassate, the second subdentate within; the third and succeeding joints stout, thickened towards the apex, so as to form a stout lobe within, while from the underside of the apex arises a slender branch (cf. *P. diversicornis*, Blr., Ann. & Mag. Nat. Hist. (8) xiii. pl. xii. fig. 10).

The antennæ of the female are stouter, the first two joints scarcely less velvety than the rest; the third to tenth are produced within into stout but successively longer apical branches.

Length 9–13 mm.

Hab. Mt. Matang, Lundu, Kuching, Mt. Sibau.

From *Ps. apicipennis*, Blr., which is the only other described Bornean species with a similar type of coloration, it is distinguished by the elytra being flatter and strongly deliscent at the apex, more strongly striped, and by the different size and shape of the apical black patch. In my key to this genus (Ann. & Mag. Nat. Hist. (8) xiii. p. 319) it should be placed next to *obscuricollis*, Pic, but from this it differs in the structure of the antennæ in the male, in the form of the frontal

excavation (in *obscuricollis* the sides of this almost meet in the middle), in the more strongly striped elytra, and in the rather larger and more sharply defined black apical patch. The latter character is remarkably constant in the series of eight specimens that I have seen.

I had before received the species for identification from Mr. J. C. Moulton of the Sarawak Museum, and was of opinion that it was merely a colour-variety of *Ps. malaccana*, Pic, from Perak; but an examination of a longer series, of both sexes, convinces me of its specific distinction. The structure of the antennæ in the male is almost identical, but the frontal excavation in *malaccana* has the sides much more convergent in the middle, the elytra are less distinctly costate or striped, and the apical patch is less extensive, its margin more suffused, &c.

It is interesting to note that while species of this type have been described in some numbers from Perak, this is the first one of the group to be recorded from Borneo, the other two Bornean species, *fulvipennis*, Blr., and *apicipennis*, Blr., having the suture intact almost to the apex.

Ischalia bryanti, sp. n.

Near *indigacea*, Pasc. The head is dark reddish, with faint metallic blue reflections, the antennæ comparatively short and stout, about half the length of the insect, the joints successively shorter from the third to the tenth, and each distinctly thickened from the base to the apex. The first two joints are concolorous with the head, third to eighth black with dark blue reflections, ninth to eleventh pale fulvous. The thorax is similar to that of *indigacea*, but more contracted behind, more evenly arcuate in front, widest in front of the middle, and ferruginous in colour. The elytra are greenish blue instead of purplish blue, broader, with the submarginal carina more elevated and nearer the middle of the elytron. The internal humeral carina is very short and coalesces with the submarginal. The legs are stout, and with the underside black with metallic bluish reflections.

Length 8 mm.

Hab. Mt. Matang, Sarawak, 2000 feet, S. ii. 14.

A single specimen.

This beautiful species is at once distinguished from its other Bornean congener *I. indigacea*, Pasc., which was taken abundantly by Mr. Bryant, by its stouter build and its reddish thorax.

XXXVIII.—A Key to the Species of the Genus *Crypturus*, with Descriptions of some new Forms. By LORD BRADBURY, F.Z.S., M.B.O.U., and CHARLES CHUBB, F.Z.S., M.B.O.U.

Key to the Species.

- A. Upper and under surface similar in colour.
- a'. Head chestnut; back brown *C. cinereus*.
 - b'. Head rufous brown; back sooty black. *C. macconnelli*.
 - c'. Head and back black *C. berlepschi*.
 - d'. Head black; back chestnut. *C. castaneus*.
- B. Under surface paler than the upper surface.
- b'. Back rufous brown; head blackish; under surface pale chestnut *C. obsoletus obsoletus*.
 - c'. Back ochraceous brown; head blackish grey; under surface fawn-colour *C. obsoletus cerviniventris*.
 - d'. Back chestnut-brown; head dusky brown; under surface greyish white *C. obsoletus griseiventris*.
 - e'. Back rich chestnut; head black; throat washed with rufous.
 - b''. Under surface cinnamon-rufous *C. soui soui*.
 - c''. Under surface tawny ochraceous *C. soui mustelinus*.
- C. Upper surface olive-brown; throat white.
- c'. Under surface umber-brown *C. soui albigularis*.
 - d'. Under surface cinnamon-rufous *C. soui hoffmannsi*.
- D. Upper surface blackish; throat more or less washed with rufous.
- d'. Upper parts greyish black; under surface chestnut-umber *C. soui andrei*.
 - e'. Upper parts brownish blackish; under surface bright chestnut *C. soui caucæ*.
 - f'. Upper surface black; under surface deep chestnut *C. soui harterti*.
- E. Upper surface coarsely vermiculated or with wavy bars.
- e'. Larger, wing more than 160 mm.; fore-neck particoloured.
 - e''. Fore-neck pale chestnut barred with black *C. undulatus undulatus*.
 - f''. Fore-neck brown with pale cross-bars *C. undulatus scolopax*.
 - g''. Fore-neck vinous brown with minute black cross-bars *C. undulatus confusus*. - f'. Smaller, wing less than 160 mm.; fore-neck uniform grey *C. transfasciatus*.
- F. Upper surface finely freckled.
- f'. Back cinnamon-brown; abdomen dull white; flanks pale rufous *C. adpersus adpersus*.
 - g'. Back greyish brown; abdomen pale buff; flanks bright rufous *C. adpersus vermiculatus*.
 - h'. Back rufous brown; abdomen buff; flanks creamy buff *C. adpersus simplex*.
 - i'. Back chestnut-brown; abdomen pale grey; flanks pale brown *C. yapura*.

- k'*. Back sooty brown; abdomen bright rufous *C. atricapillus*.
 G. With bars on the upper surface, the bars restricted to the lower back and tail.
g'. Back chestnut-brown; breast rufous; abdomen barred with dark brown .. *C. noctivagus*.
h'. Back rufous olive-brown; breast grey; abdomen buffy white *C. strigulosus* ♀.
i'. Back dark olive-brown; breast and abdomen ochraceous brown *C. columbianus*.
 II. Entire back barred, but not the neck.
h'. Bars narrow; head black; chest pale rufous *C. variegatus variegatus*.
i'. Bars broader; head slate-grey.
h''. Chest dull rufous *C. variegatus bimaculatus*.
i''. Chest brownish *C. variegatus salvini*.
 I. Back olive with blackish bars.
i'. Sides of face and chin rufous *C. brevirostris*.
k'. Sides of face dusky and chin white .. *C. bartletti bartletti*.
 K. Back black barred with greenish olive .. *C. bartletti caroli*.
 L. Back dark brown with pale buff bars... *C. cinnamomeus spencei*.
 M. Underparts for the greater portion rufous.
m'. Chest slate-grey, in contrast with the breast; throat rufous *C. dissimilis*.
n'. Chest grey washed with rufous similar to the breast; throat white *C. erythropus*.
 N. Under surface for the most part grey.
n'. Back uniform bright rufous-brown; fore-neck, breast, sides of body, and axillaries pale ash-grey; inner under wing-coverts paler *C. strigulosus* ♂.
o'. Back dark brown with a wash of slate-colour; fore-neck, breast, sides of body, and axillaries dark slate-grey; inner under wing-coverts darker *C. hellmayri*.

Crypturus macconnelli, sp. n.

Adult. Similar to *C. cinereus*, but distinguished by having the head rufous brown and the back sooty black.

Total length 270 mm.; culmen 29; wing 174; tail 40; tarsus 55.

Loc. Bonasica, British Guiana.

Type in McConnell collection.

Crypturus soui albigularis, subsp. n.

Adult. Differs from *C. soui soui* in being olive-brown above, including the back, wings, and tail, and having the head and sides of the face dark grey, the throat white, and the breast and abdomen ochraceous brown.

Total length 240 mm.; culmen 21; wing 137; tail 40; tarsus 37.

Loc. Rio de Janeiro.

Type in the British Museum.

Crypturus soui hoffmannsi, subsp. n.

Adult female. Distinguished from *C. soui soui* by having the upper parts olive-brown, the throat white, and the under surface cinnamon-rufous.

Total length 215 mm. ; culmen 21 ; wing 132 ; tail 34 ; tarsus 38.

Loc. Humaytha, Rio Madeira.

Type in Rothschild Museum at Tring.

Crypturus soui andrei, subsp. n.

Adult female. Differs from *C. soui soui* by having the upper surface greyish black and the underparts chestnut-umber.

Total length 240 mm. ; culmen 24 ; wing 136 ; tail 36 ; tarsus 35.

Loc. Trinidad.

Type in Rothschild Museum at Tring.

Crypturus soui harterti, subsp. n.

Adult female. Distinguished from *C. soui soui* in being everywhere darker, head without any shade of grey, throat tinged with grey, and the abdomen deep chestnut.

Total length 220 mm. ; culmen 22 ; wing 130 ; tail 42 ; tarsus 39.

Loc. Vaqueria, N. Ecuador.

Type in Rothschild Museum at Tring.

Crypturus undulatus confusus, subsp. n.

Adult female. Distinguished from *C. undulatus undulatus* by having the forehead slate-grey, sides of face vinous brown, fore-neck vinous brown minutely barred with black, and the back barred with deep vinous chestnut.

Total length 301 mm. ; culmen 31 ; wing 180 ; tail 53 ; tarsus 48.

Loc. Humaytha, Rio Madeira.

Type in Rothschild Museum at Tring.

Crypturus bartletti caroli, subsp. n.

Adult female. Distinguished from *C. bartletti bartletti* by having the back black with narrow fulvous cross-bars, the bars on the tail inclining to rufescent buff, the hind neck blackish, the fore-neck darker than in the type form, and the breast rufescent buff.

Total length 219 mm.; culmen 21; wing 148; tail 35; tarsus 43.

Loc. Rio Madeira.

Type in Rothschild Museum at Tring.

Crypturus cinnamomeus spencei, subsp. n.

Adult. Differs from *C. cinnamomeus cinnamomeus* by having the mantle cinnamon-brown, the back and tail dark brown rather broadly barred with buff, and the fore-neck dusky grey with rufescent bars.

Total length 295 mm.; culmen 30; wing 172; tail 46; tarsus 50.

Loc. Venezuela.

Type in the British Museum.

Crypturus hellmayri, sp. n.

Adult male. Allied to *C. strigulosus*, but differs by having the back dark brown with a wash of slate-grey, the fore-neck, breast, sides of the body, and axillaries dark slate-grey, and the inner under wing-coverts brown.

Total length 260 mm.; culmen 26; wing 152; tail 48; tarsus 47.

Loc. Humaytha, Rio Madeira.

Type in Rothschild Museum at Tring.

CRYPTURELLUS, gen. nov.

We have not included in the genus *Crypturus* the two species *C. tataupa* and *C. parvirostris*, as we consider them to differ generically, chiefly in the formation of the bills. In all the South-American species of the preceding genus (twenty) the nostrils are placed in the anterior half of the bill, whereas in *Crypturellus* they are situated in the posterior portion. The membrane on this part is more persistent than in *Crypturus* and the gonys is proportionately much longer.

We propose *C. tataupa* (Temminck) as the *type*; and the species will be as follows:—

Crypturellus tataupa (Temm.).

Crypturellus parvirostris (Wagl.).

XXXIX.—*Rhynchotal Notes*.—LV. By W. L. DISTANT.

HETEROPTERA.

Fam. Pentatomidæ.

Placosternum alleni, sp. n.

Brownish ochraceous, more or less coarsely blackly punctate; corium with a large marginal, pale, sparingly punctate spot before middle; body beneath paler and much less punctate than above, abdomen with two central series of pale obliquely transverse spots; head with the central lobes distinctly longer than the central lobe, their apices well separated; antennæ ochraceous, basal joint not nearly reaching apex of head, third and fourth joints slightly longer than second and fifth; rostrum about reaching the intermediate coxæ; pronotum broad, the lateral margins dentate, the lateral angles strongly upwardly and forwardly produced, their apices toothed on each side and slightly obtusely produced centrally; mesosternal ridge slender anteriorly and extending to between the anterior coxæ, metasternal elevation broad and angulate; abdomen beneath sparsely punctate and centrally broadly sulcate for more than half its length; head, pronotum, and scutellum coarsely blackly punctate, corium less coarsely and more brownly punctate; membrane brownish and coarsely veined.

Long. 20 mm.; exp. pronot. angl. 16 mm.

Borneo; Banting (*G. D. A.*). Type Brit. Mus.

Named after the Rev. G. Dexter Allen, who captured the species.

Fam. Reduviidæ.

Margasus nivealis, sp. n.

Pronotum, scutellum, and corium black; anterior lobe of pronotum, anterior area of posterior lobe, scutellum, corium (excluding apical angle), and the sternum thickly and almost entirely whitely tomentose; head, rostrum, abdomen beneath, and legs dark castaneous; femora with a broad subapical ochraceous annulation; antennæ dark castaneous, first joint a little longer than head and pronotum together (remaining joints mutilated in typical specimen); pronotum about as wide at base as long, posterior lateral angles acute, prominent, posterior lateral margins concavely oblique, posterior margin truncate, posterior angles distinctly lobately produced; scutellum with the disk tuberculate, the apex not elevated;

connexivum moderately produced on each side from about one-third from base, castaneous; membrane shining bronzy, slightly passing abdominal apex.

Long., incl. membr., 27 mm.; lat. pronot. angl. $6\frac{1}{4}$ mm.

Hab. Uganda Prot.; Buamba Forest, Semliki Valley, 2300-2800 feet (*S. A. Neave*, Brit. Mus.).

Murgasus pronotalis, sp. n.

Head piceous brown; pronotum purplish black, the anterior lobe and anterior margin of posterior lobe thickly ochraceously pilose; scutellum, corium, and sternum thickly ochraceously pilose; antennæ, rostrum, legs, and abdomen beneath castaneous; membrane shining bronzy brown; antennæ with the first joint about as long as head, pronotum, and scutellum together; pronotum a little broader between posterior lateral angles than long, posterior lateral angles prominent, subacute, a little directed forwardly, posterior lateral margins oblique, a little sinuate, posterior margin truncate, posterior angles distinctly lobately produced, posterior lobe with two distinct discal tubercles; scutellum with the disk tuberculate, the apex not elevated; connexivum castaneous, moderately produced on each side from about one-third from base; membrane moderately passing abdominal apex.

Long., incl. membr., 21-26 mm.; lat. pronot. angl. 5-7 mm.

Hab. Nyasaland; Mlanje (*S. A. Neave*, Brit. Mus.).

Murgasus abdominalis, sp. n.

Head, rostrum, and antennæ castaneous; pronotum, scutellum, and corium thickly ochraceously pilose, the posterior marginal area of the pronotum less so and more castaneous in hue; membrane shining bronzy; sternum thickly greyishly or palely ochraceously pilose; abdomen beneath ochraceous, *in the male concolorous, in the female with the segmental margins prominently black*; legs castaneous, femora darker than tibiæ, femora with a subapical ochraceous annulation; antennæ with the first joint about as long as head, pronotum, and scutellum together; pronotum nearly as long as broad, the lateral angles acute, a little curved forwardly, posterior lateral margins oblique, posterior margin truncate, very slightly concave, the posterior angles broadly lobately produced, posterior lobe with two distinct discal tubercles; scutellum with the disk tuberculate, the apex not elevated; connexivum ochraceous, moderately produced from about

basal half with some elongate black spots; membrane passing abdominal apex.

Long., incl. membr., 24-26 mm.; lat. pronot. angl. 6-7 mm.

Hab. Brit. E. Africa; Kibwezi, 3000 feet, Masongaleni, 3000 feet (*S. A. Neave*, Brit. Mus.). Uganda; Tero Forest (*C. C. Gowley*).

HOMOPTERA.

Fam. Cicadidæ.

Diemeniana turneri, sp. n.

Body and legs black; an elongate spot between ocelli, a central elongate spot to pronotum, lateral margins and two small central spots to mesonotum, apices of femora and femoral streaks, annulations to intermediate tibiæ, posterior tibiæ (excluding base and apex), ochraceous; margins of coxæ testaceous; connexival segmental margins beneath more or less testaceous; tegmina and wings hyaline, tegmina with the costal membrane and basal two-thirds of venation pale testaceous, remaining venation fuscous, upper margin of basal cell and an extreme basal spot black, an inner basal streak greyish white; wings with the venation pale testaceous, the outer submarginal venation black, basal streaks greyish white; front of head convexly projecting with a small apical spot, and a small spot on each anterior angle of vertex ochraceous; pronotum acutely dilated on each lateral margin; body above more or less distinctly longly pilose; opercula in male transverse, about reaching base of first abdominal segment; rostrum reaching the intermediate coxæ; tegmina almost half as broad as long.

Long., excl. tegm., ♂ 22 mm.; exp. tegm. 51 mm.

Hab. S.E. Tasmania; Mt. Wellington (*R. E. Turner*, Brit. Mus.).

This species has a very distinct appearance by its hyaline and practically unmarked tegmina from the at present only known two other species of the genus; the strong spinous dilatation of the lateral margins of the pronotum is also a salient differential character.

Mr. Turner informs me that he captured this species on the summit of Mt. Wellington (4000 feet) among stunted vegetation and on a very exposed and windy spot. He only secured one example.

Fam. Fulgoridæ.

Subfam. LOPHOPINÆ.

Pyrilla pusana, sp. n.

Body and legs shining brownish ochraceous; pronotum and mesonotum usually more or less darker in hue, sometimes concolorous, sometimes dark castaneous; tegmina dark shining ochraceous, the apical area moderately infuscate with many black spots, some minute dark spots varying in number on anterior disk; wings very palely infuscate.

Allied to *P. lycoides*, Walk., but differing by the less robust cephalic process.

Long., excl. tegm., 7-8 mm.; exp. tegm. 20-21 mm.

Hab. Pusa; Bihar (*Lefroy & Bainbriggé Fletcher*).

I had previously (*Ann. Soc. Ent. Belg.* li. p. 220, 1907) considered this species to be conspecific with *P. lycoides*, Walk., but a large series of specimens recently sent me by Mr. Fletcher has proved it to be distinct. *P. lycoides* is probably restricted to Siam.

Fam. Cercopidæ.

Phymatostetha stella, sp. n.

Body above brownish ochraceous; pronotum with a central elongate spot and a spot at each anterior lateral margin very pale stramineous or greyish white; abdomen with the basal margin, a series of lateral marginal spots, and the anal appendage stramineous; body beneath and legs pale brownish ochraceous, abdomen with a lateral marginal series of transverse black spots; tegmina pale brownish, with eight pale more or less rounded spots, the apical margin ochraceous; wings pale bronzy brown; head distinctly depressed before eyes; pronotum distinctly finely punctate; posterior tibiæ with a short spine at base and a longer spine beyond middle; rostrum reaching the intermediate coxæ; face prominently globose.

Long., excl. tegm., 13 mm.; exp. tegm. 36 mm.

Hab. Indo-China (*R. Vitalis de Salvaza*, type Brit. Mus.).

Allied to *P. sema*, Dist., from Assam.

Phymatostetha chapana, sp. n.

Head, pronotum, and scutellum ochraceous; head with lateral and basal margins, two large spots near anterior margin of pronotum, and abdomen above black; body

beneath and legs ochraceous, lateral and posterior areas of face, sternal spots, streaks to femora, bases and apices of tibiæ, apex of rostrum, and lateral and posterior abdominal segmental margins black; tegmina with the basal area stramineous, remaining and larger area brownish ochraceous, the basal area with some brownish-ochraceous spots, of which the most prominent are one in the radial area and another almost beneath it, in the brownish ochraceous area is a strongly angulated testaceous fascia, followed by a black subapical marginal fascia; wings bronzy ochraceous, the veins darker; pronotum wrinkled and finely punctate; face obsoletely discally longitudinally sulcate.

Long., excl. tegm., 17 mm.; exp. tegm. 43 mm.

Hab. Upper Tonkin, near Chapa, Lao Kay (*R. Vitalis de Salvaza*, type Brit. Mus.).

Allied to *P. signifera*, Walk.

Phymatostetha moultoni, sp. n.

Head, pronotum, and scutellum black; frontal and lateral areas of head, lateral marginal areas of pronotum, and apex of scutellum dark testaceous; abdomen above and body beneath and legs ochraceous; spots to sternum, apex of rostrum, streaks to femora, and apices of tarsi black; tegmina black, costal margin for about two-thirds its length broadly and irregularly ochraceous, two narrow transverse sanguineous fasciæ, one before, the other beyond middle, inner claval margin and narrow apical margin more or less testaceous; wings bronzy ochraceous, extreme base sanguineous; pronotum strongly wrinkled; posterior femora with two strong spines, one near base, the other beyond middle; face very obsoletely longitudinally sulcate.

Long., excl. tegm., 17 mm.; exp. tegm. 43 mm.

Hab. Borneo; Batu Laui Exped. (*J. C. Moulton*, type Brit. Mus.).

Allied to *P. circumducta*, Walk.

Cosmoscarta lunata, sp. n.

Body, legs, and tegmina ochraceous, sometimes the abdomen above is a little darker and more testaceous; wings very pale bronzy brown; the tegmina when closely examined have some obsolete darker fasciate markings; eyes blackish; pronotum with two discal dark bipunctate markings, a little before the anterior margin, a faint central longitudinal impressed line, the lateral margins moderately reflexed, a distinct oblique impression a little before each lateral angle; face

globose, centrally distinctly but shallowly longitudinally sulcate; rostrum reaching the intermediate coxæ; posterior tibiæ with a moderately long spine beyond middle and a short spine near base; tegmina a little more than two and a half times longer than broad.

Long., excl. tegm., 10 mm.; exp. tegm. 26-29 mm.

Hab. North India (Brit. Mus.).

Cosmoscarta assamensis, sp. n.

Head, pronotum, and scutellum black; a broad transverse fascia across anterior area of pronotum and the basal area of the scutellum pale dull reddish; abdomen above shining castaneous; body beneath black; rostrum and legs dull castaneous; tegmina dull blackish, base of costal membrane, basal area of clavus, an irregular transverse fascia near middle, and another much outwardly angulated fascia before apical area, dull sanguineous; wings pale fuliginous, the extreme base sanguineous; scutellum distinctly depressed at base, transversely striate; face globose, central longitudinal sulcation broad but shallow; rostrum reaching the intermediate coxæ; tegmina a little less than two and a half times as long as broad; posterior tibiæ with a long robust spine beyond middle and a short spine near base.

Long., excl. tegm., 12 mm.; exp. tegm. 32 mm.

Hab. Assam; Margherita (Brit. Mus.).

Allied to the Chinese species *C. bimacula*, Walk.

Cosmoscarta imrayi, sp. n.

Head, pronotum, and scutellum shining black; lateral and posterior margins of pronotum and a transverse fascia before middle sanguineous, lateral margins and nearly apical half of scutellum sanguineous; abdomen above blackish, with the segmental margins pale sanguineous; body beneath shining black; posterior half of face, greater part of prosternum, coxæ, trochanters, and legs pale sanguineous, tarsi black; tegmina dark shining ochraceous, apical area and six spots shining black, the spots in two transverse series of three each, the two largest on costal membrane, the smallest in middle of inner series; wings very pale fuliginous; face rather prominently longitudinally sulcate; rostrum reaching the intermediate coxæ; tegmina nearly two and a half times as long as broad; posterior tibiæ with a moderately long spine beyond middle and a short spine near base.

Long., excl. tegm., 10 mm.; exp. tegm. 21 mm.

Hab. Travancore; Peermaad (*R. S. Imray*, Brit. Mus.).

Allied to *C. flora*, Dist.

Cosmoscarta fumosa, sp. n.

Head, pronotum, and scutellum pale castaneous, pronotum with two large black spots near anterior margin, ocelli pale ochraceous; abdomen above and beneath black, the posterior segmental margins pale castaneous; sternum black; lateral margins of prosternum and legs pale fuscous; face, rostrum, coxæ, trochanters, bases of femora, and posterior tibiæ pale castaneous, spines to posterior tibiæ dark fuscous; tegmina dark dull purplish red, apical area and about seven large spots black, the spots placed, one basal and two curved transverse series of three spots each; wings very pale fuliginous, the veins darker; face globose, the central sulcations broad but not profound; rostrum reaching the intermediate coxæ; tegmina not quite two and a half times as long as broad; posterior tibiæ with a long prominent spine beyond middle and a short spine near base.

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

Hab. Darjiling (type Brit. Mus.); Sikkim, Rungpo (Ind. Mus.).

Allied to *C. ochraceicollis*, Schmidt.

Cosmoscarta nympha, sp. n.

Head and scutellum black; pronotum ochraceous, with an anterior fascia behind eyes and the posterior margin broadly black; abdomen above shining black, the posterior segmental margins narrowly dull ochraceous; body beneath black, legs somewhat fuscous; tegmina pale testaceous, apical area paler, more ochraceous, and there fuscous on the apical margin, beyond middle three fuscous spots in transverse series, the two uppermost small, the lowermost larger and somewhat lunate in shape; wings palely fuliginous; face with the central sulcation moderately well pronounced (especially near base, where it is broadest); rostrum reaching the intermediate coxæ; tegmina less than two and a half times as long as broad; posterior tibiæ with a prominent long spine beyond middle, and a smaller but distinct spine near base.

Long., excl. tegm., 11 mm.; exp. tegm. 30 mm.

Hab. Assam; Khasi Hills (*Chennell*, Brit. Mus.).

Allied to *C. dimidiata*, Dall.

Cosmoscarta balteata, sp. n.

Head, pronotum, and scutellum shining black; pronotum with a broad, anterior, transverse, ochraceous fascia; abdomen above and body beneath and legs black; lateral margins

of prosternum ochraceous; tegmina black, two basal streaks (one in costal membrane, the other in clavus) and three small spots in somewhat transverse series beyond middle pale testaceous; wings very pale fuliginous; face obsoletely centrally sulcate; rostrum reaching the intermediate coxæ; tegmina less than two and a half times as long as broad; posterior tibiæ with a strong spine beyond middle and a small spine near base.

Long., excl. tegm., 12 mm.; exp. tegm. 32 mm.

Hab. Sikhim; Dam Din (Brit. Mus.).

Cosmoscarta himalayana, sp. n.

Body above and beneath bluish black; rostrum, coxæ, trochanters, and femora sanguineous, tibiæ and tarsi black; tegmina black, a more or less transverse spot in bases of both costal membrane and clavus, and two waved transverse fasciæ (one before, the other beyond middle) pale sanguineous; wings pale fuliginous; pronotum distinctly foveate on each side before anterior margin, the lateral margins distinctly reflexed; rostrum only just reaching the intermediate coxæ; tegmina two and a half times as long as broad.

Long., excl. tegm., 9 mm.; exp. tegm. 26 mm.

Hab. East Himalayas (Brit. Mus.).

Allied to *C. margheritæ*, Dist.

Ectemnonotum baramensis, sp. n.

Body and legs black, abdomen above bluish black; tegmina with the basal and apical thirds bluish black, central third stramineous with three bluish-black spots in transverse series; wings pale fuliginous, the veins darker; head about as long as broad at base, sublaterally sulcate on each side from base to a little beyond eyes; pronotum thickly finely punctate and slightly transversely wrinkled, with a distinct depression on each side behind anterior margin, and with a slight, central, longitudinal, linear ridge; scutellum transversely wrinkled; face broadly globose; rostrum reaching the intermediate coxæ; posterior tibiæ with a long robust spine a little beyond middle.

Long., excl. tegm., 17 mm.; exp. tegm. 47 mm.

Hab. Borneo; Baram (*J. C. Moulton*, type Brit. Mus.).

Leptaspis hecuba, sp. n.

Head, pronotum, scutellum, sternum, and legs shining piceous, lateral margins to pronotum, rostrum, streaks to femora, and the tarsi distinctly paler; abdomen above and

beneath and the posterior legs ochraceous; connexival spots black; tegmina pale ochraceous, the apical third and eight spots (two in costal membrane, three on disk in longitudinal series, two in claval area, and one above claval apex) black; wings fuliginous, the veins black; ocelli shining ochraceous; pronotum with faint indications of a central longitudinal carinate line, the lateral margins narrowly reflexed; scutellum distinctly foveate at base, after which it is centrally longitudinally carinate to apex; posterior legs somewhat longly pilose, posterior tibiae with a prominent spine beyond middle; tegmina about three times as long as broad.

Long., excl. tegm., 11 mm.; exp. tegm. 30 mm.

Hab. Indo-China (*R. Vitalis de Salvaza*, type Brit. Mus.).

SYNONYMICAL NOTES.

Fam. Pentatomidæ.

Dymantis relata, Dist. Ann. & Mag. Nat. Hist. (7) ii. p. 298 (1898).

Dymantis confusa, Bergr. Rev. Zool. Afr. iii. p. 448 (1914).

I originally described this species from the Transvaal founded on three small specimens which each only measured 10 mm. I have since received other examples from the same locality which are 13 mm. in length. Bergroth's type of his *D. confusa* (of which he gives no dimensions in his description) also has a length of 13 mm.

Bergroth's differential characters of *D. plana* and *D. confusa* (as regards the colour of the antennæ, the comparative lengths of the second and third joints of same, and the length of the hemelytra) are unreliable characters, and he confesses that in some specimens these "are less obvious"; but I quite agree with him that the species can be "always easily distinguished by the quite different structure of the genital segment," and he is to be congratulated on having observed that character. It is, however, much more pronounced in some specimens than in others. The Brit. Mus. now possesses specimens from Transvaal; Lydenburg Dist., Zoutpansberg, Piet Retief; S. Africa (*Dr. Smith's Coll.*), Livingstonia (*Simon*); Mashonaland, Salisbury (*Marshall*); Nyasaland (*Cotterell*).

Halyomorpha viridescens, Walk. (*Atelocera*).

Bergroth (Rev. Zool. Afr. iii. p. 450, 1914) has redescribed this species, but at the same time only a peculiar form of it, for it is of a very variable nature, as I pointed out in 1880

(Ent. Month. Mag. xvi. p. 201). The specimen thus identified and returned to the Bureau of Entomology is a dark variety, and was originally described by Bergroth as a new species; but the mistake was detected before publication, and the name altered. Thus the diagnosis refers to a form of the species only, and does not represent its protean character.

Fam. Aradidæ.

Acantharadus giganteus.

Acantharadus giganteus, Banks, Philipp. Journ. Sci. iv. p. 580, pl. xi. fig. 8 (1909).

I have recently examined a series of this species collected by Mr. J. C. Moulton at Tabekang in Borneo, which agree in all respects with the description and figure of the Philippine type given by Banks. In the Trans. Ent. Soc. Lond. 1911, p. 597, I referred to Bergroth's claim that this species was a synonym of one he described from Penang in 1886 under the Neotropical genus *Dysodicus* (*D. quatenarius*, Bergr.), and drew attention to the totally different structure of the head in the figures of Bergroth and Banks. Bergroth has recently and with some acerbity resented this comparison (Ann. Soc. Ent. Belg. 1913, p. 151), and suggested that I had not regarded the sentence in his description "tylo jugis multo brevior," and states that "the difference is owing to the juga in [his] specimen being covered with granules right on to the very tip (which makes them contiguous on the inner side), while in Banks' specimen the granules of the apical part of the juga are failing." This contention is not supported, but absolutely disproved by the series of Bornean specimens which I have examined. But even ignoring this character, which I do not propose to do, what are we to think of the different length of the head, the position of the eyes, and the different dentation of the lateral margins of the pronotum as shown in the two figures? No one knows better than myself that an artist frequently overlooks salient characters relied on by the describer; but the line must be drawn somewhere, and Bergroth is asking too much latitude in this contention.

Fam. Membracidæ.

Otinotus karenianus, n. nom.

Otinotus pallipes, Dist. Faun. Brit. Ind., Rhynch. iv. p. 40 (1907), nom. præocc.

I have recently found that *Centrotus pallipes*, Walk., from

New Guinea, belongs to the genus *Otinotus*, and therefore my species requires renaming.

Fam. Cercopidæ.

By the kindness of Dr. Gestro, of the Genoa Museum, I have recently had an opportunity of examining the species described by Dr. Schmidt from Burma, and a few cases of synonymy may be recorded:—

Considia nitidula, Bredd. Soc. Ent. Zurich, 1902, p. 59.

Considia borealis, Schmidt, Arch. f. Naturg. lxxvi. p. 101 (1910).

Phymatostetha stáli, Butl. Cist. Ent. i. p. 267 (1874).

Phymatostetha subcostalis, Schmidt, Arch. f. Naturg. lxxvi. p. 98 (1910).

Leptataspis rotundata, Walk. (*Cercopis*) List. Hom., Suppl. p. 174 (1858).

Leptataspis plagiventris, Schmidt, Arch. f. Naturg. lxxvi. p. 65 (1910).

Cosmoscarta egens, Walk. (*Cercopis*) List Hom., Suppl. p. 171 (1858).

Cosmoscarta innota, Schmidt, Arch. f. Naturg. lxxvi. p. 72 (1910).

Var. *Cosmoscarta innominata*, Schmidt, l. c. p. 73.

Fam. Jassidæ.

PISACHOIDES, n. nom.

Pisacha, Dist. Faun. Brit. Ind., Rhynch. iv. p. 230 (1907), nom. præocc.

XL.—Some new Species of Rhynchota from Mt. Merinjak, Borneo. By W. L. DISTANT.

DURING a recent expedition to this mountain, made by Mr. J. C. Moulton, the Curator of the Sarawak Museum, a number of very interesting insects were obtained, the new species of Rhynchota being here described. A full narrative of this journey has been published elsewhere*.

HETEROPTERA.

Fam. Pentatomidæ.

MERINJAKIA, gen. nov.

Head broad, with the eyes almost but not quite reaching

* 'Zoologist,' 1914, p. 361.

anterior angles of pronotum, the head distinctly narrower than the anterior pronotal angles; head broad, considerably broader than long, the anterior margin subtruncate, central lobe reaching the anterior margin; eyes moderately obliquely elevate; pronotum concavely sinuate at insertion of head; pronotum centrally about half as long as broad at base, the anterior lateral margins obliquely convexly dilated, posterior margin truncate; scutellum broad, convex, not quite reaching apex of abdomen; rostrum about reaching the intermediate coxæ; antennæ five-jointed; first and second joints short, first moderately thickened, second shorter than first, third slightly longer than fourth or fifth; spiracles a little before lateral margins of abdomen.

Allied to *Turichea* and *Oncylaspis*, but with the lobes of the head equal in length.

Merinjukia typica, sp. n.

Body above ochraceous, thickly, coarsely, darkly punctate; anterior margins of head, a spot at apex and near base of central lobe, an excavate spot on each side of base before eyes, and two angulate transverse fasciæ on anterior disk of pronotum black; prosternum opaque violet-black; abdomen beneath ochraceous brown, the margins broadly flavous, the spiracles and a spot at apices of segmental incisures black, the incisures before the lateral margins and a short transverse excavate line between them black; femora ochraceous blackly spotted near apices, tibiæ and tarsi fuscous brown; structural characters as in generic diagnosis.

Long. 8 mm., max. breadth $7\frac{1}{2}$ mm.

Hab. Borneo; Mt. Merinjak (*J. C. Moulton*, type in Brit. Mus.).

Coptosoma nigrosignatum, sp. n.

Dull ochraceous with prominent black markings; head with the central lobe and a spot at base behind the ocelli black; pronotum with a transverse waved line before the anterior margin and four large oblong spots on posterior disk black; scutellum with a large transverse spot behind base, narrowly continued posteriorly on each side, and outwardly dilated apically, black; sternum bluish-black opaque, its anterior lateral margins, head beneath, rostrum, and legs flavescent; abdomen beneath shining testaceous, the disk suffused with blackish; head moderately subangulately prominent, vertically depressed, eyes castaneous; pronotum convex, vertically depressed in front, sparsely punctate, posterior angles subangularly rounded; scutellum broader

than long, convex, posteriorly and laterally vertically depressed, posterior margin centrally truncate.

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

Hab. Borneo; Mt. Merinjak (*J. C. Moulton*, type in Brit. Mus.).

Pygoplatys merinjakensis, sp. n.

Body above and beneath and legs ochraceous, the produced pronotal angles, the basal area of the scutellum, and abdomen beneath a little darker; membrane pale bronzy, reflecting the dark abdomen beneath, the slightly produced lateral and apical margins thus appearing much paler; head not longer than broad, somewhat strongly emarginate in front of eyes; antennæ with the first joint not quite reaching apex of head, second nearly twice as long as first (remaining joints mutilated in type); rostrum passing the anterior coxæ, its extreme apex black; pronotum somewhat sparsely punctate, distinctly bicallose on anterior area where it is somewhat transversely wrinkled, the anterior angles shortly distinctly acutely produced, the posterior angles very robust, strongly produced, slightly upwardly directed, and very coarsely punctate, distinctly wider at apex than base, the apex irregularly truncate, the posterior margin semicircularly produced over the base of the scutellum; scutellum coarsely punctate on basal, more finely punctate on apical area, the narrower apical area longitudinally grooved; corium thickly finely punctate; membrane slightly passing the abdominal apex; metasternal process narrowed anteriorly and produced to the anterior coxæ, emarginate posteriorly for the reception of the abdominal spine or tubercle.

Long. 18 mm., exp. pronot. angle 17 mm.

Hab. Borneo; Mt. Merinjak (*J. C. Moulton*, type in Brit. Mus.).

A species to be recognized by the robustly produced posterior pronotal angles, which allies it to *P. validus*, Dall.

HOMOPTERA.

Fam. Fulgoridæ.

Subfam. *ISSINÆ*.

NEODELIA, gen. nov.

Head acutely produced, longer than pronotum, about as long as mesonotum, lateral margins ridged and somewhat straight beyond eyes and then narrowed to apex, which is acute, centrally longitudinally ridged, and foveately impressed at base, face flat, the lateral margins very strongly ridged

from base to beyond eyes; clypeus triangular, the margins strongly ridged, rostrum reaching the intermediate coxæ; pronotum with the anterior margin convex, the posterior margin straight, the lateral angles moderately lobately anteriorly produced; mesonotum about as broad at base as long, the lateral margins oblique to apex which is acute; tegmina longer than wings, the costal membrane strongly convexly arched, beyond which the apical third of tegmen is narrowed with the apex obliquely truncate, veins prominent, especially so in the costal membrane and radial area, the first of which is broader than the latter, the apical third is distinctly transversely veined, the apical margin with short longitudinal cells, some of which are angular, claval area moderately lobately produced over and near base of wings; wings large, broader than tegmina at their widest expanse, the posterior margin strongly emarginate at the demarcation of the abdominal area and very slightly emarginate near middle of apical margin, the longitudinal vein in abdominal area is prominent and bifurcate at about one-third its length from posterior margin, on disk are a few transverse veins; legs somewhat robust, the tibiæ longitudinally channelled beneath, posterior tarsi with the basal joints spinously produced on each side, posterior tibiæ spined at apices.

Apparently allied to *Delia*, Melichar. (*Delia* being a generic name already used, a new name will have to be provided.)

Neodelia moultoni, sp. n.

Head, pronotum, and mesonotum brownish ochraceous minutely spotted with ochraceous, with a longitudinal central ochraceous fascia to each, somewhat duplex on mesonotum, abdomen pale ochraceous; face ochraceous, thickly sprinkled with small blackish spots; clypeus blackish; anterior and intermediate legs ochraceous with a few large castaneous spots, posterior legs blackish; abdomen beneath with very distinct black punctures; tegmina ochraceous, the costal membrane and radial area much darker in hue, as are also some of the longitudinal veins, costal margin with small greyish-white spots, three spots of the same colour in radial area, and two—one above the other—above claval area at about one-fourth from base, the transverse veins on apical third testaceous, and here the extreme margins are minutely spotted with black; wings fuliginous, the veins dull ochraceous, in abdominal area and on apical third black; structural characters as in generic diagnosis.

Long., excl. tegm., 11 mm.; exp. tegm. 35 mm.

Hab. Borneo, Mt. Merinjak, 2200 ft. (type in Brit. Mus.).

Fam. Membracidæ.

Ebhul tessellatus, sp. n.

Head, pronotum, and posterior pronotal process black, the latter somewhat tinted with castaneous; body beneath black, legs more piceous brown; tegmina black, a large spot in claval area, a similar spot in radial area, and a broad apical margin castaneous brown, a spot near claval margin, a transverse series before apical area, and a few smaller scattered spots greyish white; pronotum centrally longitudinally strongly ridged, its anterior lateral angles slightly prominent, not produced, the posterior pronotal process moderately sinuately waved, arched at base where it is separated from the scutellum, and then a little concavely sinuate and following the direction of the tegmina, its apex reaching the posterior angle of the inner tegminal margin; face centrally longitudinally sulcate.

Long. 6 mm.

Hab. Borneo, Mt. Merinjak (type in Brit. Mus.).

Allied to *E. varius*, Walk., but structurally differing by the much less prominently waved posterior pronotal process; colour-markings also different.

XLI.—Notes on *Fossorial Hymenoptera*.—XIII.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

A Revision of the Paranyssoninæ.

Family Crabronidæ.

Subfamily PARANYSSONINÆ.

Sericophorinæ, D. T., Cat. Hymen. viii. p. 578 (1897).

I follow Kohl and Dalla Torre in the association of the genera in this group. They are all distinguished by the incision on the outer margin of the mandibles and the presence of only one spur on the apex of the intermediate tibiæ. The recurrent nervures are received by the first and second cubital cells, except in *Sphodrotes*, in which both are received by the second cell. From *Pison* and its allies the group is distinguished by the entire eyes and the incision of the mandibles; from *Nysson* by the single spine of the intermediate tibiæ and the incision of the mandibles. The relationship to *Larra* is nearer, but the form of the third cubital

cell and the position of the recurrent nervures is different, as well as the normal form of the ocelli. The genera which Ashmead associates with *Sericophorus* and *Zoyphium* in his Lyrodinæ are probably the nearest relations, though I do not consider the relationship very close.

As *Paranysson* is an older name than *Sericophorus*, it should be used for the subfamily.

The pulvilli are very much developed in most of the genera, especially in *Sericophorus* and *Zoyphium*, but not more so than in some other Crabronidæ.

Key to the Genera.

- | | |
|---|---------------------------|
| 1. Second cubital cell pointed on the radial nervure ; antennæ short and clavate. | 2. |
| Second cubital cell petiolate ; antennæ not clavate and longer | 3. |
| 2. Radial cell with an appendiculate cell | <i>Sericophorus</i> , Sm. |
| Radial cell without an appendiculate cell | <i>Zoyphium</i> , Kohl. |
| 3. Cubitus of hind wing originating at a distance beyond the transverse median nervure not exceeding the length of that nervure ; hind coxæ without a spine or tubercle ; no pygidial area | <i>Sphodrotes</i> , Kohl. |
| Cubitus of hind wing originating at a distance beyond the transverse cubital nervure equal to at least twice the length of that nervure ; hind coxæ of female with a spine or tubercle ; with a pygidial area | <i>Paranysson</i> , Guér. |

Genus PARANYSSON, Guér.

Nysson (*Paranysson*), Guér. Iconogr. Règn. Animal, Insect. p. 441 (1844).

Helioryctes, Sm. Cat. Hym. B.M. iv. p. 358 (1856).

Pseudohelioryctes, Ashm. Can. Entom. xxxi. p. 248 (1899).

This genus has the mandibles deeply excised on the outer margin, and the intermediate tibiæ have only one apical spine, as in other genera of the group. The second cubital cell is petiolate, the cubitus of the hind wing originates much further from the transverse median nervure than in *Sphodrotes* or other genera of the family. The radial cell is without an appendiculate cell. There is a distinct pygidial area in the female, and also in that sex a tubercle, or more often a long spine, on the hind coxæ. The male has a pygidial area, but is without the spine or tubercle on the hind coxæ. The position of the first recurrent nervure at the apex of the first cubital also separates this genus from *Sphodrotes*, in which both recurrent nervures are received by the second cubital cell, or in one species the first interstitial with the first transverse cubital nervure.

I have discussed my identification of the type species *P. abdominale*, Guér., under that species. Ashmead (Can. Ent. p. 326, 1899) evidently differs from these conclusions, and uses *Paranysson* for several North-American species which are true Nyssoninae; but I consider he is completely mistaken in his identification of the genus. He also associates *Heliorcytes* with the Nyssoninae, but the incision of the mandibles and the presence of only one spur to the intermediate tibiae seem to me to render this association impossible. Probably he was only acquainted with *H. melanopyrus*, which he gives as the type by description. Associated with the Pisoninae together with *Sphodrotes* he places his genus *Pseudoheliorcytes* (type *P. foxii*, Ashm.), which he finds for a species apparently only distinguished from true *Heliorcytes* by the absence of the coxal spine. This spine is also missing in *Paranysson heliorcytoides*, Turn., which I certainly look on as congeneric with other *Paranysson*.

Key to the Species of Paranysson.

♀ ♀.

- | | |
|--|----------------------------------|
| 1. Wings hyaline, very slightly clouded at the apex; posterior ocelli very near to the eyes, fully three times as far from each other as from the eyes. (Asiatic.) | <i>P. assimilis</i> , Bingh. |
| Wings fuscous or fusco-violaceous; posterior ocelli never more than twice as far from each other as from the eyes, usually much less. (African.) | 2. |
| 2. Posterior ocelli nearly twice as far from each other as from the eyes; spur of hind coxæ reduced to a tubercle | <i>P. heliorcytoides</i> , Turn. |
| Posterior ocelli very little, if at all, further from each other than from the eyes; spur of hind coxæ well developed | 3. |
| 3. Spur of the hind coxæ originating before the inner angle, near the middle of the inner margin | 4. |
| Spur of the hind coxæ apical, originating close to the inner angle | 5. |
| 4. Apical joint of the flagellum no longer than the penultimate; median segment striate-reticulate | <i>P. melanopyrus</i> , Sm. |
| Apical joint of the flagellum distinctly longer than the penultimate; median segment longitudinally striated | <i>P. oscari</i> , Turn. |
| 5. Median segment longitudinally striated; pronotum ferruginous. | <i>P. abdominale</i> , Guér. |
| Median segment reticulate or striate-reticulate; pronotum black. | <i>P. quadridentatus</i> , Can. |

Paranysson abdominale, Guér.

Nysson (*Paranysson*) *abdominale*, Guér. Iconogr. Règn. Animal, Insect. p. 441 (1844).

Nysson abdominalis, Gerst. Abhandl. Halle, x. p. 122 (1866); Handl. Sitzungsab. kais. Akad. Wiss. Wien, xc. p. 318 (1887).

♀. Nigra; mandibulis fusco-ferrugineis; pronoto, abdomine, femoribus, tibiis tarsisque rufo-ferrugineis; postscutello tegulisque obscure fusco-ferrugineis; alis fusco-violaceis.

Long. 15 mm.

♀. Clypeus transverse at the apex, without lateral teeth. Second joint of the flagellum nearly twice as long as the third, apical joint equal in length to the penultimate. Posterior ocelli a little nearer to each other than to the eyes. Median segment longitudinally striated, the enclosed area very broadly rounded at the apex, no spine or tubercle on the sides of the segment. The spine on the hind coxæ originates close to the apex. Second abscissa of the radius almost equal to the third; cubitus of the hind wing originating at a distance beyond the transverse median nervure equal to nearly two and a half times the length of that nervure.

Hab. West Africa, Senegal (*Guérin*).

I have no doubt that the specimen in the British Museum mentioned by Bingham belongs to Guérin's species. Although his description is very brief, it would not fit any other African species known to me, and corresponds in every point to the specimen mentioned above.

Paranysson quadridentatus, Cam.

Helioryctes quadridentatus, Cam. Ann. Transv. Mus. ii. p. 142 (1910). ♀.

♀. Nigra; abdomine, femoribus, tibiis tarsisque rufo-ferrugineis; alis fusco-violaceis.

Long. 12-15 mm.

♀. Clypeus with two distinct teeth on each side. Second joint of the flagellum nearly half as long again as the third, apical joint no longer than the penultimate. Posterior ocelli a little further from each other than from the eyes. Median segment with short longitudinal striæ at the base, the rest of the enclosed area coarsely reticulated, with a small depression at the apex; a spine on each side of the posterior slope. Spine of the hind coxæ originating close to the apical angle. Third abscissa of the radius longer than the second, cubitus of hind wing originating at a distance from the transverse median nervure equal to at least three times the length of that nervure.

Hab. Transvaal and as far north as Nyasaland.

There seems to be some variation in the development of the spine on the sides of the median segment.

Paranysson melanopyrus, Sm.

Helioryctes melanopyrus, Sm. Cat. Hym. B.M. iv. p. 359 (1856). ♀.

♀. Nigra; mandibulis basi, tegulis, abdomine, femoribus, tibiis tarsisque ferrugineis; alis fuscis.

Long. 8-10 mm.

♀. Clypeus with two very minute teeth on each side. Second joint of the flagellum very little longer than the third, the apical joint no longer than the penultimate. Posterior ocelli about half as far again from each other as from the eyes. Median segment striate-reticulate, the enclosed area longer and more nearly semicircular than in other species. Spur of the hind coxæ originating much further from the apex than in *abdominale*, not far from the middle of the inner margin. Third abscissa of the radius scarcely as long as the second; cubitus of the hind wing originating at a distance from the transverse median nervure equal to nearly two and a half times the length of that nervure. A tubercle on each side of the median segment.

Hab. Gambia (*Smith*); Sierra Leone; Ojogbo, S. Nigeria (*J. J. Simpson*); Eastern Mbale district, S. of Mt. Elgon, Uganda (*S. A. Neave*).

The male is similar to the female, but, as in other species, the spine on the hind coxæ is not developed.

Paranysson oscar, sp. n.

♀. Nigra; mandibulis basi, tegulis, abdomine, femoribus, tibiis tarsisque rufo-ferrugineis; alis fusco-violaceis.

Long. 8 mm.

♀. Clypeus with two small teeth on each side; second joint of the flagellum short, but longer by about one-third than the third joint, apical joint distinctly longer than the penultimate. Posterior ocelli a little further from each other than from the eyes. Median segment with the enclosed area longitudinally striated, not reticulate, short and broad, the apex of the enclosed area broadly rounded and distinctly depressed below the dorsal surface towards the posterior slope, which is finely transversely striated and without lateral spines or tubercles. Spine of the hind coxa originating near the middle of the inner margin, not at the apex. Third

abscissa of the radius a little longer than the second, cubitus of hind wing originating at a distance from the transverse median nervure equal to two and a half times the length of that nervure.

Hab. Pakasa, N. Rhodesia (*Silverlock*).

This is near *melanopyrus*, Sm., but differs in the sculpture of the median segment, the absence of the lateral spines on that segment, the greater length of the apical joint of the flagellum, and in the presence of a distinct groove reaching from eye to eye behind the posterior ocelli.

Paranysson helioryctoides, Turn.

Nysson helioryctoides, Turn. Ann. & Mag. Nat. Hist. (8) ix. p. 416 (1912). ♀.

♀. Nigra; abdomine, femoribus, tibiis tarsisque rufo-ferrugineis; alis fusco-violaceis.

Long. 7 mm.

♀. Clypeus broad, without lateral teeth; second joint of the flagellum equal to the third, apical joint no longer than the penultimate. Posterior ocelli nearly twice as far from each other as from the eyes. Median segment very coarsely reticulate, the apical margin above the posterior truncation transverse, not rounded, and margined by a carina; the surface of the posterior truncation striato-punctate, with a small triangular spine on each side near the middle; the sides of the segment strongly striate. Third abscissa of the radius more than half as long again as the second. Cubitus of the hind wing originating at a distance beyond the transverse median nervure equal to about twice the length of that nervure.

Hab. Pakasa, N. Rhodesia (*Silverlock*).

This is a true *Paranysson*, having the mandibles excised on the outer margin and only one spine at the apex of the intermediate tibiæ, differing in these points from *Nysson*. The hind coxæ have no spine beneath, but there is a small tubercle.

Paranysson assimilis, Bingham.

Helioryctes assimilis, Bingham. Fauna Brit. India, Hymen. i. p. 271 (1897).

♂ ♀.

♀. Nigra; abdomine ferrugineo; tegulis, femoribus apice, tibiisque fusco-ferrugineis; tarsis brunneo-testaceis, alis hyalinis apice pallide infuscatis.

♂. Feminæ similis.

Long. 6-7 mm.

♀. Clypeus broad, with two small teeth on each side. Second joint of the flagellum short, scarcely as long as the third, apical joint no longer than the penultimate. Posterior ocelli separated from the eyes by a distance scarcely exceeding one-half of their own diameter, more than three times as far from each other as from the eyes. Median segment with the enclosed area very coarsely reticulate, a small blunt tubercle on each side of the posterior truncation. Tubercle on the hind coxæ very minute and indistinct. Third abscissa of the radius at least half as long again as the second, origin of cubitus of hind wing separated from the transverse median nervure by more than twice the length of that nervure.

Hab. Tenasserim (*Bingham*).

Paranysson foxii, Ashm.

Pseudohelioryctes foxii, Ashm. Can. Entom. xxxi. p. 248 (1899). ♀.
Helioryctes melanopyrus, Fox, Proc. Acad. Nat. Sci. Philadelphia, p. 554 (1896, nec Smith).

I have not seen this species, and the description is very insufficient.

“*Female*.—Length 14 mm. Head, thorax, antennæ, and all coxæ and trochanters black; rest of legs and the abdomen, except the pygidium above (which is dusky), ferruginous; wings fuscous black.”

In the generic description he mentions that there is no coxal spine.

Genus SPHODROTES, Kohl.

The species of this genus may be distinguished from *Sericophorus* and *Zoyphium* by the petiolate second cubital cell, by the coarse sculpture, by the comparatively small pulvilli, and by the antennæ, which are normal, not clavate, thirteen-jointed in the males, instead of twelve-jointed, as in those genera.

The genus is confined to Australia, and seems to be widely spread, though the species are not found commonly. When captured they make a buzzing sound, similar to that made by some of the larger species of *Crabro* and *Pison*.

Type of the genus, *S. punctuosus*, Kohl.

The species do not differ very greatly structurally; in all the second and third joints of the flagellum are almost equal and the posterior ocelli are nearly equidistant from the eyes and from each other. The most important structural differences are on the median segment and second ventral segment. There is no pygidial area,

Ashmead places this genus in his Pisoninæ together with his genus *Pseudohelioryctes*, which I treat as a synonym of *Paranysson*. But I consider the entire eyes and incised mandibles remove it from that group, though the genus is the most isolated of the present subfamily, and some doubt as to the correct position is justifiable. The incised mandibles and single spur of the intermediate tibiæ remove it from the Nyssoninæ. The mandibles of *S. rubricatus*, the only species in which I have been able to study the inner margin, have two small teeth near the base, as in the other genera of the subfamily. This points to the correctness of Kohl's views as to the relationship of the genus.

Key to the Species of Sphodrotes.

♀ ♀.

- | | |
|---|------------------------------|
| 1. Second ventral segment angular at the base and subtuberculate; abdomen black | <i>S. cygnorum</i> , Turn. |
| Second ventral segment rounded at the base, not subtuberculate; abdomen not wholly black | 2. |
| 2. Abdomen wholly ferruginous red | <i>S. rubricatus</i> , Turn. |
| Basal abdominal segment only ferruginous; the other segments with the apical margin narrowly ferruginous brown covered with golden pubescence | <i>S. marginalis</i> , Turn. |

♂ ♂.

- | | |
|--|------------------------------|
| 1. First recurrent nervure interstitial with the first transverse cubital nervure | <i>S. pilosellus</i> , Turn. |
| Both recurrent nervures received by the second cubital cell | 2. |
| 2. Abdomen black; median segment without tubercles on the sides of the posterior truncation | <i>S. punctuosus</i> , Kohl. |
| Abdomen more or less ferruginous; a blunt tubercle on each side of the median segment, near the middle of the posterior truncation | <i>S. rubricatus</i> , Turn. |

Sphodrotes punctuosus, Kohl.

Sphodrotes punctuosus, Kohl, Ann. naturh. Hofmus. Wien, iv. p. 189 (1889). ♂.

♂. Niger; mandibulis, antennis, articulis tribus apicalibus exceptis, femoribus apice, tibiis tarsisque ferrugineis; tegulis fusco-ferrugineis; alis hyalinis, leviter infuscatis, venis fusco-ferrugineis.

Long. 9 mm.

♂. Coarsely punctured, an obscure longitudinal carina on the scutellum; median segment punctured-rugose, with an

obscure median carina, no spines or tubercles on the sides of the segment; first dorsal segment broad, not strongly narrowed to the base. Third cubital cell nearly half as long again on the radius as on the cubitus.

Hab. Mt. Kosciusko, N.S.W. (Australian Museum); Eaglehawk Neck, Tasmania (*Turner*).

Sphodrotes cygnorum, Turn.

Sphodrotes cygnorum, Turn. Proc. Zool. Soc. London, p. 349 (1910). ♀.

♀. Nigra, pedibus ferrugineis; mandibulis tegulisque fusco-ferrugineis; alis hyalinis, leviter infuscatis, venis fusco-ferrugineis. Long. 10 mm.

♀. Coarsely punctured, more finely on the abdomen than on the thorax; median segment very coarsely rugose, longitudinally striated at the base, abruptly truncate posteriorly, with a blunt tubercle on each side of the truncation near the middle, the sides of the segment striated at the base. Abdomen broad at the base, first ventral segment with a tubercle beneath, second strongly angular at the base and subtuberculate. Third cubital cell very slightly longer on the radius than on the cubitus.

Hab. Claremont, near Perth, W. Australia (*Giles*).

The flagellum is missing in the type. This is nearer to *punctuosus* than to any of the other species, but differs in the shape of the third cubital cell, in the tubercles on the sides of the median segment, and in the angular and subtuberculate base of the second ventral segment. I do not think that these distinctions are merely sexual.

Sphodrotes pilosellus, Turn.

Sphodrotes pilosellus, Turn. Trans. Ent. Soc. London, p. 427 (1910). ♂.

♂. Niger; scapo, flagello subtus, callis humeralibus, tegulis pedibusque brunneo-ferrugineis; abdomine segmento primo toto, segmentisque 2-7 margine apicali fusco-ferrugineis; alis hyalinis, leviter infuscatis; venis fuscis, stigmatibus testaceo. Long. 7 mm.

♂. Clypeus, front, pronotum, mesopleuræ, angles of the median segment, and apical margins of the abdominal segments clothed with short golden pubescence. Second and third joints of the flagellum equal; posterior ocelli as far from each other as from the eyes. Coarsely and closely punctured; median segment coarsely rugose, with a median carina not reaching the apex, a tubercular prominence on

each side of the posterior truncation near the middle. First recurrent nervure interstitial with the first transverse cubital nervure, third cubital cell longer on the radius than on the cubitus.

Hab. Cairns, Queensland (*Dodd*).

Very near *S. marginalis* described in this paper.

Sphodrotes marginalis, sp. n.

♀. Nigra; mandibulis, scapo, flagello dimidio basali, tegulis, segmento abdominali primo nonnunquam infuscato, segmento sexto, femoribus supra, tibiis tarsisque ferrugineis; segmentis dorsalibus 2-5 margine apicali brunneis, aureo-pilosis; alis hyalinis, venis testaceis.

Long. 9 mm.

♀. Clypeus covered with shining golden pubescence, very feebly convex; second joint of the flagellum equal to the third, more than twice as long as the first; posterior ocelli as far from each other as from the eyes. Head and thorax coarsely and closely punctured; scutellum longitudinally rugose-striate; pronotum covered on the upper margin with golden pubescence. Median segment very coarsely reticulate, narrowed and rounded posteriorly; the surface of the steep posterior slope covered with golden pubescence, with a median sulcus and with a small acute spine on each side near the middle. Abdomen more finely and shallowly punctured; second ventral segment rounded at the base, not angular or tuberculate; first segment narrow at the base. Pulvilli long, forked at the apex when extended. Third cubital cell distinctly longer on the radius than on the cubitus, first recurrent nervure received by the second cubital cell at a distance from the base equal to the length of the petiole of the second cubital cell.

Hab. Maryborough, S. Queensland; Brisbane (*Hacker*).

In the Brisbane specimen there is a distinct longitudinal carina on the median segment, which is present, though more indistinct, in the Maryborough specimen.

It is possible that this may be the female of *pilosellus*, but in that species the first recurrent nervure is interstitial with the first transverse cubital nervure, and the cubitus of the hind wing originates nearer to the transverse median nervure. The first abdominal segment is much more strongly narrowed to the base in this species than in *pilosellus*.

Sphodrotes rubricatus, Turn.

Sphodrotes rubricatus, Turn. Trans. Ent. Soc. London, p. 426 (1910).

♀ ♂.

♀. Nigra; mandibulis, tegulis, abdomine pedibusque rufo-ferrugineis; alis hyalinis, leviter infuscatis, venis fuscis, stigmatibus testaceo; antennis ferrugineis, infuscatis.

Long. 8 mm.

♂. Feminæ similis; abdomine apice infuscato.

♀. Coarsely and closely punctured; median segment very coarsely longitudinally rugose-striate, the surface of the posterior truncation coarsely transversely rugose-striate, with a short stout spine on each side near the middle, the sides of the segment obliquely striated. Abdomen broad at the base, second ventral segment rounded at the base, not angular or subtuberculate. Third cubital cell nearly half as long again on the radius as on the cubitus.

♂. As in the female, with a spine on the sides of the median segment as in the female, the abdomen more coarsely punctured.

Hab. Adelaide.

Genus SERICOPHORUS, Sm.

This genus is distinguished from *Sphodrotes* by the appendiculate radial cell, by the pointed, not petiolate, second cubital cell, by the absence of coarse puncturation, by the shorter and more or less clavate antennæ, and by the more conical form of the abdomen, also by the twelve-jointed antennæ of the male. From *Zoyphium* it can only be distinguished by the appendiculate radial cell, and it is very doubtful if the two can be permanently retained as separate genera. The very large pulvillus also distinguishes both of these from *Sphodrotes*.

The genus is confined to Australia.

Type of the genus, *S. chalybæus*, Sm.

In his description of this genus ('Gattungen der Sphingiden,' p. 385) Kohl says "Tubercula humeralia alarum tegulas attingunt." This is a mistake; probably "non" has been accidentally omitted.

Key to the Species of Sericophorus.

♀ ♀.

- | | |
|---|----------------------------|
| 1. Abdomen testaceous red | <i>S. bicolor</i> , Sm. |
| Abdomen otherwise coloured | 2. |
| 2. Scutellum in the middle and first dorsal segment at the base strongly subtuberculate | <i>S. chalybæus</i> , Sm. |
| Scutellum and first dorsal segment without tubercles | 3. |
| 3. Apical joint of the antennæ broadly obliquely truncate at the apex; clypeus with two strong teeth on each side of the median lobe. | <i>S. viridis</i> , Sauss. |

- Apical joint of the antennæ conical; teeth of the clypeus either absent or very small 4.
4. Teeth of the clypeus wholly absent; colour greenish blue *S. claviger*, Kohl.
Teeth of the clypeus very small, abdomen bronze. *S. relucens*, Sm.

♂ ♂.

1. Antennæ thirteen-jointed; median segment with a distinct semicircular basal area; a spine on each side of the median segment near the base; second ventral segment with a strong transverse carina. *S. abnormis*, Turn.
Antennæ twelve-jointed; median segment without a distinct basal area or lateral spines; second ventral segment without a carina. . . . 2.
2. Scutellum and base of first dorsal segment strongly subtuberculate *S. chalybæus*, Sm.
Scutellum and base of first dorsal segment not subtuberculate 3.
3. Club of antennæ very thick, obliquely truncate at the apex; joints 3-6 of the flagellum toothed beneath *S. viridis*, Sauss.
Club of antennæ conical; joints of the flagellum not rounded or toothed beneath *S. relucens*, Sm.

Sericophorus chalybæus, Sm.

Sericophorus chalybæus, Sm. Ann. & Mag. Nat. Hist. (2) vii. p. 32 (1851). ♀.

Tachyrrhostus cyaneus, Sauss. Mem. soc. phys. & hist. nat. Genève, xiv. p. 26 (1854). ♀.

♀. Cyanea; antennarum flagello, femoribus apice, tibiis tarsisque rufo-testaceis; alis hyalinis, venis nigris.

♂. Feminæ similis; femoribus omnino rufo-testaceis.
Long., ♀ 11 mm., ♂ 7 mm.

♀. Clypeus broadly rounded at the apex, with two teeth on each side of the median lobe of the clypeus on the apical margin; penultimate joint of the antennæ very little broader than long, the apical joint a little longer than the breadth at the base, subconical, hollowed on the inner side at the apex. Front with a short longitudinal carina situated about halfway between the anterior ocellus and the base of the clypeus; posterior ocelli nearly twice as far from each other as from the eyes. Mesonotum with four distinct shallow grooves from the anterior margin reaching nearly to the middle of the segment; scutellum strongly convex and subtuberculate in the middle; median segment with a longitudinal sulcus from base to apex, in which lies a low carina. First dorsal segment subtuberculate in the middle at the base. The posterior truncation of the median segment rather irregularly transversely striated. Second cubital cell almost pointed on

the radial nervure, receiving the second recurrent nervure at one-quarter from its apex, the first recurrent nervure received nearly twice as far from the apex of the first cubital cell.

♂. As in the female; the teeth on the clypeus a little smaller; antennæ twelve-jointed, the apical joint obliquely truncate on the outer side; the joints of the flagellum not spinose beneath as in *viridis*; tubercles of the scutellum and first dorsal segment as in the female.

Hab. Australia (*Smith*); Eaglehawk Neck, S.E. Tasmania (*Turner*); Kalamunda, S.W. Australia (*Turner*).

Four females taken in Tasmania and one male in S.W. Australia. This species appears to be scarcer than *S. viridis*.

Sericophorus viridis, Sauss.

Tachyrrhustus viridis, Sauss. Mem. soc. phys. & hist. nat. Genève, xiv. p. 25 (1854). ♀.

Sericophorus viridis, Sauss. Mélang. Hymen. i. p. 69 (1854).

♀. Cyanea; abdomine viridi-æneo, nonnumquam cyaneo; clypeo, antennis, tegulis, segmento abdominali sexto pedibusque rufotestaceis; alis hyalinis, venis nigris.

♂. Feminae similis; femoribus basi nigris, segmentis abdominalibus duobus apicalibus rufotestaceis; clypeo nigro.

Long., ♀ 9-11 mm., ♂ 7 mm.

♀. Clypeus broadly subtruncate at the apex, with two small, but distinct teeth on each side of the median lobe, depressed from near the base and forming a large broad triangle. Antennæ thickened towards the apex, the apical joint very stout, as broad as long and obliquely truncate on the outer side; the eighth, ninth, and tenth joints of the flagellum broader than long. Posterior ocelli less than twice as far from each other as from the eyes. Front convex in the middle, with a very short longitudinal sulcus halfway between the anterior ocellus and the base of the clypeus. Thorax closely and finely punctured, the pronotum very steeply sloped, the mesonotum with two parallel longitudinal grooves reaching from the anterior margin to the middle; scutellum without a tubercle, median segment with a broad deep groove from the base to the apex. First dorsal segment shorter than in *chalybæus*, broad and vertically truncate anteriorly. Second cubital cell almost pointed on the radius, receiving the second recurrent nervure at one-quarter from the apex, the first recurrent nervure received at nearly twice the distance from the apex of the first cubital cell.

♂. Antennæ stouter at the apex than in the female, twelve-jointed, the third to sixth joints of the flagellum each with a small spine or tubercle beneath.

Hab. Woodford, New South Wales (*G. A. Waterhouse*); Perth, West Australia (*Turner*).

This species seems to be commoner than *chalybæus*. There is, however, only one male in the British Museum from Smith's collection, with the locality "Australia."

Sericophorus claviger, Kohl.

Tachyrhostus claviger, Kohl, Ann. natur. Hofmus. Wien, vii. p. 229 (1892). ♀.

Sericophorus claviger, D. T., Cat. Hym. viii. p. 578 (1897).

♀. Viridi-cyanea; mandibulæ ex parte, tibiæ, tarsi et segmentum anale ferruginea.

Long. 7 mm.

♀. Kohl compares this species with *chalybæus*, from which it differs in the absence of teeth on the clypeus, in the conical apical joint of the flagellum, and in the shape of the third to seventh joints of the flagellum, which somewhat resemble those of the male of *viridis*. Kohl does not mention any tubercle on the scutellum or first dorsal segment, so I conclude that they are not present in this species.

Hab. "Australia."

I have not seen this species, but Kohl's figures of the clypeus and antennæ show that it is distinct from *viridis* and *chalybæus*, to the first of which it seems to be most nearly allied.

Sericophorus relucens, Sm.

Sericophorus relucens, Sm. Cat. Hym. B.M. iv. p. 357 (1856). ♀.

? *Zoyphium rufipes*, Rohwer, Proc. U.S. Nat. Mus. xl. p. 585 (1911).

♀. Nigro-ænea, capite thoraceque opacis; segmento mediano abdomineque fulgentibus; pronoto utrinque pallide flavo; mandibulis, antennis subtus tegulisque fusco-ferrugineis; scutello, postscutello pedibusque ferrugineis.

♂. Feminae similis; segmento abdominali primo ferrugineo, segmentis duobus apicalibus rufo-testaceis.

Long., ♀ 7-8 mm., ♂ 5 mm.

♀. Clypeus transverse at the apex, with two very small teeth on each side, not always distinct when the mandibles are closed. Antennæ very short, thickened towards the apex, the third to tenth joints of the flagellum broader than long, the apical joint conical. Front without a distinct sulcus, the posterior ocelli more than twice as far from each other as from the eyes. Pronotum transverse, not depressed below the mesonotum; a transverse foveolate groove at the base of the scutellum; median segment with a very broad

median depression which is fully half as broad as long, and in which lies a strong longitudinal carina, the depression distinctly margined, the posterior truncation of the segment with a strong median carina. First abdominal segment strongly rounded at the basal angles, not truncate. The whole insect finely and closely punctured, and clothed in many places with short sericeous pubescence. Second cubital cell pointed, receiving the second recurrent nervure at about one-third from the apex, first recurrent nervure received at a slightly greater distance from the apex of the first cubital cell.

♂. Antennæ twelve-jointed, the apical joint conical, slightly hollowed on the outer side; tibiæ much less spinose than in the female.

Hab. Cape York (*Turner*); Cairns (*Turner*); Townsville (*Dodd*); Mackay, Q. (*Turner*); Richmond River, N.S.W. (*G. A. Waterhouse*); Killarpanima, S.A. (*H. J. Hillier*); Adelaide (*Smith*, type); Yallingup, S.W. Australia (*Turner*).

The commonest species of the genus. Rohwer's description of *Zoyphium rufipes* answers to this species very well, but he does not mention the bronze colour of the abdomen or the appendiculate radial cell.

Sericophorus bicolor, Sm.

Sericophorus bicolor, Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 405 (1873).

♀.

♀. Atro-cærulea; mandibulis, antennis, abdomine pedibusque rufo-testaceis; alis hyalinis, venis testaceis.

Long. 7 mm.

♀. Clypeus very broadly rounded at the apex, without lateral teeth. Head and thorax very closely and finely punctured, a shallow longitudinal sulcus on the front extending from the anterior ocellus more than halfway to the base of the clypeus; posterior ocelli nearly three times as far from each other as from the eyes. Pronotum almost vertical; the median segment with a broad longitudinal groove, which broadens from the base to the apex. Radial cell with a distinct appendix; second cubital cell pointed on the radius, receiving the second recurrent nervure at about one-fifth from the apex, first recurrent nervure received at the same distance from the apex of the first cubital cell.

Hab. Swan River, Western Australia.

The apical joints of the antennæ are missing in the type, which is unique.

Superficially the resemblance to *Zoyphium erythrosoma*, Turn., is very strong.

The median segment is margined laterally in this species by an enclosed narrow area, strongly striated.

Sericophorus abnormis, sp. n.

♂. Fusco-æneus; mandibulis basi, scapo, flagello articulo primo, tegulis, femoribus apice, tibiis tarsisque flavis; segmentis abdominalibus fascia angusta apicali sordide albida; femoribus supra fusco-ferrugineis.

Long. 6 mm.

♂. Mandibles strongly excised beneath; clypeus subtruncate at the apex, without teeth. Antennæ short, their length not equal to the breadth of the head, thirteen-jointed, the joints broader than long except the conical apical joint. Eyes diverging both towards the vertex and towards the clypeus; posterior ocelli more than twice as far from the eyes as from each other. Head and thorax minutely punctured, and clothed with very short golden pubescence, changing to silver on the front and clypeus. Postscutellum raised into a distinct tubercle in the middle. Median segment with a well-developed tubercle on each side near the base; most of the dorsal surface occupied by a well-defined semicircular basal area, which is longitudinally rugose-striate, divided by a broad but shallow longitudinal groove; abdomen opaque; the second ventral segment with a strongly raised transverse carina near the middle. Hind tibiæ with a row of spines on the outer margin, pulvilli well developed, but not abnormally large as in other species of the genus; a small tubercle on the mesosternum in front of the intermediate coxæ. Radial cell with an appendix; second cubital cell almost pointed on the radius, receiving the second recurrent nervure at one-fifth from the apex, first recurrent nervure received at the same distance from the apex of the first cubital cell.

Hab. Yallingup, S.W. Australia; December.

I took a single male of this curious species, for which a new genus will probably have to be erected when more material is available. The difference in the structure of the antennæ, median segment, second ventral segment, and pulvilli should be sufficient to separate it from *Sericophorus*, though the neuration is the same. The apical joint of the tarsi is not thickened as in both sexes of other species of *Sericophorus* and in some species of *Zoyphium*.

Genus ZOYPHIUM, Kohl.

This genus can only be separated from *Sericophorus* by the absence of an appendix to the radial cell of the fore wing. None of the other characters found in the species are common to all of the genus, and some of the species resemble *Sericophorus* very closely.

Type of the genus, *Z. sericeum*, Kohl.

The apical joint of the tarsi is thickened in most of the species, in both sexes in *Z. erythrosoma*, but not in *Z. rufonigrum* and *Z. doddi*, both of which are only known in the male sex. The spine on each side of the first abdominal segment, mentioned by Kohl in his description of the genus, seems to be a character confined to the type-species.

Key to the Species of Zoyphium.

♀ ♀.

- | | |
|---|-------------------------------|
| 1. Two cubital cells only, the second transverse cubital nervure obsolete; front as high as the middle of the inner orbit of the eye yellow..... | <i>Z. frontale</i> , Turn. |
| Three cubital cells; front black | 2. |
| 2. Abdomen entirely black | 3. |
| Abdomen not entirely black | 5. |
| 3. Clypeus convex, porrect at the apex; pronotum margined with whitish yellow .. | <i>Z. funebre</i> , Turn. |
| Clypeus not porrect at the apex, pronotum wholly black | 4. |
| 4. Antennæ black, clypeus with two small teeth on each side, first recurrent nervure almost interstitial with the first transverse cubital nervure | <i>Z. iridipenne</i> , Turn. |
| Antennæ testaceous brown; clypeus without teeth, first recurrent nervure received at a distance from the apex of the first cubital cell equal to more than half the length of the first transverse cubital nervure..... | <i>Z. kohlii</i> , Turn. |
| 5. First abdominal segment with a tubercle on each side | <i>Z. sericeum</i> , Kohl. |
| First abdominal segment without a tubercle on each side | 6. |
| 6. Thorax blackish blue; abdomen wholly testaceous red | <i>Z. erythrosoma</i> , Turn. |
| Thorax and basal and apical abdominal segments testaceous brown, remainder of abdomen black | <i>Z. dipteroides</i> , Turn. |

♂ ♂.

- | | |
|---|-------------------------------|
| 1. Abdomen wholly rufo-testaceous | <i>Z. erythrosoma</i> , Turn. |
| Abdomen wholly black | 2. |
| 2. Mesonotum and median segment ferruginous red | <i>Z. rufonigrum</i> , Turn. |
| Mesonotum and median segment black | 3. |

3. Hypopygium truncate at the apex, with a
 median spine *Z. doddi*, Turn.
 Hypopygium without a spine. *Z. crassicornis*, Oekl.

Zoyphium dipteroides, Turn.

Sericophorus dipteroides, Turn. Ann. & Mag. Nat. Hist. (7) xix. p. 275
 (1907). ♀.

Zoyphium dipteroides, Turn. Ann. & Mag. Nat. Hist. (8) x. p. 66
 (1912). ♀.

♀. Testaceo-brunnea; mandibulis apice, fronte, vertice, segmentis abdominalibus 2-5 pulvillisque nigris; alis hyalinis, venis ferrugineo-testaceis.

Long. 7 mm.

♀. Clypeus broadly subtruncate at the apex, without lateral teeth; antennæ gradually thickened to the apex, the apical joint conical, longer than broad, the three penultimate joints broader than long. Posterior ocelli nearly twice as far from each other as from the eyes. Pronotum vertical, depressed below the mesonotum; median segment short, with a transverse foveolate groove at the base which joins a longitudinal median groove. Abdomen conical, the basal segment very short and broad, abruptly truncate at the base. Radial cell without an appendix, second cubital cell pointed on the radial nervure, receiving the second recurrent nervure at one-third from the apex, first recurrent nervure received rather nearer to the apex of the first cubital cell. Pulvilli very large.

Hab. Cairns, Q. (*Turner*).

The type is still unique in the British Museum. In the shape of the abdomen the species approaches *Sericophorus viridis*, and is altogether much more robust than any other species of *Zoyphium*.

Zoyphium sericeum, Kohl.

Zoyphium sericeum, Kohl, Verh. zool.-bot. Ges. Wien, xliii, p. 571
 (1893). ♀.

♀. Nigra; mandibulis basi, clypeo, scapo, pronoto linea transversa, callis humeralibus, tibiisque intermediis et posticis supra flavis; flagello articulis basalibus, pronoto, scutello, postscutello, tegulis, pedibusque rufo-ferrugineis; abdomine aurichalceo-sericeo.

Long. 11 mm.

♀. Clypeus with two distinct teeth on each side. Posterior ocelli nearly twice as far from each other as from the eyes; apical joint of the antennæ stout and conical, about twice as long as the penultimate. A tooth on each side of the first abdominal segment near the middle.

Hab. Adelaide.

There is no specimen of this in the British Museum. It is larger than other species of the genus, though not so robust as *Z. dipteroides*. The ferruginous colour spreads more or less on to the median segment and first abdominal segment.

Zoyphium erythrosoma, Turn.

Zoyphium erythrosoma, Turn. Proc. Zool. Soc. London, p. 493 (1908).

♀.

♀. Nigra, cærulescens; mandibulis basi, clypeo, scapo, femoribus apice, tibiis tarsisque flavis; abdomine flagelloque rufo-testaceis, tegulis fuscis; alis hyalinis, venis pallide ferrugineis.

Long., ♀ 8-9 mm., ♂ 7 mm.

♂. Feminæ similis, clypeo nigro.

♀. Clypeus with two minute teeth on each side; antennæ inserted more than half as far again from each other as from the eyes, joints 6-11 broader than long, the apical joint stout and conical. Pronotum depressed below the level of the mesonotum; a deep foveolate transverse groove at the base of the scutellum. Sulcus of the median segment narrow, the carina in it not extending halfway to the apex, a few short oblique striæ at the base of the segment. Second recurrent nervure received just before two-thirds from the base of the second cubital cell, first at about the same distance on the basal side of the first transverse cubital nervure.

♂. Hypopygium pointed, with a spine on each side near the apex.

Hab. Townsville (*Dodd*); Mackay (*Turner*); Brisbane (*Hacker*).

In colour this resembles *Sericophorus bicolor*, though the clypeus in that species is blue-black and the legs the same colour as the abdomen. The first abdominal segment is much more rounded at the base in this species, the sulcus on the median segment much narrower and shallower, and the neuration different. The median segment in *bicolor* is margined at the sides and has a small striated area above the metapleuræ.

Zoyphium funebre, Turn.

Sericophorus funebris, Turn. Ann. & Mag. Nat. Hist. (7) xix. p. 276 (1907). ♀.

Zoyphium funebris, Turn. Ann. & Mag. Nat. Hist. (8) x. p. 60 (1912). ♀.

♀. Nigra: mandibulis, pronoto linea interrupta tegulisque flavis; tibiis, tarsis femoribusque apice brunneo-ferrugineis; alis hyalinis, venis fusco-testaceis.

Long. 6 mm.

♀. Clypeus much elevated in the middle and strongly porrect at the apex. Antennæ short, the joints (except the conical apical joint) broader than long; a very short longitudinal carina above the base of the antennæ. Posterior ocelli twice as far from each other as from the eyes. Median segment with a groove in which lies a carina running from the base to the apex; the pronotum not sunk below the mesonotum as much as in most species of the genus. First abdominal segment rounded at the base. Second cubital cell pointed on the radius, receiving the second recurrent nervure at one-third from the apex, first recurrent nervure received at about the same distance from the apex of the first cubital cell.

Hab. Mackay, Queensland (*Turner*).

There are two distinct longitudinal carinæ on the sides of the median segment in this species, the space between them is punctured, not striated as in the similar space in *Sericophorus bicolor*.

Zoyphium rufonigrum, Turn.

Zoyphium rufonigrum, Turn. Proc. Zool. Soc. London, p. 494 (1908).
♂.

♂. Niger; mandibulis, clypeo, pronoto, mesonoto segmentoque mediano rufo-ferrugineis; scapo, flagello articulo apicali, tibiis tarsisque flavo-testaceis; alis hyalinis, iridescentibus, venis fuscis.

Long. 4 mm.

♂. Clypeus narrowly depressed on the apical margin, without lateral teeth; apical joint of the flagellum conical, longer than broad, joints 6-10 broader than long, the antennæ twelve-jointed. Posterior ocelli about twice as far from each other as from the eyes; front with a very short shallow sulcus. Pronotum not sunk much below the mesonotum, the hind angles rather prominent. Median segment rounded at the apex, with a longitudinal sulcus in which lies a carina. Hypopygium subtruncate at the apex, with a minute spine. Second cubital cell pointed, receiving the second recurrent nervure at about one-third from the apex, first recurrent nervure received at a rather greater distance from the apex of the first cubital cell.

Hab. Port Darwin (*G. Turner*).

Zoyphium iridipenne, sp. n.

♀. Nigra; mandibulis basi pallide flavidulis; tegulis pedibusque ferrugineis; alis hyalinis iridescentibus, venis nigris.

Long. 5 mm.

♀. Head and thorax opaque, very minutely punctured; clypeus broadly truncate at the apex, with two small teeth on each side, subcarinate in the middle at the base; joints of the flagellum gradually increasing in thickness from the second to the twelfth; apical joint conical, as broad as long; ocelli in a broad triangle, the posterior pair twice as far from each other as from the eyes. Basal area of the median segment finely obliquely striated at the sides, with a median longitudinal carina not quite reaching the broadly rounded apex. Abdomen subconical, shining, very minutely punctured, the apical segment very narrowly rounded at the apex and more distinctly punctured. Hind tibiae with five short spines on the outer margin. Second cubital cell very short on the radial nervure, almost triangular, the third cubital cell half as long again on the cubitus as on the radius; first recurrent nervure received close to the apex of the first cubital cell, second at three-quarters from the base of the second cubital cell; radial cell without an appendix.

Hab. Eaglehawk Neck, Tasmania; February.

This is the first record of the genus from Tasmania. Three specimens were taken on *Leptospermum* blossom and one on a sandy road. Doubtless many small species of this genus yet remain to be discovered in Australia.

Zoyphium kohlii, Turn.

Zoyphium kohlii, Turn. Proc. Zool. Soc. London, p. 495 (1908). ♀.

♀. Nigra; mandibulis, antennis, tegulis pedibusque brunneotestaceis; alis hyalinis, iridescentibus, venis fuscis.
Long. 6 mm.

♀. Clypeus with a short tooth on each side. Antennae inserted only a little further from each other than from the eyes, the joints of the flagellum broader than long, except the large conical apical joint. Eyes somewhat convergent towards the vertex, the posterior ocelli very near to the eyes. Pronotum gradually sloped, sunk a little below the mesonotum. Median segment with a very shallow longitudinal sulcus in which lies a carina; first abdominal segment rounded at the base. Second recurrent nervure received at three-fifths from the base of the second cubital cell, first received at about an equal distance from the apex of the first cubital cell.

Hab. Mackay, Queensland (Turner).

Zoyphium doddi, Turn.

Zoyphium doddi, Turn. Ann. & Mag. Nat. Hist. (8) x. p. 59 (1912). ♂.

♂. Niger; clypeo, mandibulis, scapo pedibusque flavis; flagello
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tegulisque testaceis, alis hyalinis, venis testaceis; stigmatibus fusco.

Long. 4 mm.

♂. Clypeus broad, without lateral teeth; antennæ short, all the joints of the flagellum broader than long, except the second and eleventh (apical), the eleventh conical. Posterior ocelli more than twice as far from the eyes as from each other; the front covered with short golden pubescence. Pronotum not much below the mesonotum, gradually sloped. A deep foveolate groove at the base of the scutellum; median segment with a shallow longitudinal sulcus in which lies a carina, the base of the segment indistinctly obliquely striated. Second cubital cell pointed, receiving the second recurrent nervure at one-third from the apex.

Hab. Cairns, Queensland (*Dodd*).

Zoyphium crassicorne, Ckll.

Zoyphium crassicorne, Ckll. Canadian Entom. p. 271 (1914). ♂.

♂. Niger; pedibus aurantiacis; clypeo, mandibulis antennisque pallide ferrugineis; flagello supra infuscato; alis hyalinis, venis fusco-ferrugineis, basi pallidis.

Long. 5 mm.

♂. The antennæ are more strongly clubbed than in any other known species of the genus; the hypopygium is not produced into an apical spine as in the other known males. The apex of the abdomen "presents a broad slightly rounded truncation with obtuse but salient angles."

Hab. Brisbane (*Hacker*).

I have not been able to examine the type of this species closely, but it is quite distinct. Cockerell considers it more nearly allied to *Z. doddi* than to any other.

Zoyphium frontale, Turn.

Zoyphium frontale, Turn. Proc. Zool. Soc. London, p. 496 (1908).

♂ ♀.

♀. Nigra; clypeo, fronte scapoque flavis; flagello, tegulis pedibusque brunneo-testaceis; scutello postscutelloque fusco-ferrugineis; alis hyalinis, iridescentibus, venis fusco-ferrugineis.

Long. 5 mm.

♂. Clypeus very broad, truncate at the apex, without teeth; antennæ inserted twice as far from each other as from the eyes, all the joints of the flagellum, except the thick, conical, apical joint, broader than long. Posterior ocelli more than twice as far from each other as from the eyes. Pronotum sunk much below the level of the mesonotum;

median segment with a sulcus from the base in which lies a carina, delicately obliquely striated at the base. Second transverse cubital nervure missing, the first joining the cubitus about halfway between the two recurrent nervures.

Hab. Mackay, Queensland (*Turner*).

This species may be distinguished by the absence of the second transverse cubital nervure, by the very broad yellow front, and by the distance between the antennæ at the base.

Zoyphium rufipes, Rohw.

Zoyphium rufipes, Rohw. Proc. U.S. Nat. Mus. xl. p. 585 (1911).

I have not seen the type of this species, but the description answers so well to *Sericophorus relucens* that I suspect that the name will have to sink as a synonym.

XLII.—A new Species of *Tabanus* from India.

By GERTRUDE RICARDO.

IN a small collection of Tabanidæ sent me for identification by M. Surcouf from the Paris Museum the following new species, represented by two males and two females, occurred:—

Tabanus trichinopolis, sp. n.

Male (type), female (type), from Trichinopoly (*F. Caius*), 1911; and another male and female from the same locality.

A small species belonging to Group I. with the subcallus not showing. Eyes with cross-bands (see my table in 'Records Indian Museum,' iv. no. vi. p. 114, 1911). Frontal calli consisting of two separate calli. Abdomen reddish yellow, with four well-defined black stripes. Legs and antennæ yellow.

Length 8 mm. (male), 10 mm. (female).

Female.—*Face* covered with whitish tomentum, yellowish above, with white pubescence on the lower half. Beard white. *Palpi* stout, ending in a fine point, pale yellowish, some black pubescence above and white hairs below at base. *Antennæ* pale yellow, only the first joint left. *Forehead* covered with yellowish-grey tomentum, about five times as long as it is wide anteriorly, about a third narrower anteriorly. Frontal callus olive-coloured, almost square, almost reaching the eyes (in the other female it does so completely), the second callus darker in colour, being brown, irregular in

shape, and smaller, far from the margin of eyes; pubescence short and scanty, pale. *Eyes* with two distinct cross-bands. *Thorax* blackish, covered with greyish tomentum, which leaves apparent a double median black stripe and lateral stripes; pubescence on dorsum short but rather thick, consisting chiefly of pale fulvous hairs, those on shoulders darker and long. Scutellum same colouring, with a central blackish spot. *Abdomen* tawny olive, greyer at base, with four well-marked narrow black stripes, continued to apex; the last segment blackish, the first two segments covered with grey tomentum; the pubescence on dorsum short, chiefly black; underside the same, with no black stripes. *Legs* pale yellow, with white pubescence on the coxæ and femora and black on the tibiæ and tarsi. *Wings* clear, with yellow veins and fore border, the others brown.

Male.—Identical with female. *Eyes* with copper-coloured large facets covering two-thirds of their surface, a narrow border of small facets reach the vertex. *Antennæ* yellow, the first joint paler, the third joint with only an angle to denote the tooth.

MISCELLANEOUS.

Some Further Notes on Lamellicorn Beetles of the Subfamily Dynastinæ. By GILBERT J. ARROW.

EXPLANATION OF PLATE XIII.

Fig. 1.	Ædeagus of <i>Eophileurus</i>	<i>celebensis</i> , sp. n.
Fig. 2.	"	" <i>javanus</i> , sp. n.
Fig. 3.	"	" <i>quadrigeminatus</i> , sp. n.
Fig. 4.	"	" <i>pectoralis</i> , sp. n.
Fig. 5.	"	" <i>planatus</i> , Wied.
Fig. 6.	"	" <i>andamanicus</i> , sp. n.
Fig. 7.	"	" <i>siamensis</i> , sp. n.
Fig. 8.	"	" <i>cingalensis</i> , Arrow.
Fig. 9.	"	" <i>chinensis</i> , Fald.
Fig. 10.	"	<i>Dasygnathus inermis</i> , Blackb.
Fig. 11.	"	" <i>impotens</i> , sp. n.
Fig. 12.	"	" <i>hospes</i> , sp. n.
Fig. 13.	"	" <i>globosus</i> , sp. n.
Fig. 14.	"	<i>Cyphonistes sublaevis</i> , sp. n.
Fig. 15.	"	<i>Papuana angusta</i> , sp. n.

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

Melissodes helianthophila, sp. n.

♂.—Length about 10·5 mm., flagellum 8·5 mm.

Black, form of *M. aurigena*; head and thorax with white hair, faintly tinged with yellowish except on mesothorax; disc of scutellum with rather short fuscous hair; eyes light green; clypeus light lemon-yellow, except a black spot on each side, and usual dark lower edge; labrum with about the middle third yellow, the rest black; mandibles with no yellow spot; antennæ very long, flagellum clear fulvous beneath and strongly blackened above; third joint very short; mesothorax and scutellum shining, sparsely punctured; tegulæ piceous, with white hair. Wings hyaline, nervures subfuscous. Legs with white hair, orange ferruginous on inner side of tarsi; small joints of tarsi ferruginous. Abdomen with thin white hair, forming very obscure bands; on apical part of first segment, and disc of second, is an admixture of short fuscous hair, only visible in lateral view; hind margins of segments broadly hyaline (the first narrowly), the junction of the hyaline with the black reddened; subapical spines black.

Hab. Boulder, Colorado, at flowers of *Helianthus lenticularis*, June 16, 1914 (*Cockerell*).

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This looks like *M. aurigenia*, but is readily separated by the colour of the pubescence, dark mandibles, and dusky nervures. From *M. agilis subagilis* it is easily known by the much larger size, dusky nervures, and flagellum dark above. It is very close to *M. lupina*, but that has a spot on mandibles, and lacks the dark hair on scutellum. In my table in *Trans. Amer. Ent. Soc.* xxxii. p. 77, it runs to *M. perplexa*, from which it is readily known by the colours of clypeus and labrum. It could also run close to *M. gilensis*, which differs at once by the broadly black lateral margins of clypeus, the black labrum, and dusky wings.

Melissodes bidentis, sp. n.

♀.—Length 12 mm.

Black, the flagellum dark ferruginous beneath, except basally, wings strongly suffused with brown; head and thorax above with short dense pale ochreous hair, black at sides of vertex; hair of pleura pale ochreous, purplish black along the front and on the lowest part; hair of legs black, but the long scopa of hind tibiæ and basal part of basitarsus very pale reddish ochreous; abdomen black, without pale bands, the sides, venter, and apex with black hair. Very close to *M. cnici*, Rob., collected by Mr. Crawford at the same locality, but at thistle flowers; it differs from *cnici* by the uniformly smaller size; the redder wings, with apex of marginal cell more obtuse; the pale hair of cheeks and absence of black hair on scutellum. The mandibles are black, with at most a faint reddish tinge at extreme apex.

Hab. West Point, Nebraska, 5 ♀, at flowers of *Bidens*, Sept. 19–22, 1903 (*J. C. Crawford*). U.S. National Museum.

Megachile mendica, Cresson.

A male from East Florida in the British Museum, from the F. Smith collection, carries a manuscript name by Smith, who doubtless had the species long before it was published by Cresson. From the same source is also a male *M. petulans*, Cresson, from E. Florida.

Chelynia pavonina, Cockerell.

♀.—Near Jimtown, Colorado, June 8, 1914 (*W. P. Cockerell*). The mesothorax is golden-green, with slight coppery tints, and the scutellum is bluish green.

Protandrena cockerelli, Dunning.

Both sexes at flowers of *Asclepias*, Boulder, Colorado, July 4, 1914 (*E. Bethel*).

Agapostemon splendens, Lepageletier.

A female found dead on the snow, above Camp Albion, Colorado, 12,000 ft., 1914 (*Alfred Wheeler*). This is rather larger than usual, and a much yellower green than the specimens from Louisiana and Nebraska.

Nomia mesillæ, Cockerell.

Boulder, Colorado, a male at flowers of *Ratibida colum-naris*, Aug. 3, 1914 (*Cockerell*). This is the second known specimen.

Osmia permorata, Cockerell.

Jimtown, Colorado, at flowers of *Astragalus*, June 7, 1914 (*Cockerell*).

Osmia conjuncta marilaunidii, subsp. n.

♂.—Head, mesothorax, and scutellum yellowish green; flagellum dull ferruginous beneath; lower part of front with only one tubercle, that obscure. Wings short, brownish; legs with much green colour; hair of face dense and pure white.

Hab. Devils River, Texas, at flowers of *Marilaunidium origanifolium* (H. B. K.), May 6, 1907 (*F. C. Bishopp*). U.S. National Museum.

This is easily known from *O. subfasciata* by the larger size and sharp teeth at sides of sixth abdominal segment. It can hardly be the male of *O. botitena*, as it is more finely and densely punctured than that species.

Hoplitis monardæ, sp. n.

♀.—Length about 10 mm.

Black, the ventral scopa creamy-white; head large, the cheeks very broad and rounded; hair of head and thorax long and white, but not abundant, on lower part of clypeus it is slightly sordid; clypeus with extremely dense minute punctures, and no raised or smooth line; the lower margin

truncate, slightly concave, shining; flagellum short, obscure reddish beneath; vertex and cheeks closely punctured; mesothorax with small punctures, sparse and weak in middle; scutellum broad, not elevated, well punctured; middle of area of mesothorax dull, without lustre; tegulae rufous clouded with piceous. Wings very strongly reddened; b. n. meeting t.-m.; first r. n. joining second s.m. at a distance from its base less than half length of first t.-c., second r. n. ending at a greater distance from end of cell; tarsi with pale reddish hair on inner side; pulvilli very large. Abdomen shining, finely punctured, with white hair-bands on apical margins of segments, largely interrupted in middle; last dorsal segment broadly rounded, with fine pale hair.

Hab. Kerrville, Texas, at flowers of *Monarda citriodora*, May 31, 1906 (*F. C. Pratt*). U.S. National Museum.

Readily known from *H. truncata* (Cress.) by the absence of a raised line on clypeus and the very red wings. The clypeus is more finely punctured than in *H. sambuci*, Titus, and has no shining space above; the wings also differ in colour and venation. *H. mescalerium*, Ckll., is less related than *sambuci*.

On April 12, 1907, Mr. Pratt took *Megachile schismatura*, Ckll., a species new to Texas, at Kerrville.

Prosopis luzonica, sp. n.

♀.—Length about 6 mm.

Black, with very scanty white hair, but the posterior truncation of metathorax pale pruinose from minute hairs; head and thorax rather coarsely punctured; broad elevated region between antennae, and clypeus, longitudinally grooved, the grooves punctured at intervals and microscopically longitudinally fluted or striate between the punctures; eyes converging below; a spot (rather broader than long) at apex of clypeus, and very narrow lateral face-marks (notched or abruptly narrowed at level of top of clypeus, but continuing upward along eyes to level of middle of front), as well as interrupted swollen band on prothorax, margin of tubercles, and spot on tegulae chrome-yellow; flagellum obscurely dark reddish beneath; area of metathorax large, moderately rugose, but without distinct keels. Wings clear, faintly dusky apically, stigma rufo-fuscous, nervures sepia, recurrent nervures meeting transverso-cubitals; second s.m. much broader than high; a stripe on anterior tibiae, small spot at base of middle tibiae, and base of hind tibiae

broadly, rather light yellow. Abdomen shining, very finely punctured, first segment with a little patch of pale hair on each side apically; apex with fuscous hair.

Hab. Mt. Banahao ("Bho." on labels), Philippine Is. (Baker, 2559).

Easily known from *P. tagala*, Ashm. (type examined), by the lateral face-marks, which in *tagala* are cuneiform, truncate above, not prolonged along eyes. From the female of *P. impunctata*, Friese, from Java, it is known by the bright yellow markings and the sculpture of the region between the antennæ. *P. hewitti*, Cam., from Borneo, is an *Allodape*, as Mr. Meade-Waldo has determined from the type, which is in the British Museum.

Anthidium banningense, Cockerell.

Nevada County, California (*Calif. Horticultural Commission*).

Xenoglossa patricia angustior, Cockerell.

Fresno, California, Aug. 19 (*Calif. Hort. Comm.*). From the same locality were also sent *X. angelica*, Ckll. (July 19), and *Melissodes agilis*, Cress. (Aug. 1).

X. angelica is also sent labelled Orange County, California.

Bombomelecta fulvida (Cresson).

Flagstaff Hill, Boulder, Colorado; male at flowers of *Senecio*, Sept. 1914 (Cockerell).

Tetralonia edwardsii (Cresson).

Claremont, California (*Essig*).

Anthophora ignava, Cresson.

Portola, California, March 10, 1913 (*E. J. Newcomer*).

Halictis banabraonis, sp. n.

♀.—Length about 7 mm.

Robust, black, with black and pale hair; head broad; mandibles red at apex; clypeus coarsely irregularly punctured; supra-clypeal area convex, shining, with small punctures; head thinly clothed with short glittering pale hair, but upper two-thirds of clypeus and middle of vertex with

black or dark fuscous hair; front dull and granular, glistening at sides above; apical half or more of flagellum dull ferruginous beneath; mesothorax and scutellum with brownish-black hair; upper border of prothorax, border of tubercles, and postscutellum (except at sides) with dense reddish-ochreous pubescence; pleura and metathorax with thin pale hair; mesothorax and scutellum closely and finely punctured; area of metathorax large, glistening, with crowded, vermiform, longitudinal rugæ, those of the apical middle becoming transverse; posterior truncation of metathorax very sharply defined, its upper lateral angle on each side emitting a ridge which runs forward, enclosing with the edge of the basal area a triangular space which tapers anteriorly; tegulæ piceous, with a rufous spot. Wings dusky, stigma and nervures sepia; outer r. n. and t. c. weakened; second s. m. broad below, receiving first r. n. a short distance before its end. Legs black, with pale reddish hair, that on outer side of hind tibiæ short and black; hind spur with three long spines. Abdomen broad, black, shining, very finely punctured, second and third segments with a basal band of dense ochreous tomentum, usually only visible at the sides, occasionally almost invisible, the abdomen seeming bandless; venter with pale ochreous hair.

Hab. Mt. Barnahao, Luzon, Philippine Is. (*Baker*, 2557, 2558), 4 ♀

Related to *H. philippinensis*, Ashm., but easily separated by the much larger size and darker wings. It is also larger than *H. manila*, Ashm., with none of the greenish tint on the head. The scutellum finely punctured all over readily separates it from *H. luzonicus*, Strand. *H. manila*, Strand (not Ashm.), based on a poorly preserved specimen collected long ago by Eschscholtz, has largely yellow legs, although it is said to be a female.

Halictus flindersi leucurus, subsp. n.

♀.—Hair at apex of abdomen entirely brownish white (instead of dark fuscous); area of metathorax with stronger better-defined longitudinal ridges.

Distinguished from *H. behri* by the dark legs and mandibles; from *H. behri transvolans* by the dark tibiæ and tarsi and angular tubercles.

Hab. Bribie Island, Queensland, Nov. 2, 1913 (*Hacker*; Queensland Museum, 110).

On the same day, on Bribie Island, Mr. Hacker took

H. urbanus, Smith, and *H. helichrysi*, Ckll., the latter not quite typical.

Halictus isthmalis, sp. n.

♂.—Length about 5 mm.

Rather robust, black, with a large broadly rounded red plate at end of abdomen; mandibles dark red except at base; clypeus with a very broad, apical, pale yellow, transverse band, angularly produced in middle above; anterior knees and all the tibiæ and tarsi ferruginous, the middle and hind tibiæ with a suffused dusky cloud; tegulæ piceous, the margins subrufous. Wings hyaline, nervures and stigma reddish sepia; first r. n. meeting second t.-c., or entering basal corner of third s.m.; third s.m. large. Pubescence scanty, but much white hair in region of antennæ; hair of thorax above faintly yellowish; clypeus shining, irregularly punctured; front dull; antennæ long, black, the flagellar joints stout and swollen beneath; mesothorax and scutellum shining, with fine only moderately dense punctures; area of metathorax semilunar, well defined, with radiating ridges; abdomen broad, shining, hind margins of segments not pallid.

Hab. Eaglehawk Neck, S.E. Tasmania, Feb. 12–March 3, 1913, 2 ♂ (*R. E. Turner*; British Museum).

This can hardly be the male of *H. familiaris*, Er., or *H. globosus*, Sm.

The following table separates it from the nearly related males:—

Head very broad; tibiæ and tarsi not red; sculpture of area of metathorax extremely fine. (Adelaide.)	<i>H. cambagei</i> , Ckll.
At least the tarsi red; area of metathorax with evident ridges	1.
1. Larger; ridges absent from apical part of area; tibiæ dark	<i>H. repertus</i> , Ckll.
Smaller; ridges not thus limited; tibiæ red.	<i>H. isthmalis</i> , Ckll.

Halictus isthmalis, var. *a.*

♂.—Smaller, with area of metathorax more finely sculptured; tegulæ with a large red spot; second s.m. very narrow.

Hab. Mt. Wellington, S. Tasmania, Jan. 15–Feb. 6, 1913 (*R. E. Turner*; Brit. Museum).

I had at first separated this as a distinct species, but on closer examination it appears to be an individual variation.

H. isthmalis is readily distinguished from *H. plebeius*, Ckll., by the area of metathorax much more strongly sculptured, and not produced apically.

Halictus doddi, sp. n.

♀.—Length about 8 mm.

Rather slender, black, the first two abdominal segments light ferruginous, with a large transverse black dorsal patch, that on the first brown-black, straight behind and obtusely pointed in front, that on the second straight in front and behind, extending right across the segment, its upper border not far from the base; hair of head and thorax ochreous, on mesothorax thin and fuscous; tubercles and adjacent upper border of prothorax with a dense ochreous fringe; scutellum and postscutellum, except at extreme sides, covered with a dense reddish-ochreous felt-like tomentum, which also extends, somewhat thinner, as a pair of subtriangular patches on hind part of mesothorax; head broad; mandibles dark red apically; clypeus and supraclypeal area shining, sparsely punctured; front dull, except at sides, quite hairy; flagellum dull reddish beneath; mesothorax very finely and densely punctured; area of metathorax very finely irregularly wrinkled, without a sharp boundary; posterior truncation with salient upper corners; tegulæ clear ferruginous, minutely roughened anteriorly. Wings dusky yellowish; stigma and nervures light dull amber-colour, the outer t.-c. and r.n. weakened; second s.m. square, very large (as large as third), receiving first r.n. at extreme end. Legs black, with ochreous hair, a fuscous band on outer side of hind tibiæ and basitarsi; anterior tibiæ with the tegument dull red on inner side, except at apex, and middle tibiæ with a large bright ferruginous patch anteriorly; hind spurs simple. Abdomen long and parallel-sided, with extremely fine punctures; no distinct hair-bands, but vestiges of them at bases of segments; hair at apex fuscous; venter with no curled scopa.

Hab. Kuranda, Queensland (*Dodd*; Queensl. Museum, 121).

By the dorsal patch of dense tomentum this resembles *H. leichardti*, Ckll., from which it is easily known by the colour of the abdomen. It also approaches *Parasphcodes basilautus*, Ckll., and should perhaps be referred to *Parasphcodes*.

Parasphécodes bryotrichus sordidulus, subsp. n.

♀.—Smaller, length about $7\frac{1}{2}$ mm.

Abdomen dusky, the hind margins of the segments especially with dusky suffusion; first r. n. entering apical corner of second s. m.

Hab. Brisbane, Queensland, Aug. 5, 1913 (*Hacker*; Queensl. Museum, 122).

Halictus oxoniellus, sp. n.

♀.—Length about 5 mm.

Of ordinary form, with thin white hair; head and thorax black, except the mesothorax and scutellum, which are a fine dark blue; mandibles and antennæ black; tegulae ferruginous, clouded with picous. Wings dusky hyaline, the stigma large, picous, obtuse apically; nervures dilute sepia, outer r. n. and t.-c. almost wholly obsolete, first r. n. entering second s. m. Legs black, the small joints of middle tarsi reddish; hind femora thin and arched, hind tibiae very robust; hind spur with three large teeth. Abdomen bright ferruginous, the first segment black except a broad apical band, the other segments with black patches on extreme lateral margins; venter with long curled hairs, mesothorax shining in front, dull behind; area of metathorax with very delicate raised lines, evanescent apically; clypeus slightly metallic, with a microscopically tessellate sculpture and sparse punctures; front minutely striate.

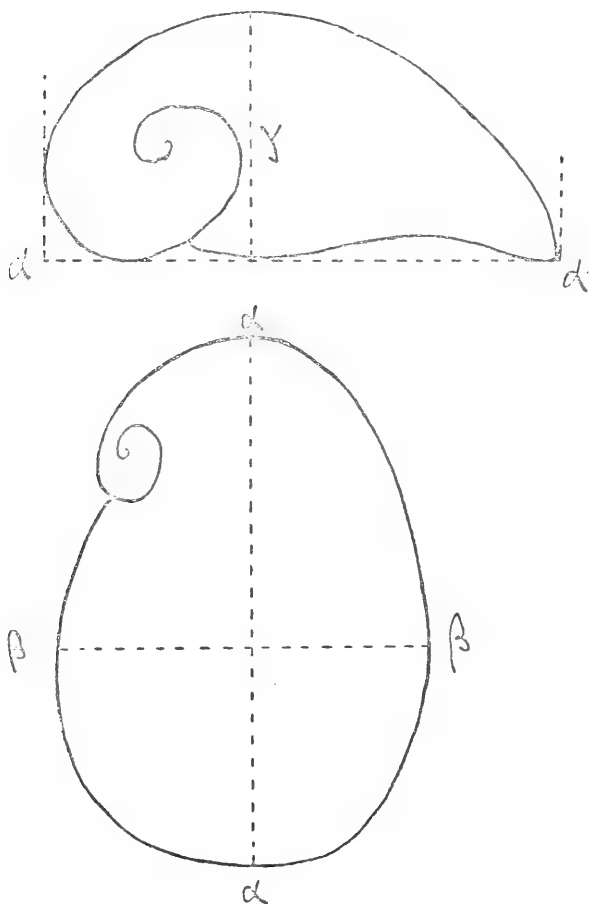
Hab. Bribie Island, Queensland, Nov. 2, 1913 (*Hacker*; Queensl. Museum, 108).

A distinct species, easily known from *H. erythrurus*, Ckll., by the dark stigma and blue mesothorax. The specific name is in allusion to the dark blue colour.

XLIV.—*A Note on the Apparent Absence of Sexual Characters in the Shell of Neritina fluviatilis.* By A. E. BOYCOTT and J. W. JACKSON (Victoria University).

WE give here the result of an enquiry into the possible occurrence of differences between the shells of male and female *Neritina fluviatilis*. Our material has been derived from two sources:—(1) the Preston-Lancaster Canal in the neighbourhood of Barton, Lancashire, collected in June

1914; and (2) the River Wye between Whitechurch and Monmouth, where it forms the boundary between Herefordshire and Gloucestershire, collected in July 1913. The two localities are essentially different in character, the canal being very sluggish, while in the Wye the species is only to



be found in shallow quick-running rapids. Of the Barton series the whole were dissected and examined, in all 288, though naturally in collecting the specimens more attention was paid to large individuals. The same selection was made in the case of those from the Wye, but of these only 93 of

the larger specimens were examined. Of the Barton series 159, or 55 %, were females; of the Wye specimens 42, or 45 %.

(1) *Measurements*.—It is not very easy to select dimensions of *Neritina* which are capable of precise and relatively easy determination, and at the same time comparable with those of shells of more conventional shape*. In an enquiry such as the present the former consideration seems to be the more important, and we have accordingly measured three dimensions of each shell, which are at any rate objective if their nomenclature is open to question. With the shell resting on a flat surface, mouth downwards, we measure (α) length, (β) width, and (γ) height. The two former are parallel to the surface on which the shell rests, the latter at right angles; the essential points are shown in the accompanying sketch. The measurements were made with sliding callipers reading with a vernier to 0.1 mm.

The results of the *Barton series* are summarized in Table I., which shows the mean figures classified in eight groups, according to the length of the shell. All the dimensions are in millimetres.

It appears in the first place that there is no substantial difference in size between males and females. The males range from 4.7 to 11.3 mm. long, the females from 5.2 to 11.6 mm. Of the larger specimens (8 mm. long and upwards) rather more are females than males, but the difference is well within the possible chance discrepancy. In the various size groups (Table II.) the percentage of males varies from 32 to 52; but here again the differences are not significant. The question would be simple if we had some structural criterion of sexual maturity; without this, however, there is no reason for thinking that the two sexes differ in size.

Differences in *shape*, which are shown by measurements of this sort, are more appreciable if the data are expressed in a relative form, as in Table III. The widths and heights are here shown as percentages of the length. It will be seen that the small shells are relatively wider and, to a less extent, higher than the larger specimens, but there is no evidence of any sexual difference.

Magnified camera-lucida drawings of the *opercula* were made in a number of the larger specimens of each sex, but no difference in size or shape could be found.

* In many cases the apex is eroded, and in some of the larger specimens has in this way disappeared, rendering it impossible to take the apex as a fixed point for any dimension.

TABLE I.

Group.	Range of length.	Males.				Females.			
		Number.	Length.	Width.	Height.	Number.	Length.	Width.	Height.
A ...	4-4.9	1	4.7	3.6	2.6	0	...	...	...
B ...	5-5.9	7	5.73	4.34	3.01	15	5.66	4.24	2.93
C ...	6-6.9	55	6.46	4.68	3.34	51	6.41	4.67	3.33
D ...	7-7.9	31	7.42	5.37	3.91	38	7.37	5.29	3.85
E ...	8-8.9	11	8.38	5.83	4.36	22	8.35	5.79	4.30
F ...	9-9.9	14	9.49	6.39	4.87	19	9.53	6.40	4.79
G ...	10-10.9	8	10.45	6.99	5.24	10	10.46	6.87	5.26
H ..	11-11.9	2	11.25	7.35	5.60	4	11.35	7.35	5.56
		129	7.44	5.30	3.84	159	7.61	5.35	3.92

TABLE II.

Group.	Percentage of total males in each group.	Percentage of total females in each group.	Percentage of total specimens in each group which are males.
A	1	...	...
B	5	9	32
C	43	32	52
D	24	24	46
E	8	14	33
F	11	12	42
G	6	6	44
H	2	3	33
Total	100	100	45

TABLE III.

Group.	Males.			Females.		
	Length.	Width.	Height.	Length.	Width.	Height.
B	100	76	53	100	75	52
C	100	72	52	100	73	52
D	100	72	53	100	72	52
E	100	70	52	100	69	51
F	100	67	51	100	67	50
G	100	67	50	100	66	50
H	100	65	50	100	65	49
	100	71	52	100	70	52

The *Wye* series were examined in the same way, and gave the following results:—

TABLE IV.

Group.	Range of length.	Males.				Females.			
		Number.	Length.	Width.	Height.	Number.	Length.	Width.	Height.
B ...	5-5.9	1	5.9	4.4	3.0	...	...	...	...
C ...	6-6.9	7	6.49	4.56	3.24	2	6.55	4.60	3.35
D ...	7-7.9	28	7.48	5.10	3.71	24	7.38	5.05	3.67
E ...	8-8.9	15	8.24	5.54	3.98	15	8.46	5.63	4.09
F ...	9-9.9	...	...	...	...	1	9.3	6.0	4.3
		51	7.54	5.14	3.71	42	7.77	5.26	3.82

The males range in length from 5.9 to 8.7 mm., the females from 6.5 to 9.3 mm. As in the Barton series, there

is some suggestion that the females may be rather larger than the males, but the difference is inconclusive. The length, width, height ratios are given in Table V. These

TABLE V.

Group.	Males.			Females.		
	Length.	Width.	Height.	Length.	Width.	Height.
B	[100	75	51]	...	...	...
C	100	70	50	[100	70	51]
D	100	68	48	100	68	50
E	100	67	48	100	67	48
F .....	...	...	...	[100	65	46]
	100	68	49	100	68	49

show that the Barton shells are relatively wider and higher than the Wye specimens, but they fail to bring out any difference between the male and female shells in the latter series.

(2) There are, of course, many differences in shape and other characters which would not be brought out by the simple measurements which we have made. Careful comparison and inspection has, however, failed to reveal any constant sexual difference in shape, texture, colour, or any other feature. In the Wye series many (54 %) of the females and relatively few (18 %) of the males showed a ragged notch or notches on the upper lip, *i. e.* on the snail's right-hand side as it crawls, and close to the generative orifice. This was, however, quite wanting in the Barton series, so that less stress can be laid upon it. It may, indeed, be artefact; if so, it possibly indicates that in the rapid currents of the Wye the females cling more closely to the stones than the males, and are more liable to damage during collection.

We do not know the reproductive habits of *Neritina* nor how the eggs are laid. There may, indeed, be no reason for supposing that there might be sexual characters in the shell; the male generative organs are roughly about the

same bulk as those of the female, the vas deferens and its coiled-up lower end taking up a good deal of room. Equally roughly, however, the same is true of *Cyclostoma*, in which the females are larger than the males*.

We may, perhaps, add that the examination of some forty radulæ did not suggest that further enquiry would lead to the discovery of any sexual character in that organ.

Summary.—We have not been able to find any sexual characteristic in the shell of *Neritina fluviatilis*.

XIV.—*Brief Descriptions of new Thysanoptera*.—IV. By RICHARD S. BAGNALL, F.L.S., F.E.S. (Hope Department of Zoology, University Museum, Oxford).

Suborder TEREBRANTIA.

Family Æolothripidæ.

Æolothrips gloriosus, sp. n.

♀.—Length about 1·1 mm.

General colour lemon-yellow. Abdominal segments 9 and 10 and tergite 8 entirely black; tergites 5 to 7 each with a blackish-brown bar almost covering the tergite, and signs of brownish markings on the anterior halves of other tergites. Eyes black. Head shaded with light greyish-brown, excepting the vertex and posterior corners, and pronotum with an indistinct marking down mid-line, expanding anteriorly and posteriorly and in centre of disc. Mesonotum and triangular disc of metanotum greyish-brown. Fore-wings lightly tinged with brown at base and with an irregular brown bar across second and fourth fifths; cilia brown. Antennal joints 1, 2, and basal half or thereabouts of 3 light lemon-yellow; rest black, the apical joints somewhat greyish black. Tips of tarsi with brown fleck.

Head rather long, quadrate, and not quite as long as the pronotum; basal joint of maxillary palpus much larger than the two apical joints together; mouth-cone large and long. Antennæ about 2·5 times as long as the head; joint 2 rather long; 3 pedicellate, cylindrical, and narrower than 2, 4, or 5; 4 distinctly angularly produced distally; 5 to 9 closely united, with 5 as long as 6 to 9 together. 3 1·5 times as

* 'Journal of Conchology,' vol. xii. (1909) p. 323.

long as 2, scarcely longer than 4; 5 to 9 together about 1.3 times the length of 6; elongate sense-areas on 3 and 4, the latter running into the produced part. Posterior ocelli almost touching margins of eyes.

Pronotum quadrate, without any long bristles, but with a basal-marginal series of minute black setæ.

Wings reaching to abdominal segment 6, typical of the genus; setæ minute, cross-veins distinct.

Abdomen with minute setæ, excepting the long bristles on 9 and 10, and a moderately conspicuous lateral pair on 8. Sutures of sternites 3-4, 4-5, 5-6, and 6-7 showing a dark transverse line; underside and sides otherwise (excepting apex) yellow.

Hab. Sorgono, Sardinia; 3 ♀s amongst a tube of *Thysanoptera* collected by Dr. A. H. Krausse, and kindly submitted to me by Dr. W. Horn of the German Entomological Museum.

Suborder TUBULIFERA.

Family Hystricothripidæ.

Genus HOLUROTHRIPS, nov.

Head broad, length to a line across anterior margins of eyes only a little longer than broad, but vertex narrowly produced beyond eyes for 0.75 the length of the head to base of produced part. Series of 4 stout knobbed spines at about middle of produced part. Posterior ocelli between eyes near anterior margins, anterior one near apex of produced vertex. Antennæ, excepting basal joint, very long and slender; longer than tube.

Abdomen broad, depressed, much as in *Hystricothrips*, Karny. Tube long and slender, about three times the length of total length of head and two-thirds the length of abdominal segments 1 to 9.

Differs from allied genera by the striking form of head and the extremely long slender antennæ.

Type. *Holurothrips ornatus*, n.

Holurothrips ornatus, sp. n.

Total length 4.6 mm.; length of tube 1.4 mm.

General colour dark blackish-brown; prothorax and distal part of mesothorax, anterior corners and margins of abdominal segment 2, and lateral margins of 3-7 yellowish-red,

the lateral margins of 8 reddish-brown. Tube yellowish, greyish near base and shading to blackish-brown at distal third. Legs yellow, shaded lightly with brown in parts.

Surface of head striate or subreticulate; cheeks each with one seta near middle, and a shorter knobbed one on a small wart just behind eye. Eyes moderately finely faceted; stout knobbed bristle protecting each posterior ocellus. Basal antennal joint stout, brown; 2 smaller, light yellow—both with minute knobbed setæ; 3-8 yellowish, stems shaded with greyish-brown in parts. Relative lengths of joints approximately 5 : 4 : 37 : 21 : 18 : 11 : 7 : 7.

Pronotum strongly transverse, about 0.4 times as long as broad; setæ on warts, knobbed, a stout pair at anterior angles forwardly directed, those on posterior angles not quite so stout and mid-lateral pair smaller.

Pterothorax transverse, broadest near juncture with the abdomen. Legs much as in *Hystricothrips*. Wings slender, nearly reaching to the seventh abdominal segment.

Abdomen broadest near base and thence narrowing to base of tube, segment 8 only 0.35 as broad as 2. Tube very long and slender, sparsely and finely setose. Terminal hairs broken in the specimens at disposal. Lateral abdominal setæ rather short, stout, knobbed, and colourless; one at each posterior angle directed at right angles from the body.

Hab. Matang, Sarawak, at 1000 ft.; two examples in decaying leaves, 2. xii. 1913 (*G. E. Bryant*).

Leeuwenia indicus, sp. n.

Very near *Leeuwenia gladiatrix*, Karny, a little smaller and broader, with a more slender tube, which is about 1.2 times the length of the abdominal segments 1-9 together.

Uniform dark chestnut-brown, surface roughly reticulated. Antennal joint 2 lighter distally and 3-8 yellow, extreme tip brownish.

Antennæ a little longer than head and prothorax together; joints 3-6 clavate, 3 and 4 practically subequal; 5 shorter than 4; 6 shorter than 5; 7 and 8 broadly united, pointed apically and together about as long as 5.

Abdomen broader than in *gladiatrix*, with the dorsal and wing-retaining spines very poorly developed. Tube not so curved as in *gladiatrix* and only sparsely and somewhat minutely setose, with setæ more or less recumbent, the most distal third or fourth being almost destitute.

Separated from *gladiatrix* by its thin and more finely
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setose tube, which in that species is coarsely setose, with both long and short, stout, suberect setæ almost to the apex; also by the dark uniform coloration of the body and the poorly developed wing-retaining and dorsal abdominal spines.

The abdomen (excluding tube) is longer and not so stout in *gladiatrix*, and the tube therefore only about 0.6 the length of the segments 1-9 together. The surface of *indicus* is apparently more strongly reticulated and sculptured than in *gladiatrix*.

Hab. One specimen from the Indian Museum (no. $\frac{4297}{20}$), Moulmein, Lower Burma, 16. xi. 11 (*F. II. Gravelly*).

Family *Idolothripidæ*.

Acanthinothrips annulipes, sp. n.

Length 8 to 9 mm.

Colour black, shining. Antennal joint 3 greyish-yellow, dark at extreme apex, with yellowish patch just before it; stem of 4 greyish-black. Distal half of fore-tibiæ yellow, with black ring just before apex, the intermediate tibiæ similar, but with ring near apex broader and not so sharply defined basally; hind-femora with a yellowish-white ring (in one specimen reddish) at about middle. All tarsi yellowish, dark apically. Wings grey—mid-ribs and cilia dark brown.

Head about 2.7 times as long as broad near base, cheeks slightly narrowed between eyes and base, and furnished with a few slender setæ. Vertex slightly produced beyond eyes. Posterior ocelli on a line drawn through anterior third of eyes, the anterior one near apex of produced part. Antennæ extraordinarily slender (excepting the two basal joints), about 3.7 times the length of the head; relative lengths of joints approximately 7 : 6 : 71 : 42 : 33 : 24 : 11 : 9. Post-ocular bristles close together and set rather far back. Eyes finely faceted.

Pronotum about 0.42 the length of head; setæ weak and colourless.

All femora thickened distally and furnished with several stout and rather long yellow bristles, somewhat as in *Anactinothrips*. Wings reaching to the sixth abdominal segment.

Abdomen long, segments somewhat as in *Actinothrips longicornis*, apical angles of the hindmost segments, at least, each with a short, stout, yellowish-brown spine, and the ninth with an additional pair on each side of the mid-line.

Tube about twice as long as the head, surface coriaceous;

sparsely setose; terminal hairs short, yellowish. Abdominal hairs moderately short, weak, and colourless.

A very distinct species.

Hab. Matang, Sarawak; 1 on dead bark, 1000 ft., 13. xii. 13; 2 on the wing, 2000 ft., 24. xii. 13; 1 Sungei China, Fort of Matang, Sarawak, by beating dead leaves, 14. xii. 13 (*G. E. Bryant*).

Anactinothrips distinguendus, sp. n.

♂.—Length 7.5 mm.

Colour chestnut-brown, tube darker near base and yellowish distally. Antennæ with second joint yellowish distally, 3 with stem yellowish, lightly shaded with brown about middle and apex brown; 4 with stem yellowish, shaded near middle, and 5 lighter basally. Wings greyish-yellow, cilia tinged with brown.

Head twice as long as prothorax and twice as long as broad near base, shaped as in *A. meinerti*, Bagn., but shorter and broader. The pair of dorsal bristles set at about the basal third, only one-half the length of the postocular bristles, weak; antocular pair short, pointed, reaching to beyond the middle of the first antennal joint. Eyes finely faceted, occupying laterally about 0.22 the total length of the head. Ocelli moderately large, equidistant, the posterior pair close to inner margins of eyes and on a line through their middle.

Antennæ almost as in *A. meinerti*, but with the fifth joint about four-fifths the length of the fourth (instead of one-half the length in *A. meinerti*); approximate lengths of joints:—14 : 12 : 84 : 50 : 40 : 22 : 15 : 12. Sense-cones very short and slender, scarcely distinguishable.

Prothorax as in *A. meinerti*, the postero-marginal bristles broken off in the single preparation, but presumably long; pair at anterior angles short and curved, and the mid-lateral pair long and strong, about 0.65 the median length of pronotum. Maxillary palpi with the second joint three times as long as the basal.

Pterothorax 0.4 broader than the prothorax, transverse. Wings and legs much as in *A. meinerti*.

Abdomen evenly narrowing to tube, with each of the segments 3 to 7 slightly and roundly produced into a prominence for the seating of bristles, which latter are evidently (from the few that are preserved) not particularly long or strong.

Tube about 0.8 the length of the head, a little more than

twice the length of the ninth segment, not three times as long as broad at base, and twice as broad at base as at apex.

Hab. BRITISH GUIANA, Bartica; 1 ♂ collected by Mr. G. E. Bodkin, with *Dicaiothrips brevicornis*, Bagn., and *D. levicollis*, Bagn., from the leaves of the mangoe-tree, June 15th, 1913.

The unique example is, unfortunately, imperfect, and has been cleared in caustic potash and mounted in balsam. It is only the second described species of *Anactinothrips*, and is readily separated from *A. meinerti*, Bagn., by the short and relatively broad head and tube, the relative lengths of the antennal joints, and the short dorsal cephalic bristles as compared to the postocular pair. The second joint of the maxillary palpi is only *twice* the length of the basal in *A. meinerti*.

Phoxothrips breviceps, sp. n.

♀.—Length 2·7 mm. Form linear.

Dark chestnut-brown, head and abdomen almost black. Fore-tibiæ and all tarsi yellow. Third antennal joint yellow, shaded brown basally and distally; basal half of 4 and base of 5 yellow. Head only 2·25 times as long as broad at widest, namely at about the posterior fifth, where it is as wide as across eyes. Produced vertex with sides parallel; 0·25 the total length of head. Eyes laterally occupying about 0·23 the total length of head.

Antennæ at least 1·25 times the length of the head; relative lengths of joints:—3 : 5 : 11 : 9 : 7 : 6 : 4 : 4—3 to 5 clavate as in *P. pugilator*.

Prothorax about 0·35 the length of head, and 1·4 times as broad as long; broadest through middle, where it is 1·25 times as broad as the head. A somewhat slender seta at each hind angle.

Pterothorax 1·25 times as wide as the prothorax, longer than broad. Legs somewhat long, especially the hind pair; fore-femora not incrassate (or armed) in the ♀, and tarsus without tooth. Wings reaching to segment 7.

Abdomen not broader than the pterothorax, narrowing from segment 7 to base of tube. Tube about 0·6 the length of head, and twice as broad at base as at apex; terminal hairs not quite as long as the tube. Abdominal hairs slender and colourless, those on ninth segment longer than tube.

Easily separated from *P. pugilator*, Karny, by its much

smaller size, the relatively short head, the longer second antennal joint, &c.

Hab. Simla, W. Himalayas, at 7000 ft., 7. v. 1910. Coll. Dr. N. Annandale. One specimen in the Indian Museum, 4300/20.

XLVI.—A new Genus of Bats allied to *Nyctophilus*.

By OLDFIELD THOMAS.

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ON examining the various bats in the Museum collection assigned to *Nyctophilus*, I find that one of them, from New Guinea, is a new species so different from the other members of the group as to warrant the formation for it of a special genus, which may be called

PHAROTIS, gen. nov. (*Vespertilionidae*).

Nearly allied to *Nyctophilus*, but the skull of different shape and the palate much shortened.

External characters essentially as in *Nyctophilus*, but the ear and nasal membranes more developed.

Nose-leaves larger than in that genus, the anterior one broad, high, its upper margin evenly convex, without median depression or notch; no vertical ridge between the nostrils; posterior projection not a mere thickening of the skin, but a more or less definite leaf, as high as, though narrower than, the anterior leaf; concavities in front of and behind it deep, their deepest part naked and peculiarly wrinkled. Ears very large, thin, leafy, connected across the forehead by a high band. Tragus long, narrowed terminally, the peculiar thickened lobe on the back placed in the middle instead of on the outer edge, and extending outwards nearly to each side.

Skull quite different in shape from that of *Nyctophilus*. Brain-case large, smooth, and rounded, without crests; muzzle very short, nasal notch deep, its posterior end behind the level of the anteorbital foramina. Interorbital region very broad, its edges smoothly rounded. Bullæ of medium size, their length about 3·5 or 3·6 mm. Anterior palatal notch deep, ending level with the hinder edge of the pre-molar; posterior palate shortened, ending not far behind the

molars; the palate is thus shortened at both ends, disproportionately so even to the short muzzle. Within the posterior nares the large foramina leading up into the nasal chamber are quite visible, and only partially covered, instead of being lost far up within the nasal channel.

Teeth in number and structure as in *Nyctophilus*, but, in correlation with the shortened muzzle, much reduced in size.

Type :—

Pharotis imogene, sp. n.

Size about as in *Nyctophilus geoffroyi*. Colour dark brown above and below, but no skins available for description. Ears and membranes uniformly brown. Membranes practically naked throughout.

Other characters as described above.

Dimensions of the type (measured on the spirit-specimen) :—

Forearm 37.5 mm.

Head and body 50; tail 42; hind foot (c. u.) 9.3; ear 25; tragus, length on inner edge 7.3; breadth 4.4; third finger, metacarpus 35, first phalanx 14; lower leg 17.5; calcar 18.

Skull: greatest length 15; basi-sinual length 10.2; zygomatic breadth 9.8; occiput to base of nasal notch 12.2; interorbital breadth 4.2; palato-sinual length 3.7; length of bulla 3.5; front of canine to back of m^3 4.5; m^1 and m^2 on outer edge 2.3.

Hab. Kamali, Lower Kemp Welch River, British New Guinea.

Type. Adult female. B.M. no. 91. 9. 10. 2. Collected November 1890 by Dr. L. Loria, and presented by the Marquis G. Doria.

This bat has so much the look of the ordinary species of *Nyctophilus* that, in days when that genus was considered to consist of only one large-eared species, with an almost unlimited range of variation, it was assigned to *Nyctophilus timoriensis* in my account of the Loria collection. Now, however, an examination of its skull shows it to be very different from any *Nyctophilus*, as may be gathered from the above description. Both its cranial and external characters are quite peculiar to itself, no one of the species of *Nyctophilus* approaching it in any of them.

I may note here with regard to *Nyctophilus* that Tomes's paper on the genus (P. Z. S. 1858, p. 25) presents a far

greater approximation to the truth than does Dobson's treatment of it in the 'Catalogue,' where but a single species is recognized.

As Tomes stated, quite a number of species are distinguishable by the characters of their skulls, although it is not at present possible to define them all completely. The earliest name, *timoriensis*, Geoff., should, I think, be dropped for the present, as it is impossible to identify it with certainty among the Australian species, and it may yet turn up in Timor. Prof. Trouessart tells me the forearm of the type measures 42 mm., a very undistinctive length. For the large species called *timoriensis* by Tomes I should use *major*, Peters, 1861*, of which the type is the British Museum specimen 44. 7. 9. 20. The other W.-Australian species is *geoffroyi*, Leach (syn. *australis*, Pet.), which ranges over a large part of the central area of the continent. In the north and east we have *gouldi*, Tomes, and in the south-east and Tasmania *unicolor*, Tomes. In N. Australia also there is the peculiar little *N. walkeri*, Thos., with quite small ears and bullæ, and in New Guinea *N. microtis*, Thos. Gray's *pacificus* still remains to be identified; it has a skull very like that of *unicolor*, but the forearm is shorter. It will, perhaps, yet turn up in one of the "Islands of the Pacific."

XLVII.—*Descriptions of Three new Fishes from South Cameroon.* By G. A. BOULENGER, F.R.S.

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EXAMPLES of three new species were contained in collections of freshwater fishes recently made by Mr. G. L. Bates in the Ja River, an affluent of the Sanga (Congo Basin), and are here described. The types are preserved in the British Museum.

Myomyrus macrops.

Depth of body $4\frac{2}{3}$ to $5\frac{1}{2}$ times in total length, length of head $4\frac{2}{3}$ to 5 times. Head $1\frac{1}{6}$ to $1\frac{1}{4}$ times as long as deep, with convex upper profile; snout $\frac{1}{4}$ to $\frac{2}{9}$ length of head,

* *Ex* Gray, Voy. Ereb. & Terr. pl. xxi, fig. 2. Plates prepared in 1845, but not published till 1875.

strongly projecting beyond mouth; mouth small, its width $\frac{1}{6}$ to $\frac{1}{5}$ length of head; nostrils below level of eye, equally distant from latter and from end of snout; eye rather large, $\frac{2}{3}$ length of snout or interorbital width. Dorsal 40-42, as long as its distance from the end of the snout. Anal 26-29, originating below 13th or 14th ray of dorsal. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, reaching base of ventral. Caudal scaly, with rounded lobes. Caudal peduncle $2\frac{1}{2}$ to 3 times as long as deep, $\frac{2}{3}$ to $\frac{2}{3}$ length of head. Dark brown, a little lighter beneath.

Total length 250 mm.

Three specimens from the Ja River and one from the Bumba River, a tributary of the Ja.

Very closely allied to *M. macrodon*, Blgr., but distinguished by the larger eye.

Mormyrus jae.

Depth of body equal to length of head, $4\frac{2}{3}$ times in total length. Head a little longer than deep, with strongly curved upper profile; snout short, measuring $\frac{2}{3}$ postorbital part of head; mouth terminal; teeth small, feebly notched, 7 in upper jaw, 10 in lower; eye in anterior half of head, a little shorter than snout, $\frac{3}{4}$ interorbital width. Dorsal 64, originating above base of ventral, its distance from base of caudal $\frac{1}{3}$ its distance from end of snout, its base, $2\frac{1}{2}$ times that of anal. Anal 26, originating much nearer base of caudal than end of snout. Pectoral pointed, $\frac{4}{5}$ length of head. Ventral nearly $\frac{1}{2}$ length of head. Caudal with long pointed lobes, a little shorter than head. Caudal peduncle 3 times as long as deep, $\frac{3}{4}$ length of head. 100 scales in lateral line, $\frac{25}{23}$ in transverse series on body, $\frac{23}{20}$ between dorsal and anal, 16 round caudal peduncle. Olive above, silvery beneath.

Total length 175 mm.

A single specimen from the Ja River.

Most nearly related to *M. macrophthalmus*, Gthr.; principally distinguished by the longer anal and the number of scales round the caudal peduncle.

Barilius batesii.

Depth of body 5 times in total length, length of head 4 times. Head $2\frac{1}{2}$ to $2\frac{2}{3}$ times as long as broad, with feebly curved upper profile; snout pointed, not projecting beyond

mouth, as long as eye, which is $3\frac{2}{3}$ to $3\frac{3}{4}$ times in length of head; interorbital width $3\frac{1}{2}$ times in length of head; mouth extending to below posterior third of eye; no barbels; naked space between præoperculum and suborbitals not quite $\frac{1}{2}$ the width of third suborbital. Gill-rakers few, rudimentary. Dorsal III 7, originating midway between occiput and root of caudal, its posterior third or half above anal; anterior rays longest, $\frac{2}{3}$ length of head. Anal III 15; anterior rays much longer than posterior, about as long as longest dorsals. Pectoral acutely pointed, a little shorter than head, not quite reaching ventral. Caudal forked. Caudal peduncle twice as long as deep. Scales with radiating striæ, 68-70 $\frac{12-12\frac{1}{2}}{7\frac{1}{2}}$, 3 between lateral line and ventral, 20-22 round caudal peduncle. Silvery; caudal fin orange, with the median rays blackish.

Total length 120 mm.

Two specimens from the Ja River.

Allied to *B. kingsleyæ*, Blgr., but distinguished by much smaller scales.

XLVIII.—*Descriptions of Two new Fishes from Northern Rhodesia.* By G. A. BOULENGER, F.R.S.

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THE British Museum is indebted to Mr. F. H. Mallard for a small series of fishes obtained by him in the Solwezi River, a tributary of the Chifulowa River, flowing into the Zambesi near the dividing range between the Zambesi and the Congo. It contains representatives of six species, two of which are here described as new. The known species are *Barbus eutenia*, Blgr., *B. lineomaculatus*, Blgr. (first described from British East Africa, but since obtained at Insiza, Rhodesia, by G. French and in the Belgian Congo at and near Elisabethville by Dr. L. Stappers), *Synodontis macrostigma*, Blgr. (discovered in the N'gami basin), and *Haplochromis moffati*, Casteln.

Barbus barilioides.

Depth of body equal to length of head, $3\frac{2}{3}$ times in total length. Snout rounded, shorter than eye, which is 3 times

in length of head and equals interorbital width; mouth small, terminal; lips feebly developed; two barbels on each side, anterior as long as eye, posterior $1\frac{1}{2}$ diameters of eye. Dorsal III 8, equally distant from centre of eye and from caudal, border straight; last simple ray not enlarged, not serrated, nearly as long as head. Anal III 5, not reaching caudal. Pectoral $\frac{3}{4}$ length of head, not reaching ventral; base of latter below anterior rays of dorsal. Caudal peduncle twice as long as deep. Scales radiately striated, 28-30 $\frac{4\frac{1}{2}}{4\frac{1}{2}}$, 2 between lateral line and ventral. Yellowish brown, darker on the back, with 12 to 16 narrow vertical bars on the sides, as in *B. fasciolatus*, Gthr., the second or third and the last expanding into a spot; belly white; basal half of vertical fins orange; eye red.

Total length 53 mm.

Two specimens.

Closely allied to *B. fasciolatus*, Gthr., from Angola. Distinguished by smaller scales (28-30 $\frac{4\frac{1}{2}}{4\frac{1}{2}}$ instead of 25 $\frac{3\frac{1}{2}}{3\frac{1}{2}}$).

Mastacembelus mellandi.

Depth of body 12 times in total length, length of head $7\frac{1}{2}$ times. Vent equally distant from head and from caudal, its distance from former 3 times its length. Snout 4 times as long as eye; mouth extending to below anterior border of eye; no præorbital or præopercular spines. Dorsal XXXII 70; last spine twice as long as eye; distance between first spine and head $\frac{1}{2}$ length of latter. Anal II 75; first spine short, second as long as last dorsal. Caudal rounded. Pectoral $\frac{1}{3}$ length of head. Scales very small, 15 between origin of soft dorsal and lateral line. Yellowish brown with blackish-brown marblings and a broad, festooned, blackish-brown lateral band in front; a vertebral series of large blackish-brown spots narrowly separated from each other; a pair of yellowish streaks, confluent in front, on each side of the back between the dark bands; caudal region blackish brown, with a network of yellow lines; lower edge of anal yellow.

Total length 310 mm.

A single specimen.

XLIX.—*Notes on the Tabanidæ of the Australian Region.*
By GERTRUDE RICARDO.

TABANINÆ.

TABANUS, Linn.

This paper is based on the material in the Brit. Mus. Coll., on a small collection of flies sent me by Mr. Froggatt for identification, which he kindly allows me to retain and add to the National Collection, on a number of Tabanidæ sent me by Mr. Wainwright for identification, on a few Tabanidæ in Diptera sent me by Mr. French from the Melbourne Museum to work out, and, lastly, on the Tabanidæ belonging to the German Entomological Museum in Berlin sent me some months ago by Herr Schenkling, which I had promised to describe, the results to be published by him in his 'Supplementa Entomologica.' I had already received from him a proof of the MS. on the species of *Tabanus* from the Palæarctic Region in the above-mentioned museum just before the war broke out, which must, of course, be laid aside till the conclusion of peace. Meanwhile, the editors of the 'Annals' have kindly undertaken to publish these notes, in which will be included species from the Celebes eastward, including Tasmania and outlying islands; the species from New Guinea have already been dealt with in my paper in 'Résultats Expedition Sci. Néerlandaise Nouv. Guinée,' ix. (3) 1913. The New Zealand species I propose to describe separately, as they appear to have little affinity with those of the mainland.

Very little work has been done in this family from this region since Macquart and Walker's time (1838-1856). In 1911 Mr. Froggatt mentioned a few species in 'March Flies.' Mr. F. H. Taylor, in Austr. Inst. Trop. Med. 1911, published 1913, described several new species and Miss Summers others in the Ann. & Mag. Nat. Hist. (8) x. (1912). Several of these new species, however, prove to be synonyms of older species (see Mr. Austen on Mr. Taylor's paper in Ann. & Mag. Nat. Hist. (8) xiii. 1914). This is not surprising, as, unless one has access to the types, it is almost impossible to identify species from the descriptions by Macquart, Walker, and Bigot. Having been able to examine the majority of these authors' types in the British and Paris Museums and in the late Mr. Verrall's collection, I am

giving redéscriptions of them, in the hope that they may prove of some service to workers in Australia and enable them to name new species with more certainty; there must be a great number of such species in the newer districts of Australia, such as Northern Queensland.

For the classification of groups see my paper on the *Tabanus* species of the Oriental Region in 'Indian Records,' iv. no. vi. (1911). The original pagination is used for Macquart's Dipt. Exot. Nomenclature of colours is taken in many instances from Ridgway's work on Colour Standards (1912). Where the eyes are not mentioned, they are bare and devoid of pubescence.

Group IV.

Forehead with no callus.

Tabanus nemotuberculatus, ♀, sp. n.

Type (female) in Mr. Froggatt's Coll. from Cape York, Queensland, 30. 2. (1906), and another female from S. Queensland (*Dr. T. L. Bancroft*), 1908, in Brit. Mus. Coll.

This type is not in very good condition, but may easily be recognized by the shading on veins of wings and by the absence of any frontal callus on forehead. Abdomen narrow, obscurely ferruginous. Antennæ and legs the same colour. Palpi short and stout.

Length 10 mm.

Face and *forehead* honey-yellow, the former with some greyish tomentum. *Palpi* a shade darker in colour, almost the same width throughout, ending in an obtuse point. *Antennæ* ferruginous, slender, with a very slight angle or tooth. *Forehead* parallel or almost wider anteriorly, about four times as long as it is broad anteriorly. *Thorax* darker than abdomen, covered with some greyish tomentum. *Scutellum* is identical. *Abdomen* (denuded) dull ferruginous. *Legs* same colour, a little darker on tarsi. *Wings* grey, fore border yellowish brown, and every longitudinal vein shaded brown; short appendix present.

The other female has the wings almost clear. Abdomen covered with greyish tomentum and with short yellowish hairs intermixed with black ones.

Tabanus nemopunctatus, ♀, sp. n.

Type (female) from Dunk Island, Queensland (*Bunfield*), 15. 1. 1902, in Mr. Froggatt's Coll.

A species at once distinguished by the absence of any calli on the forehead, which, together with the abdomen, legs, and palpi, is honey-yellow in colour.

Length 12 mm.

Face honey-yellow, with some greyish tomentum. *Palpi* same colour, long and slender, stouter at base. Beard yellow, very scanty. *Antennæ* ferruginous, the first two joints paler in colour, the third joint with a small angle or tooth. *Forehead* parallel, with golden-yellow pubescence, about five times as long as it is broad. *Thorax* dark, covered with short fulvous pubescence and tomentum of the same colour. *Abdomen* stout, short, honey-yellow, appearing darker at apex, as the pubescence at the sides is black, elsewhere golden-coloured. *Legs* honey-yellow, tarsi blackish, pubescence golden-yellow on femora, elsewhere chiefly black. *Wings* clear yellow on fore border; long appendix present.

Group VII.

Abdomen with one or more stripes, usually continuous.

Tabanus cinerescens, MacLeay, King's Survey Coast Australia, ii. p. 467 (1826); Austen, Ann. & Mag. Nat. Hist. (8) xiii. p. 265 (1914).

Tabanus cinerascens, King, see Kertész, Cat. Dipt. iii. p. 234 (1908); Wied. Auszweifel. Ins. ii. p. 647 (1830).

Tabanus tetralineatus, Taylor, Australian Institute Tropical Medicine Report for 1911, p. 68, pl. xiv. fig. 20 (1913).

In Brit. Mus. Coll. are specimens from New South Wales (*Hunter*); in German Ent. Museum females from Palmerston, N. Australia; in Mr. Wainwright's Coll. females from Port Darwin, S. Australia.

MacLeay's original description was of the vaguest and shortest kind, as follows:—

"Ashy grey, ferruginous, underneath whitish. Wings hyaline, towards the base subluteous. Abdomen with an ashy-grey median stripe and four ashy-grey spots on each side."

Fortunately the species is easily identified, even from the above few words. The following description is based on the fresh specimens:—

A large reddish-brown species, with reddish legs and antennæ and yellow palpi. Abdomen with a faint grey tomentose median stripe and grey tomentose side-spots.

Length 18–19½ mm.

Face covered with yellowish tomentum and with some

fine white hairs. Beard white. *Palpi* pale yellow, stout, ending in an obtuse point with black pubescence. *Antennæ* reddish, darker at apex, the first two joints with black hairs, the third with a distinct tooth situated about halfway up on the upper border of the first division. *Forehead* same colour as face, broad, about four times as long as it is broad, the frontal callus reddish brown, shining, large, nearly square, not reaching the eyes, posteriorly becoming narrow, with a short spindle-shaped extension. *Thorax* reddish brown, with darker stripes, and between these, yellowish-grey tomentose stripes with yellowish-grey pubescence, sides covered with grey tomentum. *Scutellum* lighter, reddish brown, with some yellowish-grey tomentum, and with black pubescence. *Abdomen* reddish brown, with black pubescence; the median narrow stripe composed of bluish-grey tomentum is often indistinct, the spots on each side are discernible on every segment except the first and last, and more distinct, being clothed with white hairs; apex of abdomen usually darker in colour; underside reddish yellow at base, becoming blackish on fore borders of the segments and yellowish on posterior borders, the whole covered with dense, short, whitish pubescence uniformly reddish with white hairs. *Wings* large, tinged yellow; veins brown.

Tabanus transversus, ♂ ♀, Walker, List Dipt. v. p. 256 (1854).

Type (male), type (female), and three other males presented by Col. Bolton.

A small brown species with a grey median stripe and segmentations on abdomen. *Forehead* with a small yellow callus. *Antennæ* and legs yellowish.

Length, ♂ 9, ♀ 10 mm.

♀. *Face* covered with yellowish-grey tomentum, a few pale hairs in centre. Beard pale yellow. *Palpi* very slender, nearly the same width throughout, pale yellow with rather thick black pubescence. *Antennæ* the same colour, blackish at apex, the first two joints with pubescence, the third with a distinct angle. *Forehead* same colour as face, about three times as long as it is broad anteriorly; it is narrowed at the vertex; frontal callus yellowish, small, not reaching eyes and with no lineal extension. *Thorax* cinnamon-brown with darker brown stripes. *Scutellum* same colour. *Abdomen* cinnamon-brown, with some darker irregular blotches of colour, the median stripe very distinct, composed of long cone-shaped spots, beginning from the second segment, covered with greyish tomentum, the segmentations narrowly

greyish, pubescence on dorsum chiefly composed of very short pale hairs; underside yellowish. *Legs* uniformly cinnamon-brown. *Wings* clear, very faintly shaded on cross-veins; stigma and veins yellowish; no appendix.

♂ is similar. Eyes with large facets on the upper two-thirds of their surface. Palpi composed of three joints, the last two almost equal in length, with long black hairs, larger and more slender than is usual in males.

Tabanus reducens, ♀, Walker, Proc. Linn. Soc. iv. p. 103 (1860); Ricardo, Records Indian Museum, iv. no. vi. p. 267 (1911).

Type (female), from Macassar, the other female from Celebes (Wallace Coll., 1857-1858).

A large blackish species, with a median well-marked grey stripe on abdomen, in general appearance not unlike *Tabanus mandarinus*, Schiner, but distinguished by the open first posterior cell of wings.

Length 20-23 mm.

Face covered with ashy-grey tomentum and with long whitish hairs. Beard white. *Palpi* stout at base, ending in a long obtuse point, pale yellowish, covered with grey tomentum and with black pubescence. *Antennæ* tawny at base, the third joint dusky, long, with a small tooth at base. *Forehead* covered with grey tomentum, narrow, about nine times as long as it is broad anteriorly; frontal callus dark chestnut-brown, long and narrow, not reaching the eyes, with a short lineal extension. *Thorax* blackish, with two fairly distinct grey tomentose stripes, hairs on shoulders black, posteriorly at sides white. *Scutellum* the same colour, covered with grey tomentum. *Abdomen* blackish, the grey tomentose median stripe very distinct, composed of elongated spots forming a united stripe; the seventh segment has no spot, traces of side-stripes are very apparent; formed of spots which do not coalesce; underside blackish, reddish at sides, with narrow grey segmentations. *Legs* blackish, the femora covered with grey tomentum; the tibiae tawny; pubescence on femora white, elsewhere black. *Wings* large, clear; veins and stigma yellowish.

Tabanus similis, ♀, Macquart, Dipt. Exot., Suppl. iv. p. 335 (1849).

Type (female) in Verrall Coll., from Tasmania, in poor condition.

A medium-sized yellowish species, with a narrow grey median stripe on a wider darker stripe on the yellowish abdomen. Antennæ, palpi, and legs all yellowish.

Length $12\frac{1}{2}$ mm.

Face covered with ashy-grey tomentum and some long pale hairs. Beard white. Palpi pale yellow, with sparse black pubescence, rather stout, ending in a point. Antennæ reddish yellow, the third joint (which is incomplete) with a distinct tooth, the first two joints paler in colour, with black pubescence. Forehead broad, about four times as long as it is wide anteriorly, almost parallel; frontal callus large, square, not reaching eyes, reddish brown, with a short lineal extension. Thorax dark in colour, with traces of lighter tomentum. Scutellum is similar. Abdomen (faded) warm buff-colour, with a broad median mummy-brown stripe, on which appears a narrow grey tomentose stripe; the apex and sides are also mummy-brown; underside very similar, but no stripes are visible. Legs reddish yellow. Wings clear, stigma yellow; no appendix present.

No fresh specimens of this species occur in any of the collections to which I have had access.

Tabanus rufinotatus, Bigot, Mém. Soc. Zool. de France, v. p. 673 (1892) (*Atylotus*).

Tabanus elesteem, Summers, Ann. & Mag. Nat. Hist. (8) x. p. 224 (1912).

Tabanus designatus, Ricardo, Résultats Expedition Sci. Néerlandaise Nouv. Guinée, ix. (3) p. 390 (1913); id. Tijd. Ent. Iv. p. 349 (1912).

Tabanus lineatus, Taylor, Austr. Inst. Trop. Med. 1911, p. 16 (1913); Austen, Ann. & Mag. Nat. Hist. (8) xiii. p. 265 (1913).

Since the publication of my description of *T. designatus* I have had the opportunity of examining Bigot's type in the late Mr. Verrall's collection, and establishing the identity of my species with it. Females of this species are in the Brit. Mus. Coll. from S. Queensland and S. Australia; in Mr. Froggatt's Coll. from New South Wales; in Mr. Wainwright's Coll. from Kuranda and Townsville, Queensland; in the German Ent. Museum from Herberton (*Dodd*), xii. 1900, 3700 ft.

Mr. Taylor records it from Queensland, Miss Summers from Port Darwin, S. Australia, and the specimens I named as *T. designatus* were collected in Dutch New Guinea. Bigot's type came from Australia.

The species is easily recognized by the presence of three greyish stripes on the reddish-brown abdomen.

Tabanus queenslandii, ♀, sp. n.

Type (a female) in Brit. Mus. Coll. from N.E. Queensland (*C. M. Kelsall*), 1910, 209; and another female from Ching Do, N. Queensland, 36. 1. 1913 (*F. H. Taylor*), 1914.

A blackish-brown species, not in very good preservation, but easily identified by the one well-marked median stripe on abdomen, composed of white tomentum.

Length 17 mm.

Face covered with greyish-yellow tomentum and with some white hairs. Beard white. *Palpi* yellow, very stout, ending in a short point, the pubescence black. *Antennæ*: the first two joints dusky yellow, with thick black pubescence, the third is broken off. *Forehead* rather broad, parallel, about five times as long as it is broad, covered with greyish-yellow tomentum, the frontal callus small, very narrow, pear-shaped, with short lineal extension. *Thorax* and *scutellum* denuded, reddish, with black stripes and some grey tomentum. *Abdomen* blackish brown, with median broad pale stripe; underside blackish, with ashy-grey tomentum on sides. *Legs* reddish, the femora with grey tomentum, the tarsi darker. *Wings* clear, stigma and veins yellowish brown.

This species bears a general resemblance to *Tabanus reducens*, Walker, from Celebes, but is smaller and has a broader forehead; the palpi also are less stout.

The female from Ching Do differs somewhat in the markings of the abdomen, the tomentose spots not being quite continuous; the first spot on the second segment reaches the anterior border, which is not the case with the two following spots; all of them are smaller and more triangular in shape. The third joint of antennæ is black, with a small tooth.

Tabanus strangmannii, ♀, sp. n.

Type (female) and others from Port Darwin, S. Australia (*Dr. Strangmann*), presented by London School of Tropical Medicine; another from Townsville, Queensland (*F. P. Dodd*); another from Port Essington, S. Australia (incorrectly labelled "*Tabanus brevivitta*, Walker"): all in Brit. Mus. Coll.; one female in Mr. Wainwright's Coll. from Rockhampton, Queensland (*Pilcher*). Type (male) from Townsville (*F. P. Dodd*).

A species easily distinguished in the group with stripes on

the abdomen, reddish brown, with a median grey stripe on abdomen, which is blackish on the first two segments. Antennæ and legs yellowish.

Length 16-17 mm., ♀.

Face covered with greyish tomentum, becoming rather yellow in the centre, where some yellow hairs are apparent; checks with white hairs. Beard white. *Palpi* chamois-leather-coloured, stout, ending in an obtuse point, pubescence white or yellowish, short. *Antennæ* reddish yellow, darker at apex, the first two joints the same colour as palpi, with some blackish hairs, the third joint with an obtuse angle at base. *Forehead* parallel, darker in colour than the face, about six times as long as it is broad; frontal callus brownish black, pear-shaped, with a lineal extension; some yellow hairs on forehead. *Thorax* blackish brown, covered with grey tomentum, with two very distinct grey- or white-haired stripes; sides of thorax with the same coloured hairs; elsewhere the pubescence is dark but short, and not noticeable; shoulders reddish, with black hairs, sides and breast grey. *Scutellum* blackish brown, with grey tomentum on each side. *Abdomen* reddish yellow, in some specimens it is darker; the median stripe is black, narrow and ill-defined on the first two segments, afterwards composed of distinct grey tomentose connected spots, forming a stripe to the sixth segment, where it ends in a fine point; sides of abdomen paler, with pale hairs; underside reddish yellow, with pale pubescence. *Legs* reddish yellow, the fore coxæ covered with grey tomentum and with grey hairs, the fore femora brownish black with some white hairs, the other femora with grey tomentum, the fore tibiæ, at apex and the tarsi blackish, the hind tibiæ with yellow hairs, all tarsi a little darker in colour. *Wings* hyaline, tinged faintly brown near stigma; veins brown.

♂. Identical; eyes with the large facets occupying quite two-thirds of their surface, reaching to the middle of the frontal triangle, but posteriorly bordered by a narrow band of the small facets.

Tabanus parvicallus, ♀, sp. n.

Type (female), from Moreton Island, Moreton Bay, near Brisbane, in Brit. Mus. Coll. (*S. Diggles*), and another female in Mr. Froggatt's Coll. from Brisbane (May 1900).

A reddish-brown medium-sized species with a black stripe on the abdomen; antennæ, palpi, and legs yellowish.

Length 18 mm.

Face covered with greyish tomentum and with white hairs. Beard white. *Palpi* yellow, large, stout, ending in a short point, covered with short black pubescence, becoming thicker at the apices. *Antennæ* reddish, the first two joints yellow with black hairs, the third joint wide at its base, with a distinct tooth situated almost halfway up on the upper border, the apical half of joint dusky in colour. *Forehead* covered with yellowish-brown tomentum, slightly narrower anteriorly, about seven times as long as it is broad; the frontal callus small, pear-shaped, with a lineal extension, reddish brown. *Thorax* reddish brown, with indistinct blackish stripes, and with grey tomentum; pubescence chiefly black, short. *Scutellum* dusky, with grey tomentum. *Abdomen* reddish brown, the black median stripe composed of oblong black spots almost continuous, those on the first three segments most distinct, their posterior borders with a few yellow or white hairs; pubescence of dorsum otherwise black, at sides white; underside reddish, with the stripe appearing through. *Legs* reddish yellow, the fore coxæ covered with dense white pubescence and grey tomentum, the others the same but the pubescence less thick; tarsi dark in colour, the hind pair less so; the pubescence on tibiæ white, elsewhere black. *Wings* clear, large, veins yellow.

This species and *T. laticallosus* are distinguished from *Tabanus sordidus*, Walker, List Dipt. v. p. 256 (1854), from New Zealand, by the smaller, narrower, frontal callus and by the narrower forehead.

Tabanus laticallosus, ♀, sp. n.

Type (female) and two other females from Moreton Island, Moreton Bay, near Brisbane (Voyage 'Rattlesnake,' Macgillivray), in Brit. Mus. Coll.; and a male from Stradbroke Island, Queensland, 8. x. 1911 (*H. Hacker*).

A species nearly allied to *T. parviccallosus*, but distinguished by the black antennæ, larger frontal callus, darker legs, brownish wings, and by the less distinct black stripe, which hardly consists of more than a black oblong spot, on the second segment. Beard yellowish. *Palpi* reddish, with black pubescence and grey tomentum. *Forehead* parallel; frontal callus reddish brown, larger than that of *T. parviccallosus*. *Thorax* and *scutellum* darker. *Abdomen* reddish brown, darker at the apex, the posterior borders of segments

with yellow hairs, thickest at the sides and in the middle, not present on the last three segments, which are covered with black hairs; pubescence elsewhere on dorsum also black; underside with the yellow hairs on every segment. *Legs* blackish, the tibiæ on their basal two-thirds reddish yellow. *Wings* tinged with brown, yellowish on fore border, veins brown.

Length 16 mm. A female from Queensland only measures 13 mm.

Tabanus duplonotatus, ♀, sp. n.

Type (female) and a series from S. Queensland, Deception Bay, S. Queensland, and Burnett River District (*T. L. Bancroft*), 1907-1912; and from Brisbane, 1902 (*H. Tryon*).

A medium-sized species allied to *Tabanus innotabilis*, Wlk., but distinguished from it by the more slender palpi, the black femora, and by the markings of abdomen, a black stripe being present with median grey-haired spots superimposed on it.

Length 14-15 mm.

Face covered with yellowish-grey tomentum, with some brownish hairs on centre below antennæ and on borders of cheeks, with white hairs at base of these last. Beard white. *Palpi* slender, almost the same width throughout, apex obtuse, pale yellow, with scattered black hairs. *Antennæ* reddish yellow, the first two joints pale yellow, with black hairs, the third red, black at apex, with a distinct small tooth crowned with some black hairs; subcallus and forehead same colour as face. *Forehead* parallel or slightly narrower at the vertex, about five times as long as it is broad, the frontal callus reddish brown, pear-shaped, with a short extension, not reaching the eyes; pubescence on forehead black. *Thorax* blackish, with some grey tomentum and covered with recumbent yellowish pubescence; sides and shoulders with longer black hairs. *Scutellum* same as thorax. *Abdomen* reddish yellow, with a median blackish stripe; the spots, composed of dirty whitish-coloured hairs, are triangular in shape, apex of abdomen darker, the pubescence on dorsum and on sides black; underside yellowish, darker on apical half, with white pubescence, short but thick. *Legs* blackish, the femora with grey tomentum and chiefly whitish pubescence; the tibiæ pale yellow, darker at apices, with black hairs; the tibiæ reddish at base, becoming darker. *Wings* grey, very faintly tinged with brown at apex, yellow on fore border, veins yellow.

Tabanus pallipennis, Macq., Dipt. Exot., Suppl. i. p. 160 (1844), would probably belong to this group, being described as black, with three grey tomentose stripes on the abdomen. Legs black; tibiæ reddish. Antennæ yellowish.

Length 12 mm.

From New Holland.

The type is probably lost, and I have not seen any specimens identifiable with this species.

L.—*The Devonian Crinoid Cupressocrinus townsendi*
König, sp. By F. A. BATHER, M.A., D.Sc., F.R.S.

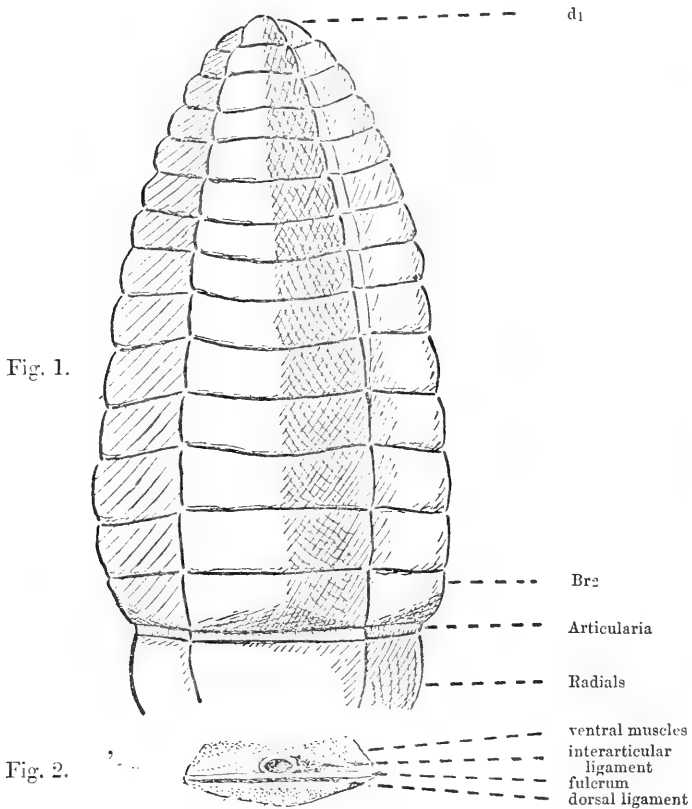
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THIS species was established by Charles D. E. König as No. 97 of his 'Icones Fossilium sectiles' (London, April 1825) under the name *Encrinus townsendi*, upon a "specimen ex Hispania allatum a Rev. Josepho Townsend." The species was said to be "articulis brachiorum angulatis et maximis distinctissima."

The holotype, preserved in the British Museum [E. 5264], consists of the five arms, from the articularia down almost to their extremities, each composed of 13 or possibly 14 brachials. The extreme length of the specimen is 79.6 mm., and its greatest diameter 57.7 mm. The specimen has, however, been crushed, so that its diameter at right angles to the preceding is only about 32 mm., a measurement which cannot be taken precisely because the specimen has been cut vertically in half. The mean of the two measurements is about 45 mm. The width of the articularia is about 23.5 mm., and this gives as the diameter of the cup about 37 mm. (fig. 1).

The brachials are all remarkable for their great relative width; the precise measurements are given later, in comparison with those of *C. elongatus*. There is a slightly rounded dorsal ridge, relatively more elevated in the distal half of the arm than in the proximal; the slope of the sides from this to the abutting margins is outwardly convex in the distal third, becomes gradually straight in the middle third, and tends to become concave in the proximal third. The greatest thickness (dorso-ventral) of the arm is about 14 mm.; the thickness of the proximal brachial is about 7.5 mm. In the thickness the cover-plates are not included.

The dorsal slopes bore coarse anastomosing rugæ, such as are often found in *C. elongatus* when the ornament of that species approaches that of *C. hieroglyphicus*.



Cyressocrinus townsendi.

Fig. 1.—The distal portion of the crown, very slightly reconstructed and restored from the actual holotype, so as to give the true proportions, which in the fossil and in König's accurate drawing of it are obscured by crushing. Nat. size.

Fig. 2.—The proximal joint-face of Br_2 . The precise outline on the ventral side is uncertain. Nat. size.

The abutting margins are broad and smooth.

The suture-lines are essentially straight; but in the arm

from which the measurements of d_2 are taken*, whether in consequence of shifting or by natural growth, the median dorsal region of the suture is more proximal than are its ventral ends, and this gives the suture that angular appearance which was emphasized by König in his figure and description. Any real divergence from the straight line that there may be consists, as in *C. elongatus*, in a dorsal saddle (*i. e.* directed distalwards) with adjacent side lobes; but these appearances are much fainter than in *C. elongatus*.

The colour is black, as in *C. elongatus*, indicating a large proportion of organic matter in the stereom.

The cover-plates have been exposed in a vertical section made through the whole fossil, and appear to have been about $4\frac{1}{2}$ to the brachial, at all events at about Br_5 , which has a length of 6.3 mm.; the diameter of each cover-plate at this level would thus be 1.4 mm. Dark spots in the vertically cut brachials probably represent nerve-canals from the axial canal to the cover-plates.

The articularia are absent from one half of the cut fossil, and have been ground down in the other half, so that they are there represented only by narrow and thin bands of stereom. The proximal articular face of Br_2 is fairly well shown in one arm of the other half (fig. 2). The width at the fulcral ridge is 25.5 mm. Immediately dorsal to this ridge is a long narrow groove (presumably for the dorsal ligament), and this gives the impression that the fulcral ridge itself is grooved. Immediately ventral to the ridge is a wide elliptical canal, 3.8 mm. \times circa 2 mm. This has a raised margin, outside which on each side is a triangular area (possibly for the interarticular ligament), depressed near the canal, but shallowing towards its apex near the outer end of the fulcral ridge. Ventral to this triangular area is another concave area, with a general slope distalwards; its outline appears to have been triangular. This last area lies over the muscle-plates of the "consolidating apparatus," just as these lie over the corresponding area in the radials; therefore the area was probably for the attachment of the ventral muscles.

The nearest allies of *C. townsendi* are without doubt

* See p. 400. Since the distal brachial of a *Cupressocrinus* may be anything from Br_3 to Br_{50} , it is convenient for purposes of comparison to designate it d_1 , and the penultimate d_2 , and so on. See, further, a paper recently sent to the Geological Society of Belgium, if it ever appears.

C. elongatus Goldfuss and *C. hieroglyphicus* Schultze, both from the Middle Devonian of the Eifel. Their remains have the same dark colour. Of these two, *C. elongatus* approaches *C. townsendi* more closely in both the ornament and the proportions of the brachials; indeed, it is only in the latter feature that distinguishing characters can be detected.

Comparison may be made with a well-preserved specimen of *C. elongatus* from Dachsberg, Gerolstein, now in the British Museum [E. 15471]. The arms of this specimen attain a length of 117 mm. and are composed of about 20 brachials, counting the articularia as Br₁. The following are comparative measurements in millimetres:—

	<i>C. elongatus.</i>		<i>C. townsendi.</i>
Width of Br ₁	22.5 to 24.7,	Mean 23.6	26
Height of Br ₂	7.7	7.3	8
Ratio, height: width, Br ₂ .	2.9	3.38, ,, 3.1	3.25
Height of Br ₃	9.4	8.6	9.6
Width ,,	18.8	18.3	24.4
Ratio, height: width, Br ₃ .	2	2.1	2.5
Height of Br ₃	6	6.1	4.8
Width ,,	15.1	15	18.4
Ratio ,,	2.5	2.45	3.8
Height of d ₂	4.3		5
Width ,,	8.2		10
Ratio ,,	1.9		2

It follows from these measurements that the relative width of the brachials is throughout greater in *C. townsendi*, the difference being pronounced in all brachials except those at the proximal and distal ends. Other differences are the greater straightness of the suture-line, the sharper angle of the dorsal ridge, and the projection of Br₂ beyond Br₁ in *C. townsendi*. In *C. elongatus* the arms are constricted in the upper part of Br₂.

The species *Cupressocrinus townsendi* must therefore be maintained, with the following diagnosis:—

A *Cupressocrinus* of dark colour (in the fossil); with ornament of anastomosing rugæ; in which the brachials of the middle tract of the arm may attain a ratio of height: width :: 1:3.8, and have almost straight slopes, meeting in a slightly rounded dorsal ridge.

Locality. König says no more than "Hispania," and there is no other direct evidence. Some inference may, however, be based on the writings of the finder.

Joseph Townsend (1739–1816), F.G.S., Fellow of Clare Hall, Cambridge, where he took his B.A. degree in 1762,

his M.A. in 1765, after studying medicine at Edinburgh, eventually settled down as Rector of Pewsey, Wilts. He travelled in Ireland (1769), in France, Holland, and Flanders (1770), in France and Spain (1786-7), and subsequently in Switzerland. On these journeys he accumulated a fine collection of minerals and fossils (Gents. Mag. 1816, ii. p. 606), and a store of intelligent observations, of which those bearing on geology were utilized in his well-known book 'The Character of Moses established for Veracity' (1812-15), and re-issued as 'Geological and Mineralogical Researches, &c.' (1824). On p. 294 of this work he states: "In the most elevated mountains of the Asturias I noticed extraneous fossils: and met with not a few in Cadiz, Murcia, Alicaut, and Tortosa." Of these districts, Asturias is the one in which Devonian rocks are now recognized. Further details are given in Townsend's remarkably interesting book 'A Journey through Spain,' which ran through three editions (1791, 1792, 1814) and was translated into French (Paris: 1800). From volume i. of this we learn that the author passed through Léon (p. 376), and he mentions various fossiliferous boulders in a torrent near by (p. 379). Limestone charged with fossil shells was observed between Puerto de Somiedo and La Pola de Somiedo (p. 390), and this may have been Devonian. Near the level of the river, two leagues from Pola de Somiedo, the marble is charged with belemnites (p. 392), and, if this be correct, its age is Mesozoic. The earlier pages of volume ii. record the author's journey through Oviedo, Aviles, and Gijon. Near the last place, he writes (p. 50): "At Peran in the limestone rock, I met with a rich variety of extraneous fossils, of corals, corallines, and coralloides, with cockles." In this locality are both Devonian and Carboniferous rocks, as shown in the coast-section published by Prof. C. Barrois (1882, "Recherches sur les Terrains anciens des Asturies, &c.," Mém. Soc. Geol. Nord, vol. ii. pt. 1); the list of fossils there quoted from the Calcaire des Cañons (p. 481) seems to correspond with Townsend's account, but this rock is Lower Carboniferous.

It is, therefore, not possible to identify any particular locality mentioned by Townsend as that from which the *Cupressocrinus* was obtained; but it seems safe to say that it came from the Asturias. Any evidence that would tend to indicate the probable locality more precisely can be furnished only by the discovery of further specimens.

Horizon. There is no reason to doubt that the species,

like all other *Cupressocrini*, is of Devonian age. The resemblance to *C. elongatus* suggests that it is Middle Devonian, though it may well be slightly later than that species. The Devonian of the north-eastern region of Spain, says L. Mallada (1898, Explic. Mapa Geol. España, tomo iii. p. 5), contains the same genera of crinoids as characterize the system in the Rhenish provinces, viz., in the limestones of Ferroñes (Upper Coblentian), Arnao (zone of *Spirifer cultrijugatus*), and Moniello (with *Calceola*, Upper Eifelian). Clearly it must be the last of these, if any, that yielded *Cupressocrinus townsendi*; and one may suppose that the fossil came from a bed closely corresponding to the "Crinoidenschicht" of the Eifel.

Cupressocrinus townsendi appears to be the only definitely described and named species of the genus as yet recorded from Spain. The fact may, however, be recalled that D. & P. Oehlert have described some massive brachials and other remains from the Middle (? Lower) Devonian of Santa Lucia in Léon, which indicate the existence of a distinct species, probably allied to *C. schlotheimi* (1897, Bull. Soc. géol. France, sér. 3, tome xxiv. p. 286).

LI.—*Notes and Synonymy of Hymenoptera in the Collection of the British Museum.* By GEOFFREY MEADE-WALDO, M.A., and CLAUDE MORLEY, F.Z.S.

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DURING the past year the large quantity of Hymenoptera from all parts of the world acquired by the late Peter Cameron has become the property of the British Museum. Among them were some 2000 type-specimens.

Up to the present all the types belonging to the families Apidæ, Eumenidæ, Vespidæ, and Masaridæ have been examined and incorporated in the collection; Mr. Claude Morley has studied a number of the types of Ichneumonidæ in the same way.

A number of these prove to belong to previously known species; notes on their synonymy will be found below.

Notes on a few species from other sources are included.

Family APIDÆ.

- Allodape 5-lineata** (Cam.) (1905) = *Prosopis 5-lineata*, Cam.
Near *A. panurgoides*, Smith, but differing in the white thoracic pubescence. A South-African species.
- Allodape marginata**, Smith (1854) = *Prosopis hewitti*, Cam. (1908).
Cameron's type is from Kuching, Borneo; the species has been recorded from several East-Indian localities.
- Colletes malma** (Cam.) = *Andrena malma*, Cam. } S. Africa (1905).
Colletes matha (Cam.) = *Andrena matha*, Cam. }
- Nomia fervida**, Smith (1875) = *Nomia nursei*, Cam., ♂. Deesa.
- Megachile ornata**, Smith (1853) = *Megachile wallacei*, Cam., ♀.
Sarawak.
- Megachile laticeps**, Smith (1853), ♂ = *M. coccinea*, Cam., ♂. }
from Phil. Isl. = *M. borneana*, Cam., ♂. } Sarawak.
= *M. varidens*, Cam., ♂. }
= *M. gadara*, Cam., ♂. }
- Megachile (Eumegachile) stirostoma** (Cam.) = *M. stirostoma*, Cam.
(1913). Dehra Dun.
- Megachile maritima**, K. (1802) = *M. melanoneura*, Cam. (1909).
Simla.
- Megachile umbripennis**, Smith (1853) = *M. lerma*, Cam. (1908).
- Megachile patellimana**, Spin. (1838) = *M. rugicauda*, Cam. (1908).
- Megachile hera**, Bingh. (1897) = *M. bombayensis*, Cam. (1908).
= *M. erythrostroma*, Cam. (1908).
= *M. kakinka*, Cam.
- Megachile nana**, Bingh. (1907) = *M. gathela*, Cam. (1908), ♀.
Deesa.
- Megachile saphira**, Cam., ♂ (1907) = *M. lefroma*, Cam., ♂ (1907).
Matheran.
- Megachile venusta**, Smith (1853) = *M. leucopsis*, Schletterer (1891).
Through the kindness of Dr. Severin I have been able to examine the types of Schletterer's species from the Congo.
- Megachile adeloptera**, Schletterer (1891) = *M. duponti*, Vachal
(1903).
- Osmia anonyma** (Cam.) = *Megachile? anonyma*, Cam. (1908).
Colonel Nurse had attached an MS. note to the specimen when he submitted it to Cameron to the effect that he did not consider it a *Megachile*.
- Nomioides comberi**, Ckll., ♀ = *Ceratina punjabensis*, Cam. (1907).

- Nomioides divisus* (Cam.) = *Ceratina divisa*, Cam. (1907) } Deesa.
 = *Ceratina spilaspis*, Cam. (1908) }
- Xylocopa flavonigrescens*, Smith (1854) = *Xylocopa malayana*,
 Cam., ♂. Singapore.
- Xylocopa fenestrata*, Fabr. (1798) = *X. bombayensis*, Cam.
- Cœlioxys confusa*, Smith (1875) = *Cœlioxys tenuilineata*, Cam., ♀
 (1913). Simla.
- Cœlioxys afra*, Lep. (1841) = *C. ruficaudis*, Cam., ♀ (1913). Simla.

Tribe DIPLOPTERA.

Family MASARIDÆ.

- Plesiomasaris maculiceps*, Cam. (1904) = *Olynerus simplicipes*,
 Cam. (1905). Mexico.

In a previous paper (Ann. & Mag. Nat. Hist. (8) vi. p. 101, 1910) I pointed out that the *O. simplicipes* described by Cameron could not belong to that genus. I have now compared it with the type of *Plesiomasaris maculiceps*, with which it is identical. In the British Museum there are also three specimens from Guerrero, 3000 feet (Godman-Salvin Coll.).

Family EUMENIDÆ.

- Eumenes canaliculatus*, Oliv. (1773) = *Eumenes lineatifrons*, Cam.
 (1912). British Guiana.
- Eumenes lucasia*, Sauss. (1852) = *Zethus broomi*, Cam. (1904).
 S. Africa.
- Eumenes campaniformis*, F. (1775) (= *urvillei*, Sauss.) = *Eumenes*
tricolor, Cam. Australia.
- I have compared Cameron's type with the Fabrician type in the Banks Collection.
- Labus interstitialis* (Cam.) = *Zethus interstitialis*, Cam. (1902).
 N. India.
- Calligaster cyanopterus*, Sauss. (1852) = *Zethus erythrostomus*, Cam.
 Java.
- Zethus lobulatus*, Sauss. (1856) = *Beoprymna rufo-ornata*, Cam.
 (1912). British Guiana.
- Montezumia pulchella* (Smith) (1857) = *Zethus rufofemoratus*, Cam.
 Borneo.
- Montezumia leprieuri*, Spin. (1841) (= *pelagica*, Sauss.) = *Monte-*
zumia rodwayi, Cam. (1912). British Guiana.

- Rhynchium imitator** (Cam.)=*Synagris imitatrix*, Cam. (1903).
Transvaal.
- Rhynchium leviscutus** (Cam.)=*Odynerus leviscutis*, Cam. (1908).
Bombay.
- Odynerus (Ancistrocerus) leucospilus**, Cam., var. (1907)=*O. (Ancistrocerus) quettaensis*, Cam. (1907).
- Odynerus drescheri**, Cam. (1905). Java=*O. kuchingensis*, Cam. (1905). Borneo.
- Odynerus (Lionotus) megaspilus**, Cam. (1907), ♀=*O. santubongensis*, Cam. (1908), ♀.
Cameron described *O. megaspilus* as an *Ancistrocerus*; *O. santubongensis* is not quite typical, the clypeus having a black spot; in *O. megaspilus* it is wholly yellow.
- Odynerus laboriosus**, Smith (1863). New Guinea=*Odynerus waigoensis*, Cam. (1913). Waigiou.
- Odynerus (Symmorphus) canadensis**, Sauss. (1856)=*Symmorphus cogitans*, Cam. (1906).
- Odynerus monteregalis**, M.-Waldo, nom. nov.=*Odynerus (Ancistrocerus) canudaensis*, Cam. (nec Sauss.). Montreal.
- Odynerus acapulcensis** (Cam.)=*Nortonia acapulcensis*, Cam. Mexico.
- Odynerus basimacula** (Cam.)=*Nortonia ? basimacula*, Cam. (1908). Texas.
- Odynerus erectus**, Cress. (1872), var.=*Odynerus birkmani*, Cam.
This specimen, described by Cameron from Texas, differs from typical *O. erectus* in having the terminal segments of the abdomen with apical yellow fasciæ.
- Paralastor apicatus**, Smith (1858). Aru=*Odynerus lorentzi*, Cam. (1911). Dutch New Guinea (Lorentz Exped.).
Dr. R. C. L. Perkins writes on this species (P. Z. S. 1914, p. 584).

Family VESPIDÆ.

- Ischnogaster fulvipennis**, Guérin (1830)=*Ischnogaster canaliculatus*, Cam. (1911).
Described from Dutch New Guinea (Lorentz Exped.).
- Ischnogaster iridipennis**, Smith (1858)=*Ischnogaster malayaensis*, Cam. (1906). Dutch New Guinea.
Described from Etna Bay (1903).
- Icaria conservator**, Smith (1860)=*Icaria waigeuensis*, Cam. (1913).
Waigiou.

Icaria nigra, Smith (1858), var. *catharinæ* (Cam.) = *Ancistrocerus catharinæ*, Cam. (1913).

All the species published with the specific name "*catharinæ*" in Cameron's paper on the Waigiou Hymenoptera (Bijdr. Dierk. viii. pp. 76-86, 1913) bear labels with the specific name "*beau-forti*" on the type-specimens. The var. *catharinæ* differs from the type in having the following yellow facial markings:—a bilobed mark between antennæ at base, a mark on lower orbits on each side, and two apical marks on clypeus. There is a specimen in the British Museum from Aru (Coll. W. W. Froggatt) which agrees with the type in the Amsterdam Museum.

Icaria confraternus (Cam.) = *Olynerus confraternus*, Cam. (1911).
Dutch New Guinea (Lorentz Exped.).

Mischocyttarus labiatus, Fab., ♂ (1804) = *Megacanthopus violaceipennis*, Cam. (1911). British Guiana.

Mischocyttarus labiatus, Fab., var. *drewseni*, Sauss. (1857) = *Megacanthopus atriceps*, Cam., and *Megacanthopus rotundicollis*, Cam.

Both described from British Guiana in 1911.

Mischocyttarus longipetiolatus (Cam.) = *Megacanthopus longipetiolatus*, Cam. (1911). British Guiana.

Nectarina lecheguana, Latr. (1824) = *Nectarina arizonensis*, Cam.
Arizona.

Protonectarina sylveiræ (Sauss.) (1853) = *Charterginus rotundilineatus*, Cam. Brazil.

A discoloured specimen, the yellow turned red by cyanide.

Chartergus chartarius, Oliv., ♂ (1791) = *Chartergus tuberculatus*, Cam., ♂ (1907). Brazil.

Parachartergus vespiceps, Sauss., var. *testaceus*, Ducke = *Xanthocaba nigrolineata*, Cam. Brazil.

Icaria speciosa, Sauss. (1855) = *Icaria rufinoda*, Cam. Singapore.

Polistes tepidus, Fab. (1775) = *Polistes malayanus*, Cam. (1906).
N. Guinea.

Polybia (Parapolybia) *orientalis*, Sauss. (1853) = *Icaria wroughtoni*,
Cam. Poona.

— (—) —, var. = *Icaria annulipes*, Cam. Dehra Dun.

— (—) —, var. = *Icaria fuscipennis*, Cam. (1900). Khasia.

This is a variable species, and Cameron has been misled by colour-differences.

Polybia occidentalis, Oliv., var. *brunneiceps* (Cam.) = *Polybia brunneiceps*, Cam. (1911). Brit. Guiana.

- Polybia rejecta**, Fab. (1798) (= *bicolor*, Sm.) = *Polybia belizensis*, Cam. (1911). Brit. Guiana.
- Megacanthopus injucundus** (Sauss.) = *Polybia bimarginata*, Cam. (1911). Brit. Guiana.
- Megacanthopus basimacula** (Cam.) = *Polybia basimacula*, Cam. (1907). British Honduras.
- Family ICHNEUMONIDÆ. By CLAUDE MORLEY, F.Z.S., F.E.S.
- Ichneumon sollicitorius**, Fab. (1775) = *Ichneumon consanguineus*, Smith (1876), New Zealand; and *Amblyteles zealandica*, Cam. (1901), New Zealand.
- Ichneumon huttoni**, Kirby (1881) = *Dejithina buchanani*, Cam. (1901). New Zealand.
- Ichneumon maculipleuralis**, Cam. (1886) = *Antelca rufa*, Cam., ? MS. Centr. Amer.
- Ichneumon placidus**, Smith (1876), nec Prov. (1875) = *Ichneumon richardi*, Cam. (1901). New Zealand.
- Ichneumon conspiratus**, Smith (1876) = *Ichneumon frederici*, Cam. (1901). New Zealand.
- Exeristes nigroscutis**, Cam. (1907) = *Charitopimpla nigroscutis*, Cam. (1907). India.
- Exeristes flavoscutis**, Cam. (1907) = *Charitopimpla flavoscutis*, Cam. (1907). India.
- Pristomerus marginicollis**, Cam. (1907) = *Pristomeridia marginicollis*, Cam. (1907). India.
- Echthromorpha notulatorix**, Fab. (1804) = *Echthromorpha læva*, Cam. (1903). India.
- Epiurus latisulcatus**, Cam. (1908) = *Pimpla latisulcata*, Cam. (1908). India.
- Epiurus sikkimensis**, Cam. (1908) = *Pimpla sikkimensis*, Cam. (1908). India.
- Cryptus sororius**, Cress. (1872) = *Campsocryptus brevicornis*, Cam. (1905). N. America.
- Cryptus maculiscutis**, Cam. (? MS.) = *Distantella maculiscutis*, Cam. (? MS.).
- Cryptus pallidilineatus**, Cam. (? MS.) = *Distantella pallidilineata*, Cam. (? MS.).
- Hemiteles areator**, Panz. (1801) = *Otacustes nigroornatus*, Cam. (1908). North America.

- Cœlichneumon sponsatorius*, Fab. (1804) = *Stenichneumon watertoni*, Cam. (1911), British Guiana; and *Ichneumon argenti-pilosis*, Cam. (1886), Mexico.
- Amblyteles montanus*, Cam., ♀, ? MS. = *Trogus montanus*, Cam., ? MS.
- Theronia penetrans*, Smith (1858) = *Theronia papuana*, Cam. (1911). New Guinea.
- Theronia zebra*, Voll. (1879) = *Theronia maskeliyer*, Cam. (1905). India.
- Neotheronia chiriquensis*, Cam. (1886) = *Neotheronia erythrea*, Cam. (1911). British Guiana.
- Neotheronia alternans*, Brullé (1846) = *Neotheronia claripennis*, Cam. (1911). British Guiana.
- Lampronota punctata*, Cress. (1870) = *Lampronota aciculata*, Cam. (1905). North America.
- Epimecis fuscipennis*, Cress. (1865) = *Epimeces fuscipennis*, Cam. (1911). British Guiana.
- Epimecis wilti*, Cress. (1870) = *Epimecis tibialis*, Cam. (1886). Mexico.
- Orona petiolaris*, Cam. (1905). N. America = "A Stilpnid genus closely allied to *Phrubus monilicornis*, Bridg." (cf. Morley, 'Ichneumonologia Britannica,' iv. p. 268, 1911).
- Hemipimpla pulcherrima*, Cress. (1886) = *Odontopimpla armatipes*, Cam. (1911). Central America, British Guiana.
- Hemipimpla vipioides*, Brullé (1846) = *Cosmiopimpla ferruginea*, Cam. (1905). S. Africa.
- Pimpla ichneumoniformis*, Cress. (1873) = *Ichneumon chiriquensis*, Cam. (1884). Central America.
- Pimpla flavipes* (Cam.) (1905) = *Lissotheronia flavipes*, Cam. (1905), India; and *Pimpla ampla*, Morley (1913).
- Glyphicnemis rufipes*, Cam., ? MS. = *Bachia rufipes*, Cam., ? MS. N. America.
- Syzeuctus xanthostomus* (Cam.), ? MS. = *Lissonota xanthostoma*, Cam., ? MS.
- Syzeuctus maculatorius*, Fab. (1787) = *Lissonota athiopica*, Cam. (1906). S. Africa.
- Syzeuctus xanthorius* (Cam.) (1904) = *Lissonota xanthoria*, Cam. India.

- Nototrachys californicus**, Cress. (1878) = *Nototrachus spilocephalus*, Cam., ? MS. N. America.
- Nototrachys variistriatus**, Morl., nom. nov. (1912) = *N. reticulatus*, Cam. (nec Cress.), 1905. Ceylon.
- Diocetes maculipes** (Cam.) (1905) = *Enytus maculipes*, Cam. (1905). N. America.
- Dicælotus testaceicornis**, Cam. (1908) = *Bathymetis testaceicornis*, Cam. (1908). N. America.
This species is extremely near *D. cameroni*, Bridg.
- Dicælotus cariniscutis**, Cam. (1906) = *Leptodermas cariniscutis*, Cam. (1906). S. Africa.
- ? **Nonus atratus**, Cress. (1886) = *Nonnus biannulatus*, Cam. (1911). British Guiana.
This genus is closely related to *Nematopodius*, Grav.
- Phæogenes erythrostomus**, Cam. (1908) = *Stilboscopus erythrostomus*, Cam. (1908). N. America.
- Henicospilus purgatus**, Say (1836) = *Enicospilus maculiceps*, Cam. (1911). British Guiana.
Two alar corneous marks are distinct.
- Henicospilus concolor**, Cress. (1869) = *Enicospilus guyanensis*, Cam. (1911). British Guiana.
- Allocamptus renovatus**, Morl. (1912) = *Ophion latilineatus*, Cam. (1911). British Guiana.
- Stauropodectonus maculipennis**, Cam. (1886) = *Enicospilus parvumaculatus*, Cam. (1911). British Guiana.
- Thyreodon cyaneus**, Brullé (1846) = *Thyreodon nigrocæruleus*, Cam. (1911). British Guiana.
- Thalessa? instigator**, Smith = *Certonotus rufipes*, Cam. (1911). New Guinea.
- Epirhyssa lorentzi**, Cam. = *Certonotus lorentzi*, Cam. (1911). New Guinea.
Closely allied to *E. japonica*, Cam.
- Epirhyssa? flavopicta**, Smith (1864), var. = *Epirhyssa albolineata*, Cam. (1911). Malaysia.
- Certonotus seminiger**, Krieg. (1901) = *Certonotus labialis*, Cam. (1907). New Guinea.
- Phytodiætoides spinipes**, Cam. (1905) = *Rhorus spinipes*, Cam. (1905), and *P. negæra*, Morl. (1913). India.
- Paniscus grumi**, Kok. (1906) = *Paniscus melanarius*, Cam., ? MS.
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- Polyclistus mansuetor**, Grav. (1829) = *Eochochus fuscipilosus*, Cam., ? MS., and *Plesioeochochus rufipes*, Cam., ? MS. S. Africa.
- Itopectis rufa**, Cam. (1906) = *Delaulax rufa*, Cam. (1912). S. Africa.
- Near *I. sponsa*, Hal. (1836).
- Mesostenoideus albomaculatus** (Cam.) (1902, nec Cress. 1864) = *Fenienias albomaculatus*, Cam. India.
- Goryphus**, Holmgr. (1868) = *Melcha*, Cam. (1902).
- Osprhynchotus gigas**, Kriech. (1894) = *Osprhynchotus ruficeps*, Cam. (1906). S. Africa.
- Idiolispa**, Först. (1868) = *Phaedro phadnus*, Cam. (1906). India, Europe.

LII.—*Four new Small Mammals from Venezuela.*

By OLDFIELD THOMAS.

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Saccopteryx pumila, sp. n.

Near *S. canescens*, Thos., but the molars larger.

External characters as in *canescens*, though the colour is rather darker so as to be intermediate between the greyish brown of *canescens* and the dark brown of *leptura*.

Size of skull as in *S. canescens*, therefore conspicuously smaller and more delicate than in *S. leptura*. Interorbital and intertemporal region narrow. Anteorbital inflation more marked than in either *canescens* or *leptura*, though less than in *Peropteryx*. Postero-lateral edges of palate directly transverse, not slanted backwards towards the middle as in *S. leptura*. Mesopterygoid fossa narrow. Basisphenoid pit without narial septum. Foramina between the outer corners of the pit and the glenoid surfaces quite small, as in *S. canescens*, much larger in *S. leptura* and *gymnura*.

Molars conspicuously larger than in *S. canescens* and *gymnura*, nearly equalling those of *S. leptura*.

Dimensions of the type :—

Forearm 37·5 mm.

Skull : greatest length 13·7 ; condylo-basal length to front of canine 11·3 ; zygomatic breadth 7·7 ; interorbital breadth 2·7 ; intertemporal breadth 2 ; breadth of brain-case 6·2 ;

palato-sinual length 3·8; front of canine to back of m^3 4·7; combined length of m^1 and m^2 on outer edge 2·4.

Hab. Altigracia, Lower Orinoco, Venezuela.

Type. Adult male. B.M. no. 98.5.8.4. Original number 9662. Collected 12th January, 1898, by Mr. G. K. Cherrie.

Specimens of this species from the Orinoco and Cayenne had hitherto been referred to *S. canescens*, but the arrival of a skull of the same form from near Lake Valencia, Carabobo, collected by Mr. S. M. Klages, has drawn my attention to its very much larger molars, on which account it should apparently be separated specifically. The type of *S. canescens* has also a well-marked basisphenoid septum, none being present in any of the four examples of *S. pumila*.

Vampyrops oratus, sp. n.

Near *V. dorsalis* and *umbratus* but smaller and the lower molars broader.

External characters about as in *V. dorsalis*, except that the colour is more smoky and the facial lines are distinctly marked, pale brownish white, the dorsal line well-defined, white.

Skull rather smaller than that of *dorsalis*, the palate shorter and the posterior palatal tube not continued quite so far back.

Incisors proportionally rather small, though much larger than in *V. zarhinus* and *recifinus*, the enamel-covered part of i^1 1·4 × 0·6 mm. Upper cheek-teeth about as in *dorsalis*, the posterior premolar with secondary cusps on the hinder edge of the main cusp. The anterior molars distinguished from those of all other members of the genus by the unusual development of their inner ledges, which project inwards considerably beyond the level of the cusps, and make the middle breadth of each tooth considerably greater than the posterior breadth, these two breadths being approximately equal in other species.

Dimensions of the type (the italicised measurements taken in the flesh):—

Forearm 47 mm.

Head and body 72; *ear* 15; *third finger, metacarpus* 43; *first phalanx* 17·5, *second phalanx* 24; *lower leg and hind foot (c. u.)* 30.

Skull: greatest length 26·3, basal length 21·4; zygomatic breadth 15; interorbital breadth 6·7; mastoid breadth

12·7; palatal length 13; front of canine to back of m^3 10; combined length of m^1 and m^2 4·6.

Hab. Galifari, Sierra del Avila, N. Venezuela. Alt. 6500'.

Type. Adult male. B.M. no. 14. 7. 27. 1. Original number 2. Collected 13th December, 1913, by Mr. S. M. Klages. Presented by the Hon. N. C. Rothschild.

This species is rather smaller than *V. dorsalis* and *V. umbratus*, Lyon, and differs from both by the development of the inner ledges to its lower molars. Mr. Glover Allen has been good enough to examine the type of *V. umbratus* for me, and he informs me that it has no such special development of the molar ledges as is present in *V. oratus*. The other species with normal-sized incisors and white dorsal line are either materially larger or smaller.

Sigmomys venester, sp. n.

Like *S. alstoni*, but smaller.

Fur rather softer than in *alstoni*, hairs of back about 11 mm. in length, the longer piles 15–16. General colour above coarsely grizzled black and buffy, quite as in *alstoni*. Sides of nose, eye-rings, and tufts at base of ear clear buffy. Undersurface grey, washed with whitish, more buffy on chest, and probably more completely buffy washed in older specimens; hairs of chin and throat white to base. Hands and feet buffy whitish. Tail dark brown above, buffy whitish below.

Skull apparently only differing from that of *S. alstoni* in its smaller size; the bullæ, however, seem to be proportionally smaller, being distinctly smaller than in the Guianian *S. savannarum*. Molars much smaller than in *S. alstoni*, about as in *savannarum*.

Dimensions of the type, somewhat immature (measured in flesh):—

Head and body 115 mm.; tail 80; hind foot 25; ear 18.

Skull: greatest length 29; condylo-incisive length 26·5; zygomatic breadth 17; nasals 10·3; interorbital breadth 4·7; palatilar length 12·2; palatal foramina 6·4; upper molar series 5, breadth of m^1 1·9.

Hab. El Trompillo, near Lake Valencia, N. Venezuela. Alt. 1300'.

Type. Immature female. B.M. no. 14. 9. 1. 63. Original number 63. Collected 5th May, 1914, by Mr. S. M. Klages. Presented by the Hon. N. C. Rothschild.

The species of *Sigmomys* are all practically alike in colour and proportions. In their skulls *S. alstoni* of Cumana differs

by its decidedly larger size, and especially its larger molars, from *S. savannarum* of the mountains of British Guiana. The present species is as small as the Guianan form, with which its molars approximately agree, but it has much smaller bullæ. Geographically it should have nothing to do with the latter.

The fact that the type is immature does not affect the size of the teeth, which have been my chief guide in distinguishing the species, but it should be noticed by other workers, who might be deceived by the general measurements above given. On the other hand the original type of *S. alstoni* is old and its molars are very much worn and crushed together, the series being therefore below normal length; the tooth-row measures about 6 mm. when in prime.

It may be here noted that Burmeister's *Lasiomys hirsutus*, from Maracaibo, is clearly a *Sigmodon*, as is shown by the figure of its skull given by Giebel. The incisors are described without mention of a groove, so that it cannot be a *Sigmomys*.

Sylvilagus valenciæ, sp. n.

Near *S. cumanicus*, but more rufescent.

Size as in *cumanicus*, therefore decidedly larger than in *orinoci*. General colour very much as in *orinoci*, not so grey as in *cumanicus*, in which the flanks especially are very markedly greyer than the dorsal colour. Under surface strongly contrasted and sharply defined pure white, the hairs white to their bases; the incursion of buffy in the groin reduced to a minimum. Head colour and markings as in *orinoci*, more intense than in *cumanicus*, the white superciliary line, blackish area between eye and ear, and deep rusty nape the same in all three. Limbs as in *orinoci*, except that the hind feet are more conspicuously white. Tail over an inch in length, therefore longer than the mere stump of the allied species, but these rudimentary tails are easily stretched out, and there may be little real difference in this respect; in colour it is smoky greyish washed with rusty above, buffy whitish below.

Skull very much as in *cumanicus*, conspicuously larger than in *orinoci*. Bullæ somewhat larger than in the former.

Dimensions of the type (measured in the flesh):—

Head and body 412 mm.; tail 27; hind foot 90; ear 62.

Skull: greatest length 80; condylo-incisive length 72.5;

zygomatic breadth 37·5 ; nasals, diagonal length 37 ; inter-orbital breadth 18·5 ; upper tooth-series (alveoli) 15·2.

Hab. Near Lake Valencia, Carabobo, N. Venezuela. Type from El Trompillo, S.E. of the Lake. Alt. 1300'.

Type. Adult male. B.M. no. 14. 9, 1. 84. Original number 80. Collected 15th May, 1914, by Mr. S. M. Klages. Presented by the Hon. N. C. Rothschild.

This hare is evidently that referred to by Mr. Osgood* as *S. cumanicus* in reference to a specimen from Maracay, on the northern side of Lake Valencia. He gave exactly its distinguishing characters, as compared with *cumanicus*, *orinoci*, and allies, but did not consider he had enough material to describe it as new.

Now, however, the confirmation afforded by Mr. Klages' specimen makes me think it should have a special name. Its chief characteristic is its uniformly buffy colour as distinguished from the more greyish tone, and especially the conspicuous grey flanks of the Cumana hare, while its greater size readily separates it from that of the Orinoco.

LIII.—On *Octopetalum*, a new Genus of Avian Cestodes.
By H. A. BAYLIS, B.A.

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[Plates XVII. & XVIII.]

THE material upon which this account is based was found among some parasitic worms collected in Nyasaland by Dr. J. E. S. Old. They were sent by him to the Imperial Bureau of Entomology, who kindly handed them to me for determination, and allowed me to keep them for the British Museum.

One of the tubes contained Cestodes taken from the intestines of a guinea-fowl, which, as the Bureau kindly undertook to discover for me, was without doubt an example of *Guttera edouardi*, Hartl. These cestodes were of two species, some of them proving to be specimens of *Davainea pintneri*, Klapotcz, which was already known to occur in another guinea-fowl, *Numida ptilorhyncha*. It is now, however, recorded for the first time, I believe, in *guttera*. Among these there were also found three whole specimens

* Field Mus. Publ. No. 149, Zool. Series, x. p. 28 (1910).

and some fragments of another form, which could be clearly distinguished by its external appearance, even in a hasty examination. Under a low power of the microscope it was seen to have a very peculiar head, which at first sight suggests the genus *Tetrabothrius*. I have not felt justified, however, in placing it in that genus, on anatomical grounds, and have been in so much doubt about its systematic position that I have felt obliged to create a new genus for it, and propose to name it

Octopetalum gutteræ, n. g., sp. n.

EXTERNAL FEATURES.

The length of an entire specimen (in spirit) is about 9 cm., and it contains, roughly, 150 proglottides.

The maximum width is 2 mm.

The scolex is very interesting and peculiar; it presents an arrangement of lappets overhanging the suckers, which is strongly suggestive of affinity with *Tetrabothrius*. These lappets, of which there is one for each sucker, are somewhat epaulette-shaped, and have their free edges turned outwards at about the level of the hinder border of the suckers. The suckers are completely hidden by the lappets, but can be made out beneath them when the head is cleared with clove-oil or creosote. Up the middle line of each lappet there runs a very marked cleft, so that it is nearly divided into two separate halves. Thus the head, when viewed from the apex, looks much like a flower with eight petals, the small apical papilla forming the centre.

There is no rostellum, unless it be represented in a rudimentary condition by the apical papilla. There are no hooks.

The suckers are somewhat oval, measuring 0.32 mm. in an antero-posterior direction, and 0.25 mm. transversely (outside measurements). It is difficult to understand how the suckers can be used for attachment to the host, unless the overhanging lappets are capable of being turned aside so as to allow them free action. From spirit-specimens it is, of course, impossible to say whether this occurs.

The width of the neck is 0.55 mm. in a specimen mounted in balsam. It is very short, segmentation beginning almost immediately behind the suckers. The segments at the anterior end are very short (about 0.02 mm.), increasing steadily in length towards the posterior end. The greatest

width occurs rather behind the middle of the strobila. The last four or five segments are from two to three times as long as broad, the last being the longest and narrowest. In one specimen the last segment measured 1 mm. broad and 3.5 mm. long.

The hinder border of each segment overlaps the following segment considerably. The genital apertures are irregularly alternate. They are situated at about the middle of the lateral border in young and sexually mature segments, but the aperture becomes shifted relatively backwards to about the posterior third of a gravid segment, owing to its elongation in front to make room for the paruterine organ, which will be described below.

INTERNAL ANATOMY.

Musculature.—Between the subcuticular layer of the body-wall and the central or medullary portion of the body there is a very considerable thickness of longitudinal muscle-bundles, of which the outer rows are the smallest, and the innermost rows the thickest and strongest. Internal to these there is a layer of fine transverse fibres, which surround the medullary parenchyme, in which the genital organs are embedded, and extend round, and slightly beyond, the large excretory canal and nerve on either side of the body.

Nervous System.—A pair of large lateral nerve-cords is present as usual; they are situated close against the excretory canals, lateral of them, and slightly to the (supposed) dorsal side.

Excretory System.—Only one pair of longitudinal excretory canals can be found, and these are of a very remarkable size, having a diameter nearly equal to the depth of the medullary region. They are connected at the hinder border of each proglottis by a transverse vessel. As this connection exists between the ventral of the two pairs of vessels in the majority of Cestodes, and as, in the other cases where only one pair occurs, it is held to be the dorsal pair that has become reduced to the point of disappearance, it seems legitimate to assume that in the present case the single pair of large canals represents the *ventral* pair (or possibly the dorsal and ventral pairs, which have coalesced). This enables us to fix upon an orientation of the animal which will serve for purposes of description. Assuming that the genital ducts pass to the *dorsal* side of the ventral excretory canals, as is usually the case, we may call that side dorsal, and in that sense the word will be used throughout the description.

Genital Organs.—There is a single set of both male and female organs in each mature segment.

The testes number 60 or more. They are rounded and have a diameter of about 0.05 mm. They lie closely together throughout the medullary parenchyma, occupying practically the whole of the space in all directions which is not taken up by the ducts and female organs.

The vas deferens is a wide, very closely coiled tube, running out from near the centre of the segment, over the longitudinal excretory canal, to enter an elongated cirrus-sac, which finally opens into the genital atrium. It is a curious fact that just before entering the cirrus-sac the vas deferens narrows suddenly to one-tenth of its previous diameter (0.0025 mm., as compared with 0.025 mm.).

The cirrus-sac is small and somewhat elongated. It is broadest at its inner end (which measures 0.042 mm. across), and tapers gradually towards its external opening. The sac lies just lateral to the longitudinal excretory vessel.

The ovary is a compact organ, more or less oval, but with a somewhat irregular outline. It lies towards the hinder part of the segment, in the ventral region, and is surrounded in almost all directions by portions of the uterus.

The vagina opens into the genital atrium immediately behind the cirrus-sac, in the same horizontal plane. From its opening it runs inwards with a slight backward inclination at first, then quickly bends so as to run parallel with the cirrus-sac. On passing internally to the excretory vessel it begins to widen out gradually, and forms a little bulbous expansion, after which it again becomes a very narrow duct, and almost at once runs into an oval receptaculum seminis at about the level of the innermost coils of the vas deferens. Between this point and the ovary there is a considerably coiled oviduct. The vagina is lined thickly, from near its external opening until it begins to widen, with stout cilia, of which a peculiar feature is that they appear to be deeply stained by hæmatoxylin. They all have their free ends pointed outwards, towards the external opening of the duct.

The uterus is a large saccular organ lying in the ventral and posterior portions of the segment, and extending round and between the other organs wherever it can find room. It seems at first to be subdivided into a number of more or less separate lobes or compartments, containing more or fewer eggs. It is also almost completely divided into two portions by the vas deferens, which presses it down on to the ventral side, so that only a narrow uterine space (just wide enough

to contain a single layer of eggs) is left below, connecting the two wider parts.

In the older proglottides, as the testes and other organs disappear, the uterus, which now appears to be a single large sac, takes up a larger proportion of the space, so that eventually it occupies the whole of the posterior half, being bounded laterally and posteriorly by the excretory vessels.

Meanwhile the anterior part of the segment has become elongated, and a remarkable change has taken place in it. A "paruterine organ" is developed, extending from the anterior border of the uterus nearly to the anterior limit of the segment. It is of a fibrous structure, and seems to be in direct communication with the uterus behind; but, curiously enough, no eggs were observed to have passed into it in any of the specimens, although this usually happens in forms in which such an organ is present. The uterus, in the most advanced segments, was quite full of large ova containing onchospheres, but the paruterine organ was invariably empty. This may, perhaps, be accounted for by supposing that the still older segments, in which the migration of the eggs had occurred, had dropped off.

The eggs contained in the uterus in the oldest segments are invested with three transparent membranous envelopes. The outer envelope is thin, and measures from 87.5μ to 100μ in diameter. The middle envelope is thicker (2.5μ) and has a diameter of 50μ . The innermost is a very thin membrane closely surrounding the embryo, which is an onchosphere, bearing hooks from 17.5μ to 20μ long.

NOTE ON THE SYSTEMATIC POSITION OF THE GENUS.

In its external appearance, and particularly in the possession of "auricular appendages" of the suckers, this form closely resembles *Tetrabothrius*. The following features, however, show considerable divergence:—

Tetrabothrius.

1. Genital pores unilateral (all on right side).
2. Yolk-gland ventral and in front of ovary.
3. Cirrus-sac separated from genital atrium by narrow muscular passage ("male cloacal canal," Fuhrmann).
4. Vagina ventral to cirrus-sac, in same vertical plane.
5. No paruterine organ.
- [6. Two pairs of longitudinal excretory canals.]

Octopetalum.

1. Genital pores irregularly alternating.
2. Yolk-gland dorsal to ovary and in posterior part of segment.
3. Cirrus-sac communicating directly with genital atrium. No muscular passage.
4. Vagina posterior to cirrus-sac, in same horizontal plane.
5. A paruterine organ present.
- [6. One pair of longitudinal excretory canals.]

It seems impossible, in face of so many characters which are usually taken to be of systematic value, actually to assign this species to *Tetrabothrius*. But no other genus among the Cyclophyllidea possesses "auricular appendages," and this seems to be a feature which may well indicate close affinity between the genera.

On the other hand, in the possession of a paruterine organ *Octopetalum* approaches more nearly to the Idiogeninæ among the Davaineidæ, or to the Paruterininæ among the Hymenolepididæ. Of the former it is worthy of remark that *Idiogenes* resembles it in having only one recognizable pair of excretory canals*. But in this subfamily there is an armed rostellum, and nothing in the shape of auricular appendages. The same objections apply to the Paruterininæ, except that a few genera (*Rhabdometra*, *Anonchotenia*, *Metroliasthes*) are destitute of a rostellum.

The absence of one pair of excretory vessels appears to be a feature of sporadic occurrence among the Cestodes, and cannot, perhaps, legitimately be taken as of systematic importance.

It is clear that the auricular appendages, just as much as the paruterine organ, or even both, may have been acquired quite independently of any close phylogenetic relationship, and it is only as a provisional measure that I propose to base the systematic position of the species on the former, and not on the latter.

GENERIC DIAGNOSIS.

OCTOPETALUM, gen. nov.

[Tetrabothriidæ?.] *Scolex unarmed, without rostellum, but with a slight conical papilla at the apex. Suckers completely covered by overhanging epaulette-shaped appendages of their anterior borders, each of these appendages having a marked median cleft extending for some distance from its free edge. Neck very short. Segments anteriorly much broader than long. The posterior segments about three times as long as broad, the last being the largest and narrowest. A single pair of lateral excretory vessels present throughout the strobila, connected in each segment by a transverse vessel. A single set of reproductive organs in each segment. Genital pores irregularly alternate. Vagina opens behind cirrus-sac, in the same horizontal plane. A paruterine organ developed in*

* Zschokke, "Recherches sur la Structure . . . des Cestodes," Mém. Inst. Nat. Genevois, tom. xvii. (1889) p. 118.

front of the uterus in gravid segments. Yolk-gland dorsal to ovary. Eggs with three transparent envelopes.

Species: *Octopetalum gutteræ*, sp. n. With the characters of the genus.

Host: *Guttera edouardi*, Hartl.

Locality. Port Herald Hills, Nyasaland.

Type-specimens in the British Museum (Natural History).

EXPLANATION OF THE PLATES.

PLATE XVII.

Fig. 1. Head of *Octopetalum gutteræ*, seen as an opaque object.

Fig. 2. Horizontal section of a sexually mature segment. *C.S.*, cirrus-sac; *Ex.*, excretory vessels; *L.M.*, longitudinal muscles; *Ov.*, ovary; *Ovd.*, oviduct; *Te.*, testes; *Ut.*, portions of uterus; *Vag.*, vagina; *V.D.*, vas deferens.

Fig. 3. Transverse section of a sexually mature segment. *Ex.*, excretory canals; *L.M.*, longitudinal muscles; *N.*, nerves; *Ov.*, ovary; *Te.*, testes; *Ut.*, portions of uterus; *Vit.*, vitelline gland.

PLATE XVIII.

Fig. 4. Horizontal section through distal end of cirrus-sac and vagina. *C.*, cirrus; *C.S.*, cirrus-sac; *G.A.*, genital atrium; *Vag.*, vagina.

Fig. 5. Horizontal section (somewhat oblique) through the genital ducts. *B.*, expanded bulb of vagina; *Ex.*, excretory vessel; *R.S.*, receptaculum seminis; *Vag.*, vagina; *V.D.*, vas deferens.

Fig. 6. View of an entire gravid segment, seen by transparency. *B.*, bulb of vagina; *Ex.*, excretory vessels; *G.A.*, genital atrium; *Par.*, paruterine organ; *Ut.*, uterus; *Vag.*, vagina; *V.D.*, vas deferens.

LIV.—Notes on the Forficularia.—XXIII. *More new Species.*
By MALCOLM BURR, D.Sc., F.E.S., &c.

Diplatys nana, sp. n.

Statura minore; fulvo-brunnea; frons tumida; pronotum sublongius quam latius, postice subangustatum; abdomen fere parallelum, segmentum ultimum haud inflatum, penultimum truncatum; forcipis brachia ♂ ♀ contigua, brevia, recta.

	♂.	♀.
Long. corporis	5-6 mm.	5.5-6.5 mm.
„ forcipis	1 „	.75 „

Small; grey and brown, varied with yellowish; antennæ yellow, 9-10 segments, which seem disproportionately long

and thick ; head brownish black, the frons tumid, sutures faint, postocular keels weak ; pronotum posteriorly a little longer than broad, slightly narrowed posteriorly, almost parallel-sided ; elytra ample, brown, with an indistinct yellow discoidal spot ; wings yellowish brown ; legs yellow ; abdomen nearly parallel-sided, brown ; last dorsal segment not inflated, smooth, slightly more narrowed in ♀ than in the ♂ ; penultimate ventral segment of ♂ nearly parallel-sided, truncate, with rounded corners, the latter protruding slightly ; forceps with branches ♂ ♀ contiguous, short, straight, and simple.

MADAGASCAR : It d'Ambre, 8 ♂, 4 ♀ (c. m.).

These specimens were also in the collection of M. Gadeau de Kerville. The species may be recognized by the small size and form of the ninth sternite of the male ; the two sexes are very much alike.

Diplatys hova, sp. n.

Fulva, capito nigro ; frons tumida ; pronotum longius quam latius, fere parallelum ; abdomen parallelum ; segmentum penultimum ventrale angulis acute valde productis ; forcipis bracchia contigua.

	♂.
Long. corporis	8.5 mm.
„ forcipis	1 „

Size medium or small ; head black, frons very tumid, occiput depressed, the keels very distinct ; antennæ yellow, the basal segment unusually long ; pronotum decidedly longer than broad, almost parallel-sided, very slightly narrowed posteriorly ; elytra and wings ample, orange, shaded with dark brown ; legs yellow ; abdomen orange, shaded darker, parallel-sided ; last dorsal segment not inflated ; penultimate ventral segment very broad, parallel-sided, posterior margin sinuate, the angles produced posteriorly to protruding points that are distinctly visible from above ; forceps with the branches subcontiguous, straight, and simple.

MADAGASCAR : It d'Ambre, 1 ♂ and one mutilated ♀ (c. m.).

I found these specimens in the rich collection of M. Henri Gadeau de Kerville, which I have recently acquired. It is an elegant little species, well distinguished by the remarkable form of the ninth sternite of the male, the protruding angles of which are easily discernible from above.

Archidux neavei, sp. n.

Statura minore; rufo-niger, capite rufo; elytra abbreviata, carinata; forcipis brachia ♂ elongata, ante apicem supra dente longo erecto spiniformi armata.

	♂.
Long. corporis	10.5 mm.
„ forcipis	5 „

Small; deep reddish black; head deep red; smooth, tumid, sutures obsolete; antennæ (?); pronotum transverse, rectangular; elytra abbreviated, exposing mesonotum in form of a broad scutellum, posteriorly emarginate, the sutural margin much shorter than costal margin, which is carinate through entire length; legs brown, the femora yellowish at the base; abdomen feebly dilated about the middle, with a minute, nearly obsolete punctulation; last dorsal segment transverse, smooth, and strongly sloping; posterior margin truncate; pygidium short, obtusely conical; forceps with branches remote, slender, elongate, parallel, and straight; just before the apex, on the upper margin, there is an erect, slender, acute spine.

GERMAN EAST AFRICA: Usangu District, 29. xi.—15. xii. 1910, 3500–4500 ft. (*S. A. Neave*), 1 ♂.

This specimen, which is in the British Museum, is apparently allied to *Archidux adolphi*, Burr; it differs in the shorter and broad pronotum, abbreviated elytra, smooth head, with the sutures indiscernible; the quite straight parallel forceps, with the long erect slender spine near the apex are very characteristic.

It is dedicated to Mr. S. A. Neave, who has obtained much interesting material from Equatorial Africa for the Imperial Bureau of Entomology.

Dicrana wigginsi, sp. n.

Statura sat magna. Fusco-nigra, fulvo-variegata; elytra valde abbreviata, scutellum magnum transversum; forcipis brachia ♂ contigua, vix asymmetrica.

	♂.	♀.
Long. corporis	23–25 mm.	22–24 mm.
„ forcipis	4–5 „	

Build rather robust; whole body strongly pubescent, colour greyish blacked, varied with tawny; head depressed, tawny, bordered with black; antennæ yellowish; pronotum narrower than the head, black, with a large tawny central spot, and a smaller one at each side and posteriorly; scutellum broad, tawny; elytra very short, much reduced at the

axillary angle, truncate posteriorly, meeting at apex of suture, hairy, dirty yellow, bordered with black; legs tawny, banded with blackish; abdomen black, the first few segments with tawny mottling; last tergite smooth, black, ample in ♂, posterior margin irregularly rounded, rectangular at the sides; in ♀ punctulate; ninth sternite ample, broadly rounded posteriorly, with a round emargination in the middle of the posterior margin; in the ♀ entire, narrowly rounded; forceps with the branches stout, trigonal, contiguous and nearly straight in both sexes, crenulate on inner margin; in ♂ slightly more curved than in the ♀.

UGANDA: Entebbe Forest, June–August 1912, 3 ♂, 1 nymph (*Wiggins*); Entebbe, May–June, 1912, 2 ♀ ♀ (*Mrs. Gowdey*).

This is the first-known African Pygidicranid with strongly abbreviated and reduced elytra; in general appearance it recalls the Indian *Kalocrania valida*.

I have pleasure in dedicating it to Mr. C. A. Wiggins, of Entebbe, Uganda, who sent me this new species among some other interesting material; for the female, as well as for many other Dermaptera, I am indebted to Mrs. C. C. Gowdey, of Entebbe.

The parameres resemble those of the other African *Pygidicraninae*, but are slenderer and very acute; the bifid transverse lobe is very narrow, and parallel-sided, and straight.

When the male genitalia have been more carefully studied in a large number of species, the arrangement of the genera in this group will probably have to be recast, and possibly they will eventually fall into geographical groups.

Cranopygia dravidia, sp. n.

Fusco-nigra, fulvo-variegata; forcipis brachia ♂ basi ipso contigua, tum fortiter arcuata, apice bimucronata, attingentia.

	♂.
Long. corporis	19 mm.
„ forcipis	3.5 „

Small; greyish black, varied with tawny; antennæ greyish, head smooth, black, marbled with tawny; pronotum as broad as the head, longer than broad, parallel-sided, posterior border straight, all angles rounded, black, with a median tawny band and narrow tawny edging; scutellum tawny; elytra black, with a broad, oblique, pale tawny band; legs tawny, marbled with black; abdomen greyish and black, densely clothed with a golden pubescence;

last tergite ample, smooth; ninth sternite ♂ broadly rounded, entire; forceps stout and depressed, trigonal, stout and broad at the base, and subcontiguous at the base itself, arcuate to enclose a lozenge-shaped area, the points meeting and bimucronate; inner margin crenulate near the base.

S. INDIA: Madura District; Shembaganur, 1 ♂ (*Father Astruc.*, c. m.).

The forceps readily distinguish this species from other Oriental species; in appearance it recalls the African *D. frontalis* and *D. separata*.

Cranopygia philippinica, sp. n.

Statura minore; colore fulvo, fusco-notato; segmentum ultimum dorsale ♂ integrum; forcipis brachia ♂ contigua, recta, intus crenulata.

	♂.	♀.
Long. corporis	15 mm.	16 mm.
„ forcipis	3 „	3 „

Relatively small; general colour buff, with dark brown markings; antennæ buff; head red-brown, with a black transverse frontal band throwing off three short lines posteriorly; occiput with five short longitudinal black stripes; pronotum suboval, rather longer than broad, almost as broad as the head, buff, with a pair of irregular black lines; scutellum small, buff; elytra dark brown, with a large discoidal long buff spot, and a narrow costal buff band; wings prominent, buff, banded with dark brown exteriorly; legs buff, with short dark brown lines; abdomen light red-brown, entirely covered with dense pale pubescence, gently dilated apically in the ♂; last dorsal segment ♂ ♀ subquadrate, broader than the abdomen; penultimate ventral segment ♂ ♀ narrowly rounded; forceps with branches depressed, red-brown, stout, contiguous, and straight in both sexes, crenate at the base.

PHILIPPINE ISLANDS: Mindoro, La Butas, 28th February, 1911; and Laguna de Nauzan, November 1909 (♂ & ♀, *Mounsey*, c. m.). *Type* in c. m.

This elegant little species is smaller and quite differently coloured from the two Singalese species.

The pattern is the same in detail in both the specimens, and probably relatively constant.

Euborellia sisera, sp. n.

Caput rufum, occiput profunde excavernato; pronotum rufum, subquadratum; elytra ad suturam attingentia, scutello brevi et

lato; pedes fulvi; abdomen ♂ segmentis lateribus 6-9 carinulatis, acuminatis ac rugulosis; segmentum penultimum ventrale ♂ rotundatum; forcipis braccia ♂ subremota, triquetra, irregulariter arcuata et asymmetrica.

	♂.
Long. corporis	18-20 mm.
„ forcipis	3 „

Antennæ red-brown, with 18 segments, the three basal segments yellow and some paler before the apex; third cylindrical and elongate, fourth half, the fifth nearly as long as third, all subcylindrical. Head deep red or reddish black, smooth and tumid, the suture faint; the middle of the occipital region occupied from the base of the head to the transverse suture by a deep, regular, longitudinal cavity. Pronotum subrectangular, slightly concealed by the rudimentary elytra, which meet for the greater part of the sutural length, exposing only a very short scutellum, which is almost as broad as the mesonotum. Metanotum larval. Prosternum elongate and parallel-sided, constricted before the base; mesonotum rounded and metanotum truncate posteriorly; all sternum yellow. Legs orange-yellow; tarsi long, the first and third segments about equal, the second minute. Abdomen black, very finely punctulate; sides of sixth to ninth segments in the ♂ acuminate, finely keeled, and rugulose. Last dorsal segment ♂ ample, smooth, transverse, with a median sulculus, truncate posteriorly, with a rugulose keel down each side; penultimate ventral segment ♂ rounded. Forceps with the branches ♂ not contiguous, trigonal, and tapering, rather elongate and irregularly arcuate, asymmetrical.

S. INDIA: Anamalai Mountains, 4000-4200 ft., 22-23 January, 1912, under dead logs, 2 ♂ (*T. B. Fletcher*).
Type in c. m.

I am indebted to Mr. T. Bainbridge-Fletcher for this peculiar species; it is chiefly remarkable for the curious cavity in the top of the head; at first I took this to be a pathological feature, but it is identical in both the male specimens available; under the lens it has every appearance of being structural. It would be most interesting to investigate its functions; possibly it is a scent-gland.

In all other respects it appears to be a typical *Euborellia*; the structure of the elytra is as in *E. greeni*, but the forceps are quite distinctive. It most nearly approaches the large black variety of *E. greeni* recorded by me from Ceylon, which is very probably a good species.

Idolopsalis andeana, sp. n.

Statura majore; corpus læve; abdomen ♂ lateribus segmentis 5-7 acutis, carinulatis ac striolatis; pygidium ♂ prominens; forcipis brachia ♂ remota, valida, intus dentata, arcuata.

	♂.	♀.
Long. corporis	19 mm.	19 mm.
„ forcipis	5.5 „	3 „

Large, deep chocolate-brown; antennæ with 14 segments, tawny, fourth nearly globular, the rest gradually lengthening, passing from ovate to cylindrical; head tumid, the sutures distinct; pronotum broader than the head, transverse, slightly widened posteriorly, smooth; meso- and metanota smooth; sternum yellow-brown, the plates rather short and broad; legs yellow-brown, tarsi strongly pubescent beneath; abdomen almost smooth, with nearly obsolete very fine punctulations; sides of fifth to seventh segments in the ♂ acute and striolate, of eighth and ninth segments convex but not acute, and striolate; last tergite ♂ ample, smooth, transverse, with a strong transverse depression near the posterior margin, which is truncate; ninth sternite ♂ broadly rounded; in ♀ sides of abdomen simple, last tergite narrowed and simple, last sternite rounded; pygidium ♂ a prominent, compressed, blunt tubercle; forceps with branches ♂ remote at base, stout, rather depressed in basal half, with a strong blunt tooth at end of basal third, then attenuate and strongly arcuate; in ♀ contiguous, straight.

ECUADOR: Cayambe, 12,000-14,000 ft., ♂ and ♀ (*Ed. Whympfer*, in c. m.).

This fine species is very similar to *I. riveti*, but the body is much smoother, the armature of the sides of the abdomen in the male much stronger. It is the largest known species of the genus, and the only one in which the pygidium is at all prominent.

Idolopsalis whympferi, sp. n.

Statura minore; nigro-brunnea; abdomen punctulatum, segmentis 5-9 ♂ lateribus acuminatis, striolatis, carinatis; forcipis brachia ♂ remota, basi triquetra, inermis, arcuata.

	♂.	♀.
Long. corporis	9-12 mm.	11-12 mm.
„ forcipis	1.5-2 „	1.5-2 „

Small, deep chocolate-brown; antennæ with 15 segments,

1 and 2 yellow, rest greyish brown, fourth ovate, rest passing to cylindrical; head smooth and tumid, sutures not very distinct; pronotum broader than the head, depressed, transverse, slightly widened posteriorly; meso- and metanota smooth; sternum yellow, the plates broad; legs yellowish, tarsi long, first three segments about equal; abdomen punctulate, sides of segments 5-9 in ♂ strongly carinate and acute, striolate and rugulose, in ♀ simple; last tergite ♂ ample, transverse, smooth, with a strong transverse depression near posterior margin, which is truncate; the depression ending at each side in a blunt incipient compressed tubercle; with distinct impressed median line in both sexes; in ♀ simple, narrow; last sternite ♂ broadly, in ♀ more narrowly rounded; pygidium ♂ a small blunt compressed tubercle, in ♀ similar but smaller, more hidden by the forceps; forceps with branches in ♂ remote, trigonal and stout at base, unarmed, and strongly arcuate, in the ♀ contiguous, simple; apical segment of parameres lanceolate.

ECUADOR: Antisanilla to Pinambura, 11,000 ft., 1 ♂ (type), 1 ♀; La Dormida, 11,800 ft., 1 ♂; Pichincha, 12,000 ft., 2 ♂ ♂; Valley of Collanes, 12,500 ft., 1 ♀.

I am very happy to dedicate this species to that intrepid mountaineer the late Mr. Edward Whymper, who brought home from the Andes several interesting Dermaptera which are now in my collection.

I. whymperi rather resembles the Mexican *I. azteca*; it is distinguished by the very characteristic armature of the sides of the abdomen in the male.

One specimen—the male from La Dormida—presents a dimorphic form of the forceps; these are depressed and broad and straight, attenuate and arcuate only at the apex; the armature of the sides of the abdomen is also rather weak.

Nesogaster mounseyi, sp. n.

Fusco-castanea, nitida; pygidium ♂ parallellum, apice truncatum; forcipis braccia ♂ remota, elongata, fere recta, basi intus crenulata, medio dente debili armata.

	♂.
Long. corporis	8.5 mm.
„ forcipis	4.5 „

Smooth, shining, dark chestnut. Antennæ with 12-13 brown ovate segments, the fourth about half as long as the third. Head smooth, tumid, sutures obsolete. Pronotum yellowish brown, square. Elytra yellowish brown. Legs

yellowish brown, paler towards the apex. Abdomen long, parallel-sided, quite smooth. Last dorsal segment smooth, transversely rectangular. Pygidium parallel-sided, apically truncate, prominent. Branches of forceps elongate, remote, nearly straight; gently laminate on inner margin at the base, and crenulate there; with a weak tooth about the middle.

PHILIPPINE ISLANDS: Mindanao, Iodaya District, Sept., Oct., 1910, 1 ♂, c. m. (*Mounsey*).

Characterized by the truncate pygidium.

LV.—*On a new Species of the rare Genus Beamys from Nyasaland.* By GUY DOLLMAN.

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Beamys major, sp. n.

Allied to *Beamys hindei*, Thos., but distinguished by its larger size.

General dimensions considerably greater than in the British East-African species, the hind foot measuring 25 mm. in length.

Colour of fur exactly as in *hindei*.

Skull very much larger and heavier, with larger teeth and broader brain-case.

Dimensions of the type (taken from dried skin):—

Head and body 160 mm.; tail 132; hind foot 25; ear 16.

Skull: greatest length 36·8; condylo-incisive length 35; length of nasals 13·5; zygomatic breadth 17·8; interorbital constriction 5·7; width of brain-case 14; palatilar length 17·7; length of upper molar series 5·9.

Hab. Mlanje, Nyasaland.

Type. B.M. no. 14. 10. 22. 2. Collected by Mr. Browne.

This Nyasaland *Beamys* is at once distinguished from the East-African species by its far greater size.

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LVI.—*Notes on Fossorial Hymenoptera.*—XIV.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

On the Mutillidæ of Western Australia and Tasmania.

IN these notes on Mutillidæ I have confined myself to the female sex, by which the species must mainly be distinguished in the future. Much confusion is likely to be caused by descriptions of the males before long series are available, the differences between many of the species in the male sex being exceedingly obscure. Although colour-differences are of some importance in the more highly coloured metallic species of N.E. Australia, the males of the West-Australian species can seldom be divided on colour-lines, most being black with more or less white pubescence. Four or five species can be easily distinguished amongst the males collected by me at Yallingup, W.A.; but, seeing that I took over twenty species of females, it is likely that more species are represented among the males.

Key to the West-Australian and Tasmanian Species of Ephutomorpha.

♀ ♀.

1. With a stout spine or tubercle on each side near the middle of the lateral margin of the thorax 2.

collections under *B. coriarius*. After carefully studying his description of his new species I am convinced the above specimens are identical with his species *macrostylus* and that they do not belong to the genus *Blepharotes*, though it is very unlike Loew to have overlooked the following characters which preclude it from belonging to *Blepharotes*, viz.: ovipositor of female, which is long and compressed at sides; short style of *antennæ* and short third joint, the absence of thick tuft-like hairs at sides of *abdomen*, and the very much slighter build of *legs*; these last three characters were noticed by Loew in his description, but of the ovipositor he makes no mention. The neuration of *wings* is very similar. Small males of *Blepharotes flava* have a slight general resemblance to this species, but the thick tuft-like hairs at sides of *abdomen* will at once distinguish them.

This is a large species: *abdomen* fulvous with reddish-yellow pubescence and black apex; *thorax* blackish; *wings* large, hyaline. *Legs* wholly black.

Length 27–35 mm.

Male.—*Face* blackish, covered with yellowish tomentum; the tubercle large, occupying the lower part of face, bearing the moustache composed of long white hairs. *Palpi* black, with black hairs. *Antennæ* black, the third joint with a long terminal bristle; the first two joints short, the first the longest, both with black hairs; the third conical, with a rather long tapering point, the joint a little longer than the first two joints together, the bristle nearly as long as the joint. *Forehead* brownish black, with white pubescence, white hairs on hind part of head, a few black hairs at vertex. *Thorax* brownish black, with black pubescence and two long bristles before the suture, two beyond, and several on posterior part of thorax; sides and breast with white pubescence. *Scutellum* same colour, with three stout bristles on posterior border. *Abdomen* flat, rather broad compared with *Asilus* species, at its widest about 5 mm., becoming narrower at apex; the first segment black with black pubescence, the others bright reddish yellow with fulvous pubescence; sides with fairly long, fine, yellowish-white hairs, thickest on the second segment, not disposed as tufts; posterior border of last segment and the genital organs black, the latter large and prominent with black pubescence; underside black, bare, with black hairs at sides. *Legs* blackish, all the femora armed with black bristles; coxæ with long white hairs, pubescence elsewhere and all bristles black. *Wings* hyaline, the posterior branch of fork strongly curved; the second posterior cell broad at base, bulging into the first, the third

wide, the fourth closed, the anal cell closed some way from the border; the small transverse vein is situated about the middle of the discal cell; veins black at base and on fore border, then reddish. Halteres black.

Female identical. Ovipositor blackish, long, including the sixth and seventh segments, compressed at sides.

NEOITAMUS, Osten-Sacken.

Cat. Dipt. N. Amer. ed. 2, pp. 82 & 235 (1878)

Itamus, Loew, Linn. Ent. iv. p. 81 (1849), præocc. Schmidt, Goeb. Coll., 1846.

The following species are recorded from Australia, Tasmania, and New Zealand:—

Neoitamus varius, Walker, List Dipt. ii. p. 457 (1849), et pt. vii. Suppl. 3, p. 742 [*Asilus*] (1855); Hutton, Trans. New Z. Inst. xxxiii. p. 22 [*Itamus*] (1901).—*Asilus fraternus* (? females only), Macq., Dipt. Exot. Suppl. i. p. 219 (1844); v. d. Wulp, Sumatra Exp. Dipt. p. 25 [*Itamus*] (1881). *Asilus bulbus*, Walker, var. B, List Dipt. pt. ii. p. 466 (1849). *Itamus melanopogon*, Schiner, 'Novara' Reise, Dipt. p. 190 (1868).

Neoitamus mistipes, Macq., Dipt. Exot. Suppl. iv. p. 398, pl. ix. fig. 3 [*Asilus*] (1849).

Neoitamus bulbus, Walker, List Dipt. ii. p. 465 [*Asilus*] (1849), et vii. Suppl. 3, p. 743 [*Asilus*] (1855).—*Itamus inquisitor*, Nowicki, Mem. d. Krakauer k.-k. Akad. d. Wiss. ii. p. 21 [*Itamus*] (1875), et Beitr. z. Kenntniss d. Dipt. Fauna Neu Seelands, 21 [*Itamus*] (1875).

Neoitamus planiceps, Schiner, 'Novara' Reise, Dipt. p. 189 [*Itamus*] (1868).

Neoitamus hyalipennis, sp. n.

The synonymy of these species here given differs considerably from that given by Kertész in his Cat. Dipt., but I believe, from the examination of Walker's types, this will prove correct.

Asilus sydneyensis does not belong to this genus.

Neoitamus varius, Walker.

Asilus fraternus, Macq. (females only).

Asilus bulbus, Walker, var. B.

Itamus melanopogon, Schiner.

Macquart's type (male) and his original series of specimens of females seen in Paris Museum, 12. 4. 11, from Tasmania. The females were identical in all respects with a specimen of Walker's *Asilus varius* which I took for comparison; the male and another male specimen were identical, with the exception of the genitalia, which were not so swollen and large, but more long oval, and the white hairs on abdomen were not

26. Second dorsal segment bright blue, no spot of pubescence on segments 3-5 *E. æneifrons*, André.
 Second dorsal segment bronze, a spot of white pubescence on each of the three following segments *E. hirtella*, Turn.
27. Almost wholly luteous brown, entirely covered with pale golden pubescence.. 28.
 Not wholly or mostly brown, or not covered with golden pubescence..... 29.
28. Abdomen subpetiolate; front not produced between the antennæ..... *E. lutaria*, Sm.
 Abdomen sessile; front bluntly produced between the antennæ *E. auropilosa*, Sm.
29. First dorsal segment strongly depressed, flattened at the base, and forming a short petiole; mostly ferruginous, head and apical segments of abdomen black, with spots of pale golden pubescence.. *E. notabilis*, Sm.
 First dorsal segment without a flattened petiole; colour not mostly ferruginous. 30.
30. Second dorsal segment almost wholly fulvous or ferruginous, or with a large fulvous spot on each side..... 31.
 Second dorsal segment without conspicuous fulvous or ferruginous markings..... 33.
31. Second dorsal segment almost wholly fulvous or ferruginous 32.
 Second dorsal segment with a large fulvous spot on each side *E. venusta*, Sm.
32. Thorax longer than broad, black; second dorsal segment as broad as long *E. instabilis*, Sm.
 Thorax as broad as long, ferruginous; second dorsal segment much longer than broad..... *E. fulvodorsalis*, Turn.
33. Second dorsal segment coarsely longitudinally rugose-striate 34.
 Second dorsal segment not coarsely rugose-striate 35.
34. Head nearly as broad as the thorax; apical band of pubescence on second dorsal segment continuous, no basal spots... *E. scabrosa*, Sm.
 Head much narrower than the thorax; apical band of pubescence on second dorsal segment broadly interrupted; two spots of pubescence at the base .. *E. scabrosiformis*, Turn.
35. Abdomen with marks of golden pubescence 36.
 Abdomen with marks of white pubescence 33.
36. Thorax as broad as long 37.
 Thorax longer than broad *E. maculata*, Sm.
37. Head and thorax ferruginous *E. bipartita*, Sm.
 Head and thorax black..... *E. scandens*, Turn.
38. Second dorsal segment with a median longitudinal band or elongate spot of white pubescence 39.

- Second dorsal segment without a median band or spot 42.
39. The band of pubescence starting from the base and broadly interrupted before the apex, leaving a spot only in the middle of the apical margin 40.
- The band of pubescence starting from the apex and not reaching the base 41.
40. Second dorsal segment with an elongate spot on each side and a transverse spot on each side at the apical margin of white pubescence; head black *E. trilineata*, Turn.
- Second dorsal segment without lateral spots on the sides or apex; head ferruginous *E. albolineata*, Sm.
41. Head finely and closely punctured; anterior angles of thorax not rounded *E. volubilis*, Turn.
- Head coarsely punctured; anterior angles of thorax rounded *E. comes*, Turn.
42. Second dorsal segment with a spot of white pubescence on each side and a spot or band at the apex 43.
- Second dorsal segment without spots on the sides, with median or apical spot or both, or with an apical band 46.
43. Second dorsal segment with a round spot of white pubescence in the middle of the apical margin; hind tibiæ strongly spinose 44.
- Second dorsal segment with an apical band of white pubescence; hind tibiæ with few spines 45.
44. Thorax scarcely longer than broad *E. quadrata*, Sm.
- Thorax longer by at least one-third than broad *E. pacificatrix*, Sm.
45. Head black; the apical band of pubescence not extending beyond the lateral spots *E. excerpta*, Turn.
- Head pale ferruginous, the apical band extending over the whole margin *E. subcristata*, Turn.
46. With a spot of white pubescence in the middle and at the apex of the second dorsal segment, and a spot at the apex of the first segment; thorax elongate-pyriform *E. modesta*, Sm.
- Second dorsal segment without a median spot, thorax not elongate, only a little longer than broad 47.
47. Second dorsal segment with a transverse apical spot of whitish pubescence; segments 3-5 also with median spots 48.
- Second dorsal segment with a narrow apical band of white pubescence; third or fifth segment also with an apical band 49.
48. Head and thorax coarsely rugose-reticulate; thorax black *E. hospes*, Sm.

- Head and thorax punctured; thorax ferruginous..... *E. cordata*, Sm.
49. Third dorsal segment with a white apical band, no band on the fifth; second segment at least as long as broad *E. cordatiformis*, Turn.
- Fifth dorsal segment with a white apical band, no band on third segment; second segment broader than long 50.
50. Thorax anteriorly longitudinally striate; antennæ and legs black *E. strigosa*, Sm.
- Thorax anteriorly coarsely rugose, antennæ and legs ferruginous *E. dorsigera*, Westw.

The Tasmanian species are the following:—

<i>E. blanda</i> , Erichs.	<i>E. amœnula</i> , Turn.	<i>E. subcristata</i> , Turn.
<i>E. porrecticeps</i> , Turn.	<i>E. postica</i> , Turn.	<i>E. cordatiformis</i> , Turn.
<i>E. soluta</i> , Erichs.	<i>E. notabilis</i> , Sm.	<i>E. dorsigera</i> , Westw.

E. blanda also occurs in Western Australia. I have not been able to include the Tasmanian species *E. lateralis*, Westw., in the key, not having seen a specimen.

Ephutomorpha porrecticeps, sp. n.

♀. Nigra; mandibulis, clypeo, antennis pedibusque ferrugineis; segmento dorsali secundo nigro-cærulescenti; primo secundoque margine apicali testaceis, albo-pilosis; clypeo porrecto, apice acute bidentato; capite magno, subrectangulari.
Long. 8–9 mm.

♀. Mandibles simple, not bidentate; clypeus strongly porrect, produced at the apex into two strong teeth; second joint of the flagellum more than half as long again as the third. Antennal tubercles small but distinct, a sinuate carina running from them towards the eyes. Head very large, much broader than long, subrectangular, slightly narrowed posteriorly, very closely, but not coarsely, punctured. Thorax not more than half as broad as the head, half as long again as the greatest breadth, rounded anteriorly, sinuate and distinctly narrowed before the base of the median segment, punctured-rugose on the mesonotum, coarsely reticulate on the median segment, the posterior truncation oblique and smooth. Abdomen sessile, a short spine on each side at the base of the first segment beneath; second dorsal segment finely punctured, the punctures more or less confluent longitudinally; pygidial area almost smooth, with a few almost obsolete striæ at the base. Intermediate and hind tibiæ with a few delicate spines on the outer side.

Hab. Eaglehawk Neck, S.E. Tasmania; February. Adelaide, S. Australia.

The structure of the clypeus is very distinct from any other species. In some points this approaches *E. blanda*, Erichs.

Ephutomorpha latidentata, sp. n.

♀. Nigra; mandibulis, clypeo, antennis, vertice, thorace supra, segmento dorsali secundo macula magna laterali utrinque, trochanteribus, tibiis basi, tarsisque ferrugineis; segmento dorsali primo apice late testaceo, argenteo-piloso; secundo apice macula magna bilobata, tertio, quarto quintoque fascia transversa argenteo-pilosis; capite late rectangulari, fronte inter antennas porrecta, lamellata, apice bidentata, thorace angulis posticis bidenticulato.

Long. 7-9 mm.

♀. Head very large, rectangular, fully half as broad again as long, much broader than the thorax, closely punctured, the punctures more or less confluent longitudinally, the front produced between the antennæ into a broad lamella, bilobed or broadly bidentate at the apex, an oblique carina running from the eye to the base of the antennæ. Mandibles with a small but distinct tooth on the inner margin near the apex; second joint of the flagellum twice as long as the third. Thorax coarsely punctured, median segment coarsely reticulate, pleuræ smooth; the thorax and median segment combined nearly twice as long as their greatest breadth, rounded anteriorly, the prothoracic tubercles marked by a minute tooth, narrowed posteriorly and obliquely truncate, a small tooth at each angle above the truncation. Abdomen sessile, the first segment with a tooth on each side at the base beneath; second dorsal segment very closely and finely punctured. Pygidial area distinct, smooth and shining. Intermediate and hind tibiæ with three or four delicate spines on the outer side.

Hab. Yallingup, S.W. Australia; October and November.

This species seems to be the western representative of *E. sanguinceps*, André, from which it differs in the presence of a tooth on the inner margin of the mandibles, the coarser sculpture of the head, the much more strongly produced frontal lamella, and the broader second abdominal segment. The colour is also different, but *E. sanguinceps* differs much in colour in different localities. In the present species the head is often black, without any red on the vertex. The frontal lamella is somewhat similar to that of *scutifrons*, André, but in that species the head is small and much narrower than the thorax.

Ephutomorpha macracantha, sp. n.

♀. Nigra; segmento dorsali primo secundoque linea angusta apicali utrinque, tertioque linea basali utrinque argenteo-pilosis; secundo macula magna elongata utrinque, quarto quintoque macula magna mediana griseo-pilosis; capite magno, subrectangulari, fronte inter antennis producta, bidentata; thorace spina parva laterali utrinque ante medium; area pygidiali longitudinaliter striata.

Long. 11-14 mm.

♀. Mandibles very strongly bidentate at the apex; second joint of the flagellum nearly twice as long as the third. Head very large, subrectangular, slightly narrowed posteriorly, coarsely punctured; a carina from the eyes, which is produced above the base of the scape, forming a porrect tubercle on each side between the antennæ. Thorax and median segment coarsely reticulate, a little longer than the greatest breadth, a spine on each side before the middle, rather abruptly narrowed behind the spine, the anterior angles not strongly rounded, the anterior margin about half as wide again as the posterior, the truncation of the median segment almost vertical. Abdomen sessile, the second segment much broader than long, closely and finely punctured-rugose. Pygidial area longitudinally striated, smooth at the apex. Intermediate and hind tibiæ strongly spinose. There is a spine on each side at the base of the first abdominal segment beneath.

Hab. Yallingup, S.W. Australia; October to December.

This is another species of the *sanguinceps*-group, and approaches that species very closely in the structure of the head. The differences are marked in the stronger sculpture, the bidentate mandibles, the shape of the thorax, with the small lateral spines and without the small spines at the apical angles, in the striate pygidium, the spinose tibiæ, the form of the patches of pubescence, and the colouring. The relationship to *sanguinceps* is more remote than that of *latidentata*.

Ephutomorpha blanda, Ericks.

Mutilla blanda, Ericks. Arch. f. Naturges. p. 262 (1842). ♀.

Mutilla concinna, Westw. Arcan. Ent. ii. p. 19 (1844). ♀.

I cannot find any structural difference between these forms, and therefore look upon them as mere colour-varieties of one species, *blanda* occurring more commonly in the south of Tasmania and *concinna* in the north. The species

also occurs on the mainland, and is apparently widely distributed over the southern coast-districts of Australia. I took a single specimen at Yallingup in September.

Ephutomorpha germana, sp. n.

♀. Nigra; mandibulis, antennis dimidio basali, vertice macula mediana, thorace supra, coxis, trochanteribus tibiisque basi ferrugineis; segmento dorsali primo fascia lata apicali, secundo macula bilobata apicali, tertio, quarto quintoque macula transversa testaceis, albo-pilosis; tarsis anticis testaceis.

Long. 4-5 mm.

♀. Mandibles with a small, feebly developed tooth on the inner margin before the apex; second joint of the flagellum a little shorter than the first and third combined. Head large and short, subrectangular, broadly rounded at the posterior angles, finely and closely punctured, the eyes separated from the posterior margin of the head by a distance considerably less than their own diameter, no carina between the eyes and the antennal tubercles. Thorax longer than the greatest breadth, strongly narrowed behind the middle, the anterior angles rounded, closely punctured, coarsely reticulate on the median segment. Abdomen subsessile, the first dorsal segment not constricted, not sunk below the level of the second, with a very short spine on each side at the base beneath; second segment as long as the greatest breadth, finely and very closely punctured, the punctures more or less confluent longitudinally. Pygidial area much longer than broad, very finely and indistinctly striate longitudinally. Hind tibiæ with four distinct spines on the outer side. Calcaria pale testaceous.

Hab. Yallingup, S.W. Australia; November.

This is very near *E. rectanguliceps*, André, and is doubtless the western form of that species. The most important differences are the smaller and less massive head, the rounding of the posterior angles of the head and of the anterior angles of the thorax, and the shorter distance between the eyes and the posterior margin of the head in the present species. In both species the colour of the head varies between black and red.

It is quite probable that intermediate forms may be discovered, which will show the distinctions pointed out to be of subspecific importance only; but, as they are structural and constant, it is better to treat them as of specific value at present. The type of *rectanguliceps* was taken near Mackay, Queensland; specimens from Townsville differ in having the

abdomen, with the exception of the middle of the second dorsal segment, testaceous brown.

Ephutomorpha cæruleiceps, sp. n.

♀. Nigra; capite cæruleo, antennis mandibulisque nigris; thorace elongato, supra ferrugineo, pleuris antice ferrugineis; segmento dorsali primo apice testaceo; secundo elongato; macula magna elongata utrinque, segmentoque ventrali secundo omnino fulvo-ferrugineis; segmentis dorsalibus 2-5 macula apicali albo-pilosa; pedibus nigro-cæruleis, tarsis apice ferrugineis.

Long. 8.5 mm.

♀. Head rather small, no broader than the thorax; closely and not very finely punctured, slightly narrowed behind the eyes and strongly rounded at the posterior angles, eyes very prominent, a carina running from below the eye to the antennal tubercle, second joint of the flagellum fully twice as long as the third; mandibles falcate, not bidentate. Thorax about half as long again as the greatest breadth, strongly narrowed beyond the middle, the anterior angles slightly rounded, about half as broad again anteriorly as posteriorly, coarsely punctured-rugose; the posterior slope oblique, the surface coarsely reticulate. First abdominal segment very short, depressed below the second, with a spine on each side at the base beneath, not constricted at the apex; second dorsal segment strongly and closely punctured, much longer than the greatest breadth; sides of the apical segments clothed with long black hairs. Hind tibiæ with one or two delicate spines on the outer side near the apex.

Hab. Kalamunda, S.W. Australia; March.

The pygidium is hidden in the type. The colour of the thorax and abdomen resembles that of *E. venusta*, Sm., but the thorax and second abdominal segment are much longer and narrower in the present species. In general form it approaches *E. rubromaculata*, André, but, in addition to the strong difference in colour, the sculpture is much coarser and the second joint of the flagellum distinctly longer than in that species.

Ephutomorpha picturata, sp. n.

♀. Violacea; capite cæruleo; mandibulis antennisque nigris; thorace rufo-ferrugineo, tarsis ferrugineis; segmentis dorsalibus secundo, tertio, quarto quintoque macula parva apicali albo-pilosa.

Long. 8 mm.

♀. Second joint of the flagellum distinctly longer than

the third; head about as broad as the thorax, rounded feebly at the posterior angles, the eyes further from the mandibles than from the posterior margin of the head, a strong curved carina from below the eyes to the antennal tubercles, the whole head closely punctured-rugose. Thorax fully half as long again as the greatest breadth, the anterior margin straight, the sides slightly convex, narrowed behind the middle, coarsely reticulate, the pleuræ finely punctured, the sides and apex of the median segment coarsely reticulate. Abdomen subpetiolate; the first segment short, distinctly constricted at the apex; second segment about half as long again as the greatest breadth, the sides moderately convex, closely and rather strongly, but shallowly, punctured-rugulose. Pygidial area shining, sparsely punctured, slightly convex. Hind tibiæ with one spine on the outer side situated rather nearer to the apex than to the base.

Hab. Yallingup, S.W. Australia; January.

This species seems to be more nearly allied to *rubromaculata*, André, than to any other, though the colouring and sculpture are very different. The same differences separate it from *cæruleiceps* described above.

Ep'utomorpha æneidorsis, sp. n.

♀. Viridi-ænea; thorace rufo-ferrugineo, mandibulis, flagello pedibusque ferrugineis; femoribus æneis; segmento dorsali secundo apice albo-ciliato, cilia in medio interrupta.

Long. 6 mm.

♀. Second joint of the flagellum scarcely as long as the third; eyes convex, situated nearer to the posterior margin of the head than to the base of the mandibles, a low curved carina running from below the eyes to the antennal tubercles; mandibles small, with a very feeble tooth on the inner margin near the apex. Head about as broad as the thorax, very feebly rounded at the posterior angles, closely and rather deeply punctured. Thorax fully half as long again as the greatest breadth, the sides slightly convex, strongly narrowed behind the middle, rather coarsely reticulate, pleuræ sparsely punctured, sides and apex of the median segment reticulate. Abdomen subpetiolate; the first segment short, distinctly constricted at the apex; second segment about half as long again as the greatest breadth, the sides slightly convex, rather finely and not very closely punctured; pygidial area shining, with a few scattered punctures. Hind tibiæ with one spine on the outer side nearer to the apex than to the base.

Hab. Yallingup, S.W. Australia; January.

This is very near *picturata* described above, but the sculpture is finer throughout, especially on the second dorsal segment, the second joint of the flagellum is shorter, the thorax rather more strongly narrowed posteriorly, and the colour and spots of pubescence different.

Ephutomorpha hirtella, sp. n.

♀. Viridi-ænea; mandibulis antennisque fuscis; thorace brunneo-ferrugineo, pedibus testaceo-ferrugineis, femoribus nigris; segmentis dorsalibus 2-5 macula apicali albo-pilosa; secundo macula elongata utrinque sparse albo-pilosa.

Long. 5 mm.

♀. Second joint of the flagellum distinctly shorter than the third. Head strongly rounded behind the eyes, closely but rather finely punctured, a strong carina running from the eyes to the antennal tubercles, the whole head clothed with short fulvous pubescence, a spot of closer white pubescence on each side on the vertex. Thorax scarcely as broad as the head, less than half as long again as broad, the sides almost parallel, slightly narrowed behind the middle, closely but not coarsely punctured; the median segment reticulate and distinctly margined laterally, the whole thorax thinly clothed with pale fulvous pubescence. Abdomen subsessile; the first segment very short and small; second dorsal segment longer than broad, the sides strongly convex, finely and closely punctured, thinly clothed with greyish hairs, a sparse elongate patch of white hairs on each side. Pygidial area opaque, with very fine indistinct striæ at the base. Hind tibiæ with a row of slender spines on the outer side.

Hab. Yallingup, S.W. Australia; November and December.

This species seems to be related to *æneifrons*, André, but the second joint of the flagellum is shorter, the second abdominal segment is less coarsely punctured and more convex at the sides, the spots of pubescence are different, also the colour of the head.

Ephutomorpha virulenta, sp. n.

♀. Ferruginea; capite nigro; pedibus fusco-ferrugineis; tarsis mandibulisque testaceis; abdomine viridi-æneo, segmentis apicalibus infuscatis; segmentis dorsalibus primo, secundo, quarto quintoque margine apicali late albo-ciliatis.

Long. 4-6 mm.

♀. Head small, narrower than the thorax, closely punctured-rugose, strongly rounded behind the eyes; second joint of the flagellum no longer than the third; mandibles small, a feeble tooth on the inner margin near the apex; a curved carina from below the eyes to the antennal tubercles; a patch of long white pubescence on each side of the vertex. Thorax a little longer than the greatest breadth, the sides almost parallel, sharply but not strongly narrowed just behind the middle, closely punctured, the median segment coarsely reticulate. Abdomen subsessile; the second dorsal segment very little longer than the greatest breadth, the sides rather strongly convex, closely and rather finely punctured; pygidial area finely longitudinally striated at the base. Hind tibiae with a row of delicate spines on the outer side.

Hab. Yallingup, S.W. Australia; October to December.

Nearly allied to *hirtella* described above, but may be distinguished by the shorter and broader thorax and second dorsal segment, and the different distribution of the bands of pubescence.

Ephutomorpha æneifrons, André.

Ephutomorpha æneifrons, André, Ann. Soc. Ent. France, lxxii. p. 441 (1903). ♀.

The type is from Port Darwin. The species also occurs at Fremantle, W.A. (*J. J. Walker*); Yallingup, W.A., December (*Turner*); and S. Australia (coll. *F. Smith*). Var. *cupreiventris*, André, from Townsville, seems to be a local race of this, the thorax being more distinctly narrowed posteriorly.

Ephutomorpha formicaria, Fabr.

Mutilla formicaria, Fabr. Syst. Ent. p. 397 (1775). ♀.

Var. *Mutilla auriceps*, Sm. Deser. New Spec. Hymen. p. 201 (1879). ♀.

The type, doubtless taken at Cooktown, is in the Banksian collection, and is identical with specimens taken by me at Cape York. *M. auriceps*, Sm., is a form with golden pubescence on the head, which occurs southwards from Mackay. The species referred to as *formicaria* by André (Ann. Soc. Ent. France, p. 432, 1903) is a different species, which I have subsequently (Proc. Zool. Soc. London, 1910) described as *E. gilesi*.

Ephutomorpha subcristata, sp. n.

♀. Pallido-ferruginea, aureo-pilosa; abdomine nigro; segmento primo dorsali fascia apicali testacea; secundo macula magna

utrinque fasciaque angusta apicali; tertio, quarto quintoque macula mediana albo-pilosis.

Long. 7 mm.

♀. Second joint of the flagellum small, a little shorter than the third; mandibles strongly incised on the outer margin near the base. Head small, narrowed in front of the eyes, rounded behind the eyes, which are prominent and situated much nearer to the posterior margin of the head than to the base of the mandibles; a distinct carina from the eye to the antennal tubercle. Head and thorax rather closely punctured, more coarsely on the median segment than elsewhere, and thickly covered with rather long pale golden pubescence. Thorax about one-third longer than the greatest breadth, the anterior angles very slightly rounded, the sides nearly parallel, strongly narrowed behind the middle, the posterior margin only a little more than half as wide as the anterior. Abdomen subsessile; the second segment much longer than broad, finely and closely punctured, the punctures more or less confluent longitudinally. Pygidial area very finely punctured at the apex, the base concealed by pubescence. Hind tibiæ with four distinct spines on the outer side.

Hab. Eaglehawk Neck, S.E. Tasmania; February.

Related to *E. mackayensis*, André, in the shape of the head, the incision of the mandibles, and the pale golden pubescence, but differs in the shorter second joint of the flagellum, the much stronger narrowing of the thorax posteriorly, the very different distribution of the spots and bands of white pubescence on the abdomen, and the longer second segment.

Ephutomorpha excerpta, sp. n.

♀. Nigra; thorace, mandibulis, coxis trochanteribusque ferrugineis; pedibus antennisque fusco-ferrugineis; segmento dorsali primo margine apicali testaceo; segmento dorsali secundo macula elongata utrinque fasciaque apicali lata, tertio, quarto quintoque macula transversa apicali albo-pilosis.

Long. 4.5 mm.

♀. Mandibles with a small blunt tooth on the inner margin near the apex; second joint of the flagellum no longer than the third. Head small, closely and not coarsely punctured, narrower than the thorax, broadly rounded at the posterior margin, a curved carina from below the eyes to the antennal tubercles. Thorax a little longer than the greatest breadth,

the sides very feebly convex, the anterior angles not rounded, very slightly narrowed posteriorly, rather deeply punctured, the punctures more or less confluent longitudinally, median segment coarsely reticulate. Abdomen subsessile, the first segment not constricted at the apex; second segment a little longer than broad, convex at the sides, very closely punctured; pygidial area smooth. Hind tibiæ with a row of four spines on the outer side.

Hab. Yallingup, S.W. Australia; November and December.

This is near *darwiniana*, André, and *labeculata*, Turn., but the thorax is much shorter and broader than in the former, and the sculpture much coarser than in the latter. The apical band of pubescence on the second dorsal segment is reduced to a spot in *darwiniana*, extends over the whole breadth between the lateral spots in *excerpta*, and along the whole apical margin in *labeculata*. *E. pacificatrix*, Sm., is a larger species, and has a double row of spines on the hind tibiæ.

Ephutomorpha trilineata, sp. n.

♀. Nigra; thorace ferrugineo; segmento dorsali primo fascia angusta apicali, secundo maculis tribus elongatis basalibus usque ad mediam porrectis, maculisque tribus transversis apicalibus, tertio, quarto quinq̄toque macula apicali albo-pilosis.

Long. 8-10 mm.

♀. Mandibles bidentate at the apex, the inner tooth short; second joint of the flagellum nearly as long as the first and third combined. Head small, much narrower than the thorax, broadly rounded behind the eyes, covered with pale golden pubescence which conceals the sculpture; eyes strongly convex, situated nearer to the posterior margin of the head than to the base of the mandibles. Thorax closely and not very coarsely punctured, the median segment coarsely reticulate, thinly covered with pale golden pubescence, distinctly longer than the greatest breadth, the anterior margin feebly arched, gradually narrowed posteriorly, the anterior margin less than half as broad again as the posterior, the pleuræ smooth, the posterior truncation almost vertical, the surface smooth. Abdomen subsessile, the first segment very short, but not narrow, the second dorsal segment finely and closely punctured, longer than the greatest breadth, the sides moderately convex; pygidial area broad, smooth and shining at the apex, opaque and finely shagreened at the base. Hind tibiæ with two rows of long

spines on the outer side, basal joint of hind tarsi with a dense scopa beneath.

Hab. Yallingup, S.W. Australia; November and December.

This is a robust species, somewhat allied to *strigosa*, Sm., and *quadrata*, Sm., but differing in the spots of pubescence on the abdomen. The thorax is a little longer than in *quadrata*, and the first dorsal segment broader.

Ephutomorpha cordatiformis, sp. n.

♀. Nigra; thorace pedibusque ferrugineis, pleuris antice nigris; mandibulis basi flagelloque fusco-ferrugineis; segmentis dorsalibus secundo tertioque apice albo-ciliatis.

Long. 3-6 mm.

♀. Second joint of the flagellum no longer than the third. Head no broader than the thorax, rounded at the posterior angles, punctured-rugose, the arched carina from the eye to the antennal tubercle rather indistinct. Thorax a little longer than the greatest breadth, the sides slightly convex, rather abruptly and very strongly narrowed behind the middle, closely and deeply punctured, many of the punctures confluent longitudinally, pleuræ more sparsely punctured, median segment reticulate, the sculpture spreading on to the surface of the truncation. Abdomen sessile; first segment broad and not very short; second dorsal segment about as broad as long, the sides only slightly convex, closely but not coarsely punctured-rugose; pygidial area broad, finely granulate. Hind tibiæ with two rows of spines on the outer side, the spines often short and not very distinct.

Hab. Eaglehawk Neck, S.E. Tasmania; February.

This is nearly allied to *E. cordata*, Sm., differing in the much coarser sculpture of the head, thorax, and second dorsal segment, and in the apical bands of pubescence on the second and third dorsal segments, which in *cordata* are represented by large spots on the middle of the apical margin. The thorax is much more strongly narrowed posteriorly than in *E. edmondi*, André, which is otherwise very closely related, though differing in the pubescence on the abdomen.

Ephutomorpha comes, sp. n.

♀. Nigra; flagello subtus fusco-ferrugineo; thorace rufo-ferrugineo; segmento dorsali primo fascia apicali, tarsisque testaceis; segmento dorsali secundo fascia lata longitudinali, tertio, quarto quintoque macula transversa albo-pilosis.

Long. 7-8 mm.

♀. Second joint of the flagellum distinctly longer than the third; head closely and rather strongly punctured, a carina from the eyes to the antennal tubercles, eyes moderately convex, situated about as far from the posterior margin of the head as from the base of the mandibles; head small, broadly rounded from a little behind the eyes. Thorax coarsely punctured, the punctures more or less confluent longitudinally, a little longer than the greatest breadth, broadly pyriform, the anterior margin broadly arched, median segment coarsely reticulate, the posterior slope almost vertical and rugose. Abdomen subsessile; second dorsal segment finely longitudinally punctured-rugulose, longer than broad, the sides moderately convex. Pygidial area broad, finely longitudinally striated. The longitudinal band of white pubescence on the second dorsal segment reaches from the apex nearly to the base. Hind tibiae with two rows of spines on the outer margin.

Hab. Yallingup, S.W. Australia; November and December.

This is somewhat allied to *trilineata* described above, but is a smaller and less massive species, with a shorter, more pyriform thorax, and very different arrangement of the white pubescence on the abdomen. *E. cordata*, Sm., is perhaps a nearer ally, but is without the longitudinal band on the second dorsal segment, and has much finer sculpture. *E. cordata* was described from Adelaide specimens, but also occurs at Yallingup in November and December. The female of the species identified by André as *E. morosa*, Westw., is nearer to this than to any other West Australian species, though in that Queensland form the thorax is never ferruginous and the front more coarsely rugose. But *morosa* was described from West Australia, and I doubt if it is identical with the Queensland form. Errors of identification in species described from the male only are very excusable, especially when the type is not available, the black species being extremely difficult to separate.

Ephutomorpha volubilis, sp. n.

♀. Nigra; mandibulis, antennis, thorace pedibusque fusco-ferrugineis; segmento dorsali primo margine apicali tarsisque testaceis; segmento dorsali secundo fascia lata longitudinali basin haud attingente, tertio, quarto quintoque macula transversa alba-pilosis.

Long. 4 mm.

♀. Second joint of the flagellum no longer than the third; head no broader than the thorax, strongly rounded

posteriorly, rather finely and not very closely punctured, with an arched carina from below the eyes to the antennal tubercles. Thorax scarcely longer than the greatest breadth, rounded at the anterior angles, not very strongly narrowed posteriorly, punctured-reticulate, the median segment reticulate, rugose on the surface of the posterior truncation, the pleuræ smooth. Abdomen sessile; the first segment very short; second dorsal segment very finely and closely punctured, almost as broad as long, the sides rather strongly convex; pygidial area smooth at the apex, with a few longitudinal striæ at the base. Hind tibiæ with two rows of spines on the outer side.

Hab. Yallingup, S.W. Australia; November.

This is allied to *E. comes* described above, but is a much smaller species, the thorax is less strongly narrowed posteriorly, and the sculpture finer.

Ephutomorpha scabrosiformis, sp. n.

♀. Nigra; thorace antennisque fuscis; pedibus fusco-ferrugineis; segmentis dorsalibus secundo, tertio quartoque macula parva basali utrinque albo-pilosa, secundo crasse longitudinaliter striato; segmento primo dense albo-piloso.

Long. 6 mm.

♀. Mandibles with an ill-defined tooth on the inner margin near the apex; second joint of the flagellum scarcely longer than the third. Head small, narrower than the thorax, coarsely punctured-rugose, with sparse whitish pubescence, broadly rounded posteriorly; the eyes strongly convex, nearer to the posterior margin of the head than to the base of the mandibles, no distinct carina between the eyes and the antennal tubercles, but one or two small spines on the usual line of the carina, a larger spine on the outer side of the antennal tubercles. Thorax coarsely rugose-reticulate, as long as the greatest breadth, the anterior margin straight, the sides rather strongly convex, moderately narrowed behind the middle, the surface of the posterior truncation smooth. Abdomen subsessile, first segment short, not constricted at the apex, second coarsely and rather irregularly longitudinally striated; pygidial area sparsely punctured. Hind tibiæ with two rows of spines.

Hab. Yallingup, S.W. Australia; December.

This is easily distinguished by the sculpture of the second dorsal segment from all the allied species except *scabrosa*, Sm., to which it is closely allied, differing in the much smaller and narrower head and the much shorter second joint of the flagellum.

Ephutomorpha fulvodorsalis, sp. n.

♀. Ferruginea; abdomine pedibusque nigris; segmento abdominali secundo tarsisque fulvis; area pygidiali lata, longitudinaliter striata.

Long. 6 mm.

♀. Head small, narrower than the thorax, coarsely and closely punctured, the posterior angles rounded, eyes prominent, a carina running from below the eye to the antennal tubercles, antennæ stout, the second joint of the flagellum scarcely as long as the third, mandibles with a small tooth on the inner margin near the apex. Thorax scarcely longer than the greatest breadth, strongly narrowed beyond the middle, strongly rounded at the sides anteriorly, coarsely and closely punctured. First dorsal segment not sunk below the level of the second, not constricted at the apex, very sparsely punctured, and thinly clothed with long grey hairs; second segment closely and rather strongly punctured, much longer than broad, not much broadened in the middle; third and fourth segments with a thin cilia of long grey hairs; pygidial area large, as broad as long, finely longitudinally striated. Hind tibiæ with a few short spines near the apex.

Hab. Yallingup, S.W. Australia; October.

In structure this species somewhat approaches *E. jucunda*, Sm., but is conspicuously different in colour and sculpture, also in the larger pygidial area.

Ephutomorpha scandens, sp. n.

♀. Nigra; tibiis intermediis et posticis, tarsisque ferrugineis; capite thoraceque sparse griseo-pilosis, abdomine sessili, segmento dorsali secundo in medio late aureo-piloso, apice anguste albo-piloso, tertio, quarto quintoque macula mediana albo-pilosa; thorace rotundato, longitudine latiore.

Long. 2.5-6.5 mm.

♀. Second joint of the flagellum a little shorter than the third; a carina running from the eye to the antennal tubercle. Head small, narrowed in front of the eyes, rounded posteriorly, the eyes prominent, much nearer to the posterior margin of the head than to the base of the mandibles. Head and thorax closely punctured, the thorax distinctly broader than long, strongly rounded at the sides, narrowed, but not very strongly, posteriorly. Abdomen sessile, the first dorsal segment sunk below the level of the second, which is broader than long and very finely and

closely punctured; pygidial area large, opaque, ovate, obscurely longitudinally striated at the base. Hind tibiæ somewhat thickened, with two rows of spines on the outer side.

Hab. Yallingup, S.W. Australia; November and December.

This species differs in its habits from most of the Mutilidæ found at Yallingup, nearly all my specimens having been taken by sweeping foliage, not running on sand.

In structure it approaches *E. auropilosa*, Sm., but differs in colour and in the much broader second abdominal segment. The colour somewhat resembles that of *E. jucunda*, Sm., but that species only has a single row of spines on the hind tibiæ, the thorax is more strongly narrowed posteriorly and the second dorsal segment much longer than in the present species. As well as *E. auropilosa*, *E. bipartita*, Sm., belongs to this group, but is a much larger and differently coloured species.

Ephutomorpha argenteolineata, André.

Ephutomorpha argenteolineata, André, Zeitschr. Hym. Dipt. v. p. 271 (1905). ♀.

Ephutomorpha perelegans, Turn. Proc. Zool. Soc. London, p. 257 (1910). ♀.

As has been pointed out to me by Mons. André, these are undoubtedly identical. The type of *argenteolineata* was taken at Port Darwin, that of *perelegans* at Townsville, showing a wider range than is usual in the smaller species of *Ephutomorpha*.

Ephutomorpha quadriceps, Sm.

Mutilla quadriceps, Sm. Descr. New Spec. Hymen. p. 206 (1879). ♀.

Hab. Lower Plenty, Victoria (*Bakewell*); Yallingup, S.W. Australia. October to December.

Evidently a wide-ranging species in the southern portion of Australia. It seems to me to be the continental subspecies of the Tasmanian *E. soluta*, Erichs., differing in the presence of a dark red spot on each side of the second dorsal segment, and in the distinctly broader pygidial area. The head is usually black in both forms, but is red in a variety of *quadriceps*.

Ephutomorpha amænula, sp. n.

♀. Viridi-cyanea; abdomine viridi-æneo; mandibulis, scapo

pedibusque pallide ferrugineis; thorace elongato, latitudine fere duplo longiore; segmento dorsali secundo apice albo-ciliato. Long. 4-6 mm.

♀. Mandibles with a short tooth on the inner margin near the apex; second joint of the flagellum a little longer than the third, but much shorter than the first and third combined; head closely punctured, small, broadly rounded behind the eyes, a low carina running from the eyes to the antennal tubercles, eyes strongly convex. Thorax nearly twice as long as the greatest breadth, not quite as broad as the head, closely and rather strongly punctured, coarsely reticulate on the median segment, the sides nearly parallel, rather abruptly but not strongly narrowed at the base of the median segment. Abdomen subpetiolate; the first segment small, very feebly constricted at the apex, with an interrupted testaceous band at the apex; second segment closely punctured, much longer than broad, very slightly convex at the sides; the three following segments with a small patch of white pubescence in the middle; pygidial area smooth and shining. Hind tibiæ hairy, the outer side without spines.

Hab. Eaglehawk Neck, S.E. Tasmania; February.

This somewhat resembles *E. amœna*, André, but the thorax in that species is much broader anteriorly, more strongly pyriform, and more coarsely punctured; the hind tibiæ are armed with spines on the outer side; the second segment more convex at the sides, and the pygidial area broader and less distinctly defined. *E. nigroænea*, Sm., is also somewhat similar in colour, but has the eyes much less convex, the sculpture of the head and thorax much coarser, the shape of the thorax different, and the pygidial area almost absent, in addition to other differences.

Ephutomorpha postica, sp. n.

♀. Nigra; antennis, tibiis tarsisque pallide ferrugineis; vertice rufo-ferrugineo; segmento dorsali secundo nigro-cæruleo, macula magna utrinque ochracea.

Long. 6 mm.

♀. Second joint of the flagellum distinctly longer than the third. Head small, no broader than the thorax, finely and very closely punctured-rugose, the posterior angles not strongly rounded, eyes strongly convex, situated as far from the posterior margin of the head as from the base of the mandibles, the arched carina from below the eyes to the antennal tubercles very indistinct; mandibles bidentate.

Thorax elongate-pyriform, finely rugose, about twice as long as the greatest breadth, the anterior angles strongly rounded, narrowed from the middle, the median segment reticulate, depressed, but not truncate; pleuræ smooth. Abdomen subpetiolate; the first segment short, much narrower than the second, not constricted at the apex; second dorsal segment finely longitudinally rugose, about half as long again as the greatest breadth, strongly convex at the sides; third dorsal segment with a transverse band of greyish pubescence; pygidial area concealed by long pale pubescence. Hind tibiæ covered with short pubescence, with one or two delicate spines on the outer side near the apex.

Hab. Eaglehawk Neck. S.E. Tasmania; March.

Taken on a fallen log, in dense scrub. This is not very nearly allied to any other species known to me.

LVII.—*Notes on the Hymenoptera in the Collection of the British Museum, with Descriptions of new Species.* By GEOFFREY MEADE-WALDO, M.A.

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V.

IN the following paper the descriptions of several new species of Apidæ and Diploptera are published, as well as notes on known species. Most of the new material is from collections recently formed by Mr. G. E. Bryant in Sarawak and Penang and by Mr. R. E. Turner in Australia. Mr. Turner's fine collections from Australia, the whole of which are now at South Kensington, are well known to all Hymenopterists. A new species of that curious Eumenid genus *Macrocalymma* is a very interesting discovery.

Mr. Bryant, who spent some nine months in Sarawak, was primarily occupied in collecting beetles, but at my request collected such bees and wasps as he encountered in his excursions. The *Thrincostruma* and *Cælioxya* were two captures of especial interest, the former as introducing a second species to a genus recorded in the Oriental Region for the first time last year, and the latter as connecting the two sexes of a species in which sexual dimorphism is very strongly developed.

Apidæ.

IDIOPROSOPIS, gen. nov.

Characters.—♂. General facies that of *Hylæus*. Head broad; as broad as mesothorax at widest, ocelli in a triangle with very wide base. A distinct malar space, mandibles medium, with two well-developed apical teeth. Joints 4–12 of antennæ produced beneath apically to an angle, giving the flagellum a serrate appearance; joint 3 very long, equalling in length joints 4 and 5. Scape simple. Tongue much as in *Hylæus*. Pronotum visible, truncate anteriorly. Propodeum subtruncate, concave medially, the anterior area not differing much in sculpture from the rest. Hind legs with trochanters dentate, the femora enormously incrassate and tibiæ spatulate. First cubital cell twice as long as second, basal nervure gently arched; stigma medium. Genital armature with the stipites simple, broadly obliquely truncate at the apex; sagittæ short, falling far short of the apices of the stipites; apical process of eighth ventral segment dilated, the apex emarginate. Six ventral segments are exposed, the sixth broadly truncate at apex.

♀. Unknown.

Type of the genus: *Idioprosopis chalcidiformis*, M.-Waldo.
Geographical distribution of species: Patagonia.

Idioprosopis chalcidiformis, sp. n.

♂. Nigra; mandibulis (apice excepto), labro, clypeo areisque inter-orbitalibus pallide luteis; tibiisque posticis aurantiacis; antennis scapo cylindrico, sparsim hirsuto, flagelli articulis 4–12 serratis; capite thoraceque sparsim griseo-pilosis, punctatis; abdomine nitido; femoribus posticis incrassatis, tuberculo subapicali instructis; tibiisque posticis spatulatis, margine apicali dentato; alis subhyalinis.

Long. 9 mm.

Black; the mandibles (except the apical teeth), labrum, clypeus, and inner orbits pale ivory-yellow; posterior tibiæ orange-yellow. Mandibles only shallowly grooved; clypeus convex, at apex broader than long. Antennæ black above, pale ferruginous beneath; scape cylindrical, with a sparse covering of long griseous hairs; joints 4–12 of flagellum serrate. Head and thorax for the most part dull, the whole densely covered with shallow punctures; scutellum and portions of propodeal area shining. Abdomen shining, impunctate. Head and thorax sparsely clothed with long

griseous pubescence. Anterior and intermediate legs normal, posterior trochanters with a stout tubercle on the inner side, posterior femora enormously incrassate, shining, rounded above; beneath there is a strong carina, terminating in a conspicuous tubercle; hind tibiæ spatulate, widening from the base, a conspicuous tooth at apex. Wings subhyaline.

Length 9 mm.

1 ♂, PATAGONIA; Chubut, Valley de Lago Blanco.

[It had been intended to publish the description of this new genus and species in my fascicle on the Prosopidinae ('Gen. Insectorum'), the MS. of which is now in the hands of M. Wytsman, of Tervueren. Owing to the unsettled state of affairs in Belgium, the date of publication is very uncertain; so it seems better to add the descriptions to the present paper.]

Thrincostruma bryanti, sp. n.

♂. Capite thoraceque nigris, abdomine fulvo-brunneo; omnino nitidus, plus minusve pubescens; clypeo medio apiceque fulvo-brunneo; alis subhyalinis, hirsutis.

Long. (capite producto) 14 mm.

Clypeus very much produced, snout-like, the apex truncate, laterally rounded, shining and finely punctured; genæ of considerable development, about equal in length to the scape, clothed with a dense sericeous pale pubescence; inner orbits feebly emarginate along their upper half; mandibles simple, fulvous brown. Antennæ wholly black, of normal proportions. Mesonotum shining, finely punctured; scutellum shining, distinctly convex; postscutellum of ordinary sculpture; enclosed area of median segment more coarsely sculptured; surface of truncation of median segment slightly concave, subglabrous, the punctures rather scattered; lateral angles of median segment forming distinct carinæ. Tegulæ brownish, nitidulous. Abdomen (as usual in the genus) with first segment somewhat elongate, and following segments rather widening towards apex of segment 3, the whole abdomen somewhat copiously clothed with long pale brown hairs. Sternite 3 extremely short, almost entirely covered by the preceding sternite, at its apex are two short rows of stiff black hairs; sternite 4 dull, bilobed, the whole surface covered with pruinosity. Anterior and intermediate tibiæ and tarsi covered with golden pubescence; posterior tibia with a conspicuous corneous tooth at apex below; posterior tarsi with golden pubescence within. Calcaria pale testaceous. Wings with the nervures and stigma dull rufous,

second and third cubital cells subequal, shorter than the first; first and second recurrent nervures interstitial with second and third transverso-cubital nervures, second transverso-cubital nervure failing before it reaches the radial cell; the patch of black hairs characteristic of genus is situated in both cubital cells 2 and 3; basal nervure interstitial with transverso-medial.

Length 14 mm.

1 ♂.

BORNEO: Sarawak, Mt. Merinjak, 1500 ft., v. 1914 (*G. E. Bryant*).

I have much pleasure in naming this most interesting discovery after its captor, Mr. G. E. Bryant. The first and, up to the present, only known species of this genus from the Oriental Region is *T. sladeni*, Ckll. (*Canad. Ent.* 1913, p. 35), described from the Khasi Hills. It differs from the present species in size, neuration, and many structural points.

XYLOCOPA, Latr.

Yet a fourth species of handsome blue and black *Xylocopa* has been discovered in the Oriental Region, this time in Sarawak. The new species may be distinguished from its nearest allies by the following differences; all three species have the head, thorax, and first tergite more or less densely clothed with azure pubescence.

♀ ♀.

1. (2) Two complete subcubital cells, first transverso-cubital cell absent or indicated by a faint streak; at least abdominal segment 2 fringed with blue at sides.
2. (1) Three complete subcubital cells, first transverso-cubital cell strong; first abdominal sparsely clothed with blue hair, second abdominal segment black. *abbotti*, Ckll. (Siam.)
3. (4) Larger species, anterior wing 19-20 mm.; segment 2 of abdomen with blue hair at sides; wings fuscous, with purple iridescence *cærulea*, F. (E. Indies.)
4. (3) Smaller species, anterior wing about 15 mm.; segments 2-4 of abdomen with blue hair at sides; wings distinctly paler, with hardly any purple iridescence [(Borneo.) *cæruleiformis*, sp. n.]

X. grubauei, Friese (1903), from Perak, is known only by the male.

The above key will serve to differentiate the females; the male of *X. (Mesotrichia) abbotti*, Ckll., is unknown.

All these three species belong to the subgenus *Koptorthosoma*, Grib.

For further information on these species, *vide* Cockerell, Trans. Amer. Ent. Soc. p. 415 (1909).

Xylocopa (Koptorthosoma) caeruleiformis, sp. n.

♀. Nigra; capite, thorace, tergite primo, tergibus 2-4 lateribus caeruleo-hirtis.

Long. 17-18 mm.

♂. Nigra; capite, thorace dense brunneo-hirtis; segmento mediano rubro; abdomine nigro- vel obscure fusco-hirto; metatarso iii. curvato.

♀. At first sight closely resembling a small *X. caerulea*, F., but at once distinguished by the characters given in key.

Mandibles shining, bidentate; supraclypeal carina shining, conspicuous, not quite reaching the apex of clypeus; joint 3 of antennæ = 4 + 5 + 6; pubescence behind the eyes from pale blue to white, and on the intermediate and posterior coxæ white. Truncation of median segment with a patch of pale yellow hair on each side. Anterior tibiæ with long pale blue hairs, anterior metatarsi with long pale hair; scopa on intermediate and posterior tibiæ more or less intermixed with pale hairs. Intermediate femora slightly concave on the inner side, posterior femora with a small tubercle on the outer side. Head and abdomen evenly punctate; mesonotum shining, impunctate in the middle, laterally punctate; median segment rugose. Wings fuscous, only faintly iridescent.

♂. Head and thorax densely clothed with fulvous-brown hairs; face without pale markings; first tergite clothed with very dark brown (almost black) hair; wings fusco-hyaline, with a bronze effulgence. Eyes large, approximating above. Punctured as in the ♀. Tergite 3 with a curious differentiated area on each side at base, only visible when the segments are drawn out; the area is rounded apically, bounded by a conspicuous sulcus, the portion enclosed being very finely punctate; posterior femora somewhat incrassate, concave on inner side; metatarsus 3 slender and curved. The truncation of the median segment is distinctly rufous.

Length 16 mm.

3 ♀ ♀, 4 ♂ ♂.

BORNEO: Sarawak, Mt. Matang, 4-10. ii. 1914, 3 ♀ ♀, 3 ♂ ♂; Mt. Matang, 3000 ft., 17. i. 1914, 1 ♂ (*G. E. Bryant*).

Xylocopa (Koptorthosoma) cærulea, F.

4 ♀ ♀, Penang, x.-xi. 1913 (*G. E. Bryant*).

Xylocopa collaris, Lep.

5 ♀ ♀, BORNEO: Mt. Matang (iii. 1914), Kuching (xi. 1914). STRAITS SETTLEMENTS: Penang, x. 1914 (*G. E. Bryant*).

Xylocopa sp.

1 ♀, Mt. Matang, ii. 1914 (*G. E. Bryant*).

This single ♀ I am unable to identify with any certainty, but for want of more material it is better to leave it unnamed for the present.

Anthidium apiforme, sp. n.

♀. Flavo-ochraceum; mandibulis apice, fronte media, area circa ocellos, lineis tribus mesonoto, scutello basi, marginibus apicalibus segmentorum abdominis, subnigris; propleuris subnigris; metatarsis iii. nigris; scopa ventrali albida, subflava, apice extremo fusco; alis subhyalinis, pallide flavis; stigma inconspicua.

♂ similis, sed capite infra dense albo-piloso, antennis longioribus. Long. 14 mm.

Rather slender for an *Anthidium*. Mandibles 4-toothed, the two outer teeth the stouter; genæ wanting; clypeus about as broad as long, convex, the apex feebly serrate; antennæ short, joint 3=4+5, terminal joint forming a point in side profile; ocelli in wide-based triangle, the two posterior ones situate in a conspicuous shining area; head as broad as thorax, scutellum well overlapping postscutellum and rounded posteriorly; truncation of median segment rounded, the basal area large and of similar structure to the rest; first segment of abdomen short, distinctly hollowed out at base, the following four segments similar; the apical fasciæ vary in degree of darkness, those on tergites 1 and 2 being comparatively pale. Scopa rather sparse, the hairs long, silvery; sternite 6 with fuscous hairs. Head and thorax with a more or less dense fulvous pubescence; the abdomen with dense pubescence, similar in colour to the chitin on which it is situated. The whole insect covered with small even punctures; meta-

tarsus iii. coarsely granulose. Wings flavo-hyaline, the costal half with conspicuous pilosity.

♂. Similar, except for a conspicuous white pubescence beneath the head, the antennæ, as frequent in this sex, rather longer.

1 ♀, 1 ♂.

BORNEO: Sarawak, Mt. Matang, 12-13. xii. 1913 (*G. E. Bryant*).

This fine insect is strongly reminiscent of a hive-bee or of species of New-World *Melipona* of the *fulvipes-scutellaris* group. It is quite unlike any described species of *Anthidium* from the Oriental Region.

Megachile malayana, Cam., var. *auriceps*, nov.

♀. *M. malayanæ* similis, sed vertice dense aureo-hirsuto.
Long. 18 mm.

This extremely handsome insect is evidently a variety of *M. malayana*, Cam., described in P. Z. S. 1901, p. 245, from the male sex. It may be noted that Cameron makes a rather serious *lapsus calami* in his Latin diagnosis, where he says "capite thoraceque dense nigro-pilosis." This is rectified in his English description.

A characteristic feature of *M. malayana* is, of course, the conspicuous *white* pubescence on the head. In the new variety diagnosed above this white pubescence is replaced by golden.

There is a ♀ of the typical form in the British Museum from the Mimika River, vii. 1910 (*A. F. R. Wollaston*), vide Ann. & Mag. Nat. Hist. (8) ix. p. 454 (1912). The new variety has the following data attached:—

DUTCH NEW GUINEA: Snow Mts., 4000-6000 ft., i.-ii. 1913 (*A. F. R. Wollaston*).

Megachile (Eumegachile) atriformis, sp. n.

♀. Nigra; alis flavo-hyalinis, margine apicali infuscata; clypeo brevissimo, apice vix punctato, carina longitudinali mediana instructo, labro apice obtuso, impunctato, aureo-sericeo; mesonoto sulcis longitudinalibus instructis, percrasse rugosissimeque punctato.

Long. 20 mm.

Strongly resembling *M. atrata*, F. Smith, in superficial characters, but differing therefrom as follows:—

M. atrata, Smith..

Mandibles robust, 5-toothed.

Clypeus finely, evenly punctured, truncate apically; no carina.

Labrum with apex broadly truncate, evenly punctured, hirsute, flat.

Mesonotum finely evenly punctured, no parapsidal grooves.

Scutellum finely evenly punctured.

M. (E.) atratiformis.

Mandibles falciform, with only 2 distinct teeth.

Clypeus with a few coarse shallow punctures basally, the apex sinuate, impunctate; a distinct longitudinal carina.

Labrum obtuse, aureo-sericeous; convex, with a blunt longitudinal carina.

Mesonotum coarsely transverse striate; with 4 parapsidal grooves, the inner pair shallow, indistinct, the outer pair deep, conspicuous.

Scutellum coarsely punctured, shining.

3 ♀ ♀.

LOWER TENASSERIM: Mergui, ii. 1889 (*Col. Bingham*), type ♀. MIDDLE TENASSERIM: Haundraw Valley, ix. 1894 (*Col. Bingham*). PENANG, 21. x. 1913 (*G. E. Bryant*).

This species was labelled "*M. atrata*, Smith, var.," by Colonel Bingham. Smith's species occurs in Tenasserim, and was represented in the Bingham collection.

Cæliovys matangæ, sp. n.

♀. Nigra; capite thoraceque crasse punctatis, abdomine minuto punctato; facie, clypeo, vertice postice, pleuris supra, macula prope tegulas, duabus maculis scutello, segmenti mediani lateribus, aureo-pilosis; tergitebus 1-5 fasciis apicalibus squamosis pallide aureis; thorace infra sternitebusque albo-pilosis; tarsis ferrugineis; alis subhyalinis.

Long. 9 mm.

♂. Nigra, albo-pilosa (facie clypeoque aureo-pilosis exceptis); segmento anali 6-spinoso; alis subfuscis.

Long. 11 mm.

♀. Vertex and thorax with coarse even punctures; abdomen shining, the punctures fine and even; tegulæ impunctate. Scutellum convex, slightly upturned towards apical margin, laterally with short blunt tubercles; a distinct transverse furrow between scutellum and mesonotum; tergites 2 and 3 with faint transverse furrows towards apex; anal segment acute, not notched at sides, basally shining, finely punctured, apically with median carina and closely punctured; anal sternite distally projecting beyond anal tergite. Wings subhyaline.

Length 9 mm.

♂. Similar to ♀ in sculpture, but differs in being considerably larger and in having the wings much darker. There is only golden pubescence on the face and clypeus, all remaining pubescence is griseous; the abdominal fascia is of griseous scales. Anal segment 6-spined, all the spines acute, the four apical ones the larger, the lower pair projecting beyond the others; a pair at the base shorter than the others. Tergite 5 with a small tubercle on each side at apex; tergites 2-5 with distinct lateral furrows.

Length 11 mm.

1 ♂, 1 ♀, taken *in coitu*.

BORNEO: Sarawak, Mt. Matang, 1000 ft., ii. 1914 (*G. E. Bryant*).

A most interesting pair; the difference in general appearance is most striking. From the allied species it may be separated as follows:—

1. (6) Face and clypeus at least with golden pubescence.
2. (3) Anal tergite produced beyond anal sternite; anal segment (♂) with 8 spines; $6\frac{1}{2}$ - $7\frac{1}{2}$ mm. (Sumatra.) . . . *sumatrana*, Endl. (1906).
3. (2) Anal tergite shorter than anal sternite.
4. (5) Larger (13 mm.); wings distinctly bicolorous, hyaline at base, fuscous at apex. ♂ unknown. (Borneo.) . . . *curvispina*, Cam. (1903).
5. (4) Smaller (9 mm. ♀, 11 mm. ♂); wings unicolorous; anal segment ♂ with 6 spines. (Borneo.) . . . *matangæ*, sp. n.
6. (1) Face and clypeus at least with white or griseous pubescence.
7. (8) Anal sternite produced beyond anal tergite: "pubescence white." ♂ unknown. 11 mm. (Borneo.) . . . *eriocephala*, Cam. (1902).
8. (7) Anal tergite longer than anal sternite; pubescence grey; anal segment (♂) with 6 spines. 10 mm. (Sumatra.) *lepotaxis*, Endl. (1906).

Cœlioxyys froggatti, Ckll.

This species was described from Victoria (Proc. Linn. Soc. New South Wales, xxxvi. p. 170, 1913). Turner took a ♀ at Eaglehawk Neck, S.E. Tasmania, ii.-iii. 1913. This is apparently the first record of the genus in Tasmania; it is not represented in Cockerell's list of Tasmanian bees (Proc. Linn. Soc. New South Wales, xxxvii. p. 599, 1913).

A long series of both sexes from Yallingup, S.W. Australia, xii. 1913, is composed of specimens all rather larger than the type (10 mm. ♀, 12 mm. ♂).

Diptera.

ISCHNOCELIA, Perkins.

Ischnocælia, Perkins, Proc. Hawaii Ent. Soc. ii. p. 32 (1908).

= *Stenolabus*, Schulthess, Deutsch. ent. Zeit. p. 189 (1910).

Dr. Perkins communicated with Dr. Schulthess concerning these genera, and agreed that they were synonymous. There does not seem to have been any record published.

Both genera have so far only been recorded from S. and E. Australia.

Ischnocælia robusta (M.-Waldo).

Elimus robustus, M.-Waldo, Ann. & Mag. Nat. Hist. (8) v. p. 40 (Jan. 1910).

= *Stenolabus vulneratus*, Schulthess, Deutsch. ent. Zeitschr. p. 191 (March 1910).

For the transference of *E. robusta* to *Ischnocælia* see Ann. & Mag. Nat. Hist. (8) xi. p. 45 (1913). I have not seen Schulthess's type; but his good description and the text-figure (*l. c.*) leave no doubt as to their synonymy.

Ischnocælia integra (Schulthess), var. *major*, nov.

Stenolabus integer, Schulthess, Deutsch. ent. Zeitschr. p. 191 (1910).
♂ ♀.

Described from New South Wales. Turner took four specimens (3 ♂♂, 1 ♀), which differ from the typical form as follows:—

♀. Clypeus black basally; two small ovate spots laterally about the middle, and the extreme apex ferruginous red.

♂. Clypeus entirely yellow. The type has the clypeus sanguineous—possibly this may be due to cyanide.

The West Australian specimens are consistently larger than the type—13 mm. (to apex of tergite 2); wings 10 mm.

The measurement of the type is 11 mm. (to apex of tergite 2) and wings 9.5 mm.

S.W. AUSTRALIA: Yallingup, Dec. 1913–Jan. 1914 (*R. E. Turner*), "flying over sand."

Macrocalymma alicia, sp. n.

♀. Nigrum; clypei dimidio basali, macula parva bilobata inter-antennas, macula post oculos, pronoti margine antico, macula mesopleurali, duabus maculis scutello, abdominis segmentis 1 et 2

fasciis apicalibus, luteis; tegulis hyalinis, vix luteo-maculatis; tibiis anticis extas luteis; tarsis anticis ferrugineis; alis subhyalinis, area costali infuscata.

Long. 11 mm.

Mandibles of median thickness, 3-dentate at apex; clypeus convex, longer than broad, apically subtruncate; joints of flagellum short, subequal. Head with the vertex subquadrate seen in profile, sharply angulated behind the eyes. Thorax long, narrow; anterior margin of pronotum truncate, the sides rounded; scutellum flat.

Head and thorax closely and coarsely punctured; median segment and abdomen closely and more finely punctate. Sternite 2 with a shallow ovate depression occupying most of its surface. Wings slightly fuscous, darker along the costa and in the radial cell.

Length 11 mm. (to apex of tergite 2).

1 ♀.

S.W. AUSTRALIA: Yallingup, Dec. 1913-Jan. 1914 (Mrs. R. E. Turner).

I have much pleasure in naming this interesting insect after its captor, Mrs. R. E. Turner, who accompanied her husband on his recent long collecting-tour in Australia.

It is a typical *Macrocalymma*, and may be readily separated from the only other described species, *M. smithianum*, Perkins (1908), as follows:—

<i>M. smithianum</i> .	<i>M. aliciae</i> .
Colours: black, ferruginous, and yellow.	Colours: black and yellow, no ferruginous (except anterior tarsi).
Antennæ mostly ferruginous.	Antennæ wholly black.
Length 8-9 mm.	Length 11 mm.

Discoelius elongatus, Sauss. (1854).

Mr. Turner caught a pair of this fine insect at Eaglehawk Neck, S.E. Tasmania, ii.-iii. 1913. Saussure described it from "S. Australia." There is a specimen in the British Museum from Victoria (*C. French*).

Pareumenes australensis, M.-Waldo (1910).

Eumenes (*Pareumenes*?) *australensis*, M.-Waldo, Ann. & Mag. Nat. Hist. (8) v. p. 44 (1910). ♂.

Described from specimens taken near Cairns by R. E. Turner in 1902. During his recent tour he caught eight more specimens, four of them females, within a mile of the type-locality.

The ♀ resembles the ♂ in every respect, but is rather larger (13 mm. to apex of tergite 2); like the ♂ the clypeus is wholly yellow.

I can refer the species without hesitation to the genus *Pareumenes* after an examination of both sexes.

Montezumia amalice (Sauss.).

Nortonia amalice, Sauss. Stettin, ent. Zeit. p. 53 (1869). ♂.

= *Montezumia australensis*, Perkins, Proc. Hawaii Ent. Soc. ii. p. 33 (1908). ♂.

Saussure's type came from Rockhampton. Dr. Perkins tells me that he thinks these insects are synonymous; specimens of *M. australensis* were submitted to Dr. Schulthess, and Dr. Perkins is under the impression that he established their synonymy. On careful comparison I have no doubt that he was correct, though there seems to have been no published record.

POLISTES, Latr. (1802).

Polistes, Latreille, Hist. Nat. Crust. Ins. iii. p. 363 (1802).

= *Abispa*, Mitchell, Exped. Eastern Australia, i. p. 104 (1838).

= *Abispa*, Sauss. Et. Fam. Vesp., Suppl. p. 169 (1854).

Saussure wrongly sank his genus *Monerebia* (1852) to *Abispa* (1838). *Abispa* is clearly not a Eumeniid wasp, as both description and context show. Nor can it be claimed that *Abispa* is a *nomen nudum*; Saussure's remark (*l. c.*) that the genus was erected solely as a name, *e. g.*, "Genus *Vespa*, subgenus *Abispa*," is misleading, as there follows a specific description of several lines, based entirely, it is true, on colour.

Monerebia, Sauss., can now be resuscitated.

In justification of this synonymy it may be of interest to quote verbatim an account from Mitchell's book concerning his experiences with "*Abispa australiana*":—"At seventeen miles we entered a plain, where grew trees of the acacia pendula, and traversed it in a south-west direction, thus proceeding where it was most elongated. On entering the wood beyond a sudden extreme pain in my thigh made me shout before I was aware of the cause; a large insect had fastened itself upon me, and, on looking back, I perceived Souter, 'the Doctor,' endeavouring to defend himself from several insects of the same kind. He told me that I had passed near a tree on which their nest was suspended; and it appeared that this had been sufficient to provoke the attacks of these

saucy insects, who wore the largest stings I had ever seen. The pain I felt was extreme, and the effect so permanent that when I alighted in the evening on that leg from my horse, not thinking of the circumstances, I fell to the ground, the muscles having been generally affected. The wound was marked by a blue circular spot, the size of a sixpence, for several months."

It is evident from this account that the insect must have been a *Polistes*, the hanging nest and savage attack being characteristic of these insects. *Monerebia* is a solitary wasp making mud cells, which it stores in the usual way with larvæ &c. for its progeny. Mr. Rowland Turner, who has lived for many years in North Queensland, where *Monerebia* is common, tells me that they can only be induced to sting under great provocation, and then it is not a very serious affair. Mitchell gives his description in a footnote (*l. c.*); the "*Abispa australiana*" is probably *Polistes tepidus*, Fab.

Ischnogaster (Parischnogaster) levifoveatus, sp. n.

♂. Niger, luteo-variegatus, *I. foveatæ* affinis, clypeo dense argenteo-piloso; clypeo (macula subquadrata excepta), pronoti margine antico et postico, maculis pleuris, scutello duabus maculis, linea postscutello, segmenti mediani apice, luteis; fascia basali tergite 3, pedibus i. et ii. plerumque tibiisque posticis intus, luteis; mandibulis antennisque infra ferrugineis; alis subhyalinis, hirsutis. Long. 12 mm.

Clypeus short, about as broad as long, the apex produced to form a small tubercle; mandibles 3-toothed, the two outer teeth widely separated; thorax as in *I. mellyi*, but scutellum and postscutellum shining, impunctate; tegulæ shining, impunctate; petiole about twice as long as thorax, very slender, the apical third feebly swollen; segment 2 with a short basal stalk, its tergite with a conspicuous differentiated area occupying the greater part of its surface; the area flattened, bordered laterally by two rounded carinæ which disappear before the apex of the segment; terminal segment strongly compressed laterally; the sternite with two sharp longitudinal ridges meeting at apex. Antennæ massive, joints 3 and 4 equal. Wings with a considerable covering of hairs, the hind wings ciliated at the end; third cubital cell short, about one-third as long as second. Whole insect nearly impunctate; the mesonotum with feeble longitudinal striation; median segment with feeble transverse striation; abdominal segments 1 and 2 shining impunctate, the following segments glabrous. Clypeus densely covered with silvery

pilosity; thorax with a sparse testaceous pile; differentiated area on tergite 2 with an indistinct row of dark fulvous pubescence parallel to the lateral carina.

Length (to the apex of tergite 2) 12 mm.

1 ♂.

BORNEO: Sarawak, Mt. Matang, 12. xii. 1913 (*G. E. Bryant*).

Closely allied to *I. foveatus*, Buys., described from Salwatti, but differs from that species in having the foveate area on tergite 2 almost destitute of pubescence.

Ischnogaster (Parischnogaster) foveatus, Buys.

This species was described by Du Buysson ('Notes from the Leyden Museum,' xxix. p. 80 (1907), ♂) from Salwatti, off N.W. New Guinea. Only the male is at present known.

Five specimens caught by Bryant at Penang in November 1913 are apparently referable to this species.

Ischnogaster (Parischnogaster) nitidipennis, Sauss.

1 ♂.

BORNEO: Sarawak, Mt. Matang, xii. 1913 (*G. E. Bryant*). Also recorded from Singapore (*H. N. Ridley* and *R. Shelford*) and Tenasserim (*Col. Bingham*).

Ischnogaster (Parischnogaster) nigricans, Cam.

2 ♀ ♀, 1 ♂.

BORNEO: Sarawak, Mt. Matang, ♂, xii. 1913. STRAITS SETTLEMENTS: Penang, x. 1913, 2 ♀ ♀ (*G. E. Bryant*). Also recorded from N.W. BORNEO: Spitang.

Ischnogaster (Parischnogaster) flavolineata, Cam.

1 ♂.

BORNEO: Sarawak, Mt. Matang, xii. 1913 (*G. E. Bryant*).

Ischnogaster (Parischnogaster) butteli, Schulthess.

2 ♂ ♂.

BORNEO: Sarawak, Mt. Matang, xii. 1913 (*G. E. Bryant*). Described from Malacca. This is the first record for Borneo.

The species is distinct from *I. flavolineata*, Cam. Schulthess was in doubt concerning their synonymy. The variegated

marking of the antennæ (Zool. Jahrb. xxxvii. p. 257, fig. α , 1914) renders this species very conspicuous.

Ischnogaster ornatifrons, Cam.

5 ♂♂.

BORNEO: Sarawak, Mt. Matang, xii. 1913; Mt. Merinjak, 1500 ft., v. 1914 (*G. E. Bryant*).

LVIII.—*Descriptions and Records of Bees*.—LXIV.

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

Megachile nidulator, Smith.

♀.—Fife Bay, New Guinea, 1899 (Froggatt coll. 217 c).

Megachile doddiana, var. *clarkei*, v. n.

♀.—Hair at sides of first dorsal segment of abdomen entirely black.

Hab. Geraldton, W. Australia, 1914 (*Clarke*; Froggatt coll. 218 c).

The specimen also carries the number 169.

Megachile calens, sp. n.

♀.—Length about 10.5 mm.

Ventral scopa bright red, black on last segment; anterior margin of clypeus with a small median tubercle; wings smoky hyaline, darker apically.

Like *M. diligens*, Sm., from Oahu, Hawaiian Is., but larger, hair of vertex black, mesothorax and scutellum with a considerable admixture of black hair; the bright red abdominal bands extremely thin or interrupted in middle.

♂.—Like *M. doanei*, Ckll., from Tahiti, the sixth abdominal segment strongly bidentate, with a broadly rounded excavation between the teeth; but hair at sides of upper part of face black instead of brown, scutellum with much black hair, second to fourth abdominal segments with short black hair on disc, the first segment with no red hair-band, that on second present only at sides, that on third almost obsolete in middle, fifth segment with black hair in middle, especially basally; sixth segment with longer teeth. Anterior coxæ with slender spines; anterior tarsi slightly

broadened, having lateral, brownish, keel-like outer margins (*doanei* has the same).

Hab. New Hebrides. The female is marked "Epi, W. W. F., 1913, 211 c," the male "E/n, 1913, W. W. F., 213 c." From Froggatt's collection.

Known from *M. jimbriventris*, Fr., by the scopa black only on last segment, the form of end of male abdomen, &c.

In my table in Proc. Linn. Soc. N.S.W. 1911, p. 175, the female *M. calens* runs to 16, but is quite distinct from the two species there given. The male runs to *M. woodfordi*, Ckll., but the structure of the sixth abdominal segment is quite different. Owing to the feebly banded abdomen it could run to *M. mortyana*, D. T., but that differs in the colour of the tarsi. *M. calens* is readily known from *M. similis*, Sm., by the light hair of the face. The male is the type.

Megachile serricauda, Cockerell.

♂.—New Hebrides; "Epi, 1913, W. W. F., 214 c" (Froggatt coll.).

This Australian species has presumably been introduced, perhaps with timber carrying the nests.

Megachile laboriosa, Smith, variety *a*.

♂.—Binaturi R., Papua, March 1913 (Froggatt coll. 215 c).

Smith's description is too brief, but Friese and Meade-Waldo have supplied some additional characters. The species, as I have determined it, is allied to *M. aberrans*, Friese, but has the abdomen beyond the third segment clothed with reddish hair, mixed with fuscous. The size (length about 13.5 mm.) is greater than Smith indicates. The cheeks have white hair beneath and the sixth abdominal segment has a median keel. The wings are dark fuscous-ferruginous. The coloured figure published by Friese only differs from my specimen in having the apical part of the abdomen a much more lively red. In the list accompanying the specimens the locality is given as "Binitura R."

Megachile aurifrons, Smith.

♀.—Brewarrina, N.S.W., 1914 (Froggatt, 205 c).

Megachile chrysopyga, Smith.

♀.—Geraldton, W. Australia, 1914 (Clarke, 172; Froggatt coll. 209 c).

Megachile cygnorum, Cockerell.

I am now satisfied that I have at different times confused three species under this name, the males of which are readily separable as follows:—

Fifth abdominal segment with light hair, except at extreme base	<i>M. captionis</i> , sp. n.
Fifth abdominal segment with conspicuous erect black hair.	1.
1. Length about 11 mm.; anterior tibiæ with a broad black band covering at least half of outer surface longitudinally	<i>M. macularis</i> , D. T.
Smaller; anterior tibiæ with a black patch on basal half outside	<i>M. cygnorum</i> , Ckll.

The *M. macularis* is Turner's 623 from Mackay; it certainly must belong with the female from the same locality. The original *macularis* was from Western Australia, but Smith's description appears to point to the species I have identified from Queensland.

Megachile captionis, sp. n.

♂.—Very close to *M. macularis* and *M. cygnorum*, but with the following special characters:—Small, length about 9 mm.; anterior tibiæ bright ferruginous, with a large basal black spot anteriorly, not nearly covering half the surface; second joint of anterior tarsi with a more or less evident black spot visible from without (as in *M. darwiniana*); outer half of tegulæ pale reddish; fifth dorsal abdominal segment with erect white or yellowish-white hair. The vertex has the hair entirely pale, not mainly black as in *darwiniana*. The anterior coxæ have an oblique flattened tooth and a patch of red hair.

♀.—Length about 10 mm.

General appearance of *M. quinquelineata*, the ventral scopa (white, black on last segment and extreme sides of penultimate) and light abdominal bands practically the same, but the mesothorax much more finely punctured and the sixth abdominal segment with a broad band of dense white tomentum. Mandibles quadridentate; clypeus extremely densely punctured, with a minute median apical tubercle; eyes lilac; flagellum red beneath; wings hyaline, short; spurs of hind legs black, but of middle ones red. There are two white hair-spots in the scutello-mesothoracic suture; the mesothorax and scutellum are almost without hair, but

are perhaps denuded; the hair of the vertex is very short and ochraceous.

Hab. Males from Brewarrina, N.S.W., 1914 (*Froggatt*, 206 c = type), and Woodend, Victoria (*French*; *Froggatt* coll. 169), the latter with green eyes, and hair of face, top of head and dorsum of mesothorax strongly yellowish. Female from Brewarrina (*Froggatt*, 210 c). The dense band of hair across sixth abdominal segment readily separates the female from *M. cetera*, Ckll.

Another male *M. captionis*, marked "Yarrowin" (*Froggatt*, 207 c), looks long and narrow, having the abdominal segments extended; it has no spot on the outer side of anterior tarsus, and there is a slight projection in the middle of the interval between the dentiform projections of the sixth abdominal segment. The flagellum is rich chestnut-red beneath. According to the list accompanying the specimens, the "Yarrowin" material is from Brewarrina, which is on the Barwon R., over 360 miles from the coast and about 60 miles from the Queensland border.

Megachile barwonensis, sp. n.

♂.—Length about $6\frac{1}{2}$ mm.

Small and slender, like a *Heriades*; head and thorax black, densely punctured; abdomen clear bright ferruginous, the first segment with the basin (except upper part) and cloud on each extreme side black; wings hyaline; face covered with white hair.

Closely allied in every way to *M. micrerythra*, Ckll., but differing as follows:—Tarsi only red apically; no white spots in scutello-mesothoracic suture (but a white hair-spot at each corner of mesothorax, the posterior ones conspicuous); sixth abdominal segment bidentate, the short tubercle-like teeth wide apart. The head is large, broader than the thorax. Flagellum slender, dull red beneath.

Hab. Yarrowin, N.S.W., 1914 (*Froggatt*, 223 c).

The name is derived from the Barwon R.

Thaumatoma callurum, sp. n.

♂.—Length about 5.5 mm.

Black, with the last three abdominal segments entirely bright clear ferruginous; head and thorax closely punctured, but shining; head large; face with much pure white hair; flagellum pale ochreous, slender throughout, except the large, flattened, spatulate, black apex; legs dark; wings hyaline, stigma pallid; abdomen strongly constricted above

between the segments; first ventral segment only slightly turgid; sixth segment bidentate, the teeth rather close together.

♀.—Length about 7 mm.

Fifth and sixth abdominal segments red, but not so bright as in the male; ventral scopa white; white hair-spots at corners of mesothorax, but none in scutello-mesothoracic suture; head large; flagellum quite normal for *Megachile*, obscure red beneath; clypeus strongly punctured, its lower margin tridentate; supraclypeal area with large punctures and a smooth area.

Hab. Yarrowin (Brewarrina), 1914 (*Froggatt*; ♂ = type, 226 c; ♀ 230 c).

Easily known by its small size and partly red abdomen. The female is very like *Megachile fultoni*, Ckll., but that has only one red abdominal segment, and the clypeus and supraclypeal area are quite different. The genus *Thaumatoma* is founded on a secondary sexual character, and the female cannot be distinguished from the group of Australian *Heriades*-like *Megachile*, which, however, should probably be separated from true *Megachile*.

Saropoda bombiformis, Smith.

♀.—Binaturi R., Papua, March 1913 (*S. H. M.*; *Froggatt* coll. 216 c). Agrees with Australian specimens.

Anthophora preissi froggatti, subsp. n.

♀.—Length fully 16 mm.

Covered with mouse-coloured hair. Differs from *A. preissi* (from Western Australia) as follows:—Antennæ black, the flagellum not red beneath; a transverse pale yellow supraclypeal band, and the lower corners of the clypeus broadly pale yellow; median pale stripe on clypeus narrow, not tapering above, but broadened at extreme upper end; hind margins of abdominal segments narrowly dark reddish; the creamy-white hair of outer side of hind tibia with a ferruginous stain at base.

Hab. Brewarrina, New South Wales, 1914 (*Froggatt*, 203 c).

At the same locality Mr. Froggatt took a male *A. pulchra*, Sm. (201 c).

Anthophora chlorocyanea, sp. n.

Anthophora cingulata, Ckll. Ann. & Mag. Nat. Hist., Oct. 1905, pp. 394, 397.

Mr. Meade-Waldo has shown that the real *A. cingulata* of Fabricius is *emendata*, Sm.

Lithurgus albofimbriatus froggatti, subsp. n.

♀.—Abdomen apparently bandless, the thin hair-bands on hind margins of segments being dark fuscous; sixth segment dorsally with a rather conspicuous patch of dark red hair; tuft of hair behind hind wings dark fuscous; median keel of clypeus very prominent.

Hab. New Hebrides; "Epi, 1913, W. W. F." (Froggatt coll. 212 c).

It is rather illogical to call this isolated form a subspecies rather than a species, but its characters are slight.

Pachyprosopis holoxanthopus, sp. n.

♂.—Length about 4.25 mm.

Robust; head formed as in *Euryglossa*, broad but not exceptionally large, black, very faintly metallic, with the whole face up to level of antennæ, and slender inconspicuous lines up anterior orbital margins, as well as the labrum and mandibles, and spot on lower part of cheeks next to base of mandibles, all bright chrome-yellow; antennæ only moderately long, entirely bright yellow; front finely but distinctly punctured; thorax black, the mesothorax and scutellum obscurely purplish, irregularly and inconspicuously punctured; tegulæ pale testaceous. Wings hyaline, stigma amber-colour, second s.m. high and narrow. Legs entirely bright chrome-yellow. Abdomen broad, with the basal half bright clear ferruginous, the apical half black or nearly, with a faint metallic tint, the apical segment dark reddish brown.

Hab. Yarrowin (Brewarrina), 1914 (Froggatt, 231 c).

Easily known from all other species by the bright red basal half of abdomen, with yellow legs and antennæ.

Euryglossa semirufa, sp. n.

♀.—Length about 5 mm.

Robust, thick-set, with hardly any pubescence; head and

thorax black, closely and very finely punctured; clypeus (except a black band down each side), subcuneiform lateral marks (ending abruptly above at level of antennæ), and large hat-shaped supraclypeal mark (notched above) pale reddish yellow, the lower part of clypeus suffused with dull red; mandibles with a large pale yellow basal spot; antennæ short, entirely clear ferruginous; tubercles light reddish yellow; tegulæ clear ferruginous. Wings hyaline, stigma and nervures dull amber-colour; second s.m. nearly square. Legs (except coxæ and trochanters) clear red, much of basal half of hind tibiæ very pale yellow. Abdomen broad and short, dullish, with extremely fine punctures, clear ferruginous without markings, except some black at extreme base of first segment; first segment beneath dark, with a broad expanded hyaline margin.

Hab. Yarrowin (Brewarrina), 1914 (*Froggatt*, 222 c).

Distinct from all others by the black head and thorax, with clear red abdomen. The clypeus is not depressed in the middle as it is in *E. albocuneata*, Ckll., which is similar in general form, but very different in markings.

Euryglossa rhodochlora, sp. n.

♀.—Length about 9 mm.

A species of the *rubricata* group; head dark bluish green, the clypeus, supraclypeal area, labrum, and mandibles black; clypeus shining, sparsely but distinctly punctured, with a strong median longitudinal depression; scape black; flagellum dark brown above, light ferruginous beneath; mesothorax and scutellum shining, sparsely punctured; mesothorax red, blackened anteriorly, especially at sides; scutellum and postscutellum black, rest of thorax dark blue-green; pleura dullish, metathorax shining; tubercles densely fringed with white hair; tegulæ pale testaceous. Wings clear, nervures and stigma dusky reddish; second s.m. much broader (longer) than high; third discoidal cell produced at end. Legs black, the knees reddish, the basitarsi dark fuscous, the small tarsal joints dull ferruginous. Abdomen with a sericeous surface, red, first segment dark blue-green except narrow apical margin, second with a transverse blue-green suffusion across disc, third more or less metallic subapically and fourth at sides, fifth and apex blue-green; venter dark, with more or less red at bases of segments.

Hab. Yarrowin (Brewarrina), 1914 (*Froggatt*, 228 c).

Readily known from the other members of the *rubricata* group by the dark legs and scutellum, &c.

Euprosopis elegans sydneyana (Ckll.).

3 ♂, Yarrowin (Brewarrina), 1914 (*Froggatt*, 232 c).

Prosopis sublateralis, sp. n.

♂.—Length about $4\frac{1}{2}$ mm.

Head black, with the mandibles, labrum, clypeus, supra-clypeal mark, and large patch of similar form just above and connected with it, and lateral face-marks (filling space between eyes and clypeus and supra-clypeal area, and going upwards as narrowing bands along inner orbits nearly to level of lower edge of middle ocellus) all cream-colour; face narrow; front very finely and closely punctured; antennæ light ferruginous, the short scape cream-coloured in front, the flagellum a little dusky above, joints quite normal; mesothorax, scutellum, axillæ, sides of prothorax, mesopleura, and an obscure patch at sides of metathorax all terra-cotta red; tubercles and two marks on upper border of prothorax creamy-white; other parts of thorax black; mesothorax dull, minutely punctured; area of metathorax semicircular, somewhat shining, irregularly wrinkled, bounded by a beaded sulcus; tegulæ ferruginous, with a white spot. Wings clear, nervures and stigma dark brown. Legs black, with the anterior and middle knees, the anterior tibiæ, the middle tibiæ at apex, hind tibiæ broadly at base and slightly at apex, and all the basitarsi creamy white; middle tibiæ light ferruginous in front; small joints of anterior and middle tarsi pallid, but of hind tarsi fuscous. Abdomen with the first two segments and the base of the third terra-cotta red, the rest black.

Hab. Yarrowin (Brewarrina), 1914 (*Froggatt*, 229 c).

The quite different area of metathorax indicates that this cannot be the male of *P. cenibera*, Ckll. It is evidently very close to *P. lateralis*, Smith, but, considering the entirely different locality and the various differences of size, markings, &c., I feel confident that the two are not sexes of one species.

Prosopis coronatula, sp. n.

♂.—Length about 4 mm.

Head and thorax black; face below antennæ entirely chalk-white, the lateral marks also extending upwards along

orbits, ending in a point at level of middle of front; supra-clypeal mark sometimes notched in middle above, but not tridentate; labrum and mandibles white; antennæ long, light ferruginous, the flagellum somewhat dusky above, the very short scape with a broad white band in front; upper border of prothorax (interrupted in middle) and tubercles white; front and mesothorax finely but distinctly punctured, pleura with coarse punctures on a dull ground; area of metathorax large, triangular, strongly wrinkled, shining; tegulæ with a white spot. Wings hyaline, stigma and nervures dark brown; first r. n. meeting t.-c. Legs marked nearly as in *P. sublateralis*, but most of anterior tibia light ferruginous, middle and hind tibiæ dark fuscous, with base and apex creamy white, all the tarsi pale. Abdomen bright ferruginous, with apex broadly black.

Hab. Brewarrina, 1914 (*Froggatt*, 220 c). Also a co-type, Yarrowin (*Froggatt*, 221 c).

Close to *P. coronata*, but easily separated by the broadly black end of abdomen &c. Also close to *P. constricta*, but clypeus without the lateral black marks, supra-clypeal mark present, &c.

LIX.—*Second List of Small Mammals from Western Yunnan collected by Mr. F. Kingdon Ward.* By OLD-FIELD THOMAS.

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IN 1912* I published a list of some small mammals collected in the neighbourhood of A-tun-tsi, N.W. Yunnan, by Mr. F. Kingdon Ward; and I am now able to supplement this by giving a list of a second collection made in the same little-known region. Some of the specimens were obtained further westwards towards the Burmese frontier.

The collection has been presented to the National Museum by the Hon. N. Charles Rothschild.

1. *Tupaia belangeri chinensis*, J. And.

♂. Yung-chang-fu, W. Yunnan. 6000'.

* Ann. & Mag. Nat. Hist. (8) ix. p. 513 (1912).

2. *Parascaptor leucurus*, Bly.

1 specimen. Su-ki, Salween Valley, lat. 27° 30' N. 7000'.

3. *Neotetracus sinensis*, Trouess.

1. Yang-pi, W. Yunnan. 7000'.

4. *Sorex wardi fumeolus*, Thos.

1. Pei-ma-shan, Mekong-Yangtze divide. 14,000'.

5. *Mustela sibirica*, Pall.

2. Immature. A-tun-tsi. 12,000'.

6. *Trogopterus* sp., probably *T. mordax*, Thos.

Skin without skull or label.

7. *Apodemus speciosus latronum*, Thos.

3. A-tun-tsi. 12,000'.

8. *Apodemus speciosus orestes*, Thos.

4. Ka-gur-pu. 12,000'.

3. Chung-tien Plateau. 11,000'.

1. Doker-la. 12,000'.

Although I provisionally record these mice under the trinomial names originally given them, their distribution suggests that they bear to each other the same sort of relationship that in Europe occurs between *A. flavicollis* and *A. sylvaticus*, larger and smaller species, otherwise closely allied, found together over a considerable area.

9. *Microtus irene*, Thos.

1. A-tun-tsi. 12,000'.

3. Mekong-Yangtse divide. 14,500'.

1. Ka-gur-pu. 15,100'.

10. *Microtus (Antelionmys) wardi*, Thos.

8. Doker-la. 12,000'.

The following are the external measurements of a male of this species, which was described from a skull only:—

Head and body 110 mm.; tail 61; hind foot 19; ear 14.

In colour *M. wardi* is quite like *M. chinensis*, as was to be expected.

11. *Microtus (Antelionomys) custos*, Thos.

1. A-tun-tsi. 12,000'.

12. *Microtus (Eothenomys) melanogaster miletus*, subsp. n.

♂. 10 miles W. of Yang-pi, W. Yunnan. 7000'.

Near *M. melanogaster eleusis*, but bulkier throughout.

General external characters, including colour and the greater length of tail, as in the subspecies *eleusis*. Size, however, somewhat greater.

Skull markedly larger and heavier than that of *eleusis*, the upper outline much more bowed, and the frontal height therefore considerably greater. Interorbital region heavy, convex, its edges not ridged. Brain-case smooth, the angles and ridges little developed. Anterior palatine foramina more widely open than in *eleusis*. Bullæ slightly smaller.

Molars larger than in *eleusis*, but their structure quite as in that form; m^3 similarly with four salient angles on its inner side.

Dimensions of the type (measured in the flesh):—

Head and body 114 mm.; tail 48; hind foot 19; ear 13.

Skull: condylo-incisive length 25; basilar length 22.2; zygomatic breadth 15.6; nasals 7.6; interorbital breadth 4.5; breadth of brain-case 12.4; height of forehead above alveolus of m^2 8.4; palatilar length 12; palatal foramina 5×1.8 ; upper molar series (crowns) 6.2.

Hab. as above.

Type. Adult male. B.M. no. 14. 10. 23. 32. Original number 34. Collected 28th February, 1914.

This vole has a skull so much larger and heavier than that of either true *melanogaster* or the subspecies *eleusis* that it might be thought distinguishable as a full species. But on the analogy of the races of *Microtus agrestis*, as admitted by Mr. Miller, we may for the present allow an equal range of variation for *M. melanogaster*, especially as the distribution of the group is probably continuous. The difference in m^3 which distinguishes *eleusis* and *miletus* from true *melanogaster* is also paralleled by that in m^1 characteristic of *Microtus agrestis exsul*.

The skull of *M. (E.) mucronatus*, G. Allen, is of about the same length as that of *miletus*, but is less bowed above, and m^3 is of the *melanogaster*, not the *eleusis*, pattern.

13. *Ochotona roylei*, Og.

1. Doker-la. 12,000'.

14. *Ochotona tibetana*, M.-Edw.

1. Doker-la. 12,000'.

LX.—*Descriptions of new Mollusca from New Caledonia, Japan, Philippines, China, and West Africa.* By G. B. SOWERBY, F.L.S.

[Plate XIX.]

Clavatula denansi, sp. n. (Pl. XIX. fig. 1.)

Testa acuminato-fusiformis, pallido fulvo-fusca, nitens, utrinque albide, parciim fusco maculata et longitudinaliter strigata; spira elata, acuta, ad apicem minute papillaris; anfractus 10, concavi, læves, supra et infra acute carinati, striis obscuris longitudinaliter arcuatis sculpti; sutura haud impressa, sed lira tenuissima instructa; anfractus ultimus acute angulatus, supra angulum valide concavus, infra angulum leviter convexus, deinde constrictus, basim versus oblique striatus, bicarinatus; rostrum mediocriter productum. Apertura latiuscula, angulata; labrum tenue, breviter bilobatum, postice late sinuatum; columella rectiuscula, tenuiter albo callosa.

Long. 26, diam. maj. 10 mm.

Hab. Gorée, West Africa (*Denans*).

A shell of striking characters, remarkable chiefly for the smooth concave declivity of the whorls. It bears some resemblance to *C. gravis*, Hinds, but the angular keel is not tubercled as in that species, the whorls above the keel are more decidedly concave, and the sinus is broader. I have only seen a single specimen of this species.

Conus egregius, sp. n. (Pl. XIX. fig. 9.)

Testa minuta, solidiuscula, utrinque acuminata, aurantia, lineis fuscis, angustis (circ. 5) æquidistantibus ornata, ubique spiraliter sulcata; spira elatiuscula, gradata; anfractus angulati, ad angulum linea fusca ornati; spira obtusa, papillaris.

Long. 4, diam. $1\frac{1}{4}$ mm.

Hab. New Caledonia.

Although the smallest of Cones this little shell seems sufficiently characteristic to have a name. Its colour is brightish orange, neatly ornamented at intervals with narrow brown lines, while the surface of the body-whorl is closely spirally grooved throughout. It may be that this and the following are the young of some larger species, but at present I am quite unable to connect them with any known forms.

Conus vividus, sp. n. (Pl. XIX. fig. 8.)

Testa minuta, vivide violacea, ad angulum zona angusta albida cingulata, ubique spiraliter sulcata, supra angulum planulata, infra angulum levissime convexa, basim versus attenuata; apice prominens crassa, saturate purpurea.

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

Hab. New Caledonia.

This brightly coloured little shell, like the last, is closely spirally grooved; it is characterized by an almost flat top, from which a prominent dark purple apex projects. I have seen about a dozen specimens of this species, presenting scarcely any variation in size, shape, or colour.

Mitra multisulcata, sp. n. (Pl. XIX. fig. 3.)

Testa elongato-fusiformis, fulvo-fusca; spira elata, acuta; anfractus 7, vix convexi, ubique spiraliter sulcati; sulcis numerosis, profundiusculis, leviter crenulatis, æqualiter latis; sutura anguste canaliculata; anfractus ultimus $\frac{2}{3}$ longitudinis testæ æquans, leviter convexus, basim versus leviter attenuatus. Apertura elongata, intus alba; columella tenuiter albo-callosa, quadriplicata, plicis validis, leviter obliquis; labrum crassiusculum valide crenulatum.

Long. 31, diam. 12 mm.

Hab. New Caledonia.

The only species with which I can compare this is *M. rüppelli* (Reeve), than which it is larger, more fusiform, and the spiral grooves are more numerous. I have before me several specimens of the new species, presenting scarcely any variation, and all having about the same number of grooves.

Mitra glabrilirata, sp. n. (Pl. XIX. fig. 5.)

Testa parva, elongato-fusiformis, angusta, fusco-nitens; anfractus 7, primi læves, rotundati, deinde rectiusculi, longitudinaliter costati; costis numerosis, læves; sutura impressa; anfractus ultimus $\frac{1}{2}$ longitudinis testæ æquans, costis partim evanidis. Apertura

breviuscula, labrum tenue, columella fusca, quadruplicata, plicis anticis minutis, posticis prominens.

Long. 11, diam. 4 mm.

Hab. I. Sibuyan, Philippines.

A small, narrow, straight-sided shell with numerous close smooth longitudinal ribs.

Mitra sibuyanensis, sp. n. (Pl. XIX. fig. 6.)

Testa parva, abbreviato-fusiformis, solidiuscula, fulvo-albida, ad suturam fusca, zona fusca interrupta cincta; spira conica, medio-criter elata, subgradata; anfractus 5, superne leviter concavi, inferne longitudinaliter crassicostati; anfractus ultimus $\frac{2}{3}$ longitudinis testæ æquans, supra convexus, deinde leviter convexus, longitudinaliter crassicostatus, spiraliter striatus, basim versus leviter attenuatus. Apertura oblonga, medio-criter lata, columella oblique rectiuscula, plicis 4 minutis munita; labrum acutum, leviter sinuosum.

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

Hab. I. Sibuyan, Philippines.

Although not very striking in appearance, this little shell does not seem to suggest a close comparison with any hitherto known species, but in external form it may be said to have, on a very small scale, some resemblance to *M. patriarchalis* (Lamk.).

Marginella bicatenata, sp. n. (Pl. XIX. fig. 7.)

Testa pyriformis, crassa, polita, albida, maculis nigris parvis bi-seriatim (postice et antice) ornata; spira obtusa, parum elata, callosa; anfractus 4, convexiusculi, leves, nitentes; anfractus ultimus postice convexus, rotundatus, vix angulatus, antice attenuatus. Apertura elongata, medio-criter lata; columella quadruplicata; labrum crassiusculum, glabrum.

Long. 13, diam. 7 mm.

This pretty shell is unique as far as my knowledge goes. Unfortunately I have no certain knowledge as to its habitat; but it was found in the collection of M. Denans without label, and most likely it was among the many fine shells collected by that gentleman at Gorée, West Africa.

Triphora hungerfordi, sp. n. (Pl. XIX. fig. 10.)

Testa sinistrorsa, elongato-acuminata, nigro-fusca; spira elata, leviter convexa; anfractus 12, bi-seriatim pustulati; pustulis rotundatis, glabratis, inæqualibus; anfractus ultimus breviusculus, circiter sex-seriatim pustulatus; rostrum valide reflexum.

Apertura subquadrata ; labrum tenue, minute crenulatum ; columella obliqua.

Long. 12, diam. $2\frac{1}{4}$ mm.

Hab. Hongkong.

In general form and appearance this shell differs but little from small dark-coloured specimens of the European *T. perversa*, but the nodulous spiral ridges are more unequal and irregular, and not interrupted by longitudinal furrows.

A few specimens of this species were brought from Hongkong many years ago by the late Surgeon-Major R. Hungerford, but until now it has remained nameless.

Turritella noumeensis, sp. n. (Pl. XIX. fig. 4.)

Testa anguste turrita, pallide fuscescens, nigro-fusco balteata ; anfractus 16, leviter convexi, spiraliter inæqualiter multilirati, longitudinaliter obscuressimo arcuatim striati, sutura impressa sejuncti ; anfractus ultimus breve infra angulatus. Apertura subquadrata ; columella brevis ; labrum tenue, late sinuatum.

Long. 27, diam. 6 mm.

Hab. Noumea, New Caledonia.

This shell is rather like *T. fasciata* (Menke), Reeve, Conch. Icon. fig. 47, but the spiral keels are much narrower and more numerous, and it is further distinguished by the broad sinuosity of the lip.

Haliotis crebrisculpta, sp. n. (Pl. XIX. fig. 2.)

Testa oblonga, depressiuscula, extus pallide fusco-carneola, liris spiralibus irregularibus numerosis profuse squamatis instructa, laminis minutis acutis per-numerosis transversim sculpta, obtusissima angulata ; foraminibus tubiferis, subamplis, quaternis perviis ; spira leviter exserta, angulata, ad angulum minute tuberculata, infra angulum concava.

Long. 30, diam. 19 mm.

Hab. New Caledonia.

This shell is distinguished by its peculiarly elaborate sculpture. The concentric ridges are very numerous, profusely tubiferously scaled ; these, as well as the interstices, are crossed throughout by very profuse sharp laminæ.

Pitaria pygmaea, sp. n. (Pl. XIX. fig. 11.)

Testa parva, subovalis, compressiuscula, tenuis, albida, concentricè creberrime striata ; umbones obtusiusculi, incurvati, ante medium locati ; lunula cordiformis, leviter impressa ; margo dorsalis anticus brevis, concavo declivis, posticus longior, declivis ; lateribus rotundatis. Pagina interna pellucida, lævis ; cardo normalis.

Latero-post. 9, umbono-marg. 4, crass. 4 mm.

Hab. New Caledonia.

A small thin shell of very simple form and character. The surface looks smooth, but under the lens it is seen to be closely concentrically striated.

Tellina roblini, sp. n. (Pl. XIX. fig. 16.)

Testa transversim elongata, albo-nitens, concentrice et parum oblique irregulariter sulcata; umbones obtusi, vix elevati, post medium locati; margo dorsalis anticus leviter arcuatus, oblique declivis, posticus subrecto declivis, brevior; latus anticum rotundatum, posticum angulatum; ligamentum externum, breve. Pagina interna glabra, pallide luteo tineta; dens cardinalis in utraque valvis duo, lateralis elongatis, leviter elevatis.

Antero-post. 13, umbono-marg. 8 mm.

Hab. New Caledonia.

A small white shining shell resembling *T. rhomboides* (Gaim.) in form, characterized by slightly oblique striæ.

Macoma caledonica, sp. n. (Pl. XIX. fig. 13.)

Testa subtrigona, compressiuscula, tenuis pellucide albida; utraque valva concentrice crebrisulcata; umbones acutiusculi, fere centrali; margo dorsalis utrinque declivis, ventralis arcuatus; latus anticum rotundatum, posticum acuminatum. Pagina interna alba, linea pallii latissime sinuata; dens cardinalis minutissimis, lateralis nullis.

Antero-post. 12, umbono-marg. 8 mm.

Hab. New Caledonia.

A delicate little shell, elate at the umbones, and with the dorsal margin sloping on each side. Although simple in character, it does not seem to suggest near affinity with any known species.

Macoma indifferens, sp. n. (Pl. XIX. fig. 15.)

Testa compressa ovalis, tenuis, sordide albida, concentrice irregulariter striata, postice obscurissime angulata; umbones acuti, vix prominens, leviter post medium locati; margo dorsalis anticus arcuatus, posticus recto-declivis, ventralis arcuatus; latus anticum rotundatum, posticum breviter truncatum. Pagina interna alba, linea palliari latissime sinuata; dens cardinalis in utroque valvæ duo, lateralis nullis.

Antero-post. 37, umbono-marg. 28 mm.

Hab. Manila, Philippines.

In form this shell somewhat resembles *M. nobilis* (Hanley), which is also a Philippine species, but it lacks the colour and is not so distinctly concentrically sulcated. It is still more

like the Mediterranean *M. cumana* (Da Costa), but the concentric sulci are finer and closer, and the umbones somewhat less prominent.

Cardium euglyptum, sp. n. (Pl. XIX. fig. 14.)

Testa transverse oblonga, albidā, postice fusco maculata, costis radiantibus circiter 35, confertis, creberrime arcuatim squamatis; umbones obtusiusculi, antice locati; margo dorsalis posticus arcuatus, anticus truncatus; area ligamenti elongato cordiformis. Pagina interna radiatim obscure lirata, postice pulcherrime fusco maculata, ad marginem crenulata.

Antero-post. 10, umbono-marg. 8 mm.

Hab. N. Caledonia.

A pretty little shell with close-set radiating riblets, which are closely crossed by small arched scales. The brown markings on the posterior side show clearly and brightly in the interior.

Scintilla clausa, sp. n. (Pl. XIX. fig. 17.)

Testa transverse ovalis, compressiuscula, nitida, pallide carnea, clausa, concentricè obscurissime et irregulariter concentricè striata; umbones acuti, vix elevati, antemedium locati; margo dorsalis anticus breviter declivis, posticus longior, arcuatus, ventralis parum arcuatus vel rectiusculus; lateribus rotundatis. Pagina interna leviter rugosa, impressiones musculares trigono-clongatis, linea palealis arcuata, haud sinuata.

Antero-post. 6, umbono-marg. 5 mm.

Hab. New Caledonia.

Compared with *S. semiclausā*, Sowerby, Proc. Zool. Soc. 1865, this shell is paler in colour, more oval in form, and there is no hiatus between the valves.

EXPLANATION OF PLATE XIX.

- Fig.* 1. *Clavatula denansi*.
Fig. 2. *Haliotis crebrisculpta*.
Fig. 3. *Mitra multisulcata*.
Fig. 4. *Turritella noumeensis*.
Fig. 5. *Mitra glabrilirata*.
Fig. 6. — *sibuyanensis*.
Fig. 7. *Marginella bicatenata*.
Fig. 8. *Conus vividus*.
Fig. 9. — *egregius*.
Fig. 10. *Triphora hungerfordi*.
Fig. 11. *Pitaria pygmæa*.
Fig. 12. *Voluta prevostiana*, var. *clara*.
Fig. 13. *Macoma caledonica*.
Fig. 14. *Cardium euglyptum*.
Fig. 15. *Macoma indifferens*.
Fig. 16. *Tellina roblini*.
Fig. 17. *Scintilla clausa*.

LXI.—Notes on *Voluta prevostiana*, Crosse, and *V. megaspira*, Sowerby, with Description of a new Variety of the Former. By G. B. SOWERBY, F.L.S.

[Plate XIX. fig. 12.]

Voluta prevostiana, Crosse, Journ. de Conch. vol. xxvii. p. 42, pl. i.

Voluta lyræformis, Kiener, Coq. Viv., *Voluta*, p. 35, pl. xlii. fig. 2 (non Brod. Zool. Journ. vol. iii. p. 83).

Voluta megaspira, Tryon, Journ. of Conch. vol. iv. p. 95 (non Sowerby, Thes. Conch. vol. i. p. 208, pl. xlvi. figs. 31, 32).

This species, which has been erroneously confounded with *V. megaspira*, is very distinct from it. The type of the latter, exhibited in our National Collection, has quite a different form and calibre. In describing it my father remarks that he had only seen a single specimen of the species; and now, after all these years, I must confess myself in the same position, and, as far as my knowledge goes, the shell remains unique. No habitat is mentioned with the description, and perhaps the species is not Japanese. Compared with *V. prevostiana* the body-whorl is shorter in proportion to the spire, the papillary apex is larger, the surface of the shell is smooth, without the fine longitudinal laminæ characteristic of Crosse's species, and, finally, it has five rather prominent folds on the columella.

V. prevostiana, of which specimens have recently been received from Japan, sent by Hirase, varies considerably in size, but very little in form and general proportions. Our smaller adult specimen measures 63 mm., and the largest I have seen about 180 mm. in length. Crosse describes the species as having four columella folds, the two posterior ones being very small and scarcely visible; this I find to be the case with some, but in others the third and fourth are entirely absent. All the specimens have one very prominent obliquely sinuous fold, the second being much less prominent.

Among the shells received from Hirase is one so different in appearance that I at first thought of giving it a specific name, but have concluded to call it a variety.

Voluta prevostiana, Crosse, var. *clara*, Sowerby, var. n.
(Pl. XIX. fig. 12.)

Shell of a delicate cream-colour throughout the exterior, entirely destitute of colour-markings; aperture of a smooth

pale fawn-colour; columella with only one oblique fold, above which upon very close examination the faintest possible indication of a projection may be perceived.

The single columella fold has been regarded as a generic character (Watson's genus *Guivillea*). In the *Ann. & Mag. Nat. Hist.* ser. 7, vol v. p. 439, pl. xi. fig. 1 (1900), I described a *Voluta uniplicata*, which it has been suggested should be called a *Guivillea*; but I find that the single fold is not even a specific character.

LXII.—*Descriptions of new Species of Snakes in the Collection of the British Museum.* By G. A. BOULENGER, F.R.S.

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Typhlops kenti.

Snout very prominent, with obtusely angular horizontal edge and inferior nostrils. Rostral very large, extending to the level of the eyes, the portion visible from below as long as broad; nasal completely divided, the cleft proceeding from the second labial; præocular present, narrower than the nasal or the ocular, in contact with the second and third labials; eyes distinct; supraoculars and parietals much larger than the scales on the body; four upper labials. Diameter of body 67 times in the total length; tail as long as broad, ending in a small spine. 18 scales round the body. Pale brown above, yellowish beneath.

Total length 270 mm.

A single specimen from Northern Queensland, from the collection of the late Mr. W. Saville Kent.

Allied to *T. unguirostris*, Peters, *waitii*, Blgr., and *affinis*, Blgr.

Typhlops vermis.

Snout very prominent, rounded; nostrils lateral. Rostral narrow, about one-fourth width of head; nasal completely divided, the cleft proceeding from the anterior subocular; two suboculars, separating the præocular and the ocular from the labials; eyes hidden; upper head-scales (præfrontal, frontal, interparietal, supraoculars, and parietals) much larger than the scales on the body; four upper labials. Diameter of body 35 to 45 times in the total length; tail as long as

broad, obtusely pointed, without spine. 18 scales round the body. Colourless.

Total length 120 mm.

Several specimens from Bitye, S. Cameroon, received from Mr. G. L. Bates.

Allied to *T. mirus*, Jan, from Ceylon.

Opisthotropis maxwelli.

Snout short and broad, much depressed, not projecting. Rostral twice as broad as deep, just visible from above; internasals twice as long as broad; nasal cleft extending from the nostril to the first labial; a single præfrontal; frontal large, as broad as long, a little more than twice as broad as the supraocular, much shorter than the parietals; loreal longer than deep; two præ- and two postoculars; a very elongate anterior temporal; seven upper labials, fifth entering the eye, seventh very long; anterior chin-shields a little larger than the posterior, in contact with five lower labials. Scales in 17 rows, smooth on the nape, feebly keeled on the body, rather strongly keeled towards the tail. Ventrals 151; anal divided; subcaudals 56. Blackish above, yellow beneath.

Total length 305 mm.

A single female specimen from South Fokien, China, presented by Mr. J. Preston Maxwell.

Closely allied to *O. atra*, Gthr., stated to be from West Africa (habitat very doubtful). Distinguished by the longer internasals, two præoculars instead of one, and the shorter body.

Contia africana.

Rostral much broader than deep, just visible from above; suture between the internasals a little shorter than that between the præfrontals; nasal undivided; frontal twice as long as broad, not much broader than the supraocular, longer than its distance from the end of the snout, shorter than the parietals; loreal small, longer than deep; one præocular; two postoculars; temporals 1+1; seven upper labials, third and fourth entering the eye; four lower labials in contact with the anterior chin-shields, which are longer than the posterior and in contact with each other in front. Scales smooth, in 15 rows. Ventrals 162; anal divided; subcaudals 69. Greyish brown above, with dark brown spots, the largest of which form two alternating series on the anterior

part of the back ; a broad darker brown nuchal collar, narrowly interrupted in the middle ; lower parts white.

Total length 400 mm. ; tail 100.

A single female specimen, collected by Mr. Willoughby P. Lowe at Erkowit, Red Sea Province of the Soudan, and presented to the British Museum by Mr. Abel Chapman.

This species, the first African representative of the genus *Contia*, is most nearly related to *C. fasciata*, Jan, from Syria, Persia, and Transcaspia.

Amblycephalus stanleyi.

Rostral slightly broader than deep, scarcely visible from above ; internasals much shorter than the præfrontals, latter entering the eye ; frontal hexagonal, once and a half as long as broad, longer than its distance from the end of the snout, shorter than the parietals ; loreal longer than deep, entering the eye ; no præocular ; one postocular and two suboculars, separating the eye from the upper labials ; temporals 2 + 3 ; seven upper labials, last very long ; first lower labial forming a short suture with its fellow behind the symphysial ; three pairs of large chin-shields, the first longer than broad. Body compressed. Scales in 15 rows, dorsals (5 or 7 rows) feebly keeled. Ventrals 155 ; anal entire ; subcaudals 57. Pale buff above, yellowish white beneath ; a large black blotch on the upper surface of the head, from behind the internasal shields to the nape, where it divides into two longitudinal bands ; more or less regular transverse series of black spots on the body, some forming interrupted cross-bands ; a black streak on each side of the head, from the eye to the nuchal band ; lower parts with black dots.

Total length 440 mm. ; tail 95.

A single male specimen from N.W. Fokien, China, presented to the British Museum by Dr. Arthur Stanley, Curator of the Shanghai Museum.

We are now acquainted with twelve species of *Amblycephalus*, which may be distinguished by means of the following synopsis :—

I. A single shield (loreal) between the nasal and the eye.

A. One or two labials entering the eye ; scales smooth.

1. Frontal at least as broad as long ; symphysial in contact with an azygous chin-shield ; ventrals 148-176.

Six upper labials *A. levis*, Boie.

Seven upper labials *A. malaccanus*, Peters.

2. Frontal longer than broad; no azygous chin-shield in contact with the symphysial; ventrals 175-194.
- Symphysial in contact with a pair of chin-shields; a præocular below the loreal . . . *A. monticola*, Cantor.
- First lower labial in contact with its fellow behind the symphysial; no præocular . . . *A. vertebralis*, Blgr.
- B. Eye separated from the labials by suboculars; dorsal scales feebly keeled; first lower labial in contact with its fellow behind the symphysial; ventrals 155. *A. stanleyi*, Blgr.
- II. Loreal separated from the eye by one or two præoculars; eye separated from the labials by suboculars.
- A. Præfrontal entering the eye.
1. Ventrals 195-215; subcaudals 96-113; dorsal scales feebly keeled.
- Vertebral scales unicarinate; eye surrounded by four shields; a single anterior temporal *A. hamptonii*, Blgr.
- Vertebral scales bicarinate; eye surrounded by eight or nine shields; three superposed anterior temporals *A. nuchalis*, Blgr.
2. Ventrals 136-164; subcaudals 31-53.
- a. Dorsal scales feebly keeled.
- Frontal as long as the suture between the parietals *A. macularius*, Theob.*
- Frontal shorter than the suture between the parietals *A. andersonii*, Blgr.
- b. Dorsal scales smooth *A. moellendorffi*, Boettg.
- B. Præfrontal excluded from the eye.
- Dorsal scales smooth; ventrals 138 *A. margaritophorus*, Jan.
- Dorsal scales feebly keeled; ventrals 161-183. *A. carinatus*, Boie.

LXIII.—*On the Spiny Mice of British East Africa, with a Description of a new Species from Magadi.* By GUY DOLLMAN.

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IN the collection of mammals recently presented to the British Museum by A. Biayne Percival, Esq., is a series of Spiny Mice from Magadi, South Masailand District,

* *A. modestus*, Theob., is insufficiently characterized, and may be identical with this species.

British East Africa; these specimens represent an entirely new species, which is here described as

Acomys nubilus, sp. n.

About equal to *Acomys wilsoni* in size, but with longer tail and very much darker in general colour.

Size of body less than in the *ignitus* and *pulchellus* groups, more as in the short-tailed *wilsoni*; tail fairly long, measuring from 65 to 67 mm. in length, and thus much longer than in the other small species where the tail very rarely exceeds 50 mm. in length.

General colour of dorsal surface dark sepia-brown, slightly speckled with buff, but not exhibiting the marked speckled effect found in *wilsoni* and *ablutus*. Flanks pale buff speckled with dark brown. Backs of hands and feet dirty white. Entire underparts white.

Skull very much like that of *wilsoni*, slightly larger throughout, with a rather broader brain-case.

Dimensions of the type (measured in the flesh):—

Head and body 83 mm.; tail 65; hind foot 14; ear 12.

Skull of type badly broken; the following dimensions are those of another specimen, No. 1477, from the type-locality: greatest length 25·4; condylo-incisive length 22·4; zygomatic breadth 12; interorbital constriction 4·5; breadth of brain-case 12; length of palatal foramina 5·8; length of upper molar series 4.

This specimen (No. 1477) is exactly similar to the type in general colour, but I have not been able to use it as a type, since the tail is badly broken.

Type. Adult. Original number 1481. Collected June 14th, 1913.

This striking and distinct species is immediately distinguished from *A. wilsoni* by its very much longer tail and darker colour; in general colour *nubilus* is darker than any of the other East African *Acomys*, with the exception of the slate-coloured *percevali*. It is a little difficult to decide to which group this species belongs, and for the present it seems most satisfactory to regard it as a link between the large long-tailed *ignitus* group and the small short-tailed *wilsoni*.

The following are the various forms of *Acomys* now recognized in British East Africa:—

1. *Acomys ignitus*, Dollm., originally described from specimens collected by Mr. Kemp at Voi, has since been found by Mr. Percival at various localities between Voi and the coast. There are now before me specimens

from the Taru Desert and Witu which are undoubtedly true *ignitus*. On the west this species was found by Mr. W. P. Lowe on the Southern Guaso Nyiro and Narossura Rivers in the Nyanza Province.

2. *Acomys i. kempfi*, Dollm., has been recorded from many localities along the Northern Guaso Nyiro; the type-locality of this form is the Chanler Falls; Mr. Percival has collected *kempfi* all along the river as far as the Lorian Swamp, and in the west he has found it at Baringo and on the Larrogie Mountains and Mathews Range.
3. *Acomys i. montanus*, Hell., is only known from the specimens collected by Mr. Percival in the Marsabit District.
4. *Acomys percivali*, Dollm., was first found on the Northern Guaso Nyiro at the Chanler Falls. Since this discovery Mr. Percival has collected this conspicuous species on the Laikipia Plateau and on Mt. Urguess (Mt. Gargues).
5. *Acomys pulchellus*, Dollm., type-locality Chanler Falls, Northern Guaso Nyiro, has been collected by Mr. Percival at Lasamis on the Marsabit Road; a specimen from as far north as Mt. Nyiro seems also to belong to this species.
6. *Acomys nubilus*, Dollm., is known only from the specimens collected by Mr. Percival at Magadi.
7. *Acomys wilsoni*, Thos., originally described from Mombasa, has since been collected at Kitui, Voi, Taveta, Teita Hills, Tsavo River, Yata Plains, Mazeras, Taru Desert, Sagala, and the Witu Forest.
8. *Acomys w. ablutus*, Dollm., a close ally of the above, was founded on a series of specimens obtained by Mr. Kemp at Nyama Nyango, on the Northern Guaso Nyiro.

These eight forms may be arranged for identification as follows:—

- A. Tail long, more than 75 mm. in length.
- a. Size of body large (head and body about 100 mm. in length).
 - a'. Colour of dorsal surface bright orange-rufous *ignitus*.
 - b'. Colour of dorsal surface pale greyish sandy buff *i. kempfi*.
 - c'. Colour of dorsal surface dark vinaceous drab *i. montanus*.

- b.* Size of body smaller (head and body about 90 mm. in length).
- a'.* Dorsal surface pale greyish buff; underparts pure white. Spines slender *pulchellus.*
- b'.* Dorsal surface slate-grey; underparts dirty grey, never pure white. Spines coarse .. *percivali.*
- B.** Tail short, never more than 70 mm. in length.
- a.* Tail more than 60 mm. in length (average length 66). General colour of back dark sepia-brown *nubilus.*
- b.* Tail less than 60 mm. in length (average length 50 mm.).
- a'.* General colour bright rufous orange speckled with brown *wilsoni.*
- b'.* General colour drab-brown speckled with pale buff. Size rather smaller *w. ablutus.*

LXIV.—*Two new Pigmy Gerbils from British East Africa.*
By GUY DOLLMAN.

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Dipodillus percivali, sp. n.

Intermediate in size between *Dipodillus diminutus*, Dollm., and *D. harwoodi*, Thos.

General colour of dorsal surface rather richer than in *diminutus*, on the back the effect is almost as rich as in the "amber-brown" of Ridgway (1912), gradually becoming paler on the flanks (between "ochraceous tawny" and "cinnamon"). Backs of hands and feet and ventral surface of body white. Tail like that of *harwoodi*.

Skull considerably larger than that of *diminutus*, but not as large as in the Naivasha species.

Dimensions of the type (measured in the flesh):—

Head and body 78 mm.; tail 102; hind foot 20; ear 11.

Skull: greatest length 23·7; basilar length 16·8; length of nasals 8·5; zygomatic breadth 12·2; interorbital constriction 4; breadth across brain-case 11·5; length of anterior palatal foramina 4·3; length of upper cheek-teeth (from front alveolar border to back of last molar) 3·6.

Hab. Voi, British East Africa. Altitude 2500 feet.

Type. Adult female. Original number 1544. Collected and presented to the British Museum by A. Blayney Percival, Esq.

This Voi *Dipodillus* is evidently more nearly related to the northern form *D. diminutus*, from the Northern Guaso Nyiro than to the Naivasha species, *D. harwoodi*. In general dimensions it is intermediate between these two species and in colour rather richer and brighter than *diminutus*.

This handsome little Gerbil I have named after the collector, Mr. Blayne Percival, the value of whose field-work in British East Africa it would be difficult to exaggerate.

Dipodillus luteus, sp. n.

Allied to *D. harwoodi*, Thos., but distinguished by its very much duller and paler colour.

Size of body as in *harwoodi*, tail rather shorter.

General colour of dorsal surface dirty drab-buff, near "tawny-olive" (Ridgway, 1912), washed over with greyish brown, the resulting effect very much paler and more subdued than in *harwoodi*. Backs of hands and feet and under surface of body white.

Skull slightly larger, with broader nasals and wider brain-case.

Dimensions of the type (measured in the flesh):—

Head and body 74 mm.; tail 94; hind foot 21; ear 10.

Skull: greatest length 26.5; basilar length 19.3; zygomatic breadth 13.5*; interorbital constriction 5.4; breadth of brain-case 12.8; length of anterior palatal foramina 5; length of upper cheek-teeth (from front alveolar border to back of last molar) 4.

Hab. Southern Guaso Nyiro, Nyanza Province, British East Africa. Altitude 6500 feet.

Type. Adult male. B.M. no. 13. 10. 18. 65. Original number 118. Collected by W. P. Lowe, Esq., on November 29th, 1912, and presented to the British Museum by G. P. Cosens, Esq.

The pale drab colour of this form immediately separates it from *harwoodi*, *diminutus*, and *percivali*.

We thus have four species of the genus *Dipodillus* in British East Africa:—(i.) *D. diminutus*, from the Northern Guaso Nyiro (altitude 3200 feet); (ii.) *D. percivali*, from Voi (altitude 2500 feet); (iii.) *D. harwoodi*, from Naivasha (altitude 6300 feet); and (iv.) *D. luteus*, from the Southern Guaso Nyiro (altitude 6500 feet).

* Approximate

LXV.—*On a new Anomalurus from the Cameroons.*

By GUY DOLLMAN.

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Anomalurus fraseri griselda, subsp. n.

Related to *Anomalurus fraseri nigrensis*, Thos., but general colour very much paler.

Size of body as in the other members of this group.

General colour of back slate-grey, washed with brownish yellow. Muzzle, head, sides of neck, flanks, and hind-quarters pale ashy grey; light markings on shoulders very pronounced. Ventral surface of body washed over with pale grey; in *nigrensis* the belly is pure white.

Skull larger than that of *nigrensis*, with longer nasals and larger teeth.

Dimensions of the type (measured in the flesh):—

Head and body 345 mm.; tail 245; hind foot 62; ear 37.

Skull: greatest length 61; basilar length 47.7; zygomatic breadth 39; greatest length of nasals 16.5; palatilar length 23.5; length of upper cheek-teeth 13.6.

Hab. Biteye, South Cameroons. Altitude 2000 feet.

Type. Adult male. B.M. no. 14. 7. 23. 44. Original number 726. Collected by Mr. G. L. Bates on February 25th, 1914.

The light-coloured head, shoulders, flanks, and hind-quarters render this Cameroon *Anomalurus* quite distinct from the allied forms.

LXVI.—*Descriptions of new Species of Cyphogastra (Coleoptera, Buprestidæ).* By CHAS. O. WATERHOUSE, I.S.O., F.E.S.

THE Natural History Museum has recently received a specimen of the genus *Cyphogastra*, which agrees in most respects with Capitaine Kerremans' diagnosis of *C. aterrima* (Ann. Soc. Ent. Belge, lv. p. 297, 1911). He says that it is intense black, and differs, moreover, from *C. ventricosa*, with which he compares it, in wanting the subhumeral spot on the elytra.

C. ventricosa has usually two vittæ at the apex of the elytra; the sutural one, however, is sometimes, though rarely, absent. The Museum specimen has only one lateral yellow vitta at the apex of the elytra. I can only suppose that Kerremans has compared *aterrima* with the variety of *ventricosa*, in which the sutural vitta is absent, or that in *aterrima* the sutural vitta is sometimes absent as in *ventricosa*. They are hardly likely to be distinct species.

While determining this species, I have noticed the two following species, which appear to be undescribed.

Cyphogastra bicolor, sp. n.

Capite cyaneo; thorace læte cyaneo-viridi, utrinque fovea magna flavo-pilosa; elytris læte purpureo-cupreis, evidenter punctulatis, ad apicem cyaneis; corpore subtus viridi, flavo-pulverulenti.
Long. 27, lat. 8.5 mm.

Hab. S.E. New Guinea.

Head very dark blue, with a little dark green near the eyes; convex with a rather small, deep, elliptical fovea between the eyes. Thorax bright bluish green, the anterior angulation of the sides very obtuse, not prominent, not thickened; the sides subparallel, only very slightly widening towards the hind angles, which are very slightly prominent, convex and coarsely punctured. The median channel moderately deep, with a single line of small punctures. The disk with few punctures. The lateral impression large, shallow, leaving a small sub-equilateral area at the hind angles, merging in front of the lateral angulation into two small impressions; all the impressed parts filled with yellow powder. Elytra bright coppery with a slight purple shade, distinctly but not strongly punctured (the punctures at the base rather larger), rather broader behind the middle than at the base, then gradually narrowed towards the apex, the apex very slightly widened and gently compressed, denticulate, the sutural angle acute. The apex is dark blue, bordered with green basally.

Body beneath bright golden green, more or less clothed with yellow powder, which forms spots on the abdomen.

There is nothing in the British Museum with which I can compare this. The very wide shallow lateral impressions leave only a very small triangular space at the hind angles.

I propose placing it near *C. apicalis*, Kerrem., but the elytra are slightly more pisciform at apex.

Cyphogastra suffusa, sp. n.

Capite thoraceque cyaneo-nigris; elytris evidententer punctatis, purpureo-cupreis, ad basin æneo suffusis, vittis brevibus et apice cyaneis; corpore subtus æneo, griseo-pulverulento.
Long. 25-29, lat. 8-9 mm.

Hab. S.E. New Guinea.

Head with a deep triangular impression in front, occupying nearly the whole width between the eyes, gradually narrowed to the vertex. Thorax with scarcely any trace of punctuation on the disk, strongly punctured at the sides; the lateral anterior angulation very obtuse, not projecting, the sides behind this parallel, the posterior angles not projecting. The central channel not very deep, impunctate. The lateral impression is deep (filled with yellow powder) consisting of two confluent portions (somewhat as in *cyanipes*, *apicalis*, &c.), the anterior portion transverse, the posterior part vertical, leaving a raised area at the posterior angle, the anterior angle of which is acute and projecting obliquely into the impression. There are the usual anterior impressions, one at the anterior angle and the other between this and the raised disk. The elytra are scarcely wider behind the middle than at the base, narrowed to the apex, where they are only very slightly compressed, denticulate, the sutural tooth scarcely more prominent than the others. The general colour is not very bright coppery, becoming darker and slightly more purple towards the apex, the basal area suffused with an obscure brassy shade; the region near the scutellum cyaneous with coppery punctures. The extreme base has three short cyaneous costæ, the one nearest to the scutellum the longest. The under side is brownish æneous, sparingly clothed with greyish-yellow powder, which leaves the middle of the abdomen and some lateral spots smooth and shining. Legs cyaneous above, brownish-æneous below.

This may be placed near *C. cyanipes*, Kerrem., from which it differs in colour, in having the lateral angulation of the thorax more obtuse and less prominent. The punctuation of the elytra is much less strong throughout and is very delicate posteriorly. The elytra in *C. cyanipes* (type) do not show the three short cyaneous costæ at the base as in this species. The colour below is the same.

LXVII.—*A new Crab of the Genus Calappa from West Africa.* By W. T. CALMAN, D.Sc.

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A SMALL but very interesting collection of Crustacea obtained by trawling off Lagos, West Africa, has recently been presented to the British Museum (Natural History) by Mr. J. Cadman, of the Western Fisheries, Ltd. Among them are five specimens of a crab that appears to differ from any species hitherto described.

Calappa piscatorum, sp. n.

Carapace about four-fifths as long as wide, very convex; the longitudinal grooves well marked, surface smooth, except for a few low and ill-defined tubercles anteriorly and scattered granules near the posterior margin. Lateral expansions small, formed of acutely triangular teeth, which are not distinctly keeled on the upper surface; laterally there are three teeth, which are continued without any well-marked limit by the more obtuse teeth of the antero-lateral margin, becoming obsolete anteriorly; posteriorly are three more acute and well-separated teeth on each side, the last pair directed backwards, bounding the true hind margin, which is beaded and convex or obscurely angled in the middle.

Front projecting well beyond the orbits, with a deep excavation, the distance between the points about equal to two-thirds the width of the orbit.

Endostomial septum convex anteriorly.

Crest of the merus four-lobed, each lobe with a sharp point, the anterior lobe acute and turned forwards. Outer surface of palm with blunt tubercles and scattered granules between them; crest of palm with five palisade-like teeth and three blunt tubercles; tooth at proximal end of lower border sharp, but not spiniform.

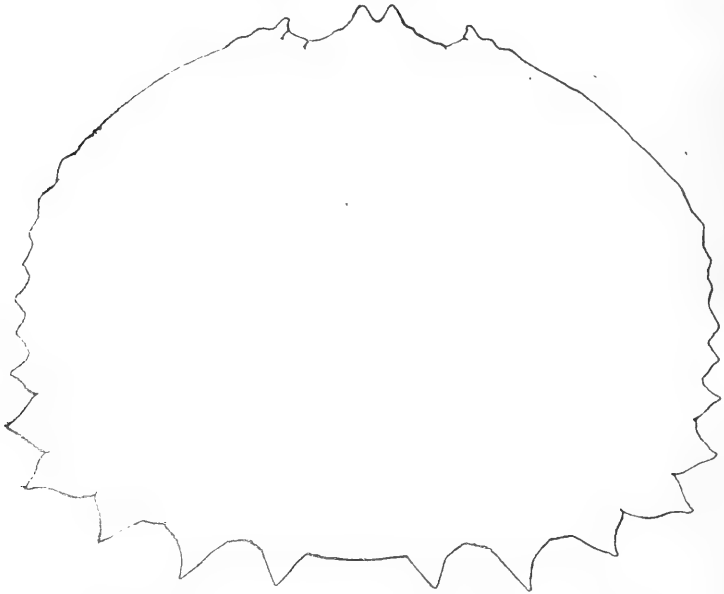
Dimensions of carapace in millimetres:—

	♀.	♂.	♂.	♂.	♂.
Length	77·0	74·0	72·5	69·5	68·5
Breadth	96·0	95·0	93·0	86·5	86·0

Locality. "Off Lagos, West Africa. Mud bottom."

Remarks. In general aspect this species approaches the Mediterranean and West-African *C. granulata* (Linn.), but differs from it and from all the other species of which specimens are available for comparison in the very large and backwardly directed teeth on the hinder margin of the

carapace. According to the figure given by Brito Capello (Jorn. Sci. Lisboa, iii. 1871, pl. ii. fig. 2), *C. guerini* somewhat resembles it in the disposition, although not in the size, of these teeth. Alcock suggests (J. Asiat. Soc. Bengal, lxv. (2) 1896, p. 144) that *C. guerini* is based on a young specimen of *C. lophos*, but the specimens here described are too large for this character to be due to immaturity.



Calappa piscatorum, sp. n., ♂. Outline of carapace. Natural size.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 24th, 1914.—Dr. A. Smith Woodward, F.R.S., President,
in the Chair.

The following communication was read:—

‘The Paradoxidian Fauna of a part of the Stockingford Shales.’

By Vincent Charles Illing, B.A., F.G.S.

This communication deals mainly with a small subdivision of the Stockingford Shales occurring at the base of the Oldbury division. The beds have been termed the Abbey Shales, and are about 100 feet thick, consisting mainly of blue laminated shales, although glauconitic sandy horizons occur at frequent intervals. This small subdivision passes down into the Purley Shales, while it is separated from the overlying shales (which are probably of Lower Maentwrog age) by a calcareous conglomerate lying upon an eroded surface of

the underlying blue shales, although the irregularity of the eroded surface does not appear to be great in the somewhat poor exposures.

The beds have been examined in a series of trenches situated near the Abbey Mound in Hartshill Hayes, and have yielded over fifty different species of trilobites—each ranging through one or more of about fifteen fossiliferous horizons in the sequence. The fauna shows marked affinities with those of the equivalent beds in Wales, Scandinavia, and Bohemia, and the following subdivision into zones has been attempted:—

<i>Horizon.</i>		
G 3-G 1	.....	Upper <i>P.-davidis</i> Fauna.
F 3-F 1	.....	Lower <i>P.-davidis</i> Fauna.
E 3-E 1	(pars)	<i>Hartshillia</i> Fauna.
E 1	(pars)-D 1	Upper <i>hicksii</i> Fauna.
C 3-B 1	.....	Lower <i>hicksii</i> Fauna.
A 4-A 1	.....	<i>P.-aurora</i> Fauna.

The importance of the Abbey Shales lies in the possibility which they afford of a close correlation between the Swedish and British Paradoxidian faunas, for the intermediate geographical position is accompanied by an intermediate type of fauna forming a link between these two well-known areas.

The following is a brief summary of the correlation that appears to agree best with the available evidence:—

SOUTH WALES.	HARTSHILL.	SCANDINAVIA.	
} <i>P.-davidis</i> Zone.	Upper <i>P.-davidis</i> Fauna.	<i>P.-davidis</i> Zone.	
	Lower <i>P.-davidis</i> Fauna.	<i>P.-davidis</i> Zone.	
	<i>Hartshillia-inflata</i> Fauna.	<i>C.-æqualis</i> Sub-zone.	} <i>P.-lesarti</i> Zone.
} <i>P.-hicksii</i> Zone.	Upper <i>hicksii</i> Fauna.	} <i>Agnostus-parvifrons</i> Sub-zone.	
	Lower <i>hicksii</i> Fauna.		
<i>P.-aurora</i> Zone.	<i>P.-aurora</i> Fauna.	<i>Ct.-exsulans</i> Sub-zone (pars).)	

In addition, the evidence suggests that the Upper Purley Shales correspond to the rest of the *Ct.-exsulans* Zone and also to the *P.-ölandicus* Zones of Sweden.

The Abbey Shales appear to have been deposited in rather a shallow open sea, in which slight changes in conditions introduced marked variations in the rock-types. Corresponding to these alternating physical conditions there occur alternations of faunas—a good example being afforded by *Agnostus rex*, found in the coarse shales, and *A. cf. intermedius*, found in the blue shale.

Towards the close of the Middle Cambrian Period excessive shallowing of the water introduced a period of marine erosion—causing a break in the sedimentary sequence with the elimination of the equivalents of the *P.-forchhammeri* Zone, and probably a portion of the *P.-davidis* Zone. This break appears to have extended over a large part of Great Britain, attention being drawn to the fact that none of the characteristic forms which occur exclusively in the rich *P.-forchhammeri* Zone of Scandinavia have been noted from any locality in Great Britain.

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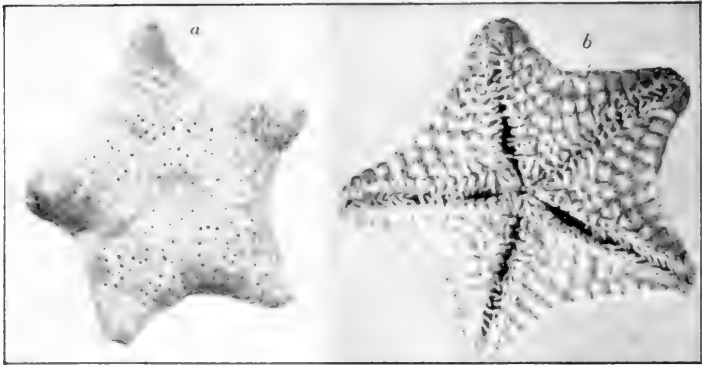
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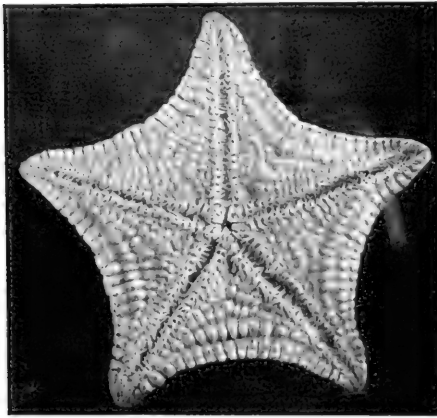
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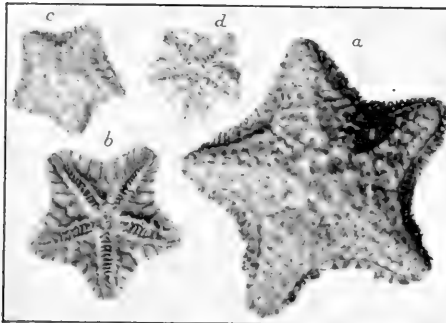
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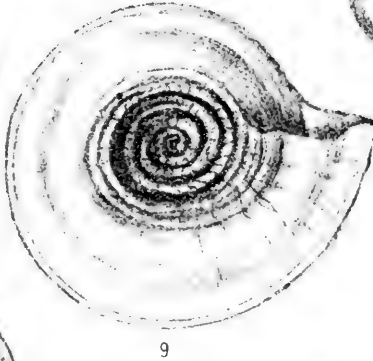
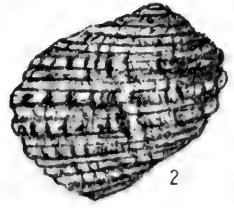


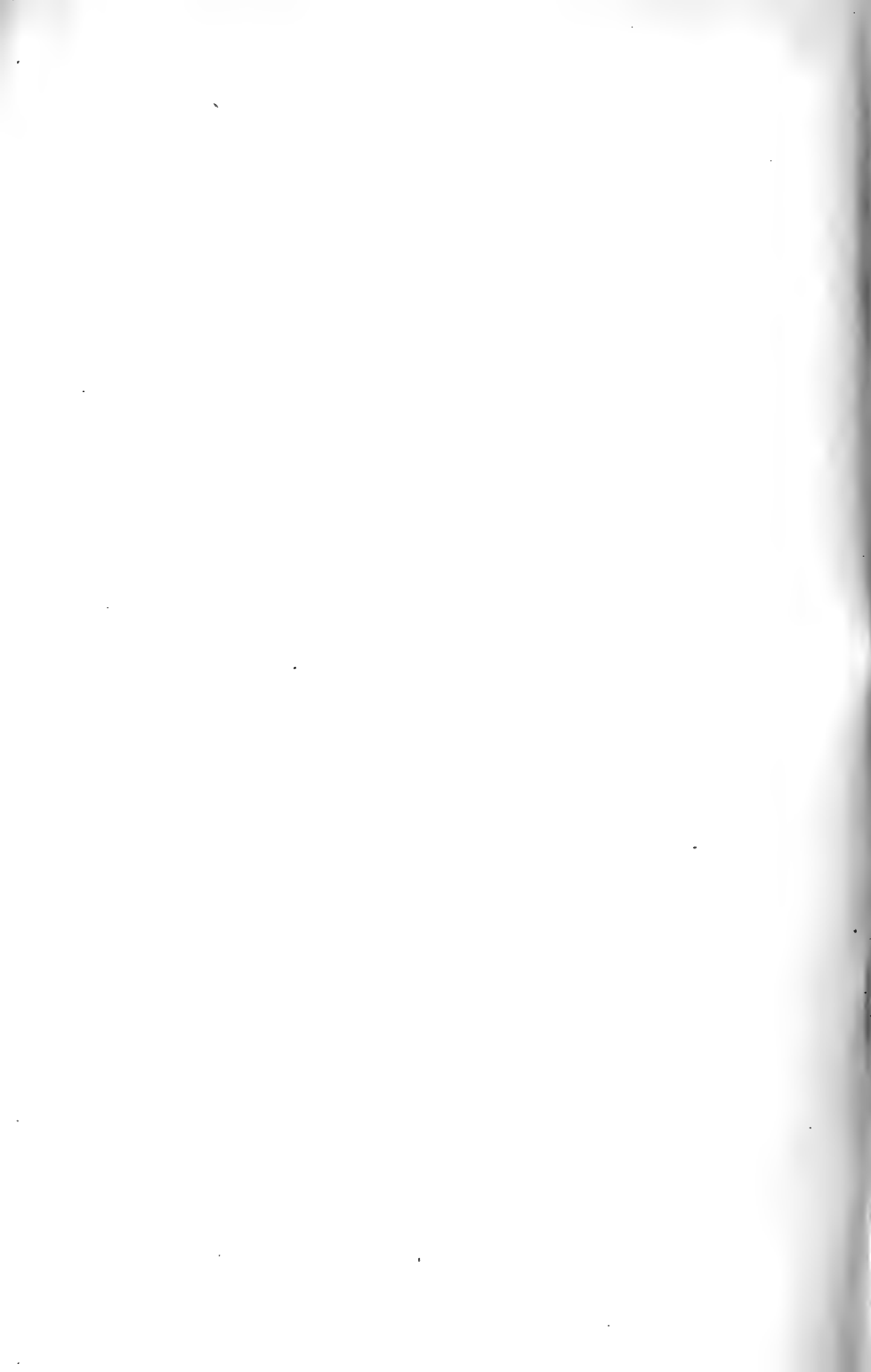
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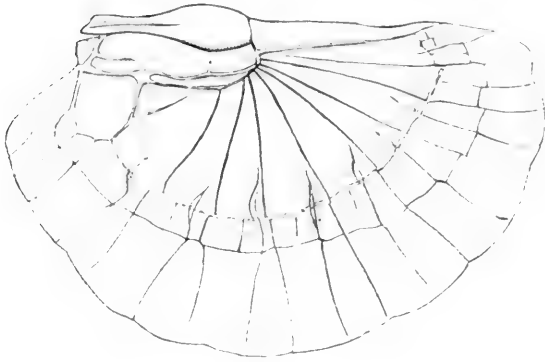


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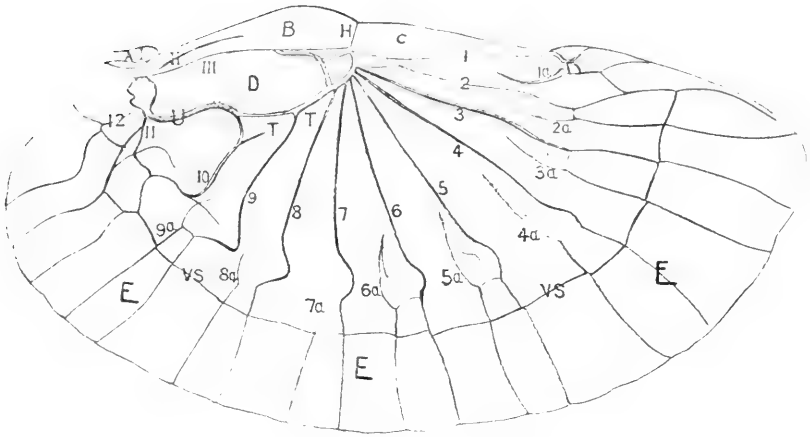




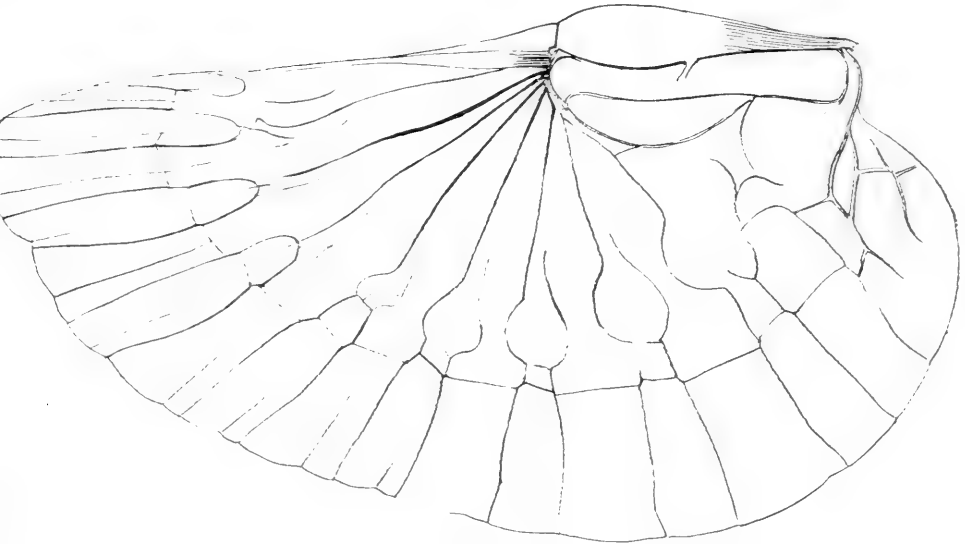




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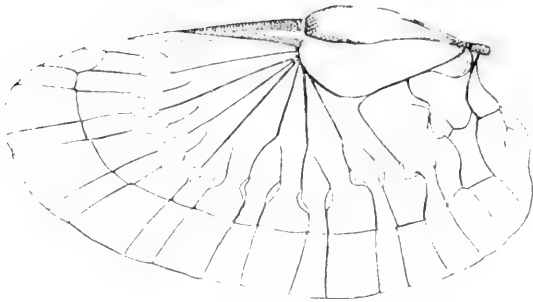


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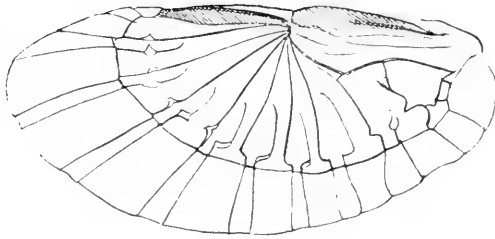


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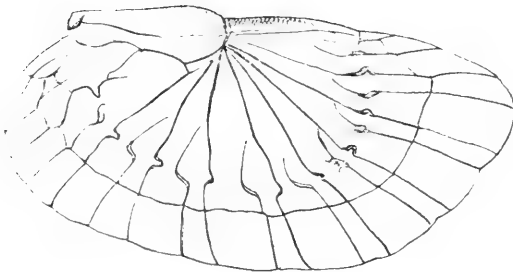




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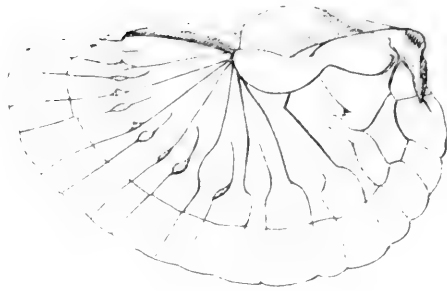


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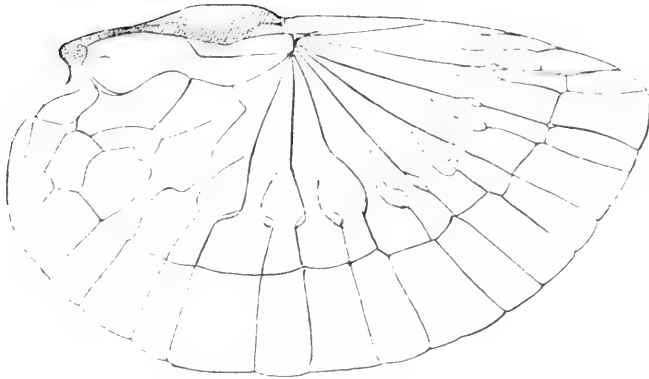


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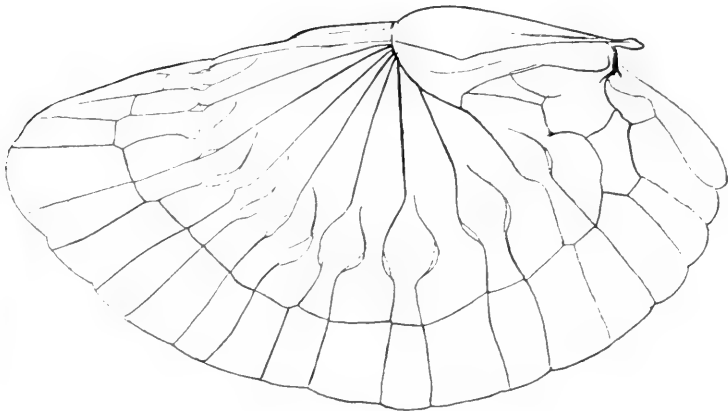




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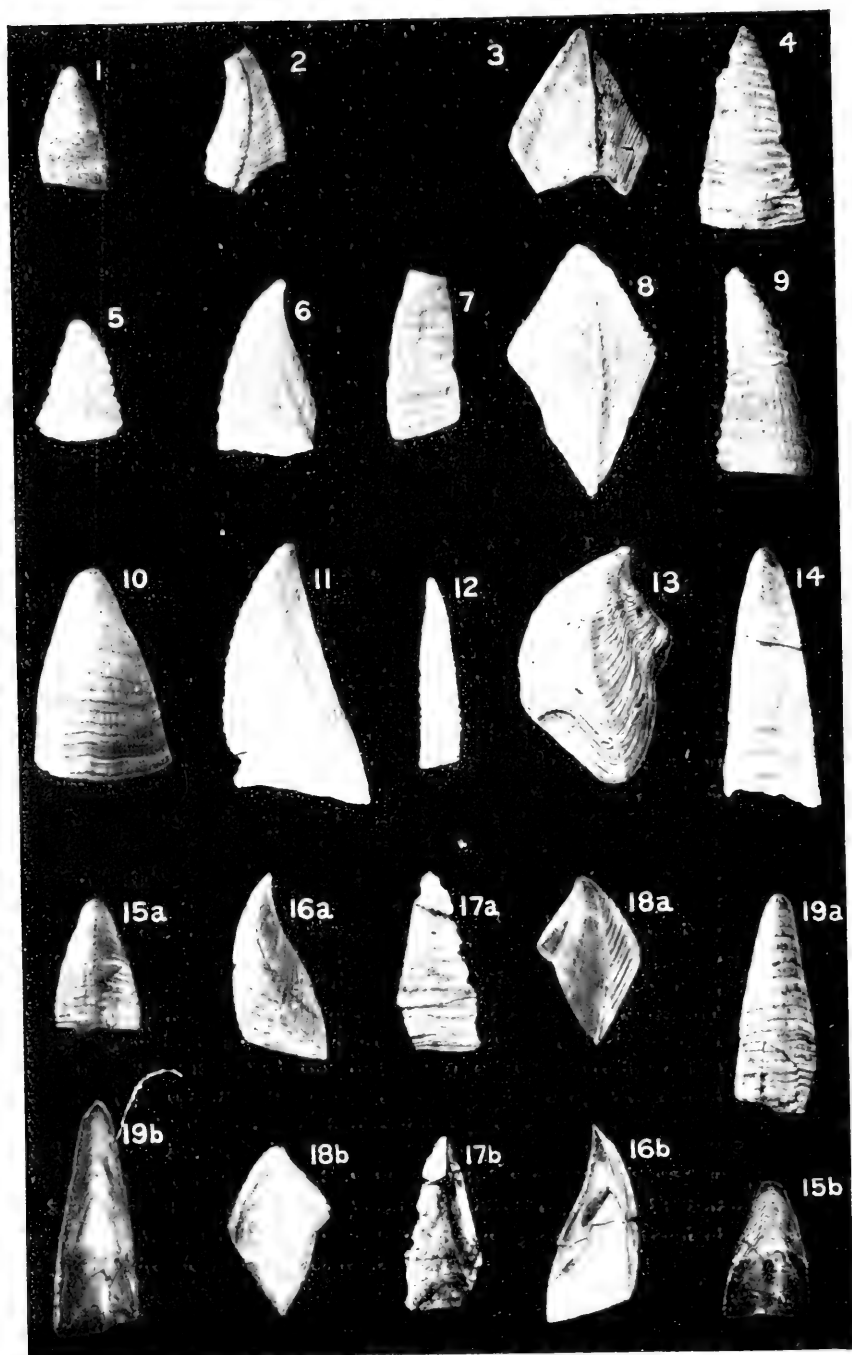


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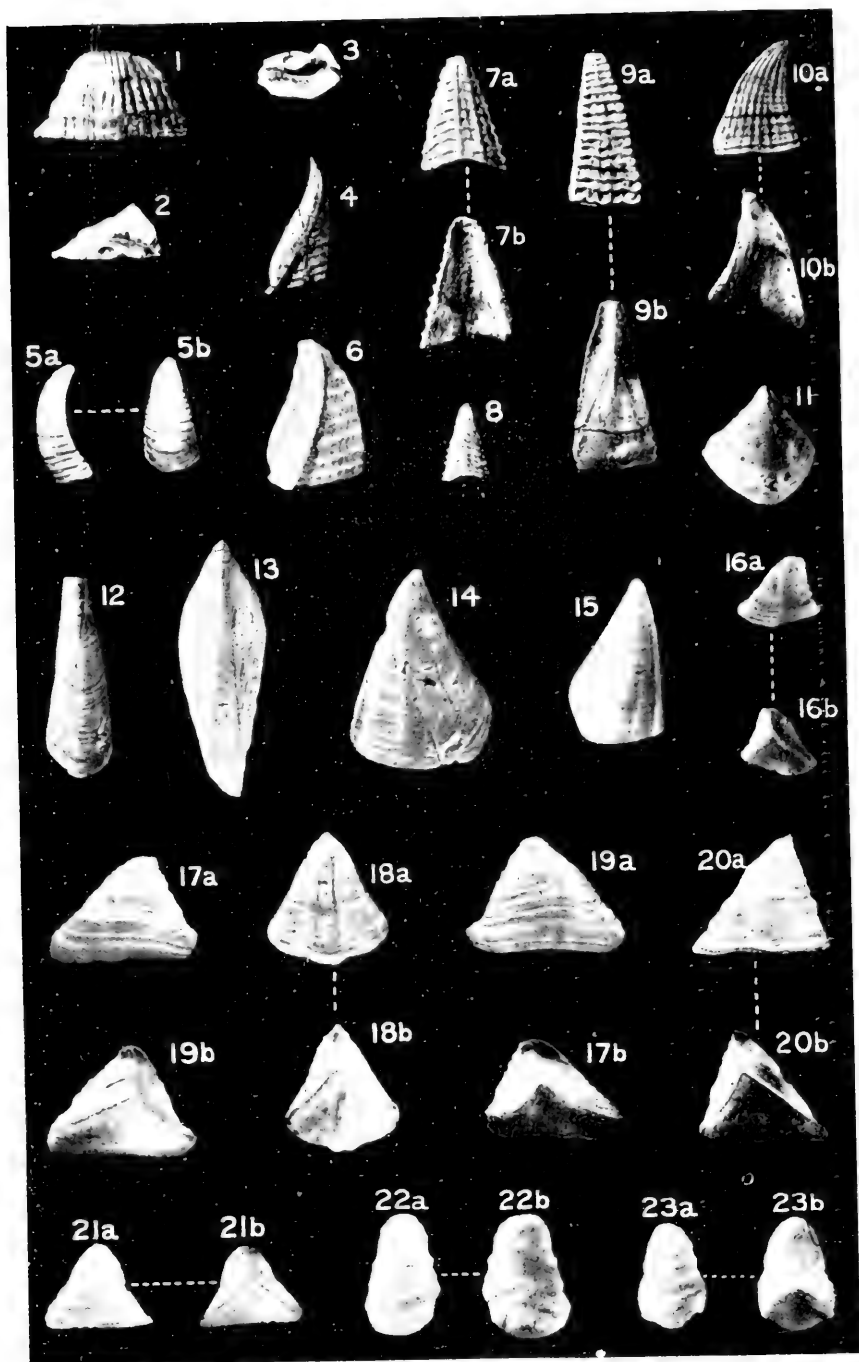




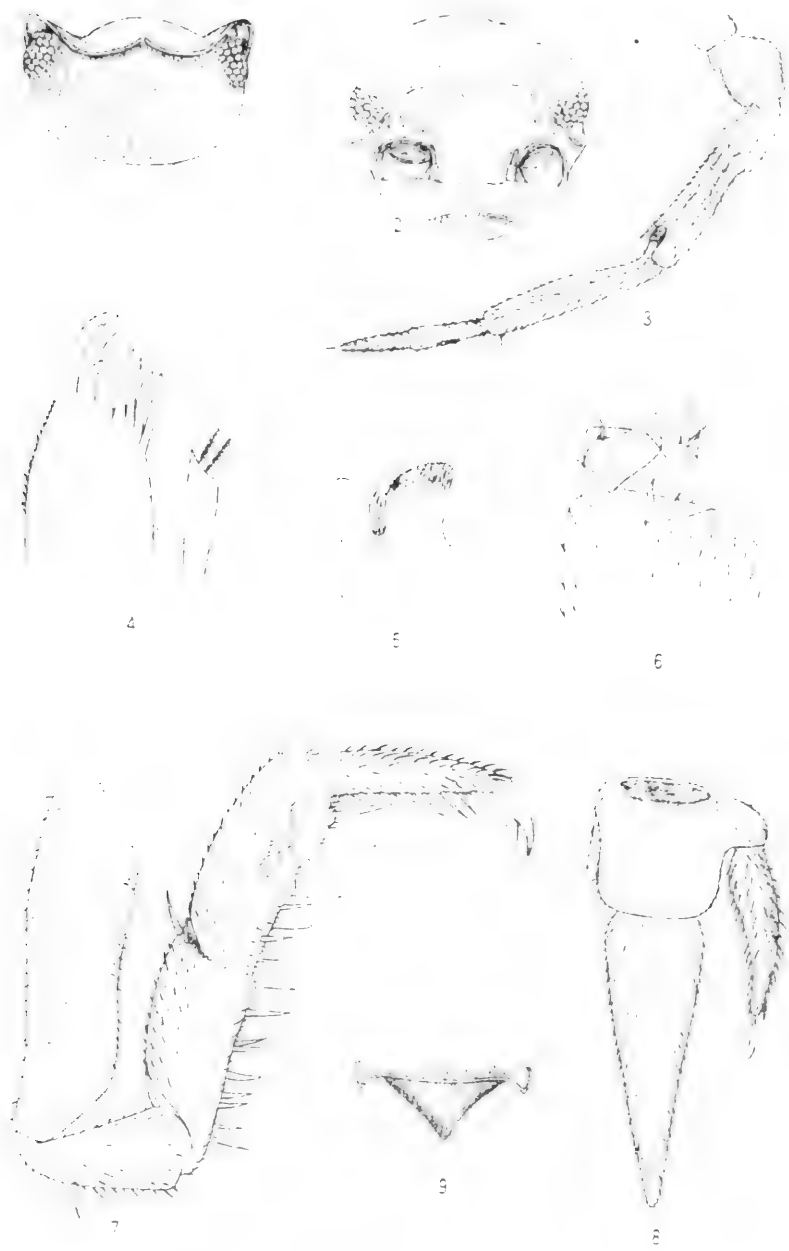
Skull of *Pleurosaurus goldfussi*.





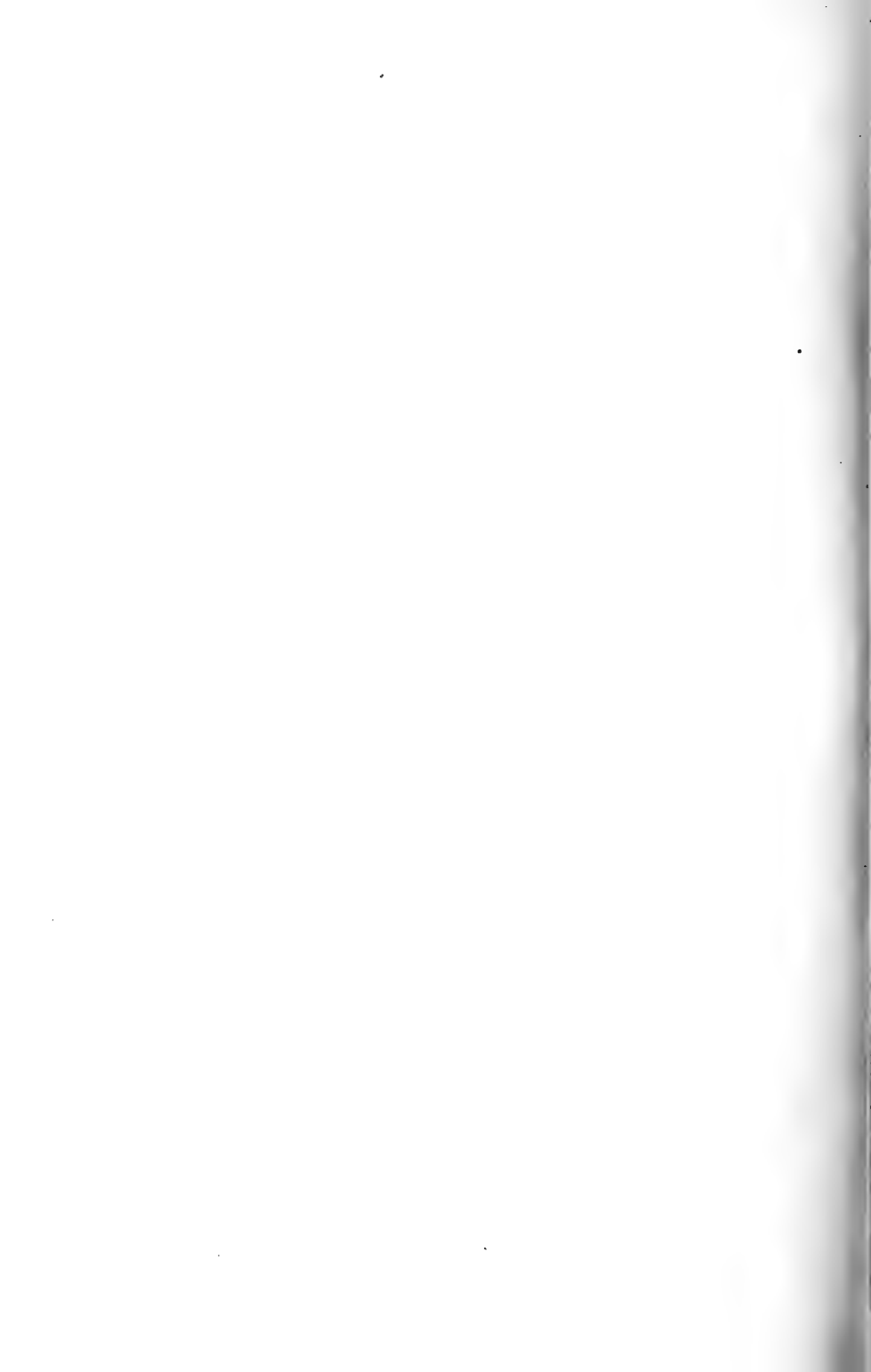


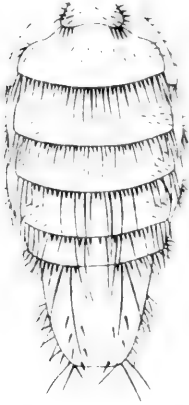




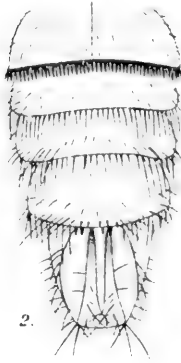
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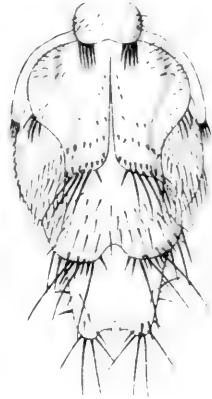




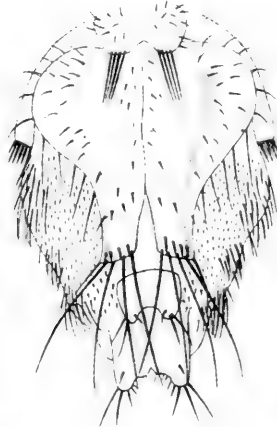
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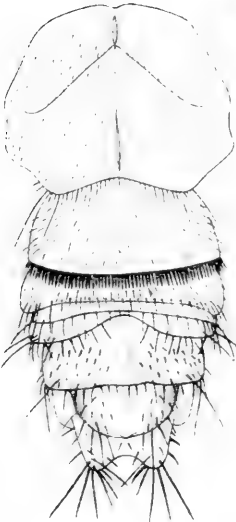
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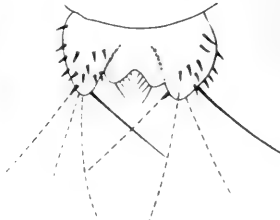
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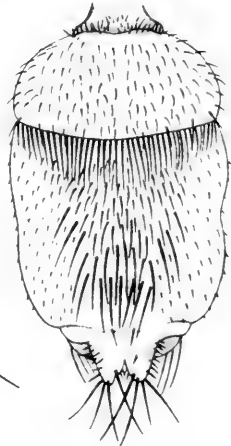
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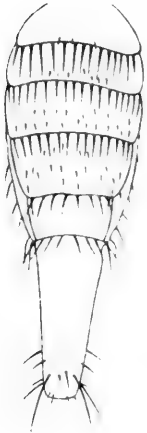


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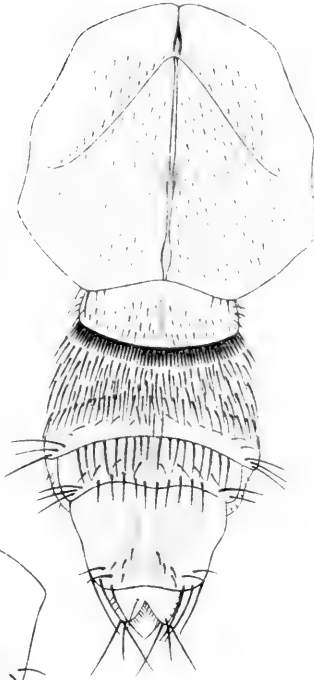
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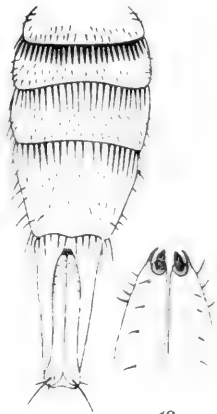




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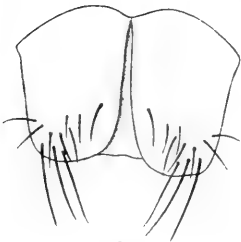
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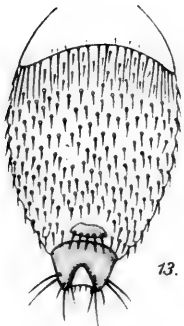
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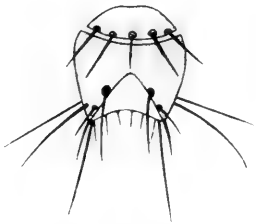
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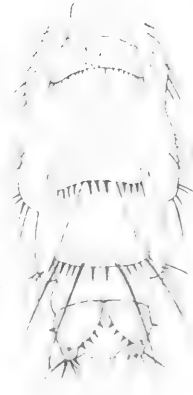
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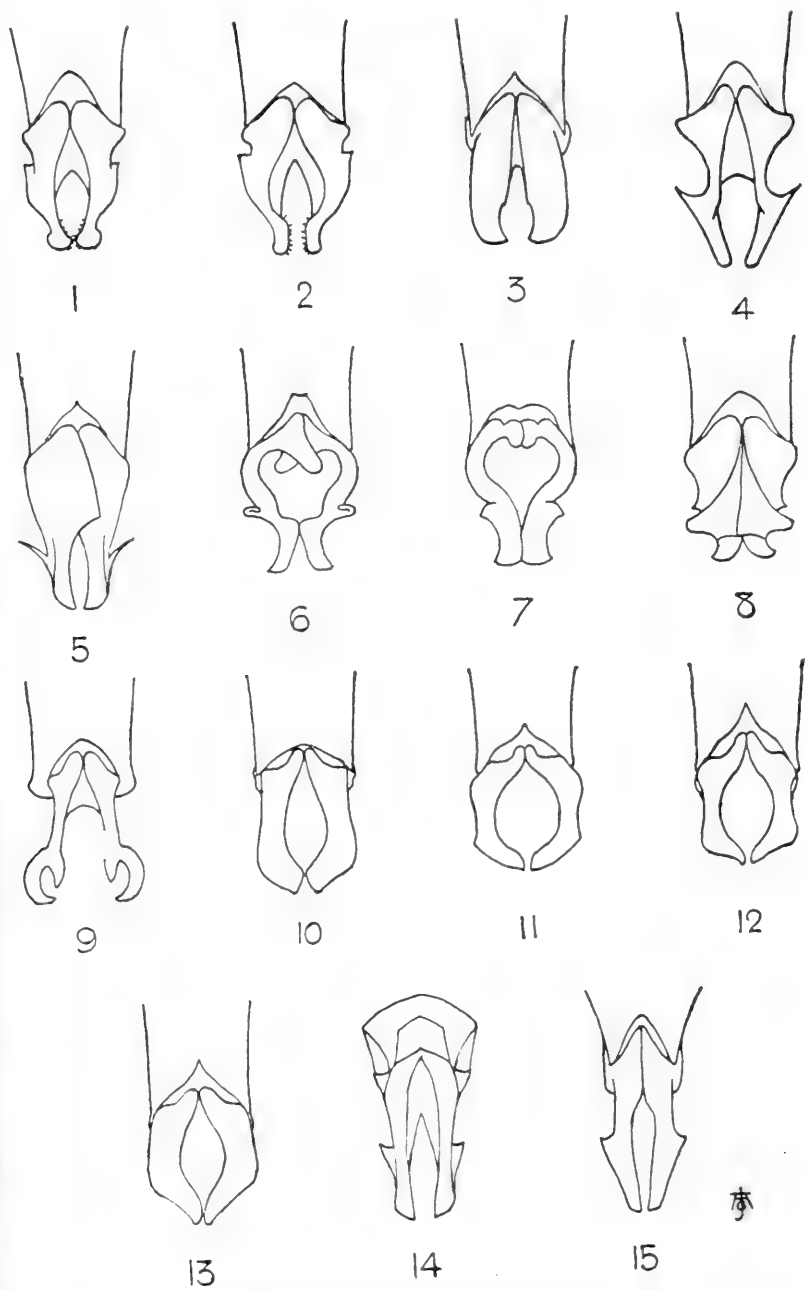


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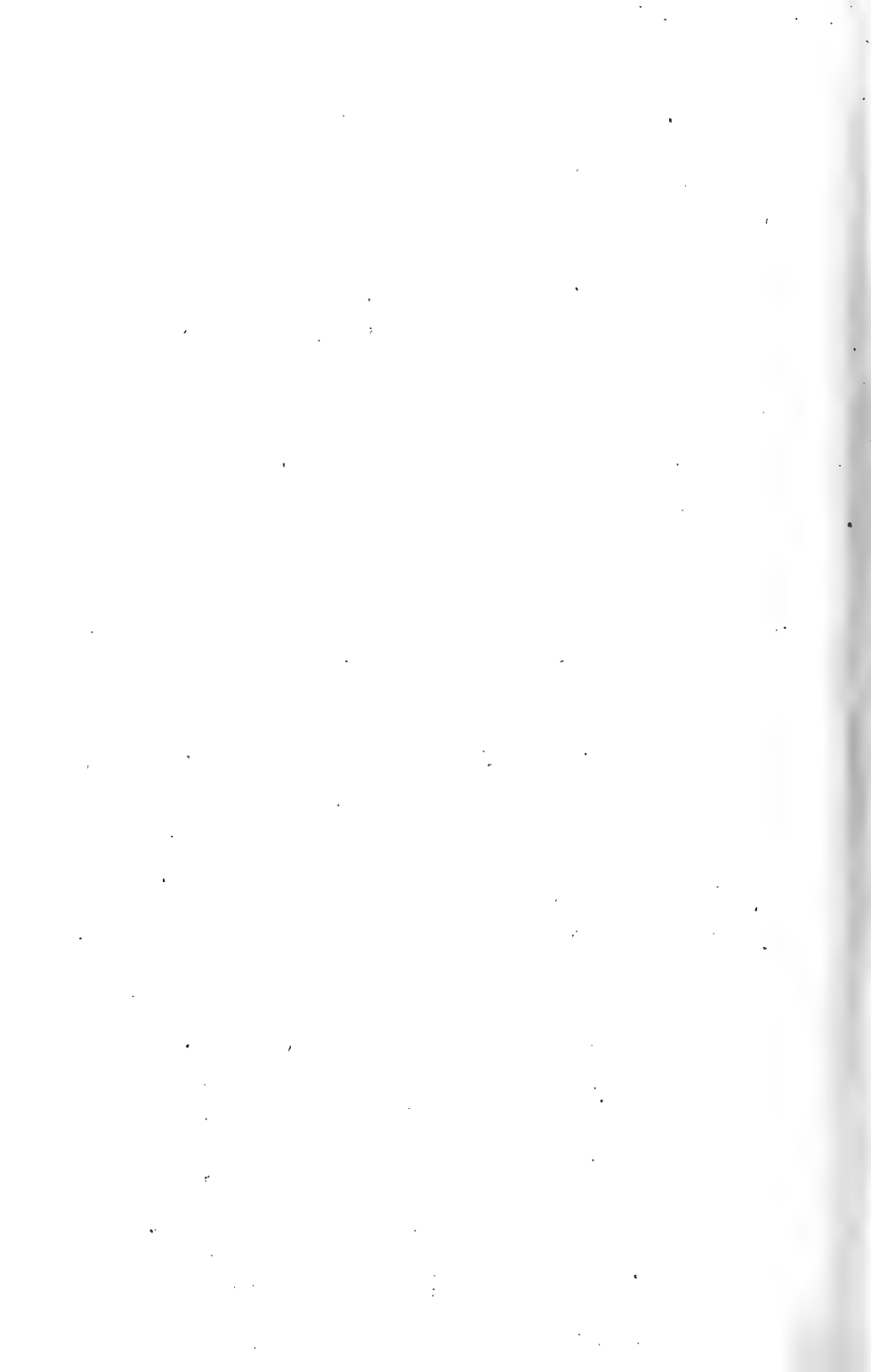


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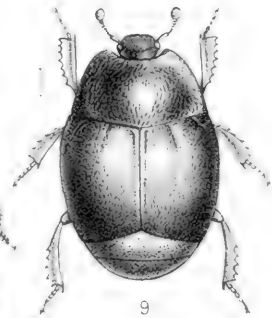
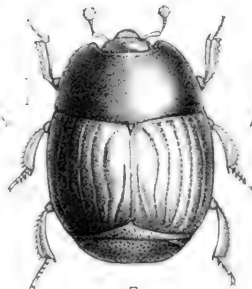
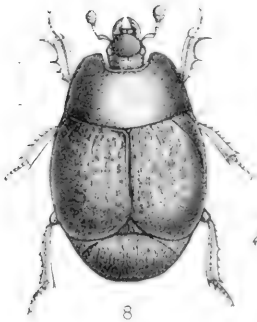
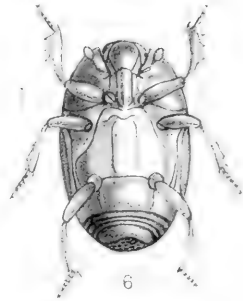
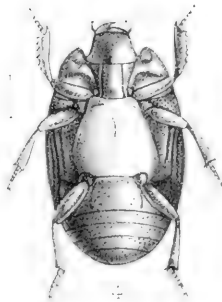
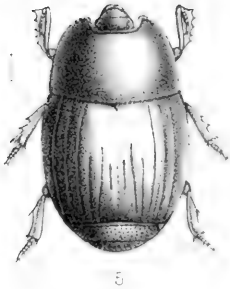
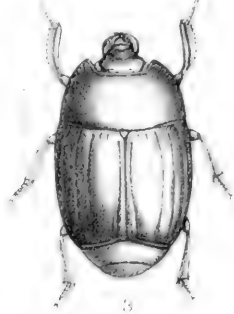
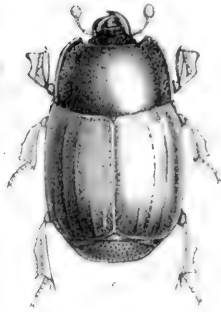
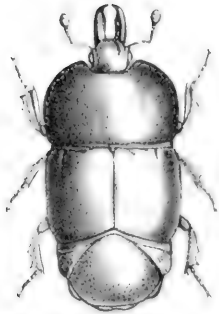
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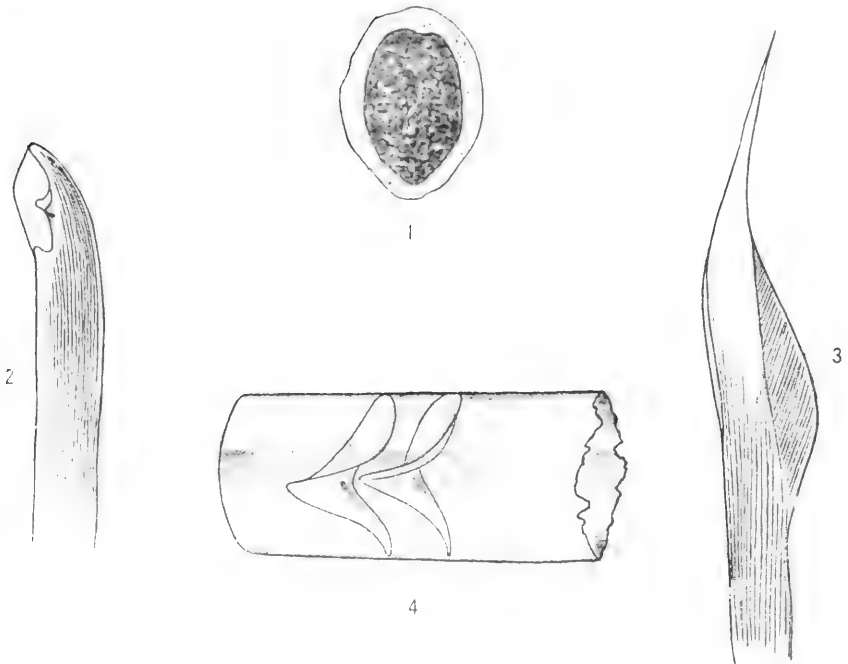


Charaxia hamptoni. ♂, ♀.







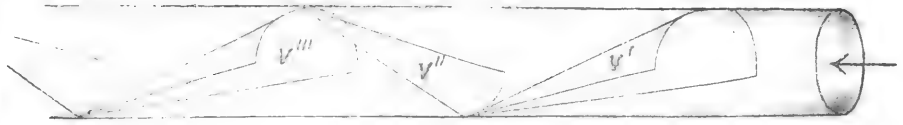


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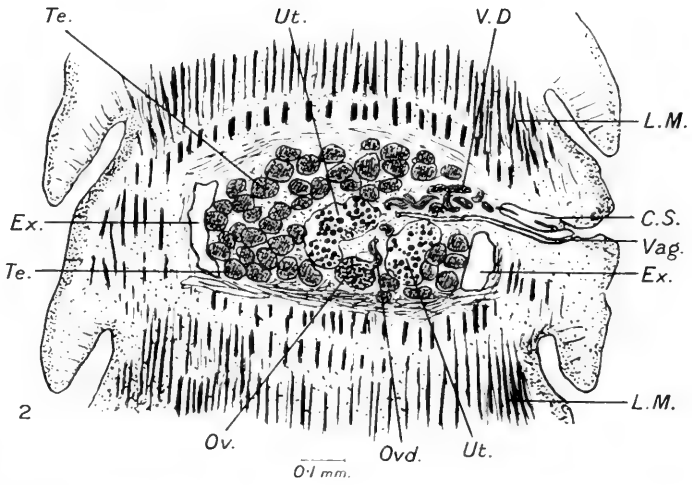


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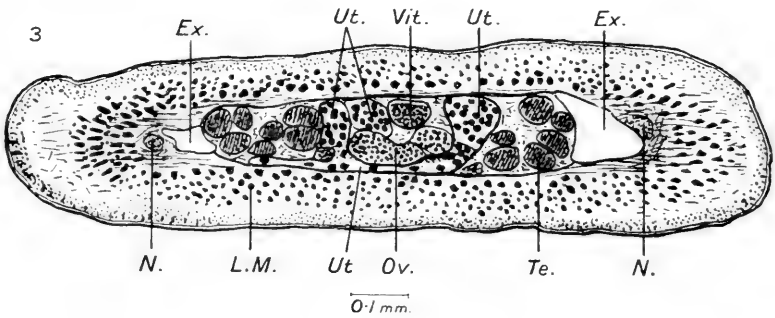




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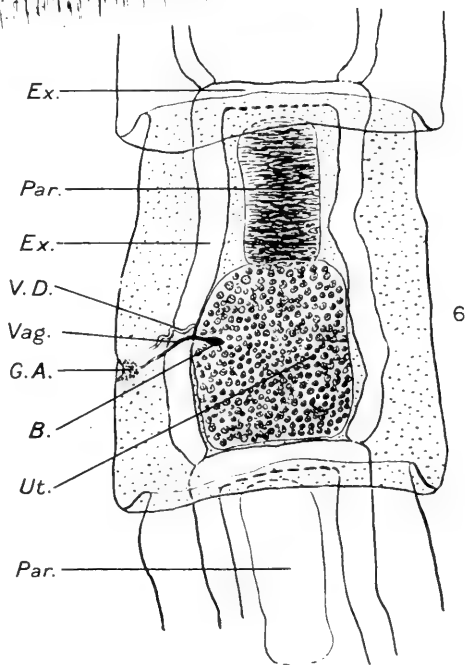
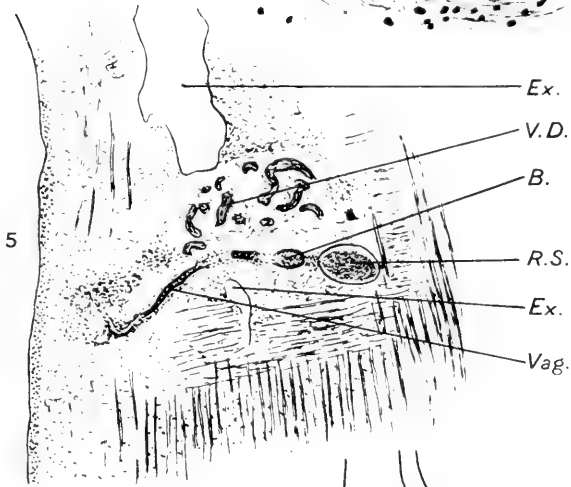
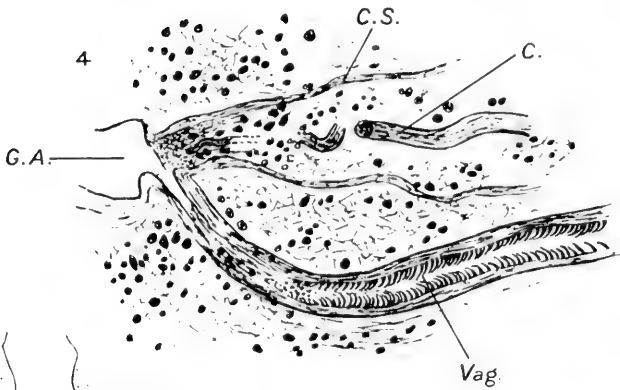


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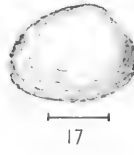
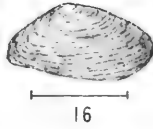
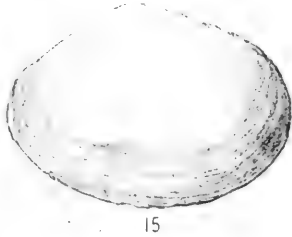
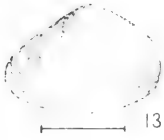
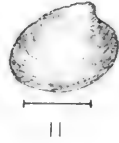


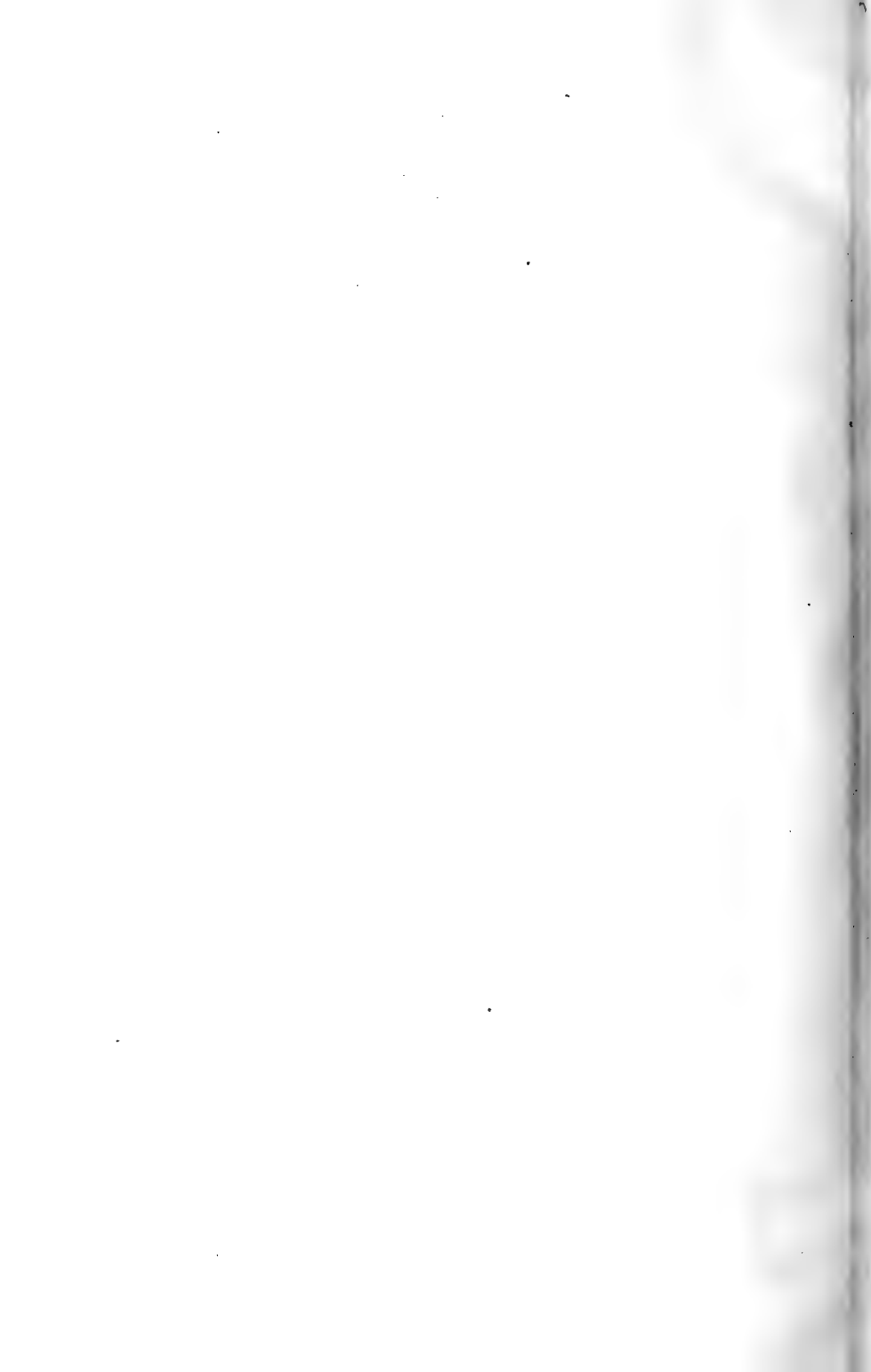
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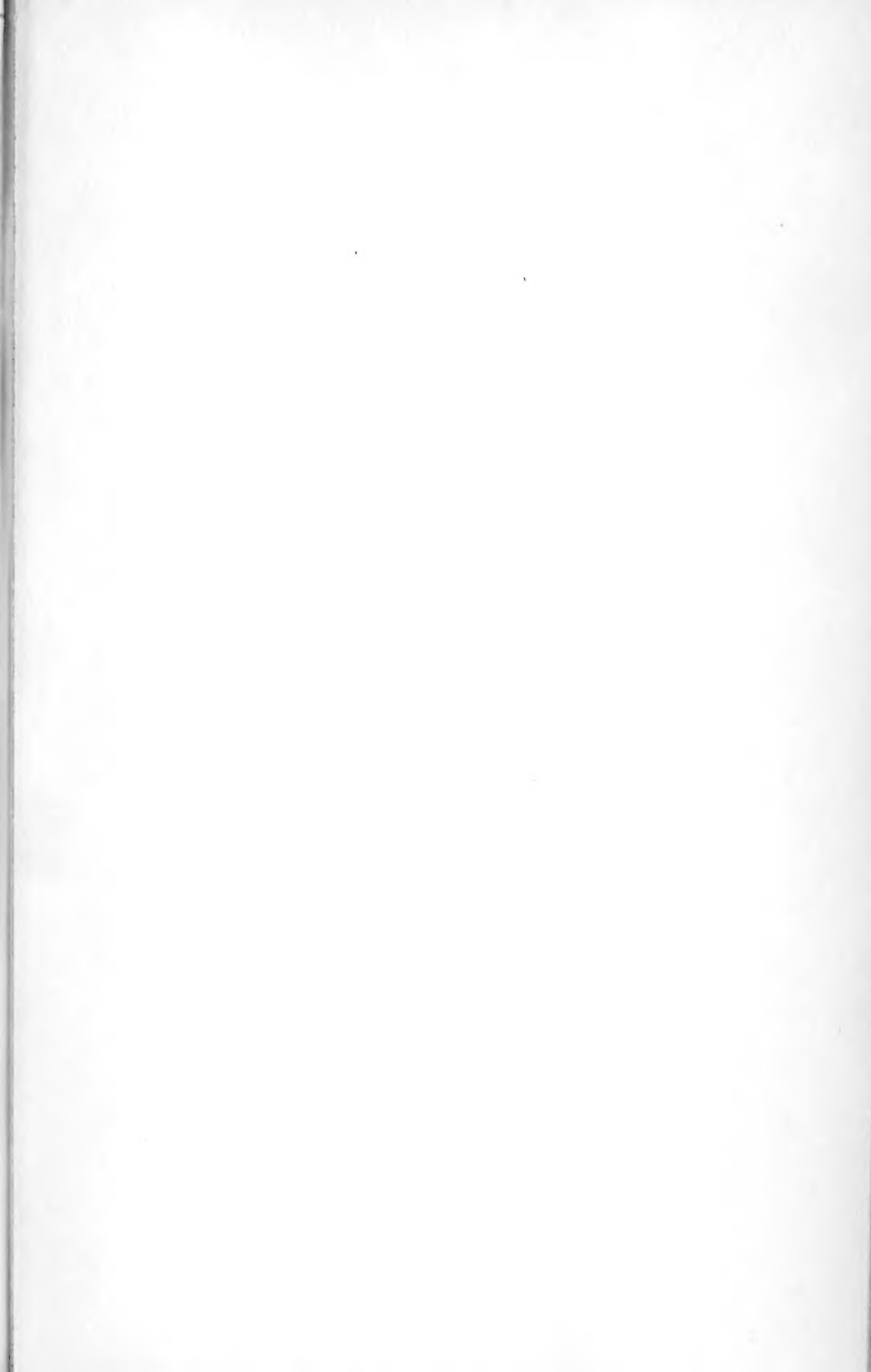


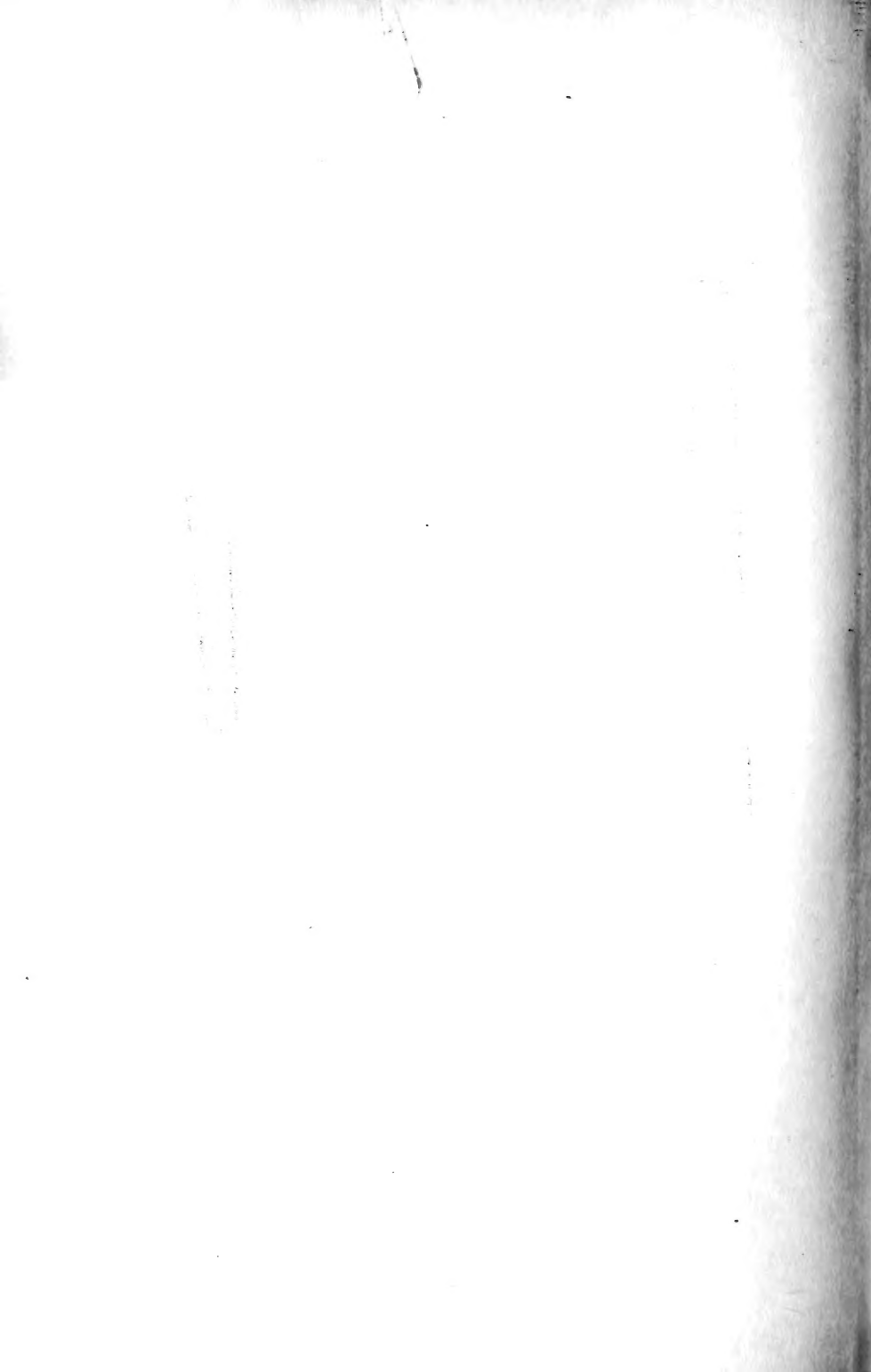












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